

02-Oct-04

Filter: None

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description	
Acrylic Resins	Horn, Milton B.	Reinhold Publishing Corp New York, N	©1960		91500	Adult Non-Fiction	668.423 Ho	vii, 184 p., illus., 20 cm.	
Acrylics & Epoxies	Coyard, H., P. Deligny and N. Tuck	John Wiley & Sons - SITA Chichester, [	©2001		0471978949	99422	Adult Non-Fiction	668.4 Co	ix, 365 p., illus., 24 cm.
ACS Style Guide: A Manual for Authors and Editors	Dodd, Janet S. (editor)	American Chemical Socie Washington, [	©1997		0841234620	100382	Adult Non-Fiction	808.066 Ac	xii, 460 p., illus., 24 cm.
Addition Polymers: Formation and Characterization	Smith, Derek A. (editor)	Plenum Press New York, N	[1968]			07919	Adult Non-Fiction	547.84 Sm	vii, 492 p., illus., 23 cm.
Additives for Coatings	Bieleman, Johan H. (editor)	Wiley - VCH Weinheim, G	©2000		3527297855	99408	Adult Non-Fiction	667.9 Ad	xviii, 372 p., illus., 25 cm.
Additives for Water-Based Coatings: The Proceedings of a Symposium Organized by the North West Region of the Industrial Division of the Royal Society of Chemistry	Karsa, David R. (editor)	Royal Society of Chemistr Cambridge, [	©1990		0851866077	07899	Adult Non-Fiction	667.9 Ad	viii, 283 p., illus., 21 cm.
Adhesion Aspects of Polymeric Coatings	Baghdachi, Jamil A.	Federation of Societies fo Philadelphia, [	©1996		0934010064	55947-2	Reference	667.9 Fe	34 p., illus., 28 cm.
Adhesion Aspects of Polymeric Coatings: Vol. 2	Symposium on Adhesion Aspects of Polymeric Coatings (2nd: 2000: Newark, NJ) Mittal, K. L. (editor)	VSP BV Utrecht, The	©2003		9067643777	106792	Adult Non-Fiction	677 Sy	viii, 213 p., illus., 25 cm.
Adhesion Measurement of Thin Films, Thick Films, and Bulk Coatings: ASTM Symposium Philadelphia, PA	Symposium on Adhesion Measurement of Thin Films, Thick Films, and Bulk Coatings (2-4 Nov. 1976)	American Society for Test Philadelphia, [	©1978		0464000025	13009	Adult Non-Fiction	667.9 Mi	402 p., illus., 24 cm.
Adhesion of Polymers	Veselovsky, R. A. (Roman Aleksandrovich) and Vladimir N.(Nikolaevich) Kestelman	McGraw-Hill Book Compa New York, N	©2002		0071370455	105686	Adult Non-Fiction	668 Ve	xi, 397 p., illus., 24 cm.
Adhesion Promotion Techniques: Technological Applications	Mittal, K. L. and A. Pizzi (editors)	Marcel Dekker, Inc. New York, N	©1999		0824702391	89759	Adult Non-Fiction	620.1 Ad	ix, 404 p., illus., 24 cm.
Adhesive Bonding: Techniques and Applications	Cagle, Charles V.	McGraw-Hill Book Compa New York, N	[1968]		0070095868	13018	Adult Non-Fiction	668.3 Ca	ix, 351 p., illus., 23 cm.
Adhesive Technology: Developments Since 1977	Torrey, S. (editor)	Noyes Data Corporation Park Ridge, [	©1980		0815507879	13023	Adult Non-Fiction	668.3 To	xii, 500 p., illus., 24 cm.
Adhesives Technology: Developments Since 1979	Gutcho, M. H. (Marcia Halpern), 1924- (editor)	Noyes Data Corporation Park Ridge, [	©1983		0815509219	00090	Adult Non-Fiction	668.302 Gu	xii, 452 p., illus., 24 cm.
Adhesives, Sealants and Coatings for the Electronics Industry	Flick, Ernest W.	Noyes Publications Park Ridge, [	©1986		0815510551	02814	Adult Non-Fiction	668.302 FI	xviii, 197 p., 24 cm.
Adhesives: Recent Developments	Herman, Bernard S.	Noyes Data Corporation Park Ridge, [	©1976		0815506139	13020	Adult Non-Fiction	668.3 He	x, 302 p., 25 cm.
Adsorption and Aggregation of Surfactants in Solution	Mittal, K. L. and Dinesh O. Shah (editors)	Marcel Dekker, Inc. New York, N	©2003		0824708431	111670	Adult Non-Fiction	541.3 In	xvii, 697 p., illus., 24 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Aerosols: Science and Technology	Shepherd, Herman R. (editor)	Interscience Publishers, Inc. - New York, N	[1961]	1124046038	43931	Adult Non-Fiction	541.345 Sh	xiv, 548 p., illus., 24 cm.
Aerospace and Aircraft Coatings	Chattopadhyay, Ashok K. and Mark R. Zentner	Federation of Societies for Applied Polymer Science - Philadelphia, Pa	©1990	0934010080	55947-1	Reference	667.9 Fe	32 p., illus., 28 cm.
Aging and Chemical Resistance	Bonten, Christian and Robert Berlich	Hanser Publishers / Hanser - Munich, Ger	©2001	1569903328	111729	Adult Non-Fiction	620.1 Bo	128 p., illus., charts, 14 cm.
Alkyds & Polyesters	Deligny, P. and N. Tuck	John Wiley & Sons - SITA - Chichester, UK	©2000	0471978957	99423	Adult Non-Fiction	660 De	xi, 204 p., illus., 24 cm.
Aluminum Paint and Powder	Edwards, Junius David, 1890- and Robert I. Wray	Reinhold Publishing Corp - New York, N	©1955	1124108874	13003	Adult Non-Fiction	667.69 Ed	viii, 219 p., illus., diagrams, 24 cm.
Analysis of Paints and Related Materials: Current Techniques for Solving Coatings Problems	Golton, William C. (editor)	American Society for Testing and Materials - Philadelphia, Pa	©1992	0803114656	49008	Adult Non-Fiction	667.6 An	vii, 203 p., illus., 24 cm.
Analytical Chemistry of Synthetic Colorants	Peters, A. T. and H. S. Freeman (editors)	Blackie Academic & Professional - London, UK	©1995	0751402087	50475	Adult Non-Fiction	547.86 An	xi, 212 p., illus., 24 cm.
Annual Book of ASTM Standards: Section 06 -- Paints, Related Coatings and Aromatics (Volumes 06.01-06.04)	American Society for Testing and Materials	American Society for Testing and Materials - Philadelphia, Pa	©2003	0803135424	57279	Reference	620.1 Am (Sec v.	illus., 28 cm.
Antifouling Marine Coatings	Williams, Alec	Noyes Data Corporation - Park Ridge, N	©1973	0815504640	34101	Adult Non-Fiction	667.9 Wi	ix, 271 p., illus., 25 cm.
Application of Paints and Coatings	Levinson, Sidney B.	Federation of Societies for Applied Polymer Science - Philadelphia, Pa	©1988	0934010099	55947-0	Reference	667.9 Fe	49 p., illus., 28 cm.
Applications of Synthetic Resin Latices [Vol. 1: Fundamental Chemistry of Latices and Applications in Adhesives]	Warson, Henry and C.A. Finch	John Wiley & Sons - Chichester, UK	©2001	0471952680	99428-1	Adult Non-Fiction	668.374 Wa v.	xxix, 700 p., illus., 24 cm.
Applications of Synthetic Resin Latices [Vol. 2: Latices in Surface Coatings: Emulsion Paints]	Warson, Henry and C.A. Finch	John Wiley & Sons - Chichester, UK	©2001	0471954616	99428-2	Adult Non-Fiction	668.374 Wa v.	xxiv, 447 p., illus., 24 cm.
Applied Polymer Science	Craver, J. Kenneth and Roy W. Tess (editors)	Organic Coatings and Plastics - Washington, D	©1975		43963	Adult Non-Fiction	547.84 Ap	xiii, 921 p., illus., 25 cm.
Art of Chemistry: Myths, Medicines, and Materials	Greenberg, Arthur	John Wiley & Sons - Hoboken, NJ	©2003	0471071803	104503	Adult Non-Fiction	540.9 Gr	xix, 357 p., [16] p. of plates: ill
Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing	Abraham, Herbert, 1883-	D. Van Nostrand Company - Princeton, NJ	[1960-6		44813	Adult Non-Fiction	553.27 Ab	5 v., illus., maps, diagrams, 2
ASTM Standards on Color and Appearance Measurement	American Society for Testing and Materials, Committee E-12 on Appearance	ASTM International - West Conshohocken, Pa	©2000	0803127359	105687	Reference	630.1 As	xxiii, 710 p., illus., 28 cm. + 1
ASTM Standards Related to Testing of Radiation-Cured Coatings	American Society for Testing and Materials	ASTM International - West Conshohocken, Pa	©2002	0803130449	105706	Reference	667 As	xv, 578 p., illus., 28 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Automotive Coatings	McBane, Bruce N.	Federation of Societies fo Philadelphia, ©1987		0934010110	55947-0	Reference	667.9 Fe	61 p., illus., 28 cm.
Billmeyer and Saltzman's Principles of Color Technology	Berns, Roy S.	John Wiley & Sons New York, N ©2000	3rd edition	047119459	99409	Adult Non-Fiction	667 Be	ix, 247 p., illus. (some color),
Biodegradability of Surfactants	Karsa, David R. and M. R. Porter (editors)	Blackie Academic & Profe London, UK / ©1995	1st edition	0751402060	50467	Adult Non-Fiction	668.1 Bi	xiii, 257 p., illus., 24 cm.
Biodegradation Techniques for Industrial Organic Wastes	DeRenzo, D. J. (editor)	Noyes Data Corporation Park Ridge, ©1980		081550800	15188	Adult Non-Fiction	628.54 Bi	x, 358 p., illus., 25 cm.
Cationic Radiation Curing	Koleske, Joseph V.	Federation of Societies fo Philadelphia, ©1991		0934010137	55947-1	Reference	667.9 Fe	27 p., illus., 28 cm.
Chemical and Process Technology Encyclopedia	Considine, Douglas Maxwell (editor-in-chief)	McGraw-Hill Book Compa New York, N [1974]		007012423	12954	Adult Non-Fiction	660 Co	xxix, 1261 p., illus., 24 cm.
Chemical Formulary: Collection of Commercial Formulas for Making Thousands of Products in Many Fields	Bennett, H. (Harry), 1895-1990 (editor-in-chief)	Chemical Publishing Com Brooklyn, NY 1933-		0820603635	09724	Reference	660.83 Ch	v. 23 cm.
Chemical Hazard Communication Guidebook: OSHA, EPA and DOT Requirements	Waldo, Andrew B. and Richard deC. Hinds	Executive Enterprises, Inc New York, N ©1991	2nd edition	1558407588	56535	Reference	363.17 Wa	583 p., illus., 28 cm.
Chemical Process Industries	Shreve, Randolph Norris, 1885-1975 and Joseph A. Brink	McGraw-Hill Book Compa New York, N ©1977	4th edition	0070571457	12955	Adult Non-Fiction	660.2 Sh	xiii, 814 p., illus., 25 cm.
Chemistry - vol. 1 Volume 1 of: "Polyurethanes: Chemistry and Technology"	Saunders, J. H. (James Henry), 1923- and K. C. Frisch	Interscience Publishers, I New York, N ©1962			13043	Adult Non-Fiction	668.423 Sa	xv, 368 p., illus., 24 cm.
Chemistry and Technology of UV & EB Formulations for Coatings, Inks and Paints [Vol. 1: UV & EB Curing Technology & Equipment]	Mehnert, R., A. Pincus, I. Janorsky, R. Stowe and A. Berejka	John Wiley & Sons Chichester, [©1998		0471978906	89747	Adult Non-Fiction	660 Ch	x, 291 p., illus., 24 cm.
Chemistry in the Utilization of Wood	Farmer, Robert Harvey	Pergamon Press, Ltd. Oxford, UK [1967]	[1st edition]	0080121373	14913	Adult Non-Fiction	674.134 Fa	viii, 193 p., illus., 20 cm.
Chemistry of Organic Film Formers	Solomon, D. H. (David Henry)	John Wiley & Sons (Krieg New York, N [1967]		0882751654	43971	Adult Non-Fiction	547.84 So	xi, 369 p., illus., 24 cm.
Chemistry of Synthetic Dyes and Pigments	Lubs, H. A. (Herbert August), 1891- (editor)	Hafner Publishing Compa New York, N [1965, ©			18530	Adult Non-Fiction	667.2 Lu	xiv, 734 p., illus., 24 cm.
Chemistry of Wood	Browning, B. L. (Bertie Lee), 1902- (editor)	Interscience Publishers, I New York, N ©1963			14912	Adult Non-Fiction	674.134 Br	x, 689 p., illus., 24 cm.
Classic Paints and Faux Finishes: How to Use Natural Materials and Authentic Techniques in Today's Decorating	Sloan, Annie, 1949- and Kate Gwynn	Reader's Digest Associati Pleasantville, ©1993		0895775239	23718	Adult Non-Fiction	745.7 Sl	160 p., illus. (some color), 28
Coating and Drying Defects: Troubleshooting Operating Problems	Gutoff, Edgar B. and Edward D. Cohen	John Wiley & Sons New York, N ©1995		0471598100	50465	Adult Non-Fiction	667 Gu	xvi, 287 p., illus., 27 cm.
Coating Film Defects	Pierce, Percy E. and Clifford K. Schoff	Federation of Societies fo Philadelphia, ©1994	Revised edition	0934010145	55947-0	Reference	667.9 Fe	25 p., illus., 28 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Coatings Encyclopedic Dictionary	LeSota, Stanley (editor)	Federation of Societies fo Philadelphia, ©1995		0934010048	65280	Reference	667.9 Co	1 v., xvi, 391 p., 24 cm.
Coatings of High-Temperature Materials	Hausner, Henry Herman, 1901- (editor)	Plenum Press New York, N ©1966		0306302101	13008	Adult Non-Fiction	667.9 Ha	ix, 296 p., illus., 26 cm.
Coatings of Polymers and Plastics	Ryntz, Rose Ann and Philip V. Yaneff (editors)	Marcel Dekker, Inc. New York, N ©2003		0824708946	111669	Adult Non-Fiction	668.4 Co	x, 359 p., illus., 24 cm.
Coatings Raw Materials - vol. 1 Volume 1 of: "Coatings Technology"	Fibiger, W. and A. C. Boyce (editors)	ITE Consultants Willowdale, O 1998	3rd edition		84296	Adult Non-Fiction	667.9 Co	various pagings, illus., diagra
Coatings Technology	Fibiger, W. and A. C. Boyce (editors)	ITE Consultants Willowdale, O 1998	3rd edition		84296	Adult Non-Fiction	667.9 Co	various pagings, illus., diagra
Coatings Technology	Fibiger, W. and A. C. Boyce (editors)	ITE Consultants Willowdale, O ©2002	5th edition, Revised		106361	Adult Non-Fiction	667.9 Co	3 v., illus., 28 cm.
Coatings Technology Annual: 1978	Gillies, M. T. (editor)	Noyes Data Corporation Park Ridge, ©1978	1st edition	0815507054	35194	Adult Non-Fiction	667.6 Co	xiv, 353 p., 24 cm.
Coatings Technology Handbook	Satas, Donatas and Arthur A. Tracton (editors)	Marcel Dekker, Inc. New York, N ©2001	2nd edition, Revised and expanded	0824704398	99418	Reference	667.9 Co	xvi, 902 p., illus., 26 cm.
Coil Coatings	Gaske, Joseph E.	Federation of Societies fo Philadelphia, ©1987		0934010153	55947-0	Reference	667.9 Fe	20 p., illus., 28 cm.
Colloid and Surface Properties of Clays and Related Minerals	Giese, Rossman F. and Carel J. van Oss (editors)	Marcel Dekker, Inc. New York, N ©2002		082479527	111668	Adult Non-Fiction	541.3 Gi	xvi, 295 p., illus., 24 cm.
Colloid-Polymer Interactions: From Fundamentals to Practice	Farinato, Raymond S. and Paul L. Dubin (editors)	John Wiley & Sons New York, N ©1999		0471243167	88634	Adult Non-Fiction	541.33 Fa	x, 417 p., illus., 25 cm.
Colloidal Dispersions: Suspensions, Emulsions, and Foams	Morrison, Ian Douglas and Sydney Ross	John Wiley & Sons New York, N ©2002		0471176257	105707	Adult Non-Fiction	541.3 Mo	xxvii, 616 p., illus., 25 cm.
Colloidal Domain: Where Physics, Chemistry, Biology and Technology Meet	Evans, D. Fennell and Hakan Wennerstrom	Wiley - VCH, Verlag Gmb New York, N ©1999	2nd edition	0471242470	88636	Adult Non-Fiction	541.345 Ev	xl, 632 p., illus., 26 cm.
Color and Appearance	Pierce, Percy E. and Robert T. Marcus	Federation of Societies fo Philadelphia, ©1994		093401017	55947-2	Reference	667.9 Fe	44 p., illus., 28 cm.
Color and Its Reproduction	Field, Gary G.	GATF Press Pittsburgh, P ©1999	2nd edition	0883622017	89745	Adult Non-Fiction	535.6 Fi	475 p., illus. (some color), 27
Color for Science, Art and Technology	Nassau, Kurt (editor)	Elsevier Amsterdam, ©1998		0444898468	99410	Reference	535.6 Co	xvii, 491 p., illus. (some color),
Color Science: Concepts and Methods, Quantitative Data and Formulae	Wyszecki, Gunter and W. S. (Walter Stanley) Stiles	John Wiley & Sons New York, N ©1982	2nd edition	0471021067	00296	Adult Non-Fiction	535.6 Wy	xv, 950 p., illus., 27 cm.
Color: A Multidisciplinary Approach	Zollinger, Heinrich, 1919-	Verlag Helvetica Chimica Zurich, Switz ©1999		3906390187	89746	Adult Non-Fiction	535 Zo	x, 258 p., illus. (some color), 2

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Colour Index	Society of Dyers and Colourists	Society of Dyers and Color Bradford, [Yo	©1956	2nd edition	08254	Reference	667.2 So	xxviii, 809 p., 29 cm. (Include
Complete Guide to Painting Your Home: Doing It the Way a Professional Does, Inside and Out	Luts, Jack, 1918- and Pete Peterson	Betterway Publications, In White Hall, V	©1989		1558701192 21208	Adult Non-Fiction	698.1 Lu	160 p., illus., 28 cm.
Comprehensive Guide to the Hazardous Properties of Chemical Substances	Patnaik, Pradyot	John Wiley & Sons New York, N	©1999	2nd edition	0471291757 89749	Adult Non-Fiction	615.9 Pa	xxiii, 984 p., illus., 26 cm.
Copyright Handbook: How to Protect and Use Written Works	Fishman, Stephen	Nolo Press Berkeley, CA	©2002	6th edition	0873378555 54747	Reference	346.73 Co 200	[various pagings], illus., 28 cm
Corrosion	Shreir, L. L., R. A. Jarman and G. T. Burstein (editors)	Butterworth-Heinemann, Oxford, UK	1994	3rd edition	0750610778 49681	Reference	620.1 Co	xxv, various paging (approx. 3
Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering	Uhlig, Herbert Henry, 1907-	John Wiley & Sons New York, N	©1985	3rd edition	0471078182 07945	Adult Non-Fiction	620.1 Uh	xiv, 441 p., illus., 24 cm.
Corrosion Control - vol. 2 Volume 2 of: "Corrosion"	Shreir, L. L., R. A. Jarman and G. T. Burstein (editors)	Butterworth-Heinemann, Oxford, UK	1994	3rd edition	0750610778 49681	Reference	620.1 Co	xxv, various paging (approx. 3
Corrosion Engineering	Fontana, Mars Guy, 1910- and Norbert D. Greene	McGraw-Hill Book Compa New York, N	[1967]		0070214603 14747	Adult Non-Fiction	620.1122 Fo	391 p., illus., 23 cm.
Corrosion Inhibitors: Developments Since 1980	Collie, M. J. (editor)	Noyes Data Corporation Park Ridge, ©1983			081550957 00750	Adult Non-Fiction	620.1 Co	xii, 379 p., illus., 24 cm.
Corrosion Inhibitors: Recent Developments	Robinson, J. S., 1936-	Noyes Data Corporation Park Ridge, ©1979			0815507577 14752	Adult Non-Fiction	620.112 Ro	xiii, 306 p., illus., 25 cm.
Corrosion Prevention by Protective Coatings	Munger, Charles G.	National Association of C Houston, TX ©1984			0915567040 04800	Adult Non-Fiction	620.1122 Mu	512 p. [8] pages of plates, illu
Corrosion Protection By Coatings	Wicks, Zeno W., Jr.	Federation of Societies fo Philadelphia, ©1987			0934010188 55947-0	Reference	667.9 Fe	22 p., illus., 28 cm.
Corrosion-Resistant Linings and Coatings	Schweitzer, Philip A.	Marcel Dekker, Inc. New York, N	©2001		0824705548 99411	Adult Non-Fiction	620.1 Sc	vi, 427 p., illus., 24 cm.
Design and Analysis of Experiments	Montgomery, Douglas C.	John Wiley & Sons New York, N	©2001	5th edition	0471316490 105708	Adult Non-Fiction	001.4 Mo	xii, 684 p., illus., 26 cm.
Designing Safer Polymers	Anastas, Paul T., Paul H. Bickart and Mary M. Kirchhoff	Wiley - Interscience Publi New York, N	[2000]		0471397334 104502	Adult Non-Fiction	668.9 An	x, 116 p., illus., 24 cm.
Development and Use of Polyester Products	Doyle, E. N.	McGraw-Hill Book Compa New York, N	[1969]		1125256915 31421	Adult Non-Fiction	668.422 Do	x, 371 p., illus., 23 cm.
Dictionary of Colloid and Interface Science	Schramm, Laurier Lincoln	John Wiley & Sons New York, N	©2001	2nd edition	0471394068 99412	Reference	541.3 Di	x, 218 p., 25 cm.
Electrodeposition and Radiation Curing of Coatings, 1970	Ranney, Maurice William, 1934-	Noyes Data Corporation Park Ridge, ©1970			0815501348 35843	Reference	671.732 Ra	170 p., illus., 27 cm.
Electrofinishing	Brimi, Marjorie A. and James R. Luck	American Elsevier Publish New York, N	©1965		14899	Adult Non-Fiction	671.732 Br	v, 282 p., 24 cm.
Elements of Color: A Treatise on the Color System of Johannes Itten Based on His Book "The Art of Color"	Itten, Johannes, 1888-1967 (Faber Birren, editor)	Van Nostrand Reinhold C New York, N	[1970]		0442240384 89726	Adult Non-Fiction	701.8 It	96 p., illus. (part color) portrait

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Emulsification and Polymerization of Alkyd Resins	Gooch, Jan W. (Jan Woodall), 1946-	Kluwer Academic / Plenu New York, N	©2002	0306467178	105709	Adult Non-Fiction	668 Go	xxii, 223 p., illus., 24 cm.
Emulsion and Water-Soluble Paints and Coatings	Martens, Charles R.	Reinhold Publishing Corp New York, N	[1964]	0442155581	13002	Adult Non-Fiction	667.63 Ma	viii, 160 p., illus., 24 cm.
Encyclopedia of Basic Materials for Plastics	Simonds, Herbert R. (Herbert Rumsey), 1887- and James M. Church (editors)	Reinhold Publishing Corp New York, N	[1967]	0442155948	16492	Reference	668.4 Si	viii, 500 p., illus., 27 cm.
Epoxy Resin Technology: Developments Since 1979	DiStasio, J. I. (editor)	Noyes Data Corporation Park Ridge,	©1982	0815508883	02315	Adult Non-Fiction	668.374 Ep	xii, 366 p., illus., 25 cm.
Epoxy Resins: Chemistry and Technology	May, Clayton A. and Yoshio Tanaka (editors)	Marcel Dekker, Inc. New York, N	©1973	0824714466	49233	Adult Non-Fiction	668.374 Ma	xii, 801 p., illus., 26 cm.
European Coatings Handbook	Brock, Thomas, Michael Groteklaes and Peter Mischke	Vincentz-Verlag Hannover, G	©2000	387870559	100380	Adult Non-Fiction	667.9 Br	410 p., illus., 27 cm.
Expanded Plastics and Related Products: Developments Since 1978	Meltzer, Yale L.	Noyes Data Corporation Park Ridge,	©1983	0815509553	00747	Adult Non-Fiction	668.4 Me	x, 262 p., illus., 25 cm.
Experimental Methods in Polymer Science: Modern Methods in Polymer Research and Technology	Tanaka, Toyochi (editor)	Academic Press San Diego, C	©2000	012683265	89756	Adult Non-Fiction	547.7 Ex	xii, 604 p., illus., 24 cm.
Exposure Studies of Organic Pigments in Paint Systems	Vesce, Vincent C.	Allied Chemical Company New York, N	©1959		12999	Adult Non-Fiction	667.623 Ve	143 p., illus., plates, tables, 23
Exterior Water-Based Trade Paint Formulations	Flick, Ernest W.	Noyes Data Corporation Park Ridge,	©1980	0815508204	64075	Adult Non-Fiction	667.63 Fl	xvi, 349 p., 24 cm.
Failure Analysis of Paints and Coatings	Weldon, Dwight G.	John Wiley & Sons Chichester, [	©2001	0471490725	99413	Adult Non-Fiction	667.6 We	xii, 285 p., illus., 24 cm.
Fifty-Five Colorful Years: The Story of Paint in America	Trigg, Ernest T., b. 1877.	Pequot Press Stonington, C	[1954]		12994	Adult Non-Fiction	667.6 Tr	xvi, 307 p., illus., portraits., 22
Film Formation	Wicks, Zeno W., Jr.	Federation of Societies fo Philadelphia,	©1986	0934010196	55947-0	Reference	667.9 Fe	19 p., illus., 28 cm.
Film Formation in Coatings: Mechanisms, Properties, and Morphology	Provdor, Theodore, 1939- and Marek W. Urban, 1953- (editors)	American Chemical Socie Washington,	©2001	0841237123	105710	Adult Non-Fiction	667 Fi	viii, 304 p., illus., 24 cm.
Finishes for Exterior Wood: Selection, Application and Maintenance	Williams, R. Sam, Mark T. Knaebe and William C. Feist	Forest Products Society Madison, WI	©1996	0935018832	106363	Adult Non-Fiction	698.12 Wi	127 p., illus. (some color), 28
Finishing Exterior Wood	Feist, William C.	Federation of Societies fo Philadelphia,	©1996	0934010218	55947-2	Reference	667.9 Fe	44 p., illus., 28 cm.
Fire Retardant Building Products and Coatings, 1970	Ranney, Maurice William, 1934-	Noyes Data Corporation Park Ridge,	©1970	0815503121	16503	Reference	691 Ra	186 p., illus., 28 cm.
Flame Retardant Coatings and Building Materials	Williams, Alec	Noyes Data Corporation Park Ridge,	©1974	081550523	34102	Adult Non-Fiction	667.9 Wi	x, 310 p., illus., 25 cm.
Formulation - vol. 2 Volume 2 of: "Polymer Blends"	Paul, D. R. and C. B. Bucknall (editors)	John Wiley & Sons New York, N	©2000	0471352799	89757	Adult Non-Fiction	668.9 Po	xiv, 600 p., illus., 25 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Free Radical Radiation Curing	Koleske, Joseph V.	Federation of Societies fo Philadelphia, ©1997	Revised edition	0934010226	55947-3	Reference	667.9 Fe	29 p., illus., 28 cm.
Fundamental Principles of Polymeric Materials	Rosen, Stephen L., 1937-	John Wiley & Sons New York, N ©1982		0471087041	13052	Adult Non-Fiction	668.9 Ro	xvi, 346 p., illus., 24 cm.
Fundamentals of Aerosol Science	Shaw, David T. (editor)	John Wiley & Sons New York, N ©1978		0471029491	00014	Adult Non-Fiction	541.345 Fu	ix, 372 p., illus., 24 cm.
Fundamentals of Paint, Varnish and Lacquer Technology	Singer, Elias	American Paint Journal C St. Louis, MO [©1957]			34098	Adult Non-Fiction	667.6 Si	330 p., 21 cm.
Getting Permission: How to License and Clear Copyrighted Materials Online and Off	Stim, Richard	Nolo Press Berkeley, CA ©2001	1st edition	087337536	105689	Adult Non-Fiction	346.730 St	[various pagings], illus., forms,
Getting Rid of Graffiti: A Practical Guide to Graffiti Removal and Anti-Graffiti Protection	Whitford, M. J. (Maurice J)	E & FN Spon (Chapman London, UK ©1992	1st edition	0442314906	31811	Adult Non-Fiction	667 Wh	xvi, 160 p., [16] p. of plates (s
Glossary of Color Terms	Inter-Society Color Council Committee, Federation of Societies for Coatings Technology	Federation of Societies fo Philadelphia, ©1981			44466	Reference	535.6 Gl	vii, 87 p., 23 cm.
Guide to Solvent Waste Reduction Alternatives: Final Report		ICF Consulting Associate Los Angeles, [1986]			41634	Adult Non-Fiction	363.728 Gu	272 p. in various pagings, 28
Handbook of Adhesive Raw Materials	Flick, Ernest W.	Noyes Publications Park Ridge, ©1982		0815508972	33820	Adult Non-Fiction	668.411 Fl	xxx, 303 p., 24 cm.
Handbook of Adhesives	Skeist, Irving (editor)	Van Nostrand Reinhold C New York, N ©1977	2nd edition	0442276346	13021	Adult Non-Fiction	668.3 Sk	xviii, 921 p., illus., 27 cm.
Handbook of Analytical Toxicology	Sunshine, Irving (editor)	CRC (Chemical Rubber C Cleveland, O [1969]	1st edition	0849335515	44570	Reference	547.33 Ha	xiv, 1081 p., illus., 28 cm.
Handbook of Emergency Response to Toxic Chemical Releases: A Guide to Compliance	Cheremisinoff, Nicholas P.	Noyes Publications Park Ridge, ©1995		0815513658	50457	Adult Non-Fiction	363.17 Ch	x, 315 p., illus., 28 cm.
Handbook of Fillers and Reinforcements for Plastics	Katz, Harry S. and John V. Milewski (editors)	Van Nostrand Reinhold C New York, N ©1978		0442253729	13025	Adult Non-Fiction	668.4 Ha	viii, 652 p., illus., 26 cm.
Handbook of Fire Retardant Coatings and Fire Testing Services		Technomic Publishing Co Lancaster, P ©1990		0877626901	21899	Reference	667.69 Ha	v, 255 p., illus., 29 cm.
Handbook of Industrial Surfactants	Ash, Michael and Irene Ash (compilers)	Synapse Information Res Endicott, NY ©2000	3rd edition	1890595217	101997	Reference	620 As	xiii, 2129 p., 28 cm.
Handbook of Organic Coatings: A Comprehensive Guide for the Coatings Industry	Seymour, Raymond Benedict, 1912- and Herman F. Mark	Elsevier Science Publishi New York, N ©1990		0444015191	23956	Adult Non-Fiction	667.92 Se	ix, 350 p., illus., 24 cm.
Handbook of Paint and Coating Raw Materials	Ash, Michael and Irene Ash (editors)	Gower Publishing Limited Aldershot, [H ©1996		0566077876	100255	Reference	667.9 Ha	(v.1: xvi, 1000 p.); (v.2: xvi, 58
Handbook of Paint Raw Materials	Flick, Ernest W.	Noyes Publications Park Ridge, ©1989	2nd edition	0815511841	07912	Adult Non-Fiction	667.6 Fl	xxvii, 998 p., 25 cm.
Handbook of Plastics, Elastomers and Composites	Harper, Charles A. (editor-in-chief)	McGraw-Hill Book Compa New York, N ©2002	4th edition	0071384766	105711	Adult Non-Fiction	668.4 Ha	xii, 884 p., illus., 24 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description	
Handbook of Polymer Testing: Physical Methods	Brown, Roger P. (editor)	Marcel Dekker, Inc. New York, N	©1999	0824701712	89755	Adult Non-Fiction	620.13 Ha	x, 845 p., illus., 26 cm.	
Handbook of Pressure-Sensitive Adhesive Technology	Satas, Donatas (editor)	Van Nostrand Reinhold C New York, N	©1982	0442257244	00015	Adult Non-Fiction	668.3 Ha	xvi, 620 p., illus., 24 cm.	
Handbook of Solvents	Wypych, George (editor)	ChemTec Publishing Toronto, Can	©2001	1895198240	99414	Reference	660 Ha	xxix, 1675 p., illus., 24 cm.	
Hansen Solubility Parameters: A User's Handbook	Hansen, Charles M.	CRC (Chemical Rubber C Boca Raton,	©2000	0849315255	89761	Adult Non-Fiction	547.7 Ha	208 p., illus., 26 cm.	
Hazardous and Toxic Materials: Safe Handling and Disposal	Fawcett, Howard H.	John Wiley & Sons New York, N	©1984	0471804835	02760	Adult Non-Fiction	615.902 Fa	xi, 296 p., illus., 24 cm.	
Hazardous Chemicals Desk Reference	Lewis, Richard J., Sr. (editor)	John Wiley & Sons New York, N	©2002	0471441651	105718	Reference	604.7 Le	xx, 1695 p., 26 cm.	
Hazardous Materials Transport Guide	BNA (Bureau of National Affairs) Staff	Bureau of National Affairs Washington,	©1984	0871794624	30113	Adult Non-Fiction	344.73 Ha	x, 366 p., 23 cm.	
High Performance Pigments	Smith, Hugh MacDonald (editor)	Wiley - VCH Weinheim, G	©2002	3527302042	99417	Adult Non-Fiction	667.29 Hi	xv, 435 p., illus. (some color),	
Historical Review and Natural Raw Materials - vol. 1 Volume 1 of: "Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing"	Abraham, Herbert, 1883-	D. Van Nostrand Compan Princeton, NJ	[1960-6		6th edition	44813	Adult Non-Fiction	553.27 Ab	5 v., illus., maps, diagrams, 2
Hot Melt Adhesives	Bateman, D. L.	Noyes Data Corporation Park Ridge,	©1978	0815507046	13017	Adult Non-Fiction	668.3 Ba	xiv, 494 p., illus., 25 cm.	
Household, Automotive and Industrial Chemical Formulations	Flick, Ernest W.	Noyes Publications Park Ridge,	©1984	0815509707	01020	Reference	660.272 Fl	xxii, 360 p., 25 cm.	
How to Make Patent Drawings Yourself	Lo, Jack and David Pressman	Nolo Press Berkeley, CA	©1999	0873374916	89754	Adult Non-Fiction	608.022 Lo	1 v. (various pagings) illus., 2	
Hydrophile-Lipophile Balance of Surfactants and Solid Particles: Physicochemical Aspects and Applications	Kruglyakov, Pyotr M. (Maksimovich)	Elsevier Science B.V. Amsterdam,	©2000	0444502572	105712	Adult Non-Fiction	541.3 Kr	xii, 391 p., illus., 25 cm.	
Industrial Coatings - vol. 3 Volume 3 of: "Coatings Technology"	Fibiger, W. and A. C. Boyce (editors)	ITE Consultants Willowdale, O	1998		3rd edition	84296	Adult Non-Fiction	667.9 Co	various pagings, illus., diagra
Industrial Coatings: Properties, Applications Quality and Environmental Compliance	ASM/ESD Advanced Coatings Technology Conference (2-5 Nov 1992)	ASM International Materials Par	©1992	0871704617	49546	Adult Non-Fiction	667.9 In	vi, 170 p., illus., 29 cm.	
Industrial Detergency	Niven, William W.	Reinhold Publishing Corp New York, N	[1955]			34103	Adult Non-Fiction	668.1 Ni	340 p., illus., 24 cm.
Industrial Inorganic Pigments	Buxbaum, Gunter (editor)	Wiley - VCH, Verlag Gmb New York, N	©1998	3527288783	73389	Reference	667.29 In	xiii, 289 p., illus. (some color),	
Industrial Organic Pigments: Production, Properties, Applications	Herbst, Willy and Klaus Hunger	VCH, Verlagsgesellschaft Weinheim, G	©1997	3527288368	73390	Reference	667.29 He	xvi, 652 p., illus. (some color),	

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Industrial Organic Pigments: Production, Properties, Applications	Herbst, Willy and Klaus Hunger	Wiley - VCH, Verlag Gmb Weinheim, G ©2004	3rd edition, Completely revised	3527305769	111667	Adult Non-Fiction	667 He	xviii, 660 p., illus. (some color)
Industrial Painting: Principles and Practices	Roobol, Norman R.	Hanser Gardner Publicati Cincinnati, O ©1997	2nd edition	1569902151	78748	Adult Non-Fiction	667 Ro	xii, 340 p., illus., 26 cm.
Industrial Plastics: Theory and Applications	Lokensgard, Erik	Thomson Delmar Learnin Albany, NY ©2004	4th edition	1401804691	111666	Adult Non-Fiction	668.4 Ri	xvii, 528 p., illus., 28 cm.
Industrial Raw Materials - vol. 2 Volume 2 of: "Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing"	Abraham, Herbert, 1883-	D. Van Nostrand Compan Princeton, NJ [1960-6	6th edition		44813	Adult Non-Fiction	553.27 Ab	5 v., illus., maps, diagrams, 2
Industrial Water-Based Paint Formulations	Flick, Ernest W.	Noyes Publications Park Ridge, ©1988		0815511469	64073	Adult Non-Fiction	667.63 Fl	xvi, 277 p., 25 cm.
Infrared Absorption Spectroscopy	Nakanishi, Koji, 1925- and Philippa H. Solomon	Holden-Day, Inc. San Francisc ©1977	2nd edition	0816262519	44141	Adult Non-Fiction	535.842 Na	x, 287 p., illus., 26 cm.
Infrared Spectroscopy Atlas for the Coatings Industry	Chicago Society for Coatings Technology (Infrared Spectroscopy Committee)	Federation of Societies fo Philadelphia, ©1980		0934010005	02019	Adult Non-Fiction	667.9 Ch	xi, 896 p., illus., 29 cm.
Infrared Spectroscopy Atlas for the Coatings Industry	Chicago Society for Coatings Technology (Infrared Spectroscopy Atlas Working Committee)	Federation of Societies fo Philadelphia, ©1991	4th edition	093401003	100378	Adult Non-Fiction	667.9 In	Vol 1: vi, pp. 1-510, illus., 29 c
Infrared Spectroscopy: Its Use in the Coatings Industry	Chicago Society for Paint Technology (Infrared Spectroscopy Committee)	Federation of Societies fo Philadelphia, ©1969			44140	Adult Non-Fiction	535.842 Ch	x, 456 p. chiefly graphs, 29 c
Inorganic Pigments: Manufacturing Processes	Gutcho, M. H. (Marcia Halpern), 1924- (editor)	Noyes Data Corporation Park Ridge, ©1980		0815508115	12984	Adult Non-Fiction	667.29 In	xvi, 488 p., illus., 25 cm.
Inorganic Primer Pigments	Smith, Alan	Federation of Societies fo Philadelphia, ©1988		0934010234	55947-1	Reference	667.9 Fe	26 p., illus., 28 cm.
Inside the Technical Consulting Business: Launching and Building Your Independent Practice	Kaye, Harvey	John Wiley & Sons New York, N ©1998	3rd edition	0471183415	105713	Adult Non-Fiction	620 Ka	xvii, 366 p., illus., 24 cm.
Interfacial Forces and Fields: Theory and Applications	Jyh-Ping, Hsu (editor)	Marcel Dekker, Inc. New York, N ©1999		0824719646	89750	Adult Non-Fiction	541.33 In	xi, 671 p., illus., 24 cm.
Interior Water-Based Trade Paint Formulations	Flick, Ernest W.	Noyes Data Corporation Park Ridge, ©1980		0815508034	13000	Adult Non-Fiction	667.63 Fl	xvii, 364 p., 25 cm.
Introduction to Coatings Technology	Brandau, Alan H.	Federation of Societies fo Philadelphia, ©1990		0934010242	55947-1	Reference	667.9 Fe	46 p., illus., 28 cm.
Introduction to Paint Chemistry and Principles of Paint Technology	Turner, G. P. A. (Gerald Patrick Anthony)	Chapman and Hall New York, N ©1980	2nd edition	041216180	12996	Adult Non-Fiction	667.6 Tu	229 p., illus., 23 cm.
Introduction to Pigments	Braun, Juergen H.	Federation of Societies fo Philadelphia, ©1993		0934010269	55947-1	Reference	667.9 Fe	34 p., illus., 28 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Introduction to Polymers and Resins	Prane, Joseph W.	Federation of Societies fo Philadelphia, ©1986		0934010285	55947-0	Reference	667.9 Fe	35 p., illus., 28 cm.
Kirk-Othmer Encyclopedia of Chemical Technology	Grayson, Martin (executive editor)	Wiley - Interscience Publi New York, N ©1984,	3rd edition	0471041548	16482	Reference	660.3 En 1984	24 v., illus., diagrams., 27 cm.
LASCT Bibliography 2004	City of Commerce (California) Public Library	City of Commerce Public City of Comm 2004	Novembe r 2004		58625	Reference	016.5 Ci 2004	854 p., 28 cm.
License Your Invention	Stim, Richard	Nolo Press Berkeley, CA ©2002	3rd edition	0873378571	105688	Adult Non-Fiction	346.730 St	[Various pagings], illus., forms
Macromolecular Symposia: Quo Vadis -- Coatings?	Meisel, I. (editor)	Wiley - VCH, Verlag Gmb Weinheim, G ©2002		3527304770	105719	Adult Non-Fiction	547.7 Ma	958 p., illus., 24 cm.
Manufactured Products - vol. 3 Volume 3 of: "Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing"	Abraham, Herbert, 1883-	D. Van Nostrand Compan Princeton, NJ [1960-6	6th edition		44813	Adult Non-Fiction	553.27 Ab	5 v., illus., maps, diagrams, 2
Marine Coatings	Bleile, Henry R. and Stephen Rodgers	Federation of Societies fo Philadelphia, ©1989		0934010293	55947-1	Reference	667.9 Fe	28 p., illus., 28 cm.
Materials Science of Polymers for Engineers	Osswald, Tim A. and Georg Menges	Hanser Gardner Publicati Cincinnati, O ©2003	2nd edition	1569903484	111665	Adult Non-Fiction	620.1 Os	xviii, 622 p., illus., 23 cm.
McCutcheon's Volume 1: Emulsifiers & Detergents		McCutcheon's Division, M Glen Rock, N ©2004	North American edition	094425473	92041	Reference	668.108 Mc	v.; 28 cm.
McCutcheon's Volume 2: Functional Materials		McCutcheon's Division, M Glen Rock, N ©2004	North American edition	0944254977	2528	Reference	668.108 Mc	v.; 28 cm.
Measurement of Colour	Wright, W. D. (William David), 1906-	D. Van Nostrand Compan Princeton, NJ [1964]	3rd edition		44136	Adult Non-Fiction	535.6 Wr	x, 291 p., illus. (part color), 22
Measuring Colour	Hunt, R. W. G. (Robert William Gainer), 1923-	Ellis Horwood, Ltd.; John Chichester, [©1987		0745801250	06130	Adult Non-Fiction	535.6 Hu	221 p., [8] p. of plates, illus. (
Mechanical Properties of Coatings	Hill, Loren W.	Federation of Societies fo Philadelphia, ©1987		0934010315	55947-0	Reference	667.9 Fe	25 p., illus., 28 cm.
Mechanical Properties of Polymers	Nielsen, Lawrence E.	Van Nostrand Reinhold C New York, N ©1962			43968	Adult Non-Fiction	547.84 Ni	ix, 274 p., illus., 24 cm.
Metal / Environment Reactions - vol. 1 Volume 1 of: "Corrosion"	Shreir, L. L., R. A. Jarman and G. T. Burstein (editors)	Butterworth-Heinemann, Oxford, UK 1994	3rd edition	0750610778	49681	Reference	620.1 Co	xxv, various paging (approx. 3
Metal Cleaning	Spring, S. (Samuel), 1916-	Reinhold Publishing Corp New York, N [1963]			29240	Adult Non-Fiction	671.7 Sp	234 p., illus., 24 cm.
Metal Surface Characteristics Affecting Organic Coatings	Perfetti, Bruno M.	Federation of Societies fo Philadelphia, ©1994		0934010323	55947-2	Reference	667.9 Fe	70 p., illus., 28 cm.
Methodologies for Predicting the Service Lives of Coating Systems	Martin, Jonathan W., Sam C.Saunders, F. Louis Floyd and John P. Wineburg	Federation of Societies fo Philadelphia, ©1996		0934010331	55947-2	Reference	667.9 Fe	34 p., illus., 28 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Methods of Testing: Fabricated Bituminous Products - vol. 5 Volume 5 of: "Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing"	Abraham, Herbert, 1883-	D. Van Nostrand Compan Princeton, NJ	[1960-6 6th edition		44813	Adult Non-Fiction	553.27 Ab	5 v., illus., maps, diagrams, 2
Methods of Testing: Industrial Raw Bituminous Materials - vol. 4 Volume 4 of: "Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing"	Abraham, Herbert, 1883-	D. Van Nostrand Compan Princeton, NJ	[1960-6 6th edition		44813	Adult Non-Fiction	553.27 Ab	5 v., illus., maps, diagrams, 2
Microstructure and Microtribology of Polymer Surfaces	Tsukruk, Vladimir V. and Kathryn J. Wahl (editors)	American Chemical Socie Washington,	©2000	0841236828	89758	Adult Non-Fiction	547.7 Mi	xiv, 526 p., illus., 24 cm.
Modern Electroplating	Lowenheim, Frederick A. (editor)	John Wiley & Sons New York, N	[©1963] 2nd edition		14902	Adult Non-Fiction	671.732 El	xvi, 769 p., illus., diagrams, ta
Modern Styrenic Polymers: Polystyrenes and Styrenic Copolymers	Scheirs, John and Duane B. Priddy (editors)	John Wiley & Sons, Ltd. Chichester, [	©2003	0471497525	111664	Adult Non-Fiction	668.4 Mo	xxxi, 757 p., illus., 24 cm.
Molecular Adhesion and Its Applications: The Sticky Universe	Kendall, Kevin	Kluwer Academic / Plenu New York, N	©2001	0306465205	111663	Adult Non-Fiction	541.3 Ke	xix, 429 p., illus., 24 cm.
Natural Pigments	Bentley, K. W. (Kenneth Walter)	Interscience Publishers, I New York, N	©1960		12997	Adult Non-Fiction	667.623 Be	vii, 306 p., 24 cm.
Natural Resins Handbook	Mantell, C. L. (editor)	American Gum Importers' Brooklyn, NY	[©1939]		44587	Reference	553.29 Na	96 p. (incl. tables, diagrams),
New Concepts for Coating Protection of Steel Structures: ASTM Symposium, Lake Buena Vista, FL	Symposium on Paint and Related Coatings and Materials and Steel Structures	American Society for Test Philadelphia,	©1984	0484100014	01990	Adult Non-Fiction	667.9 Ne	135 p., illus., 23 cm.
New Product Development: From Initial Idea to Product Management	Annacchino, Marc A.	Elsevier / Butterworth-Hei Amsterdam,	©2003	0750677325	111662	Adult Non-Fiction	658.5 An	xxxi, 567 p., illus., 24 cm. + C
Novel Surfactants: Preparation, Applications, and Biodegradability	Holmberg, I. Krister (editor)	Marcel Dekker, Inc. New York, N	©2003 2nd edition, Revised and expanded	0824743008	111661	Adult Non-Fiction	668 No	643 p., illus., 24 cm.
Organic Coating Technology: Pigments and Pigmented Coatings	Payne, Henry Fleming	John Wiley & Sons New York, N	©1961		34097	Adult Non-Fiction	667.6 Pa v.2	viii, pp. 675-1399, illus., 24 cm
Organic Coatings for Corrosion Control	Bierwagen, Gordon P. (editor)	American Chemical Socie Washington,	©1998	084123549	73388	Reference	620.1 Or	xiii, 448 p., illus. (some color),
Organic Coatings: Science and Technology	Wicks, Zeno W., Jr.	Wiley - Interscience Publi New York, N	©1999 2nd edition	0471245070	78749	Adult Non-Fiction	667 Wi	xxi, 630 p., illus., 26 cm.
Organic Pigments	Lewis, Peter A.	Federation of Societies fo Philadelphia,	©1995 2nd edition	0934010358	55947-1	Reference	667.9 Fe	43 p., illus., 28 cm.
Organophosphorus Monomers and Polymers	Gefter, Eugenii Leonidovich	Pergamon Press, Ltd. Oxford, UK /	©1962 Authoriz d edition		43965	Adult Non-Fiction	547.84 Ge	vii, 302 p., illus., 26 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Outlines of Paint Technology	Morgans, W. M. (Wilfred Morley), 1907-	Halstead Press New York, N ©1990	3rd edition	0470216549	07925	Adult Non-Fiction	667.62 Mo	xv, 503 p., illus., 24 cm.
Paint and Coating Testing Manual	Koleske, Joseph V. (editor)	American Society for Test Philadelphia, ©1995	14th edition	0803120605	100254	Adult Non-Fiction	667.6 Pa	xvii, 925 p., illus., 29 cm.
Paint and Surface Coatings: Theory and Practice	Lambourne, R. and T. A. Strivens (editors)	William Andrew Publishin Norwich, NY ©1999	2nd edition	1884207731	89751	Adult Non-Fiction	667.6 Pa	xii, 784 p., illus., 25 cm.
Paint Film Defects: Their Causes and Cure	Hess, Manfred (editor)	Reinhold Publishing Corp New York, N ©1965	2nd edition		25331	Adult Non-Fiction	667.6 He	xvi, 604 p., illus., 60 plates, ta
Paint Film Degradation: Mechanisms and Control	Hare, Clive H., 1941-	SSPC: The Society for Pr Pittsburgh, P ©2001		1889060666	108664	Adult Non-Fiction	667.6 Ha	viii, 631 p., illus., 29 cm.
Paint Handbook	Weismantel, Guy E. (editor)	McGraw-Hill Book Compa New York, N ©1981		0070690618	08387	Reference	667 Pa	754 p. in various pagings, illus
Paint Problem Solver		Paint & Decorating Retail St. Louis, MO ©2000	7th edition		106366	Adult Non-Fiction	667.6 Pa	136 p., color illus., 30 cm. + 1
Paint Red Book: Comprehensive Directory of the Formulators & Suppliers to the Paint, Coatings and Ink Industry	D'Amico, Esther (editor)	Cygnus Publishing Comp Melville, NY ©1999	Volume 88, Number 13		10571	Reference	667.6 Pa 1999	284 p., illus., 29 cm.
Paint Testing Manual: Physical and Chemical Examination of Paints, Varnishes, Lacquers and Colors	Sward, G. G. (editor)	American Society for Test Philadelphia, [1972]	13th edition		16489	Reference	667.6 Pa	xii, 599 p., illus., 29 cm.
Paint/Coatings Dictionary	Federation of Societies for Coatings Technology (Definitions Committee)	Federation of Societies fo Philadelphia, ©1978			16490	Reference	667.9 Fe	xviii, 613 p., 24 cm.
Painting of Plastics	Ryntz, Rose Ann	Federation of Societies fo Philadelphia, ©1994		0934010366	55947-2	Reference	667.9 Fe	32 p., illus., 28 cm.
Paints and Their Applications - vol. 2 Volume 2 of: "Surface Coatings"	Oil and Colour Chemists' Association, Australia	Chapman and Hall New York, N ©1983	2nd edition, Revised	0412256606	00866	Adult Non-Fiction	667.9 Su	viii, 408 p., illus., 25 cm.
Paints, Coatings and Solvents	Stoye, Dieter and Werner Freitag (editors)	Wiley - VCH Weinheim, G ©1998	2nd edition, Completely revised	3527288635	99415	Adult Non-Fiction	667.6 Pa	xvii, 414 p., illus., 25 cm.
Paper Coating Trends in the Worldwide Paper Industry	Patrick, Ken L. (editor)	Miller Freeman Publicatio San Francisc ©1991		087930247	53690	Adult Non-Fiction	676.235 Pa	164 p., illus., 28 cm.
Paper Coatings	Harper, Donald T.	Noyes Data Corporation Park Ridge, ©1976		0815506406	14919	Adult Non-Fiction	676.235 Ha	xii, 335 p., illus., 24 cm.
Patent Strategy: For Researchers and Research Managers	Knight, H. Jackson	John Wiley & Sons New York, N ©2001	2nd edition	0471492612	111659	Adult Non-Fiction	346.730 Kn	xvi, 201 p., illus., 24 cm.
Performance - vol. 2 Volume 2 of: "Polymer Blends"	Paul, D. R. and C. B. Bucknall (editors)	John Wiley & Sons New York, N ©2000		0471352799	89757	Adult Non-Fiction	668.9 Po	xiv, 600 p., illus., 25 cm.
Performance Enhancement in Coatings	Orr, Edward W.	Hanser Gardner Publicati Cincinnati, O ©1998		1569902631	78750	Adult Non-Fiction	667 Or	xviii, 292 p., illus., 25 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Permeability and Other Film Properties of Plastics and Elastomers		Plastics Design Library Norwich, NY ©1995		1884207146	99416	Adult Non-Fiction	745 Pe	x, 706 p., illus., 29 cm.
Permeability Properties of Plastics and Elastomers: A Guide to Packaging and Barrier Materials	Massey, Liesl K.	Plastics Design Library / Norwich, NY ©2003	2nd edition	1884207979	111660	Adult Non-Fiction	620.1 Ma	xiv, 601 p., illus., 29 cm.
Physical Chemistry of Polymer Rheology	Furukawa, Junji	Kodansha Ltd. / Springer- Tokyo, Japan ©2003		3540000534	111658	Adult Non-Fiction	530 Fu	xv, 278 p., illus., 24 cm.
Physical Chemistry of Surfaces	Adamson, Arthur W.	Interscience Publishers, I New York, N [1967]	2nd edition		43932	Adult Non-Fiction	541.3453 Ad	xx, 747 p., illus., 24 cm.
Pictorial Standards of Coatings Defects	Philadelphia Society for Coatings Technology (Pictorial Standards Sub-Committee)	Federation of Societies fo Philadelphia, ©1979	7th printing	9991165231	100379	Adult Non-Fiction	667.9 Pi	1 volume, (looseleaf), illus., 2
Pigment Handbook	Lewis, Peter A. (editor, v1); Patton, Temple C. (editor, v2, v3)	John Wiley & Sons New York, N ©1988	2nd edition	0471828335	08255	Reference	667.29 Pi	v1(xxvi, 945 p.) v2(viii, 455 p.)
Pigments for Inkmakers	Sanders, J. D.	SITA (Selective Industrial London, UK ©1989		0947798072	21207	Adult Non-Fiction	667.29 Sa	vii, 238 p., 24 cm.
Pigments for Paints and Inks: Physical and Chemical Properties	Morgans, W. M. (Wilfred Morley), 1907-	Selection & Industrial Trai Manchester, [1977]		0905716027	12986	Adult Non-Fiction	667.29 Mo	[8], 140 p., illus., 27 cm.
Pigments in Paint	Preuss, Harold P.	Noyes Data Corporation Park Ridge, ©1974		0815505132	12998	Adult Non-Fiction	667.623 Pr	viii, 134 p., illus., 29 cm.
Plasticizer Technology: Volume 1	Bruins, Paul F. (editor)	Reinhold Publishing Corp New York, N ©1965			13028	Adult Non-Fiction	668.41 Br v.1	viii, 248 p., illus., diagrams, 24
Plastics and Coatings: Durability, Stabilization, Testing	Ryntz, Rose Ann (editor)	Hanser Gardner Publicati Cincinnati, O ©2001		1569902909	99419	Adult Non-Fiction	620.1 PI	ix, 243 p., illus., 25 cm.
Plastics Engineering Handbook of the Society of the Plastics Industry, Inc.	Frados, Joel (editor)	Van Nostrand Reinhold C New York, N ©1976	4th edition	0442224699	07918	Adult Non-Fiction	668.41 So	xvi, 909 p., illus., 27 cm.
Plastics Engineering Handbook of the Society of the Plastics Industry, Inc.	Berins, Michael L. (editor)	Van Nostrand Reinhold C New York, N ©1991	5th edition	0442317999	08308	Adult Non-Fiction	668.41 So	xvi, 845 p., illus., 26 cm.
Plastics Extrusion Technology	Griff, Allan L.	Reinhold Publishing Corp New York, N [1968]	2nd edition		13035	Adult Non-Fiction	668.413 Gr	xi, 352 p., illus., 24 cm.
Plastics Industry Safety Handbook	Society of the Plastics Industry	Cahners Books Boston, MA [1973]		084361207	07904	Adult Non-Fiction	668.4 So	xi, 333 p., illus., 24 cm.
Plastics vs. Corrosives	Seymour, Raymond Benedict, 1912-	John Wiley & Sons New York, N ©1982		0471081825	00012	Adult Non-Fiction	620.192 Se	xii, 285 p., illus., 24 cm.
Plating of Plastics with Metals	McDermott, John	Noyes Data Corporation Park Ridge, ©1974		0815505264	66106	Adult Non-Fiction	668.41 Ma	x, 278 p., illus., 25 cm.
Plating of Plastics: Recent Developments	Domino, Francis A.	Noyes Data Corporation Park Ridge, ©1979		0815507704	13047	Adult Non-Fiction	668.49 Do	xi, 385 p., illus., 25 cm.
Polyamide Resins	Floyd, Don Edgar	Reinhold Publishing Corp New York, N [1966]	2nd edition		08484	Adult Non-Fiction	668.41 FI	viii, 227 p., illus., 24 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Polymer Blends	Paul, D. R. and C. B. Bucknall (editors)	John Wiley & Sons New York, N	©2000	0471352799	89757	Adult Non-Fiction	668.9 Po	xiv, 600 p., illus., 25 cm.
Polymer Characterization Techniques and Their Application to Blends	Simon, George P. (editor)	American Chemical Socie Washington,	©2003	0841238189	111657	Adult Non-Fiction	668.9 Po	xiii, 516 p., [2] p. of plates: illu
Polymer Colloids: Science and Technology of Latex Systems	Daniels, Eric S., E. David Sudol and Mohamed S. El-Aasser (editors)	American Chemical Socie Washington,	©2001	084123759	105714	Adult Non-Fiction	668.9 Po	xii, 413 p., illus., 24 cm.
Polymer Fractionation	Cantow, Manfred J. R.	Academic Press New York, N	©1967		12957	Adult Non-Fiction	660.2844 Ca	xii, 527 p., illus., 24 cm.
Polymer Handbook	Brandrup, J. and E. H. Immergut (editors)	John Wiley & Sons New York, N	©1989	0471812447	07926	Adult Non-Fiction	547.84 Po	1 v. (various pagings) illus., 2
Polymer Handbook	Brandrup, J., E. H. Immergut and E. A. Grulke (editors)	John Wiley & Sons New York, N	©1999	0471166286	79968	Reference	547.84 Po	1 v. (various pagings) illus., 2
Polymer Surfaces: From Physics to Technology	Garbassi, Fabio, Marco Morra and Ernesto Occhiello	John Wiley & Sons New York, N	©1998	0471971006	89760	Adult Non-Fiction	547.7 Ga	ix, 486 p., illus., 23 cm.
Polymer Yearbook 18	Pethrick, Richard A. and Gennady E. Zaikov (editors)	Rapra Technology Limite Shrewsbury,	©2003	1859573835	111656	Adult Non-Fiction	547.7 Po v.18	v., illus, 24 cm.
Polymeric Materials: Structure, Properties, Applications	Ehrenstein, Gottfried Wilhelm	Hanser Gardner Publicati Cincinnati, O	©2001	1569903107	105715	Adult Non-Fiction	620.1 Eh	xviii, 27 p., illus., 23 cm.
Polymers at Surfaces and Interfaces	Jones, Richard A. L. (Richard Anthony Lewis), 1961- and Randal W. Richards	Cambridge University Pre Cambridge,	©1999	052147440	79969	Reference	620.1 Jo	ix, 377 p., illus., 26 cm.
Polymers: Chemistry and Physics of Modern Materials	Cowie, J. M. G. (John MacKenzie Grant)	Chapman and Hall New York, N	©1991	0412031213	09715	Adult Non-Fiction	547.7 Co	ix, 436 p., illus., 23 cm.
Polypropylene	Kresser, Theodore O. J.	Reinhold Publishing Corp New York, N	©1960		13041	Adult Non-Fiction	668.423 Kr	xi, 268 p., illus., 20 cm.
Polyurethanes, Polyamides, Phenoplasts, Aminoplasts, Maleic Resins	Oldring, P.K.T. and N. Tuck (editors)	John Wiley & Sons - SITA Chichester, [	©2001	0471978965	99644	Adult Non-Fiction	660 Ol	v, 399 p., illus., 24 cm.
Polyurethanes: Chemistry and Technology	Saunders, J. H. (James Henry), 1923- and K. C. Frisch	Interscience Publishers, I New York, N	©1962		13043	Adult Non-Fiction	668.423 Sa	xv, 368 p., illus., 24 cm.
Powder Coating: A Practical Guide to Equipment, Processes and Productivity at a Profit	Cowley, Mike	John Wiley & Sons - SITA Chichester, [	©1999	0471979007	99421	Adult Non-Fiction	667.9 Co	vii, 222 p., illus., 24 cm.
Powder Coatings	Jilek, Josef H.	Federation of Societies fo Philadelphia,	©1991	0934010374	55947-1	Reference	667.9 Fe	35 p., illus., 28 cm.

Title	Author	Publisher	Location	Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Powder Coatings Technology	Ranney, Maurice William, 1934-	Noyes Data Corporation	Park Ridge,	©1975		0815505647	13012	Adult Non-Fiction	667.9 Ra	xii, 426 p., illus., 28 cm.
Practical Guide to Plastics Applications	Crosby, Edward G. and Stephen N. Kochis	Cahners Books	Boston, MA	[1972]		0843612053	34104	Adult Non-Fiction	668.4 Cr	xiv, 191 p., illus., 24 cm.
Practical Process Research & Development	Anderson, Neal G.	Academic Press	San Diego, C	©2000		0120594757	88637	Adult Non-Fiction	660.282 An	xxiii, 354 p., illus., 24 cm.
Prediction of Polymer Properties	Bicerano, Jozef, 1952-	Marcel Dekker, Inc.	New York, N	©2002	3rd edition, Revised and expanded	0824708210	105717	Adult Non-Fiction	668.9 Bi	xviii, 756 p., [4] p. of plates, ill
Prepaint Specialties and Surface Tolerant Coatings	Flick, Ernest W.	Noyes Publications	Park Ridge,	©1991		0815512732	09716	Adult Non-Fiction	667.9 Fl	xxvi, 614 p., 25 cm.
Preparative Methods of Polymer Chemistry	Sorenson, Wayne R. (Richard), Fred (Wilfred) Sweeny and Tod W. Campbell	John Wiley & Sons	New York, N	©2001	3rd edition	0471589926	105716	Adult Non-Fiction	547 So	xvi, 488 p., illus., 24 cm.
Pressure Sensitive Adhesives: Formulations and Technology	Dunning, Henry R.	Noyes Data Corporation	Park Ridge,	©1977	2nd edition	0815506724	13019	Adult Non-Fiction	668.3 Du	xii, 428 p., illus., 25 cm.
Principles of Aerosol Technology	Sanders, Paul A. (Paul Amsdon), 1913-	Van Nostrand Reinhold C	New York, N	[1970]			64296	Adult Non-Fiction	660 Sa	x, 418 p., illus., 24 cm.
Principles of Color Technology	Billmeyer, Fred W. and Max Saltman	John Wiley & Sons	New York, N	©1981	2nd edition	047103052	50827	Adult Non-Fiction	535.6 Bi	xv, 240 p., illus., [4] leaves of
Principles of Industrial Chemistry	Clausen, Chris A., 1940- and Guy C. Mattson	John Wiley & Sons	New York, N	©1978		047102774	12953	Adult Non-Fiction	660 Cl	xiv, 412 p., illus., 24 cm.
Printing and Dyeing of Fabrics and Plastics	James, Ronald W.	Noyes Data Corporation	Park Ridge,	©1974		0815505337	34094	Adult Non-Fiction	667.3 Ja	x, 275 p., illus., 25 cm.
Printing Inks: Developments Since 1975	Duffy, J. I. (Joan Irene), 1950-	Noyes Data Corporation	Park Ridge,	©1979		0815507720	12989	Adult Non-Fiction	667.5 Du	xii, 336 p., illus., 24 cm.
Printing Inks: Recent Developments	Wells, Andrew M.	Noyes Data Corporation	Park Ridge,	©1976		0815506058	12990	Adult Non-Fiction	667.502 We	xii, 328 p., illus., 25 cm.
Project Management: Strategic Design and Implementation	Cleland, David I. and Lewis R. Ireland, 1937-	McGraw-Hill Book Compa	New York, N	©2002	4th edition	0071393102	105698	Adult Non-Fiction	658.4 Cl	xx, 656 p., illus., 24 cm.
Properties of Solvents	Marcus, Y.	John Wiley & Sons	New York, N	©1998		0471983691	79970	Reference	541.3 Ma	xiv, 239 p., illus. 24 cm.
Protective Coatings: Fundamentals of Chemistry and Composition	Hare, Clive H., 1941-	SSPC: The Society for Pr	Pittsburgh, P	©1998		0938477900	108665	Adult Non-Fiction	667.9 Ha	vi, 514 p., illus., 29 cm.
PVC Technology	Penn, W. S.	Wiley - Interscience Publi	New York, N	[1972, ©	3rd edition	0471679305	13042	Adult Non-Fiction	668.423 Pe	xii, 545 p., illus., 23 cm.
Quality Control in Metal Finishing: Based on a Symposium at the Borough Polytechnic, London	Isserlis, G. (editor)	Columbine Press	Manchester,	©1967			14900	Adult Non-Fiction	671.73 Qu	x, 118 p., illus., [16] plates, ta

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Radiation Cured Coatings	Costanza, John R., A. P. Silveri and Joseph A. Vona	Federation of Societies fo Philadelphia, ©1986			55947-2	Reference	667.9 Fe	24 p., illus., 28 cm.
Radiation Curing of Coatings	Koleske, Joseph V., 1930- (ASTM Committee D-1 on Paint and Related Coatings, Materials and Applications)	ASTM International West Consho ©2002		0803120958	105699	Adult Non-Fiction	668.4 Ko	vii, 244 p., illus., 23 cm.
Radiation Technology for Polymers	Drobny, Jiri George	CRC (Chemical Rubber C Boca Raton, ©2003		1587161087	105700	Adult Non-Fiction	668.9 Dr	206 p., illus., 24 cm.
Rauch Guide to the U. S. Paint Industry: A Market Survey and Analysis -- 2001-02 Edition		Impact Marketing Consult Manchester ©2001	5th edition		97813	Reference	338.4 Ra 2001	x, 274 p., illus, 28 cm.
Raw Materials and Their Usage - vol. 1 Volume 1 of: "Surface Coatings"	Oil and Colour Chemists' Association, Australia	Chapman and Hall New York, N ©1983	2nd edition, Revised	0412256606	00866	Adult Non-Fiction	667.9 Su	viii, 408 p., illus., 25 cm.
Reactive Polymer Blending	Baker, W. (Warren E.), C. (Chris E.) Scott and G.-H. (Guo-Hua) Hu (editors)	Hanser Gardner Publicati Cincinnati, O ©2001		1569903123	105701	Adult Non-Fiction	668.9 Ba	xvi, 289 p., illus., 25 cm.
Relating Materials Properties to Structure: Handbook and Software for Polymer Calculations and Materials Properties	David, D. J. (Donald Joseph), 1930-	Technomic Publishing Co Lancaster, P ©1999		1587160889	90422	Adult Non-Fiction	620.1 Da	xxviii, 689 p., illus., 23 cm. + 1
Rheology	Schoff, Clifford K.	Federation of Societies fo Philadelphia, ©1997	Reprint	0934010390	55947-1	Reference	667.9 Fe	42 p., illus., 28 cm.
Rheology Modifiers Handbook: Practical Use and Application	Braun, David B. and Meyer R. Rosen	William Andrew Publishin Norwich, NY [1999?]		0815514417	82249	Adult Non-Fiction	660 Br	ix, 505 p., illus., 25 cm.
Sax's Dangerous Properties of Industrial Materials	Lewis, Richard J., Sr. (editor) [Sax, N. Irving (Newton Irving)]	John Wiley & Sons New York, N ©2000	10th edition	0471354074	105720	Reference	604.7 Sa	3 v. (v1: xxvi, 950 p.; v2: xxvi,
Science of Powder Coatings: Chemistry, Formulation and Application (Vol. 1)	Bate, David A.	SITA (Selective Industrial London, UK ©1990		0947798005	23727	Adult Non-Fiction	667.9 Ba	viii, 321 p., illus., 24 cm.
Sealants and Caulks	Prane, Joseph W.	Federation of Societies fo Philadelphia, ©1989		0934010404	55947-1	Reference	667.9 Fe	28 p., illus., 28 cm.
Shellac: Its Origin and Applications	Hicks, Edward	Chemical Publishing Com New York, N ©1961			34099	Adult Non-Fiction	667.79 Hi	272 p., illus., 23 cm.
Silicone Surfactants	Hill, Randal M. (editor)	Marcel Dekker, Inc. New York, N ©1999		0824700104	89762	Adult Non-Fiction	668.1 Si	viii, 360 p., illus., 24 cm.
Silicones in Coatings	Finzel, William A. and Harold L. Vincent	Federation of Societies fo Philadelphia, ©1996		0934010412	55947-2	Reference	667.9 Fe	34 p., illus., 28 cm.
Skeptical Environment: Measuring the Real State of the World	Lomborg, Bjorn, 1965-	Cambridge University Pre Cambridge, ©2001	Revised and updated edition	0521010683	105702	Adult Non-Fiction	363.7 Lo	xxiii, 515 p., illus., 26 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Solid-Liquid Dispersions	Dobias, Bohuslav, Xueping Qiu and Wolfgang von Rybinski	Marcel Dekker, Inc. New York, N 1999		0824700147	88635	Adult Non-Fiction	541.345 Do	vii, 562 p., illus., 24 cm.
Solvent Waste Reduction Alternatives Symposia: Conference Proceedings	Solvent Waste Reduction Alternatives Symposia (1986: Santa Clara and Los Angeles, CA)	ICF Consulting Associate Los Angeles, [1986?]			41635	Adult Non-Fiction	363.728 So	vi, 186 p., illus., 28 cm.
Solventless and High Solids Industrial Finishes: Recent Developments	Gillies, M. T. (editor)	Noyes Data Corporation Park Ridge, ©1980		081550828	13013	Adult Non-Fiction	667.9 So	x, 342 p., illus., 24 cm.
Solvents	Stout, Ron L. and William H. Ellis	Federation of Societies fo Philadelphia, ©1998	2nd edition	0934010439	55947-2	Reference	667.9 Fe	36 p., illus., 28 cm.
Specialized Curing Methods for Coatings and Plastics: Recent Advances	Ranney, Maurice William, 1934-	Noyes Data Corporation Park Ridge, ©1977		0815506600	13011	Adult Non-Fiction	667.9 Ra	xi, 244 p., illus., 25 cm.
Structure - Performance Relationships in Surfactants	Esumi, Kunio and Minoru Ueno (editors)	Marcel Dekker, Inc. New York, N ©2003	2nd edition, Revised and expanded	0824740440	111655	Adult Non-Fiction	668 St	viii, 802 p., illus., 24 cm.
Successful Product Development: Speeding from Opportunity to Profit	Rosenau, Milton D., 1931-	John Wiley & Sons New York, N ©2000		047131532	89748	Adult Non-Fiction	658.5 Ro	xi, 151 p., illus., 24 cm.
Surface Activity: Principles, Phenomena and Applications	Tsujii, Kaoru	Academic Press San Diego, C ©1998		0127022805	82250	Adult Non-Fiction	668 Ts	x, 245 p., illus., 24 cm.
Surface Characterization Methods: Principles, Techniques and Applications	Milling, Andrew J. (editor)	Marcel Dekker, Inc. New York, N ©1999		0824773365	89763	Adult Non-Fiction	541.3 Su	viii, 412 p., illus., 24 cm.
Surface Coatings	Oil and Colour Chemists' Association, Australia	Chapman and Hall New York, N ©1983	2nd edition, Revised	0412256606	00866	Adult Non-Fiction	667.9 Su	viii, 408 p., illus., 25 cm.
Surfaces, Interfaces and Colloids: Principles and Applications	Myers, Drew, 1946-	Wiley - VCH, Verlag Gmb New York, N ©1999	2nd edition	0471330604	82251	Adult Non-Fiction	541.3 My	xx, 501 p., illus., 24 cm.
Surfactants and Polymers in Aqueous Solution	Jonsson, Bo	John Wiley & Sons Chichester, [1999		0471974226	82252	Adult Non-Fiction	668.1 Jo	xii, 438 p., illus., 23 cm.
Surfactants and Polymers in Aqueous Solution	Holmberg, I. Krister, Bo Jonsson, Bengt Kronberg and Bjorn Lindman	John Wiley & Sons, Ltd. Chichester, [©2003	2nd edition	0471498831	105703	Adult Non-Fiction	668 Su	xvi, 545 p., illus., 24 cm.
Surfactants in Polymers, Coatings, Inks, and Adhesives	Karsa, David R. (editor)	Blackwell Publishing / CR Oxford, Engla ©2003		084932808	111654	Adult Non-Fiction	668 Su	xi, 306 p., illus., 24 cm.
Surfactants: A Practical Handbook	Lange, K. Robert (editor)	Hanser Gardner Publicati Cincinnati, O ©1999		1569902704	99424	Adult Non-Fiction	668.1 Su	xiii, 237 p., illus., 25 cm.
Technology - vol 2 Volume 2 of: "Polyurethanes: Chemistry and Technology"	Saunders, J. H. (James Henry), 1923- and K. C. Frisch	Interscience Publishers, I New York, N ©1962			13043	Adult Non-Fiction	668.423 Sa	xv, 368 p., illus., 24 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Technology for Waterborne Coatings	Glass, Edward J. (editor)	American Chemical Socie Washington, ©1997		0841235015	72301	Reference	667.9 Te	viii, 304 p., illus., 24 cm.
Technology of Paints, Varnishes and Lacquers	Martens, Charles R. (editor)	Robert E. Kreiger Publishi Huntington, N 1974 [©		0882751549	12995	Adult Non-Fiction	667.6 Te	viii, 744 p., illus., 24 cm.
Technology, Formulation and Application of Powder Coatings	Howell, David M.	John Wiley & Sons - SITA Chichester, [©2000		047197899	99420	Adult Non-Fiction	660 Ho	xx, 361 p., illus., 24 cm.
Testing of Organic Coatings	Gaynes, Norman I.	Noyes Data Corporation Park Ridge, ©1977		0815506503	13007	Adult Non-Fiction	667.9 Ga	viii, 275 p., illus., 25 cm.
Textbook of Polymer Science	Billmeyer, Fred W.	John Wiley & Sons New York, N ©1984	3rd edition	0471031968	07933	Adult Non-Fiction	541.7 Bi	xviii, 578 p., illus., 24 cm.
Thesaurus of Paint and Allied Technology: A Guide to Technical Terms Employed in the United States, Canada and Great Britain	Federation of Societies for Paint Technology	Federation of Societies fo Philadelphia, [1968]			36216	Reference	667.9 Fe	264 p., 22 cm.
Toward Pollution-Free Manufacturing	Institute for Local Self-Reliance	AMA Membership Publica New York, N ©1986		0814423272	26250	Adult Non-Fiction	363.72 To	122 p., 23 cm.
Toxic Substances Controls Primer: Federal Regulation of Chemicals in the Environment	Worobec, Mary Devine	Bureau of National Affairs Washington, ©1984		0871794586	30112	Adult Non-Fiction	344.73 Wo	xi, 224 p., 23 cm.
Toxicology: The Basic Science of Poisons	Casarett, Louis J. and John Doull (editors)	Macmillan Publishing Co New York, N [1975]		0023199601	14476	Adult Non-Fiction	615.9 Ca	xiii, 768 p., illus., 26 cm.
Trade Sale and Architectural Coatings - vol. 2 Volume 2 of: "Coatings Technology"	Fibiger, W. and A. C. Boyce (editors)	ITE Consultants Willowdale, O 1998	3rd edition		84296	Adult Non-Fiction	667.9 Co	various pagings, illus., diagra
Trademark: Legal Care for Your Business & Product Name	Elias, Stephen	Nolo Press Berkeley, CA ©2001	5th edition	0873375793	89740	Adult Non-Fiction	346.73 El	1 v. (various pagings) illus., fo
Trademark: Legal Care for Your Business & Product Name	Elias, Stephen	Nolo Press Berkeley, CA ©2003	6th edition	0873379454	111653	Adult Non-Fiction	346.730 El	1 v. (various pagings), illus., 2
Treatise of Japanning and Varnishing: 1688	Stalker, John and George Parker	Alec Tiranti, Ltd. London, UK ©1960			13005	Adult Non-Fiction	667.8 St	xvi, 84 p., 24 plates, 26 cm.
Understanding Chemical Patents: A Guide for the Inventor	Maynard, John T. and Howard M. Peters	American Chemical Socie Washington, ©1991	2nd edition	0841219982	100381	Adult Non-Fiction	660.027 Ma	xvi, 183 p., illus., 24 cm.
Understanding Paint	Fuller, Wayne R.	American Paint Journal C St. Louis, MO ©1965			34096	Adult Non-Fiction	667.6 Fu	135 p., 21 cm.
Understanding Thermoplastic Elastomers	Holden, Geoffrey	Hanser Gardner Publicati Cincinnati, O ©2000		1569902895	105704	Adult Non-Fiction	678 Ho	vii, 110 p., illus., 23 cm.
Using the Hazardous Waste Manifest: A Manual of Federal and State Requirements		Inter/Face Associates, Inc Middleton, C ©1985			30439	Reference	363.728 Us	1 v. (various pagings) illus., 3
Vinyl Acetate Emulsion Polymerization and Copolymerization With Acrylic Monomers	Erbil, H. Yildirim	CRC (Chemical Rubber C Boca Raton, ©2000		0849323037	105705	Adult Non-Fiction	668.4 Er	324 p., illus. 25 cm.
Vol 1-Properties and Economics Volume cs of: "Pigment Handbook"	Lewis, Peter A. (editor, v1); Patton, Temple C. (editor, v2, v3)	John Wiley & Sons New York, N ©1988 (	2nd edition	0471828335	08255	Reference	667.29 Pi	v1(xxvi, 945 p.) v2(viii, 455 p.)

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Vol 1: Emulsifiers & Detergents Volume ts of: "McCutcheon's Volume 1: Emulsifiers & Detergents"		McCutcheon's Division, M Glen Rock, N ©2004	North American edition	094425473	92041	Reference	668.108 Mc	v.; 28 cm.
Vol 1: Emulsifiers & Detergents Volume ts of: "McCutcheon's Volume 2: Functional Materials"		McCutcheon's Division, M Glen Rock, N ©2004	North American edition	0944254977	2528	Reference	668.108 Mc	v.; 28 cm.
Vol 1: Part I-Dyes and Pigments (Usage) Volume e) of: "Colour Index"	Society of Dyers and Colourists	Society of Dyers and Colo Bradford, [Yo ©1956	2nd edition		08254	Reference	667.2 So	xxviii, 809 p., 29 cm. (Include
Vol 1: Trade Name Products Volume ts of: "Handbook of Paint and Coating Raw Materials"	Ash, Michael and Irene Ash (editors)	Gower Publishing Limited Aldershot, [H ©1996		0566077876	100255	Reference	667.9 Ha	(v.1: xvi, 1000 p.); (v.2: xvi, 58
Vol 1: Waterborne & Solvent Based Acrylics and.. Volume .. of: "Waterborne & Solvent Based Acrylics and Their End User Applications"	Oldring, Peter and Peter Lam (editors)	SITA (Selective Industrial London, UK ©1996		0947798447	70138	Reference	667.9 Wa v.1	1 v. (xiii, 490 p.) illus., 26 cm.
Vol 1: Waterborne & Solvent Based Acrylics and.. Volume .. of: "Waterborne & Solvent Based Epoxies and Their End User Applications"	Oldring, Peter (editor)	SITA (Selective Industrial London, UK ©1996		0947798498	70139	Reference	667.9 Wa v.2	xii, 516 p., illus., 24 cm.
Vol 1: Waterborne & Solvent Based Acrylics and.. Volume .. of: "Waterborne & Solvent Based Saturated Polyesters and Their End User Applications [Vol. 4: Polyesters]"	Sanders, Don (editor)	John Wiley & Sons - SITA Chichester, [©1999		0471978884	99427	Adult Non-Fiction	667.9 Wa v.4	xiii, 577 p., illus., 24 cm.
Vol 1: Waterborne & Solvent Based Acrylics and.. Volume .. of: "Waterborne & Solvent Based Surface Coating Resins and Their Applications [Vol. 3: Polyurethanes]"	Thomas, Paul (editor)	John Wiley & Sons - SITA Chichester, [©1998		0471978868	99425	Adult Non-Fiction	667.9 Wa v.3	xv, 443 p., illus., 24 cm.
Vol 2-Applications and Markets Volume ts of: "Pigment Handbook"	Lewis, Peter A. (editor, v1); Patton, Temple C. (editor, v2, v3)	John Wiley & Sons New York, N ©1988 (	2nd edition	0471828335	08255	Reference	667.29 Pi	v1(xxvi, 945 p.) v2(viii, 455 p.)
Vol 2: Chemical Products Volume ts of: "Handbook of Paint and Coating Raw Materials"	Ash, Michael and Irene Ash (editors)	Gower Publishing Limited Aldershot, [H ©1996		0566077876	100255	Reference	667.9 Ha	(v.1: xvi, 1000 p.); (v.2: xvi, 58
Vol 2: Functional Materials Volume ls of: "McCutcheon's Volume 1: Emulsifiers & Detergents"		McCutcheon's Division, M Glen Rock, N ©2004	North American edition	094425473	92041	Reference	668.108 Mc	v.; 28 cm.
Vol 2: Functional Materials Volume ls of: "McCutcheon's Volume 2: Functional Materials"		McCutcheon's Division, M Glen Rock, N ©2004	North American edition	0944254977	2528	Reference	668.108 Mc	v.; 28 cm.
Vol 2: Part I-Dyes and Pigments (Usage) Volume e) of: "Colour Index"	Society of Dyers and Colourists	Society of Dyers and Colo Bradford, [Yo ©1956	2nd edition		08254	Reference	667.2 So	xxviii, 809 p., 29 cm. (Include
Vol 2: Waterborne & Solvent Based Epoxies and.. Volume .. of: "Waterborne & Solvent Based Acrylics and Their End User Applications"	Oldring, Peter and Peter Lam (editors)	SITA (Selective Industrial London, UK ©1996		0947798447	70138	Reference	667.9 Wa v.1	1 v. (xiii, 490 p.) illus., 26 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Vol 2: Waterborne & Solvent Based Epoxies and.. Volume .. of: "Waterborne & Solvent Based Epoxies and Their End User Applications"	Oldring, Peter (editor)	SITA (Selective Industrial London, UK	©1996	0947798498	70139	Reference	667.9 Wa v.2	xii, 516 p., illus., 24 cm.
Vol 2: Waterborne & Solvent Based Epoxies and.. Volume .. of: "Waterborne & Solvent Based Saturated Polyesters and Their End User Applications [Vol. 4: Polyesters]"	Sanders, Don (editor)	John Wiley & Sons - SITA Chichester, [	©1999	0471978884	99427	Adult Non-Fiction	667.9 Wa v.4	xiii, 577 p., illus., 24 cm.
Vol 2: Waterborne & Solvent Based Epoxies and.. Volume .. of: "Waterborne & Solvent Based Surface Coating Resins and Their Applications [Vol. 3: Polyurethanes]"	Thomas, Paul (editor)	John Wiley & Sons - SITA Chichester, [	©1998	0471978868	99425	Adult Non-Fiction	667.9 Wa v.3	xv, 443 p., illus., 24 cm.
Vol 3-Characterization and Physical Relationships Volume ps of: "Pigment Handbook"	Lewis, Peter A. (editor, v1); Patton, Temple C. (editor, v2, v3)	John Wiley & Sons New York, N	©1988 (2nd edition	0471828335	08255	Reference	667.29 Pi	v1(xxvi, 945 p.) v2(viii, 455 p.)
Vol 3: Part II-Dyes and Pigments (Chemical Constitutions) Volume s) of: "Colour Index"	Society of Dyers and Colourists	Society of Dyers and Colo Bradford, [Yo	©1956 2nd edition		08254	Reference	667.2 So	xxviii, 809 p., 29 cm. (Include
Vol 3: Waterborne & Solvent Based Surface Coating Resins and.. Volume .. of: "Waterborne & Solvent Based Acrylics and Their End User Applications"	Oldring, Peter and Peter Lam (editors)	SITA (Selective Industrial London, UK	©1996	0947798447	70138	Reference	667.9 Wa v.1	1 v. (xiii, 490 p.) illus., 26 cm.
Vol 3: Waterborne & Solvent Based Surface Coating Resins and.. Volume .. of: "Waterborne & Solvent Based Epoxies and Their End User Applications"	Oldring, Peter (editor)	SITA (Selective Industrial London, UK	©1996	0947798498	70139	Reference	667.9 Wa v.2	xii, 516 p., illus., 24 cm.
Vol 3: Waterborne & Solvent Based Surface Coating Resins and.. Volume .. of: "Waterborne & Solvent Based Saturated Polyesters and Their End User Applications [Vol. 4: Polyesters]"	Sanders, Don (editor)	John Wiley & Sons - SITA Chichester, [	©1999	0471978884	99427	Adult Non-Fiction	667.9 Wa v.4	xiii, 577 p., illus., 24 cm.
Vol 3: Waterborne & Solvent Based Surface Coating Resins and.. Volume .. of: "Waterborne & Solvent Based Surface Coating Resins and Their Applications [Vol. 3: Polyurethanes]"	Thomas, Paul (editor)	John Wiley & Sons - SITA Chichester, [	©1998	0471978868	99425	Adult Non-Fiction	667.9 Wa v.3	xv, 443 p., illus., 24 cm.
Vol 4: Part III-Abbreviations Volume ns of: "Colour Index"	Society of Dyers and Colourists	Society of Dyers and Colo Bradford, [Yo	©1956 2nd edition		08254	Reference	667.2 So	xxviii, 809 p., 29 cm. (Include
Vol 4: Waterborne & Solvent Based Saturated Polyesters and.. Volume .. of: "Waterborne & Solvent Based Acrylics and Their End User Applications"	Oldring, Peter and Peter Lam (editors)	SITA (Selective Industrial London, UK	©1996	0947798447	70138	Reference	667.9 Wa v.1	1 v. (xiii, 490 p.) illus., 26 cm.
Vol 4: Waterborne & Solvent Based Saturated Polyesters and.. Volume .. of: "Waterborne & Solvent Based Epoxies and Their End User Applications"	Oldring, Peter (editor)	SITA (Selective Industrial London, UK	©1996	0947798498	70139	Reference	667.9 Wa v.2	xii, 516 p., illus., 24 cm.
Vol 4: Waterborne & Solvent Based Saturated Polyesters and.. Volume .. of: "Waterborne & Solvent Based Saturated Polyesters and Their End User Applications [Vol. 4: Polyesters]"	Sanders, Don (editor)	John Wiley & Sons - SITA Chichester, [	©1999	0471978884	99427	Adult Non-Fiction	667.9 Wa v.4	xiii, 577 p., illus., 24 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Vol 4: Waterborne & Solvent Based Saturated Polyesters and.. Volume .. of: "Waterborne & Solvent Based Surface Coating Resins and Their Applications [Vol. 3: Polyurethanes]"	Thomas, Paul (editor)	John Wiley & Sons - SITA Chichester, [	©1998	0471978868	99425	Adult Non-Fiction	667.9 Wa v.3	xv, 443 p., illus., 24 cm.
Vol 5: 1963 Supplement Volume nt of: "Colour Index"	Society of Dyers and Colourists	Society of Dyers and Colo Bradford, [Yo	©1956 2nd edition		08254	Reference	667.2 So	xxviii, 809 p., 29 cm. (Include
Water Soluble Polymers: Solution Properties and Applications	Amjad, Zahid (editor)	Plenum Press New York, N	©1998	0306459310	78751	Adult Non-Fiction	547 Wa	xii, 259 p., illus., 26 cm.
Water-Based Industrial Finishes: Recent Developments	Gillies, M. T. (editor)	Noyes Data Corporation Park Ridge,	©1980	0815508123	64074	Adult Non-Fiction	667.63 Gi	xii, 435 p., 25 cm.
Water-Based Paint Formulations	Flick, Ernest W.	Noyes Data Corporation Park Ridge,	1975-<©	0815513453	50461	Adult Non-Fiction	667 FI	v. <3, 4 > 25 cm.
Water-Based Trade Paint Formulations	Flick, Ernest W.	Noyes Publications Park Ridge,	©1988	0815511477	07902	Adult Non-Fiction	667.63 FI	xxv, 697 p., 25 cm.
Water-Soluble Polymers: Recent Developments	Meltzer, Yale L.	Noyes Data Corporation Park Ridge,	©1979	0815507429	51469	Adult Non-Fiction	668.4 Me	xiv, 496 p., illus., 25 cm.
Water-Soluble Resins: An Industrial Guide	Flick, Ernest W.	Noyes Publications Park Ridge,	©1991 2nd edition	0815512740	50462	Adult Non-Fiction	668 FI	xiv, 436 p., 25 cm.
Waterborne & Solvent Based Acrylics and Their End User Applications	Oldring, Peter and Peter Lam (editors)	SITA (Selective Industrial London, UK	©1996	0947798447	70138	Reference	667.9 Wa v.1	1 v. (xiii, 490 p.) illus., 26 cm.
Waterborne & Solvent Based Epoxies and Their End User Applications	Oldring, Peter (editor)	SITA (Selective Industrial London, UK	©1996	0947798498	70139	Reference	667.9 Wa v.2	xii, 516 p., illus., 24 cm.
Waterborne & Solvent Based Saturated Polyesters and Their End User Applications [Vol. 4: Polyesters]	Sanders, Don (editor)	John Wiley & Sons - SITA Chichester, [	©1999	0471978884	99427	Adult Non-Fiction	667.9 Wa v.4	xiii, 577 p., illus., 24 cm.
Waterborne & Solvent Based Surface Coating Resins and Their Applications [Vol. 3: Polyurethanes]	Thomas, Paul (editor)	John Wiley & Sons - SITA Chichester, [	©1998	0471978868	99425	Adult Non-Fiction	667.9 Wa v.3	xv, 443 p., illus., 24 cm.
Waterborne Coatings [Vol. 3 -- Surface Coatings]	Wilson, Alan D., John W. Nicholson and Havard J. Prosser (editors)	Elsevier Applied Science London, UK /	©1990	1851665188	23559	Adult Non-Fiction	667.9 Su v.3	x, 304 p., illus., 25 cm.
Waterborne Coatings: A Compilation of Papers from the Journal of Coatings Technology	FSCT Publications Committee (editors)	Federation of Societies fo Philadelphia,	©2001	0934010528	107321	Adult Non-Fiction	667.9 Wa	xv, 796 p., illus., 28 cm.
Waterborne Coatings: Emulsion and Water-Soluble Paints	Martens, Charles R.	Van Nostrand Reinhold C New York, N	©1981	0442251378	03813	Adult Non-Fiction	667.63 Ma	x, 316 p., illus., 24 cm.
Waterproofing and Water-Repellency	Moilliet, John Lewis (editor)	Elsevier Publishing Comp New York, N	©1963		14927	Adult Non-Fiction	677.682 Mo	x, 502 p., illus., 24 cm.
Weathering of Plastics: Testing to Mirror Real Life Performance	Wypych, George (editor)	Plastics Design Library Norwich, NY	©1999	1884207758	89764	Adult Non-Fiction	668.4 We	x, 320 p., illus., 23 cm.
Western Coatings Symposium, 1985 (sound recording)		Cassette Productions Unli Pasadena, C	1985		56827	Adult Non-Fiction	667.9 We Part	22 sound cassettes [Tapes #4
Western Coatings Symposium, Technical Excellence and Innovations for 1987		Technical Program, Stein Pasadena, C	23 Feb. 1987		53696	Adult Non-Fiction	667.9 We Part	2 videorecordings, VHS forma
White Pigments	Braun, Juergen H.	Federation of Societies fo Philadelphia,	©1995	0934010447	55947-2	Reference	667.9 Fe	43 p., illus., 28 cm.
World-Wide Limits for Toxic and Hazardous Chemicals in Air, Water and Soil	Sittig, Marshall	Noyes Publications Park Ridge,	©1994	0815513445	50478	Adult Non-Fiction	615.9 Si	xxxiv, 792 p., 26 cm.

Title	Author	Publisher - Location - Date	Edition	ISBN	Dynix	Shelf Location	Call No.	Description
Writing and Designing Manuals	Robinson, Patricia A. and Ryn Etter	CRC (Chemical Rubber C Boca Raton, ©2000	3rd edition	1566703786	99426	Adult Non-Fiction	808.066 Ro	202 p., illus., 24 cm.
Year Book: F.S.C.T. Membership Directory	Federation of Societies for Coatings Technology	Federation of Societies fo Philadelphia, ©2002			10231	Reference	667.5 Fe 2002	400 p., illus., 21 cm.
Yearbook and Directory: 2002-2003	Los Angeles Society For Coatings Technology	Group Administrative Ser Los Alamitos, ©2002			57894	Reference	667.9 Lo 2002	146 p., illus., 21 cm.



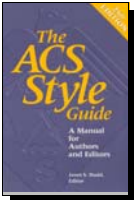
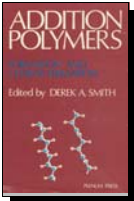
370 items in index

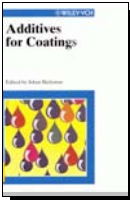
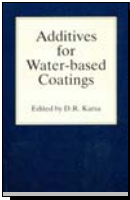

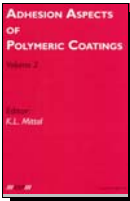

Commerce Library LASCT Holdings - medium detail






by Title: **A**

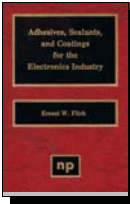

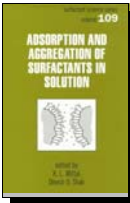

02-Oct-04




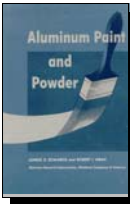
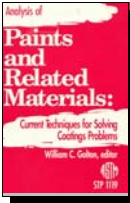
Filter: None

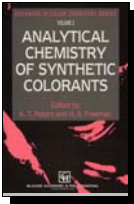



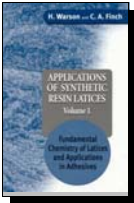
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Acrylic Resins	830	Acrylic Resins <i>Author:</i> Horn, Milton B. <i>Publish.:</i> Reinhold Publishing Corporation <i>- place:</i> New York, NY <i>- date:</i> ©1960 <i>Subject:</i> Acrylic resins <i>Desc:</i> vii, 184 p., illus., 20 cm.	<i>Dynix:</i> 91500 <i>Call No:</i> 668.423 Ho <i>ISBN:</i> <i>LCCN:</i> 60-8707 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Reinhold Plastics Applications Series: No. 14 <i>Year:</i> 1960 <i>Price:</i> \$30.00
	Acrylic Resins Epoxy coatings Plastic coatings	795	Acrylics & Epoxies <i>Author:</i> Coyard, H., P. Deligny and N. Tuck <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©2001 <i>Subject:</i> Plastic coatings <i>Desc:</i> ix, 365 p., illus., 24 cm.	<i>Dynix:</i> 99422 <i>Call No:</i> 668.4 Co <i>ISBN:</i> 0471978949 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 1: Resins for Surface Coatings] <i>Year:</i> 2001 <i>Price:</i> \$95.00
	Chemical literature -- Authorship -- Handbooks, manuals, etc Chemistry English language -- Style -- Handbooks, manuals, etc. Writing	796	ACS Style Guide: A Manual for Authors and Editors <i>Author:</i> Dodd, Janet S. (editor) <i>Publish.:</i> American Chemical Society <i>- place:</i> Washington, DC <i>- date:</i> ©1997 <i>Subject:</i> Chemical literature -- Authorship -- Handbooks, manuals, etc. <i>Desc:</i> xii, 460 p., illus., 24 cm.	<i>Dynix:</i> 100382 <i>Call No:</i> 808.066 Ac <i>ISBN:</i> 0841234620 <i>LCCN:</i> 96-49413 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1997 <i>Price:</i> \$27.00
	Addition polymerization Polymers and polymerization	3	Addition Polymers: Formation and Characterization <i>Author:</i> Smith, Derek A. (editor) <i>Publish.:</i> Plenum Press <i>- place:</i> New York, NY <i>- date:</i> [1968] <i>Subject:</i> Addition polymerization <i>Desc:</i> vii, 492 p., illus., 23 cm.	<i>Dynix:</i> 07919 <i>Call No:</i> 547.84 Sm <i>ISBN:</i> <i>LCCN:</i> 68-28666 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1968 <i>Price:</i> \$25.00

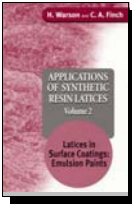
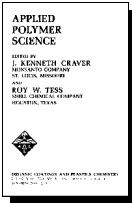
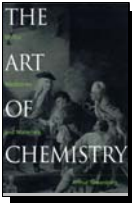
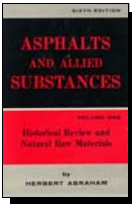
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Coatings -- Additives	797	Additives for Coatings <i>Author:</i> Bieleman, Johan H. (editor) <i>Publish.:</i> Wiley - VCH - <i>place:</i> Weinheim, Germany - <i>date:</i> ©2000 <i>Subject:</i> Coatings -- Additives <i>Desc:</i> xviii, 372 p., illus., 25 cm.	<i>Dynix:</i> 99408 <i>Call No:</i> 667.9 Ad <i>ISBN:</i> 3527297855 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 2000 Price: \$148.50
	Emulsion paint -- Additives Protective coatings -- Additives	671	Additives for Water-Based Coatings: The Proceedings of a Symposium Organized by the North West <i>Author:</i> Karsa, David R. (editor) <i>Publish.:</i> Royal Society of Chemistry - <i>place:</i> Cambridge, UK - <i>date:</i> ©1990 <i>Subject:</i> Protective coatings -- Additives <i>Desc:</i> viii, 283 p., illus., 21 cm.	<i>Dynix:</i> 07899 <i>Call No:</i> 667.9 Ad <i>ISBN:</i> 0851866077 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Special Publication: No 76 Year: 1990 Price: \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	752	Adhesion Aspects of Polymeric Coatings <i>Author:</i> Baghdachi, Jamil A. <i>Publish.:</i> Federation of Societies for Coatings Technology - <i>place:</i> Philadelphia, PA - <i>date:</i> ©1996 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 34 p., illus., 28 cm.	<i>Dynix:</i> 55947-26 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010064 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS26 Year: 1996 Price: \$50.00
	Adhesion -- Congresses Plastic coating -- Congresses Polymers -- Congresses	943	Adhesion Aspects of Polymeric Coatings: Vol. 2 <i>Author:</i> Symposium on Adhesion Aspects of Polymeric Coatings (2nd: 2000: N <i>Publish.:</i> VSP BV - <i>place:</i> Utrecht, The Netherlands / Boston, MA - <i>date:</i> ©2003 <i>Subject:</i> Polymers -- Congresses <i>Desc:</i> viii, 213 p., illus., 25 cm.	<i>Dynix:</i> 106792 <i>Call No:</i> 677 Sy <i>ISBN:</i> 9067643777 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 2003 Price: \$131.00
	Adhesion -- Congresses Coatings -- Congresses Thick films -- Congresses Thin films -- Congresses	4	Adhesion Measurement of Thin Films, Thick Films, and Bulk Coatings: ASTM Symposium Philadelphia <i>Author:</i> Symposium on Adhesion Measurement of Thin Films, Thick Films, and <i>Publish.:</i> American Society for Testing and Materials - <i>place:</i> Philadelphia, PA - <i>date:</i> ©1978 <i>Subject:</i> Adhesion -- Congresses <i>Desc:</i> 402 p., illus., 24 cm.	<i>Dynix:</i> 13009 <i>Call No:</i> 667.9 Mi <i>ISBN:</i> 0464000025 <i>LCCN:</i> 77-84460 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> ASTM Special Technical Publication: No. 640 Year: 1978 Price: \$25.00


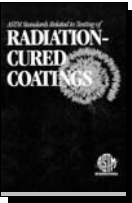


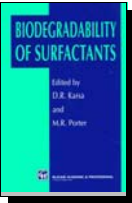
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Adhesives Polymers	908	Adhesion of Polymers <i>Author:</i> Veselovsky, R. A. (Roman Aleksandrovich) and Vladimir N.(Nikolaevich) <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Adhesives <i>Desc:</i> xi, 397 p., illus., 24 cm.	<i>Dynix:</i> 105686 <i>Call No:</i> 668 Ve <i>ISBN:</i> 0071370455 <i>LCCN:</i> 2001-026703 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> McGraw-Hill Professional Engineering Series <i>Year:</i> 2002 <i>Price:</i> \$78.50
	Adhesion Composite materials -- Surfaces Polymers -- Surfaces Surfaces (Technology)	5	Adhesion Promotion Techniques: Technological Applications <i>Author:</i> Mittal, K. L. and A. Pizzi (editors) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Surfaces (Technology) <i>Desc:</i> ix, 404 p., illus., 24 cm.	<i>Dynix:</i> 89759 <i>Call No:</i> 620.1 Ad <i>ISBN:</i> 0824702391 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Materials Engineering: No. 14 <i>Year:</i> 1999 <i>Price:</i> \$168.50
	Adhesives	6	Adhesive Bonding: Techniques and Applications <i>Author:</i> Cagle, Charles V. <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> [1968] <i>Subject:</i> Adhesives <i>Desc:</i> ix, 351 p., illus., 23 cm.	<i>Dynix:</i> 13018 <i>Call No:</i> 668.3 Ca <i>ISBN:</i> 0070095868 <i>LCCN:</i> 68-16167 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1968 <i>Price:</i> \$25.00
	Adhesives -- Patents	7	Adhesive Technology: Developments Since 1977 <i>Author:</i> Torrey, S. (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1980 <i>Subject:</i> Adhesives -- Patents <i>Desc:</i> xii, 500 p., illus., 24 cm.	<i>Dynix:</i> 13023 <i>Call No:</i> 668.3 To <i>ISBN:</i> 0815507879 <i>LCCN:</i> 79-25936 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 148 <i>Year:</i> 1980 <i>Price:</i> \$25.00
	Adhesives	8	Adhesives Technology: Developments Since 1979 <i>Author:</i> Gutcho, M. H. (Marcia Halpern), 1924- (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1983 <i>Subject:</i> Adhesives <i>Desc:</i> xii, 452 p., illus., 24 cm.	<i>Dynix:</i> 00090 <i>Call No:</i> 668.302 Gu <i>ISBN:</i> 0815509219 <i>LCCN:</i> 82-19096 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 215 <i>Year:</i> 1983 <i>Price:</i> \$25.00

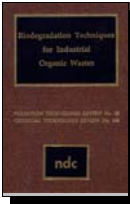

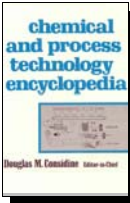
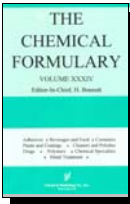
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Adhesives -- Handbooks, manuals, etc. Coating Technology Electronics -- Materials -- Catalogs Sealing (Technology) -- Handbooks, manuals, etc.	9	Adhesives, Sealants and Coatings for the Electronics Industry <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1986 <i>Subject:</i> Electronics -- Materials -- Catalogs <i>Desc:</i> xviii, 197 p., 24 cm.	<i>Dynix:</i> 02814 <i>Call No:</i> 668.302 FI <i>ISBN:</i> 0815510551 <i>LCCN:</i> 85-25930 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1986 <i>Price:</i> \$25.00
	Adhesives -- Patents	10	Adhesives: Recent Developments <i>Author:</i> Herman, Bernard S. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1976 <i>Subject:</i> Adhesives -- Patents <i>Desc:</i> x, 302 p., 25 cm.	<i>Dynix:</i> 13020 <i>Call No:</i> 668.3 He <i>ISBN:</i> 0815506139 <i>LCCN:</i> 76-2195 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 65 <i>Year:</i> 1976 <i>Price:</i> \$25.00
	Adsorption Surface active agents	1454	Adsorption and Aggregation of Surfactants in Solution <i>Author:</i> Mittal, K. L. and Dinesh O. Shah (editors) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©2003 <i>Subject:</i> Surface active agents <i>Desc:</i> xvii, 697 p, illus., 24 cm.	<i>Dynix:</i> 111670 <i>Call No:</i> 541.3 In <i>ISBN:</i> 0824708431 <i>LCCN:</i> 2002-036811 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Surfactant Science Series: Vol. 109 -- International Symposium on Surfactants in Solution (13th: 2000: Gainesville, FL) <i>Year:</i> 2003 <i>Price:</i> \$195.00
	Aerosols	11	Aerosols: Science and Technology <i>Author:</i> Shepherd, Herman R. (editor) <i>Publish.:</i> Interscience Publishers, Inc. <i>- place:</i> New York, NY <i>- date:</i> [1961] <i>Subject:</i> Aerosols <i>Desc:</i> xiv, 548 p., illus., 24 cm.	<i>Dynix:</i> 43931 <i>Call No:</i> 541.345 Sh <i>ISBN:</i> 1124046038 <i>LCCN:</i> 61-8070 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1961 <i>Price:</i> \$25.00

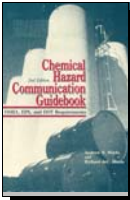
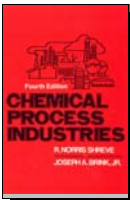

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	755	Aerospace and Aircraft Coatings <i>Author:</i> Chattopadhyay, Ashok K. and Mark R. Zentner <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1990 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 32 p., illus., 28 cm.	<i>Dynix:</i> 55947-14 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010080 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS14 <i>Year:</i> 1990 <i>Price:</i> \$50.00
	Elastomers Polymers Thermoplastics	1375	Aging and Chemical Resistance <i>Author:</i> Bonten, Christian and Robert Berlich <i>Publish.:</i> Hanser Publishers / Hanser Gardner Publications <i>- place:</i> Munich, Germany / Cincinnati, OH <i>- date:</i> ©2001 <i>Subject:</i> Thermoplastics <i>Desc:</i> 128 p., illus., charts, 14 cm.	<i>Dynix:</i> 111729 <i>Call No:</i> 620.1 Bo <i>ISBN:</i> 1569903328 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Plastics Pocket Power <i>Year:</i> 2001 <i>Price:</i> \$16.50
	Gums and resins	798	Alkyds & Polyesters <i>Author:</i> Deligny, P. and N. Tuck <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©2000 <i>Subject:</i> Gums and resins <i>Desc:</i> xi, 204 p., illus., 24 cm.	<i>Dynix:</i> 99423 <i>Call No:</i> 660 De <i>ISBN:</i> 0471978957 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 2: Resins for Surface Coatings] <i>Year:</i> 2000 <i>Price:</i> \$135.00
	Aluminum Paint	12	Aluminum Paint and Powder <i>Author:</i> Edwards, Junius David, 1890- and Robert I. Wray <i>Publish.:</i> Reinhold Publishing Corporation <i>- place:</i> New York, NY <i>- date:</i> ©1955 <i>Subject:</i> Aluminum <i>Desc:</i> viii, 219 p., illus., diagrams, 24 cm.	<i>Dynix:</i> 13003 <i>Call No:</i> 667.69 Ed <i>ISBN:</i> 1124108874 <i>LCCN:</i> 55-6623 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1955 <i>Price:</i> \$25.00
	Coatings technology Paint -- Analysis	14	Analysis of Paints and Related Materials: Current Techniques for Solving Coatings Problems <i>Author:</i> Golton, William C. (editor) <i>Publish.:</i> American Society for Testing and Materials <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1992 <i>Subject:</i> Paint -- Analysis <i>Desc:</i> vii, 203 p., illus., 24 cm.	<i>Dynix:</i> 49008 <i>Call No:</i> 667.6 An <i>ISBN:</i> 0803114656 <i>LCCN:</i> 92-22563 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> STP (Special Technical Publication): No. 1119 <i>Year:</i> 1992 <i>Price:</i> \$61.00


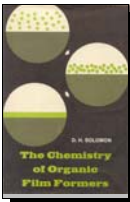

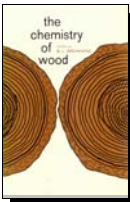

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Dyes and dyeing -- Chemistry Nuclear magnetic resonance spectroscopy	15	Analytical Chemistry of Synthetic Colorants <i>Author:</i> Peters, A. T. and H. S. Freeman (editors) <i>Publish.:</i> Blackie Academic & Professional <i>- place:</i> London, UK / New York, NY <i>- date:</i> ©1995 <i>Subject:</i> Dyes and dyeing -- Chemistry <i>Desc:</i> xi, 212 p., illus., 24 cm.	<i>Dynix:</i> 50475 <i>Call No:</i> 547.86 An <i>ISBN:</i> 0751402087 <i>LCCN:</i> 94-71949 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 1st edition <i>Series:</i> Advances in Color Chemistry Series: Vol. 2. <i>Year:</i> 1995 <i>Price:</i> \$75.00
	ASTM	771	Annual Book of ASTM Standards: Section 06 -- Paints, Related Coatings and Aromatics (Volumes 06) <i>Author:</i> American Society for Testing and Materials <i>Publish.:</i> American Society for Testing and Materials <i>- place:</i> Philadelphia, PA <i>- date:</i> ©2003 <i>Subject:</i> ASTM <i>Desc:</i> v. illus., 28 cm.	<i>Dynix:</i> 57279 <i>Call No:</i> 620.1 Am (Sect. 0) <i>ISBN:</i> 0803135424 <i>LCCN:</i> 83-641658 <i>Shelf:</i> Reference	<i>Edition:</i> 1993, 1994, 1998, 2001 & 2003 <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$50.00
	Ships -- Corrosion Ships -- Fouling	17	Antifouling Marine Coatings <i>Author:</i> Williams, Alec <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1973 <i>Subject:</i> Ships -- Corrosion <i>Desc:</i> ix, 271 p., illus., 25 cm.	<i>Dynix:</i> 34101 <i>Call No:</i> 667.9 Wi <i>ISBN:</i> 0815504640 <i>LCCN:</i> 73-188407 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Coatings Technology Review: No. 1 <i>Year:</i> 1973 <i>Price:</i> \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	781	Application of Paints and Coatings <i>Author:</i> Levinson, Sidney B. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1988 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 49 p., illus., 28 cm.	<i>Dynix:</i> 55947-09 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010099 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS9 <i>Year:</i> 1988 <i>Price:</i> \$50.00
	Emulsions Gums and resins, Synthetic Polymers	799	Applications of Synthetic Resin Latices [Vol. 1: Fundamental Chemistry of Latices and Applications i] <i>Author:</i> Warson, Henry and C.A. Finch <i>Publish.:</i> John Wiley & Sons <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©2001 <i>Subject:</i> Gums and resins, synthetic <i>Desc:</i> xxix, 700 p., illus., 24 cm.	<i>Dynix:</i> 99428-1 <i>Call No:</i> 668.374 Wa v.01 <i>ISBN:</i> 0471952680 <i>LCCN:</i> 00-044922 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Applications of Synthetic Resin Latices <i>Year:</i> 2001 <i>Price:</i> \$158.50

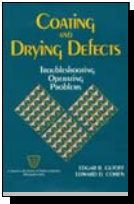


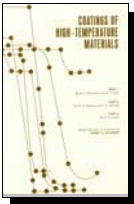
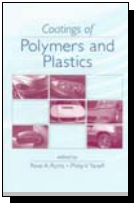
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Emulsions Gums and resins, Synthetic Polymers		802 Applications of Synthetic Resin Latices [Vol. 2: Latices in Surface Coatings: Emulsion Paints] <i>Author:</i> Warson, Henry and C.A. Finch <i>Publish.:</i> John Wiley & Sons <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©2001 <i>Subject:</i> Gums and resins, synthetic <i>Desc:</i> xxiv, 447 p., illus., 24 cm.	<i>Dynix:</i> 99428-2 <i>Call No:</i> 668.374 Wa v.02 <i>ISBN:</i> 0471954616 <i>LCCN:</i> 00-044922 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Applications of Synthetic Resin Latices <i>Year:</i> 2001 <i>Price:</i> \$135.00
	Plastics -- Congresses Polymers and polymerization -- Congresses.		18 Applied Polymer Science <i>Author:</i> Craver, J. Kenneth and Roy W. Tess (editors) <i>Publish.:</i> Organic Coatings and Plastics Chemistry Division of the American Chemical Society <i>- place:</i> Washington, DC <i>- date:</i> ©1975 <i>Subject:</i> Plastics -- Congresses <i>Desc:</i> xiii, 921 p., illus., 25 cm.	<i>Dynix:</i> 43963 <i>Call No:</i> 547.84 Ap <i>ISBN:</i> <i>LCCN:</i> 75-23010 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1975 <i>Price:</i> \$25.00
	Alchemy Chemistry -- History Medicine -- History		909 Art of Chemistry: Myths, Medicines, and Materials <i>Author:</i> Greenberg, Arthur <i>Publish.:</i> John Wiley & Sons <i>- place:</i> Hoboken, NJ <i>- date:</i> ©2003 <i>Subject:</i> Chemistry -- History <i>Desc:</i> xix, 357 p., [16] p. of plates: illus. (some color), 29 cm.	<i>Dynix:</i> 104503 <i>Call No:</i> 540.9 Gr <i>ISBN:</i> 0471071803 <i>LCCN:</i> 2002-009950 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Wiley-Interscience Series <i>Year:</i> 2003 <i>Price:</i> \$59.95
	Asphalt Asphalt -- Bibliography Bitumen	Historical Review and Natural Raw Materials - vol. 1 Industrial Raw Materials - vol. 2 Manufactured Products - vol. 3 Methods of Testing: Fabricated Bituminous Products - vol. 5 Methods of Testing: Industrial Raw Bituminous Materials - vol. 4	19 Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing <i>Author:</i> Abraham, Herbert, 1883- <i>Publish.:</i> D. Van Nostrand Company, Inc. <i>- place:</i> Princeton, NJ <i>- date:</i> [1960-63], ©1918 <i>Subject:</i> Asphalt <i>Desc:</i> 5 v., illus., maps, diagrams, 24 cm.	<i>Dynix:</i> 44813 <i>Call No:</i> 553.27 Ab <i>ISBN:</i> <i>LCCN:</i> 60-16501 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 6th edition <i>Series:</i> <i>Year:</i> 1960 <i>Price:</i> \$25.00






Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Colorimetry -- Standards Materials -- Appearance -- Standards	912	ASTM Standards on Color and Appearance Measurement <i>Author:</i> American Society for Testing and Materials, Committee E-12 on Appearance <i>Publish.:</i> ASTM International <i>- place:</i> West Conshohocken, PA <i>- date:</i> ©2000 <i>Subject:</i> Materials -- Appearance -- Standards <i>Desc:</i> xxiii, 710 p., illus., 28 cm. + 1 computer laser optical disc (4¾")	<i>Dynix:</i> 105687 <i>Call No:</i> 630.1 As <i>ISBN:</i> 0803127359 <i>LCCN:</i> 00-026268 <i>Shelf:</i> Reference	<i>Edition:</i> 6th edition <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$175.00
	Plastic coatings -- Testing -- Standards -- United States Radiation curing -- Standards -- United States	913	ASTM Standards Related to Testing of Radiation-Cured Coatings <i>Author:</i> American Society for Testing and Materials <i>Publish.:</i> ASTM International <i>- place:</i> West Conshohocken, PA <i>- date:</i> ©2002 <i>Subject:</i> Radiation curing -- Standards -- United States <i>Desc:</i> xv, 578 p., illus., 28 cm.	<i>Dynix:</i> 105706 <i>Call No:</i> 667 As <i>ISBN:</i> 0803130449 <i>LCCN:</i> 2002-018569 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2002 <i>Price:</i> \$110.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	782	Automotive Coatings <i>Author:</i> McBane, Bruce N. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1987 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 61 p., illus., 28 cm.	<i>Dynix:</i> 55947-07 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010110 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS7 <i>Year:</i> 1987 <i>Price:</i> \$50.00
	Color Dyes and dyeing	803	Billmeyer and Saltzman's Principles of Color Technology <i>Author:</i> Berns, Roy S. <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2000 <i>Subject:</i> Color <i>Desc:</i> ix, 247 p., illus. (some color), 29 cm.	<i>Dynix:</i> 99409 <i>Call No:</i> 667 Be <i>ISBN:</i> 047119459X <i>LCCN:</i> 99-045534 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$78.50
	Surface active agents -- Biodegradation Surfactants	614	Biodegradability of Surfactants <i>Author:</i> Karsa, David R. and M. R. Porter (editors) <i>Publish.:</i> Blackie Academic & Professional; Chapman and Hall <i>- place:</i> London, UK / New York, NY <i>- date:</i> ©1995 <i>Subject:</i> Surface active agents -- Biodegradation <i>Desc:</i> xiii, 257 p., illus., 24 cm.	<i>Dynix:</i> 50467 <i>Call No:</i> 668.1 Bi <i>ISBN:</i> 0751402060 <i>LCCN:</i> 94-78346 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 1st edition <i>Series:</i> <i>Year:</i> 1995 <i>Price:</i> \$119.95

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Factory and trade waste -- Purification Hazardous wastes -- Biodegradation Organic water pollutants -- Biodegradation	20	Biodegradation Techniques for Industrial Organic Wastes <i>Author:</i> DeRenzo, D. J. (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1980 <i>Subject:</i> Factory and trade waste -- Purification <i>Desc:</i> x, 358 p., illus., 25 cm.	<i>Dynix:</i> 15188 <i>Call No:</i> 628.54 Bi <i>ISBN:</i> 081550800X <i>LCCN:</i> 80-12834 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 158 / Pollution Technology Review: No. 65 <i>Year:</i> 1980 <i>Price:</i> \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	783	Cationic Radiation Curing <i>Author:</i> Koleske, Joseph V. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1991 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 27 p., illus., 28 cm.	<i>Dynix:</i> 55947-16 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010137 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS16 <i>Year:</i> 1991 <i>Price:</i> \$50.00
	Chemistry, Technical -- Encyclopedias	21	Chemical and Process Technology Encyclopedia <i>Author:</i> Considine, Douglas Maxwell (editor-in-chief) <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> [1974] <i>Subject:</i> Chemistry, Technical -- Encyclopedias <i>Desc:</i> xxix, 1261 p., illus., 24 cm.	<i>Dynix:</i> 12954 <i>Call No:</i> 660 Co <i>ISBN:</i> 007012423X <i>LCCN:</i> 73-12913 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1974 <i>Price:</i> \$25.00
	Chemistry -- laboratory manuals Chemistry, Technical -- Formulae, receipts, prescriptions -- Periodicals Chemistry, Technical -- Formulae, receipts, prescriptions. Formularies	164	Chemical Formulary: Collection of Commercial Formulas for Making Thousands of Products in Many <i>Author:</i> Bennett, H. (Harry), 1895-1990 (editor-in-chief) <i>Publish.:</i> Chemical Publishing Company, Inc. <i>- place:</i> Brooklyn, NY <i>- date:</i> 1933- <i>Subject:</i> Chemistry, Technical -- Formulae, receipts, prescriptions <i>Desc:</i> v. 23 cm.	<i>Dynix:</i> 09724 <i>Call No:</i> 660.83 Ch <i>ISBN:</i> 0820603635 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Chemical Formulary Series <i>Year:</i> 1933 <i>Price:</i> \$50.00

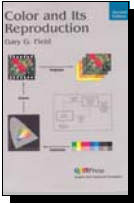

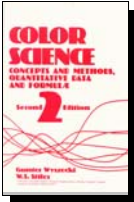
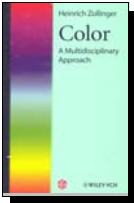
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Hazardous substances -- Law and legislation -- United States -- Handbooks, manuals, etc. Hazardous substances -- United States -- Safety measures -- Handbooks, manuals, etc. United States. Dept. of Transportation United States. Environmental Protection Agency United States. Occupational Safety and Health Administration	22	Chemical Hazard Communication Guidebook: OSHA, EPA and DOT Requirements <i>Author:</i> Waldo, Andrew B. and Richard deC. Hinds <i>Publish.:</i> Executive Enterprises, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1991 <i>Subject:</i> United States. Occupational Safety and Health Administration <i>Desc:</i> 583 p., illus., 28 cm.	<i>Dynix:</i> 56535 <i>Call No:</i> 363.17 Wa <i>ISBN:</i> 1558407588 <i>LCCN:</i> 90-084191 <i>Shelf:</i> Reference	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1991 <i>Price:</i> \$49.95
	Chemistry, Technical	23	Chemical Process Industries <i>Author:</i> Shreve, Randolph Norris, 1885-1975 and Joseph A. Brink <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> ©1977 <i>Subject:</i> Chemistry, Technical <i>Desc:</i> xiii, 814 p., illus., 25 cm.	<i>Dynix:</i> 12955 <i>Call No:</i> 660.2 Sh <i>ISBN:</i> 0070571457 <i>LCCN:</i> 77-4236 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 4th edition <i>Series:</i> <i>Year:</i> 1977 <i>Price:</i> \$25.00
	Photochemistry -- Industrial applications Polymers -- Curing Radiation curing	24	Chemistry and Technology of UV & EB Formulations for Coatings, Inks and Paints [Vol. 1: UV & EB C <i>Author:</i> Mehnert, R., A. Pincus, I. Janorsky, R. Stowe and A. Berejka <i>Publish.:</i> John Wiley & Sons <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©1998 <i>Subject:</i> Radiation curing <i>Desc:</i> x, 291 p., illus., 24 cm.	<i>Dynix:</i> 89747 <i>Call No:</i> 660 Ch <i>ISBN:</i> 0471978906 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology <i>Year:</i> 1998 <i>Price:</i> \$148.50



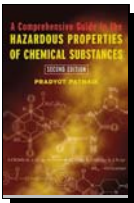

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Wood -- Chemistry	25	Chemistry in the Utilization of Wood <i>Author:</i> Farmer, Robert Harvey <i>Publish.:</i> Pergamon Press, Ltd. <i>- place:</i> Oxford, UK <i>- date:</i> [1967] <i>Subject:</i> Wood -- Chemistry <i>Desc:</i> viii, 193 p., illus., 20 cm.	<i>Dynix:</i> 14913 <i>Call No:</i> 674.134 Fa <i>ISBN:</i> 0080121373 <i>LCCN:</i> 66-29789 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> [1st edition] <i>Series:</i> Pergamon Series of Monographs on Furniture and Timber: Vol. 9 <i>Year:</i> 1967 <i>Price:</i> \$25.00
	Polymers Polymers and polymerization	26	Chemistry of Organic Film Formers <i>Author:</i> Solomon, D. H. (David Henry) <i>Publish.:</i> John Wiley & Sons (Krieger Publishing Company) <i>- place:</i> New York, NY <i>- date:</i> [1967] <i>Subject:</i> Polymers and polymerization <i>Desc:</i> xi, 369 p., illus., 24 cm.	<i>Dynix:</i> 43971 <i>Call No:</i> 547.84 So <i>ISBN:</i> 0882751654 <i>LCCN:</i> 66-28765 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1967 <i>Price:</i> \$25.00
	Dyes and dyeing -- Chemistry Pigments Synthetic products	28	Chemistry of Synthetic Dyes and Pigments <i>Author:</i> Lubs, H. A. (Herbert August), 1891- (editor) <i>Publish.:</i> Hafner Publishing Company <i>- place:</i> New York, NY <i>- date:</i> [1965, ©1955] <i>Subject:</i> Dyes and dyeing -- Chemistry <i>Desc:</i> xiv, 734 p., illus., 24 cm.	<i>Dynix:</i> 18530 <i>Call No:</i> 667.2 Lu <i>ISBN:</i> <i>LCCN:</i> 64-7905 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> American Chemical Society Monograph Series <i>Year:</i> 1955 <i>Price:</i> \$25.00
	Wood -- Chemistry	165	Chemistry of Wood <i>Author:</i> Browning, B. L. (Bertie Lee), 1902- (editor) <i>Publish.:</i> Interscience Publishers, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1963 <i>Subject:</i> Wood -- Chemistry <i>Desc:</i> x, 689 p., illus., 24 cm.	<i>Dynix:</i> 14912 <i>Call No:</i> 674.134 Br <i>ISBN:</i> <i>LCCN:</i> 63-15416 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1963 <i>Price:</i> \$25.00
	Decoration and ornament Paint Painting -- Technique	29	Classic Paints and Faux Finishes: How to Use Natural Materials and Authentic Techniques in Today' <i>Author:</i> Sloan, Annie, 1949- and Kate Gwynn <i>Publish.:</i> Reader's Digest Association <i>- place:</i> Pleasantville, NY <i>- date:</i> ©1993 <i>Subject:</i> Painting -- Technique <i>Desc:</i> 160 p., illus. (some color), 28 cm.	<i>Dynix:</i> 23718 <i>Call No:</i> 745.7 SI <i>ISBN:</i> 0895775239 <i>LCCN:</i> 93-5027 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1993 <i>Price:</i> \$25.00

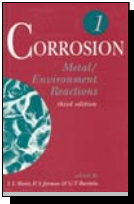




Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Coatings -- Defects Drying	648	Coating and Drying Defects: Troubleshooting Operating Problems <i>Author:</i> Gutoff, Edgar B. and Edward D. Cohen <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1995 <i>Subject:</i> Coatings -- Defects <i>Desc:</i> xvi, 287 p., illus., 27 cm.	<i>Dynix:</i> 50465 <i>Call No:</i> 667 Gu <i>ISBN:</i> 0471598100 <i>LCCN:</i> 94-21972 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> SPE (Society of Plastics Engineers) Monographs <i>Year:</i> 1995 <i>Price:</i> \$69.95
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	784	Coating Film Defects <i>Author:</i> Pierce, Percy E. and Clifford K. Schoff <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1994 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 25 p., illus., 28 cm.	<i>Dynix:</i> 55947-08 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010145 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> Revised edition <i>Series:</i> Federation Series on Coatings Technology: No. FS8R94 <i>Year:</i> 1994 <i>Price:</i> \$50.00
	Coatings -- Dictionaries Coatings processes -- Dictionaries	30	Coatings Encyclopedic Dictionary <i>Author:</i> LeSota, Stanley (editor) <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1995 <i>Subject:</i> Coatings -- Dictionaries <i>Desc:</i> 1 v., xvi, 391 p., 24 cm.	<i>Dynix:</i> 65280 <i>Call No:</i> 667.9 Co <i>ISBN:</i> 0934010048 <i>LCCN:</i> 95-061644 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1995 <i>Price:</i> \$105.00
	Diffusion coatings Protective coatings Refractory transition metal compounds	31	Coatings of High-Temperature Materials <i>Author:</i> Hausner, Henry Herman, 1901- (editor) <i>Publish.:</i> Plenum Press <i>- place:</i> New York, NY <i>- date:</i> ©1966 <i>Subject:</i> Diffusion coatings <i>Desc:</i> ix, 296 p., illus., 26 cm.	<i>Dynix:</i> 13008 <i>Call No:</i> 667.9 Ha <i>ISBN:</i> 0306302101 <i>LCCN:</i> 65-12156 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1966 <i>Price:</i> \$25.00
	Plastic coatings Polymers	1460	Coatings of Polymers and Plastics <i>Author:</i> Ryntz, Rose Ann and Philip V. Yaneff (editors) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©2003 <i>Subject:</i> Plastic coatings <i>Desc:</i> x, 359 p., illus., 24 cm.	<i>Dynix:</i> 111669 <i>Call No:</i> 668.4 Co <i>ISBN:</i> 0824708946 <i>LCCN:</i> 2003-043754 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Materials Engineering: No. 21 <i>Year:</i> 2003 <i>Price:</i> \$155.00

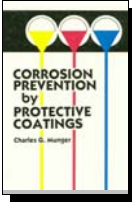

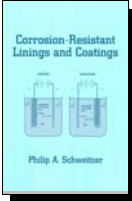

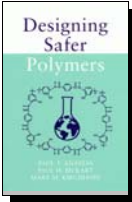
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Coating processes Paint materials Protective coatings	Coatings Raw Materials - vol. 1 Industrial Coatings - vol. 3 Trade Sale and Architectural Coatings - vol. 2	32 Coatings Technology <i>Author:</i> Fibiger, W. and A. C. Boyce (editors) <i>Publish.:</i> ITE Consultants <i>- place:</i> Willowdale, Ontario, Canada <i>- date:</i> 1998 <i>Subject:</i> Coating processes <i>Desc:</i> various pagings, illus., diagrams, 28 cm.	<i>Dynix:</i> 84296 <i>Call No:</i> 667.9 Co <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1998 <i>Price:</i> \$100.00
	Coating processes Paint materials Protective coatings		938 Coatings Technology <i>Author:</i> Fibiger, W. and A. C. Boyce (editors) <i>Publish.:</i> ITE Consultants <i>- place:</i> Willowdale, Ontario, Canada <i>- date:</i> ©2002 <i>Subject:</i> Protective coatings <i>Desc:</i> 3 v., illus., 28 cm.	<i>Dynix:</i> 106361 <i>Call No:</i> 667.9 Co <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 5th edition, Revised <i>Series:</i> <i>Year:</i> 2002 <i>Price:</i> \$300.00
	Coating processes -- Patents -- Periodicals Coatings -- Patents -- Periodicals		33 Coatings Technology Annual: 1978 <i>Author:</i> Gillies, M. T. (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1978 <i>Subject:</i> Coating processes -- Patents -- Periodicals <i>Desc:</i> xiv, 353 p., 24 cm.	<i>Dynix:</i> 35194 <i>Call No:</i> 667.6 Co <i>ISBN:</i> 0815507054 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 1st edition <i>Series:</i> <i>Year:</i> 1978 <i>Price:</i> \$25.00
	Coating processes		804 Coatings Technology Handbook <i>Author:</i> Satas, Donatas and Arthur A. Tracton (editors) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©2001 <i>Subject:</i> Coating processes -- Handbooks, manuals, etc. <i>Desc:</i> xvi, 902 p., illus., 26 cm.	<i>Dynix:</i> 99418 <i>Call No:</i> 667.9 Co <i>ISBN:</i> 0824704398 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> 2nd edition, Revised and expanded <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$188.50
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals		785 Coil Coatings <i>Author:</i> Gaske, Joseph E. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1987 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 20 p., illus., 28 cm.	<i>Dynix:</i> 55947-04 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010153 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS4 <i>Year:</i> 1987 <i>Price:</i> \$50.00


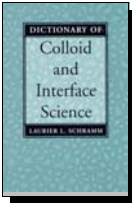

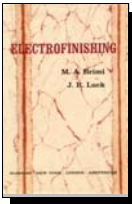

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Clay Clay Materials Colloids	1369	Colloid and Surface Properties of Clays and Related Minerals <i>Author:</i> Giese, Rossman F. and Carel J. van Oss (editors) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Clay <i>Desc:</i> xvi, 295 p., illus., 24 cm.	<i>Dynix:</i> 111668 <i>Call No:</i> 541.3 Gi <i>ISBN:</i> 082479527X <i>LCCN:</i> 2001-055551 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Surfactant Science Series: Vol. 105 <i>Year:</i> 2002 <i>Price:</i> \$128.50
	Adsorption Colloids Polymers	640	Colloid-Polymer Interactions: From Fundamentals to Practice <i>Author:</i> Farinato, Raymond S. and Paul L. Dubin (editors) <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Adsorption <i>Desc:</i> x, 417 p., illus., 25 cm.	<i>Dynix:</i> 88634 <i>Call No:</i> 541.33 Fa <i>ISBN:</i> 0471243167 <i>LCCN:</i> 98-50702 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$115.00
	Colloids	914	Colloidal Dispersions: Suspensions, Emulsions, and Foams <i>Author:</i> Morrison, Ian Douglas and Sydney Ross <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Colloids <i>Desc:</i> xxvii, 616 p., illus., 25 cm.	<i>Dynix:</i> 105707 <i>Call No:</i> 541.3 Mo <i>ISBN:</i> 0471176257 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Wiley-Interscience Series <i>Year:</i> 2002 <i>Price:</i> \$91.50
	Colloids Surface chemistry	642	Colloidal Domain: Where Physics, Chemistry, Biology and Technology Meet <i>Author:</i> Evans, D. Fennell and Hakan Wennerstrom <i>Publish.:</i> Wiley - VCH, Verlag GmbH & Co. (John Wiley & Sons) <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Colloids <i>Desc:</i> xl, 632 p., illus., 26 cm.	<i>Dynix:</i> 88636 <i>Call No:</i> 541.345 Ev <i>ISBN:</i> 0471242470 <i>LCCN:</i> 98-23227 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Advances in Interfacial Engineering Series <i>Year:</i> 1999 <i>Price:</i> \$89.95
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	786	Color and Appearance <i>Author:</i> Pierce, Percy E. and Robert T. Marcus <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1994 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 44 p., illus., 28 cm.	<i>Dynix:</i> 55947-22 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 093401017X <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS22 <i>Year:</i> 1994 <i>Price:</i> \$50.00

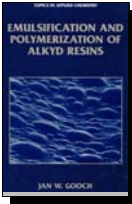
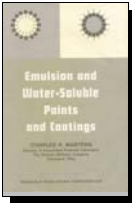


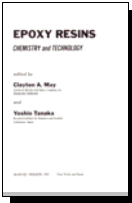
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Color	34	Color and Its Reproduction <i>Author:</i> Field, Gary G. <i>Publish.:</i> GATF Press - <i>place:</i> Pittsburgh, PA - <i>date:</i> ©1999 <i>Subject:</i> Color <i>Desc:</i> 475 p., illus. (some color), 27 cm.	<i>Dynix:</i> 89745 <i>Call No:</i> 535.6 Fi <i>ISBN:</i> 0883622017 <i>LCCN:</i> 97-74131 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$58.50
	Color	805	Color for Science, Art and Technology <i>Author:</i> Nassau, Kurt (editor) <i>Publish.:</i> Elsevier - <i>place:</i> Amsterdam, The Netherlands - <i>date:</i> ©1998 <i>Subject:</i> Color <i>Desc:</i> xvii, 491 p., illus. (some color), 25 cm.	<i>Dynix:</i> 99410 <i>Call No:</i> 535.6 Co <i>ISBN:</i> 0444898468 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Azimuth Series: Vol. 1 <i>Year:</i> 1998 <i>Price:</i> \$118.50
	Color	35	Color Science: Concepts and Methods, Quantitative Data and Formulae <i>Author:</i> Wyszecki, Gunter and W. S. (Walter Stanley) Stiles <i>Publish.:</i> John Wiley & Sons - <i>place:</i> New York, NY - <i>date:</i> ©1982 <i>Subject:</i> Color <i>Desc:</i> xv, 950 p., illus., 27 cm.	<i>Dynix:</i> 00296 <i>Call No:</i> 535.6 Wy <i>ISBN:</i> 0471021067 <i>LCCN:</i> 82-2794 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Wiley Series in Pure and Applied Optics <i>Year:</i> 1982 <i>Price:</i> \$25.00
	Color -- Psychological aspects Color in art Color vision Colorimetry Colors -- Analysis	36	Color: A Multidisciplinary Approach <i>Author:</i> Zollinger, Heinrich, 1919- <i>Publish.:</i> Verlag Helvetica Chimica Acta; Wiley-VCH, - <i>place:</i> Zurich, Switzerland / New York, NY - <i>date:</i> ©1999 <i>Subject:</i> Color -- Analysis <i>Desc:</i> x, 258 p., illus. (some color), 24 cm.	<i>Dynix:</i> 89746 <i>Call No:</i> 535 Zo <i>ISBN:</i> 3906390187 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$98.50

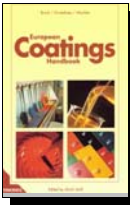



Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Colors Dyes and dyeing Dyes and dyeing -- Chemistry	Vol 1: Part I-Dyes and Pigments (Usage) Vol 2: Part I-Dyes and Pigments (Usage) Vol 3: Part II-Dyes and Pigments (Chemical Constitutions) Vol 4: Part III-Abbreviations Vol 5: 1963 Supplement	37 Colour Index <i>Author:</i> Society of Dyers and Colourists <i>Publish.:</i> Society of Dyers and Colourists; American Association of Textile Chemi <i>- place:</i> Bradford, [Yorkshire], UK / Lowell, MA <i>- date:</i> ©1956 <i>Subject:</i> Dyes and dyeing <i>Desc:</i> xxviii, 809 p., 29 cm. (Includes 1963 Supplement)	<i>Dynix:</i> 08254 <i>Call No:</i> 667.2 So <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1956 <i>Price:</i> \$250.00
	House painting -- Amateurs' manuals Interior decoration -- Amateurs' manuals		672 Complete Guide to Painting Your Home: Doing It the Way a Professional Does, Inside and Out <i>Author:</i> Luts, Jack, 1918- and Pete Peterson <i>Publish.:</i> Betterway Publications, Inc. <i>- place:</i> White Hall, VA <i>- date:</i> ©1989 <i>Subject:</i> House painting -- Amateurs' manuals <i>Desc:</i> 160 p., illus., 28 cm.	<i>Dynix:</i> 21208 <i>Call No:</i> 698.1 Lu <i>ISBN:</i> 1558701192 <i>LCCN:</i> 88-37724 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1989 <i>Price:</i> \$25.00
	Chemicals Chemicals -- Tables Hazardous Substances -- toxicity Toxicology		1 Comprehensive Guide to the Hazardous Properties of Chemical Substances <i>Author:</i> Patnaik, Pradyot <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Toxicology <i>Desc:</i> xxiii, 984 p., illus., 26 cm.	<i>Dynix:</i> 89749 <i>Call No:</i> 615.9 Pa <i>ISBN:</i> 0471291757 <i>LCCN:</i> 98-39972 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$155.00
	Copyright -- United States -- Popular Works		915 Copyright Handbook: How to Protect and Use Written Works <i>Author:</i> Fishman, Stephen <i>Publish.:</i> Nolo Press <i>- place:</i> Berkeley, CA <i>- date:</i> ©2002 <i>Subject:</i> Copyright -- United States -- Popular works <i>Desc:</i> [various pagings], illus., 28 cm.	<i>Dynix:</i> 54747 <i>Call No:</i> 346.73 Co 2002 <i>ISBN:</i> 0873378555 <i>LCCN:</i> 2002-071919 <i>Shelf</i> Reference	<i>Edition:</i> 6th edition <i>Series:</i> Nolo Press Self-Help Law Books <i>Year:</i> 2002 <i>Price:</i> \$28.50



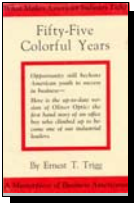

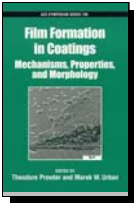
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Corrosion and anti-corrosives	Corrosion Control - vol. 2 Metal / Environment Reactions - vol. 1	39 Corrosion <i>Author:</i> Shreir, L. L., R. A. Jarman and G. T. Burstein (editors) <i>Publish.:</i> Butterworth-Heinemann, Ltd. <i>- place:</i> Oxford, UK <i>- date:</i> 1994 <i>Subject:</i> Corrosion and anti-corrosives <i>Desc:</i> xxv, various paging (approx. 3184 pp.), illus., 24 cm.	<i>Dynix:</i> 49681 <i>Call No:</i> 620.1 Co <i>ISBN:</i> 0750610778 <i>LCCN:</i> 93-13859 <i>Shelf:</i> Reference	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1994 <i>Price:</i> \$125.00
	Corrosion and anti-corrosives		645 Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering <i>Author:</i> Uhlig, Herbert Henry, 1907- <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1985 <i>Subject:</i> Corrosion and anti-corrosives <i>Desc:</i> xiv, 441 p., illus., 24 cm.	<i>Dynix:</i> 07945 <i>Call No:</i> 620.1 Uh <i>ISBN:</i> 0471078182 <i>LCCN:</i> 84-13034 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1985 <i>Price:</i> \$25.00
	Corrosion and anti-corrosives		40 Corrosion Engineering <i>Author:</i> Fontana, Mars Guy, 1910- and Norbert D. Greene <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> [1967] <i>Subject:</i> Corrosion and anti-corrosives <i>Desc:</i> 391 p., illus., 23 cm.	<i>Dynix:</i> 14747 <i>Call No:</i> 620.1122 Fo <i>ISBN:</i> 0070214603 <i>LCCN:</i> 67-19901 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1967 <i>Price:</i> \$25.00
	Corrosion and anti-corrosives		41 Corrosion Inhibitors: Developments Since 1980 <i>Author:</i> Collie, M. J. (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1983 <i>Subject:</i> Corrosion and anti-corrosives <i>Desc:</i> xii, 379 p., illus., 24 cm.	<i>Dynix:</i> 00750 <i>Call No:</i> 620.1 Co <i>ISBN:</i> 081550957X <i>LCCN:</i> 83-13055 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 223 <i>Year:</i> 1983 <i>Price:</i> \$25.00
	Chemical inhibitors -- Patents Corrosion and anti-corrosives -- Patents		42 Corrosion Inhibitors: Recent Developments <i>Author:</i> Robinson, J. S., 1936- <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1979 <i>Subject:</i> Chemical inhibitors -- Patents <i>Desc:</i> xiii, 306 p., illus., 25 cm.	<i>Dynix:</i> 14752 <i>Call No:</i> 620.112 Ro <i>ISBN:</i> 0815507577 <i>LCCN:</i> 79-14637 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 132 <i>Year:</i> 1979 <i>Price:</i> \$25.00






Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Corrosion and anti-corrosives	646	Corrosion Prevention by Protective Coatings <i>Author:</i> Munger, Charles G. <i>Publish.:</i> National Association of Corrosion Engineers <i>- place:</i> Houston, TX <i>- date:</i> ©1984 <i>Subject:</i> Corrosion and anti-corrosives <i>Desc:</i> 512 p. [8] pages of plates, illus., 29 cm.	<i>Dynix:</i> 04800 <i>Call No:</i> 620.1122 Mu <i>ISBN:</i> 0915567040 <i>LCCN:</i> 84-61872 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1984 <i>Price:</i> \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	787	Corrosion Protection By Coatings <i>Author:</i> Wicks, Zeno W., Jr. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1987 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 22 p., illus., 28 cm.	<i>Dynix:</i> 55947-05 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010188 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS5 <i>Year:</i> 1987 <i>Price:</i> \$50.00
	Corrosion and anti-corrosives Protective coatings	806	Corrosion-Resistant Linings and Coatings <i>Author:</i> Schweitzer, Philip A. <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©2001 <i>Subject:</i> Protective coatings <i>Desc:</i> vi, 427 p., illus., 24 cm.	<i>Dynix:</i> 99411 <i>Call No:</i> 620.1 Sc <i>ISBN:</i> 0824705548 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Corrosion Technology: Vol. 16 <i>Year:</i> 2001 <i>Price:</i> \$153.50
	Experimental design	916	Design and Analysis of Experiments <i>Author:</i> Montgomery, Douglas C. <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2001 <i>Subject:</i> Experimental design <i>Desc:</i> xii, 684 p., illus., 26 cm.	<i>Dynix:</i> 105708 <i>Call No:</i> 001.4 Mo <i>ISBN:</i> 0471316490 <i>LCCN:</i> 99-057472 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 5th edition <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$101.50
	Environmental chemistry -- Industrial applications -- Congresses Polymers -- Environmental aspects Polymers -- Synthesis	910	Designing Safer Polymers <i>Author:</i> Anastas, Paul T., Paul H. Bickart and Mary M. Kirchhoff <i>Publish.:</i> Wiley - Interscience Publishers <i>- place:</i> New York, NY <i>- date:</i> [2000] <i>Subject:</i> Environmental chemistry -- Industrial applications -- Congresses <i>Desc:</i> x, 116 p., illus., 24 cm.	<i>Dynix:</i> 104502 <i>Call No:</i> 668.9 An <i>ISBN:</i> 0471397334 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$69.95

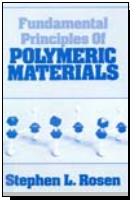



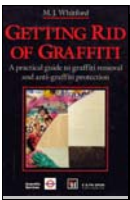
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Gums and resins Polyesters	166	Development and Use of Polyester Products <i>Author:</i> Doyle, E. N. <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> [1969] <i>Subject:</i> Polyesters <i>Desc:</i> x, 371 p., illus., 23 cm.	<i>Dynix:</i> 31421 <i>Call No:</i> 668.422 Do <i>ISBN:</i> 1125256915 <i>LCCN:</i> 68-8032 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1969 <i>Price:</i> \$25.00
	Colloids -- Dictionaries Surface chemistry -- Dictionaries	807	Dictionary of Colloid and Interface Science <i>Author:</i> Schramm, Laurier Lincoln <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2001 <i>Subject:</i> Colloids -- Dictionaries <i>Desc:</i> x, 218 p., 25 cm.	<i>Dynix:</i> 99412 <i>Call No:</i> 541.3 Di <i>ISBN:</i> 0471394068 <i>LCCN:</i> 00-047731 <i>Shelf:</i> Reference	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$48.50
	Electrophoretic deposition -- Patents Radiation curing -- Patents	674	Electrodeposition and Radiation Curing of Coatings, 1970 <i>Author:</i> Ranney, Maurice William, 1934- <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1970 <i>Subject:</i> Electrophoretic deposition -- Patents <i>Desc:</i> 170 p., illus., 27 cm.	<i>Dynix:</i> 35843 <i>Call No:</i> 671.732 Ra <i>ISBN:</i> 0815501348 <i>LCCN:</i> 76-117449 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Chemical Process Series <i>Year:</i> 1970 <i>Price:</i> \$50.00
	Electrolytic polishing Electroplating	43	Electrofinishing <i>Author:</i> Brimi, Marjorie A. and James R. Luck <i>Publish.:</i> American Elsevier Publishing Company <i>- place:</i> New York, NY <i>- date:</i> ©1965 <i>Subject:</i> Electroplating <i>Desc:</i> v, 282 p., 24 cm.	<i>Dynix:</i> 14899 <i>Call No:</i> 671.732 Br <i>ISBN:</i> <i>LCCN:</i> 65-27527 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1965 <i>Price:</i> \$25.00
	Colors Painting -- Technique	167	Elements of Color: A Treatise on the Color System of Johannes Itten Based on His Book "The Art of <i>Author:</i> Itten, Johannes, 1888-1967 (Faber Birren, editor) <i>Publish.:</i> Van Nostrand Reinhold Company <i>- place:</i> New York, NY <i>- date:</i> [1970] <i>Subject:</i> Color <i>Desc:</i> 96 p., illus. (part color) portraits, 21 cm.	<i>Dynix:</i> 89726 <i>Call No:</i> 701.8 It <i>ISBN:</i> 0442240384 <i>LCCN:</i> 77-124314 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Basic Color Library <i>Year:</i> 1970 <i>Price:</i> \$40.00





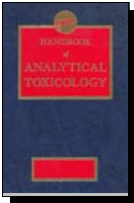
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Alkyd resins Emulsification	935	Emulsification and Polymerization of Alkyd Resins <i>Author:</i> Gooch, Jan W. (Jan Woodall), 1946- <i>Publish.:</i> Kluwer Academic / Plenum Publishers <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Alkyd resins <i>Desc:</i> xxii, 223 p., illus., 24 cm.	<i>Dynix:</i> 105709 <i>Call No:</i> 668 Go <i>ISBN:</i> 0306467178 <i>LCCN:</i> 2001-053915 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Topics in Applied Chemistry <i>Year:</i> 2002 <i>Price:</i> \$91.50
	Paint	44	Emulsion and Water-Soluble Paints and Coatings <i>Author:</i> Martens, Charles R. <i>Publish.:</i> Reinhold Publishing Corporation <i>- place:</i> New York, NY <i>- date:</i> [1964] <i>Subject:</i> Paint <i>Desc:</i> viii, 160 p., illus., 24 cm.	<i>Dynix:</i> 13002 <i>Call No:</i> 667.63 Ma <i>ISBN:</i> 0442155581 <i>LCCN:</i> 64-22873 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1964 <i>Price:</i> \$25.00
	Plastics -- Dictionaries	168	Encyclopedia of Basic Materials for Plastics <i>Author:</i> Simonds, Herbert R. (Herbert Rumsey), 1887- and James M. Church () <i>Publish.:</i> Reinhold Publishing Corporation <i>- place:</i> New York, NY <i>- date:</i> [1967] <i>Subject:</i> Plastics -- Dictionaries <i>Desc:</i> viii, 500 p., illus., 27 cm.	<i>Dynix:</i> 16492 <i>Call No:</i> 668.4 Si <i>ISBN:</i> 0442155948 <i>LCCN:</i> 67-26047 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1967 <i>Price:</i> \$50.00
	Epoxy resins -- Patents	46	Epoxy Resin Technology: Developments Since 1979 <i>Author:</i> DiStasio, J. I. (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1982 <i>Subject:</i> Epoxy resins -- Patents <i>Desc:</i> xii, 366 p., illus., 25 cm.	<i>Dynix:</i> 02315 <i>Call No:</i> 668.374 Ep <i>ISBN:</i> 0815508883 <i>LCCN:</i> 81-18926 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 204 <i>Year:</i> 1982 <i>Price:</i> \$25.00
	Epoxy resins	47	Epoxy Resins: Chemistry and Technology <i>Author:</i> May, Clayton A. and Yoshio Tanaka (editors) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1973 <i>Subject:</i> Epoxy resins <i>Desc:</i> xii, 801 p., illus., 26 cm.	<i>Dynix:</i> 49233 <i>Call No:</i> 668.374 Ma <i>ISBN:</i> 0824714466 <i>LCCN:</i> 72-78242 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1973 <i>Price:</i> \$25.00

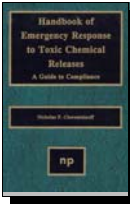


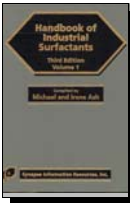
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Coating processes -- Handbooks, manuals, etc. Coatings -- Handbooks, manuals, etc. Finishes and finishing -- Handbooks, manuals, etc. Materials -- Handbooks, manuals, etc.	808	European Coatings Handbook <i>Author:</i> Brock, Thomas, Michael Groteklaes and Peter Mischke <i>Publish.:</i> Vincentz-Verlag <i>- place:</i> Hannover, Germany <i>- date:</i> ©2000 <i>Subject:</i> Coatings -- Handbooks, manuals, etc <i>Desc:</i> 410 p., illus., 27 cm.	<i>Dynix:</i> 100380 <i>Call No:</i> 667.9 Br <i>ISBN:</i> 387870559X <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Coatings Compendia <i>Year:</i> 2000 <i>Price:</i> \$108.00
	Plastic foams	48	Expanded Plastics and Related Products: Developments Since 1978 <i>Author:</i> Meltzer, Yale L. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1983 <i>Subject:</i> Plastic foams <i>Desc:</i> x, 262 p., illus., 25 cm.	<i>Dynix:</i> 00747 <i>Call No:</i> 668.4 Me <i>ISBN:</i> 0815509553 <i>LCCN:</i> 83-12165 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 221 <i>Year:</i> 1983 <i>Price:</i> \$25.00
	Polymers Polymers -- Experiments Polymers -- Research -- Methodology	49	Experimental Methods in Polymer Science: Modern Methods in Polymer Research and Technology <i>Author:</i> Tanaka, Toyochi (editor) <i>Publish.:</i> Academic Press <i>- place:</i> San Diego, CA <i>- date:</i> ©2000 <i>Subject:</i> Polymers <i>Desc:</i> xii, 604 p., illus., 24 cm.	<i>Dynix:</i> 89756 <i>Call No:</i> 547.7 Ex <i>ISBN:</i> 012683265X <i>LCCN:</i> 99-61578 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Series in Polymers, Interfaces and Biomaterials <i>Year:</i> 2000 <i>Price:</i> \$75.00
	Paint industry and trade Pigments	668	Exposure Studies of Organic Pigments in Paint Systems <i>Author:</i> Vesce, Vincent C. <i>Publish.:</i> Allied Chemical Company, National Aniline Division <i>- place:</i> New York, NY <i>- date:</i> ©1959 <i>Subject:</i> Pigments <i>Desc:</i> 143 p., illus., plates, tables, 23 cm.	<i>Dynix:</i> 12999 <i>Call No:</i> 667.623 Ve <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1959 <i>Price:</i> \$25.00



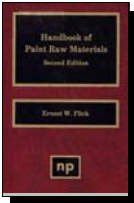

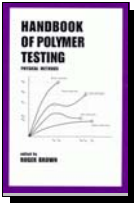
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Emulsion paint -- Handbooks, manuals, etc.	50	Exterior Water-Based Trade Paint Formulations <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1980 <i>Subject:</i> Emulsion paint -- Handbooks, manuals, etc. <i>Desc:</i> xvi, 349 p., 24 cm.	<i>Dynix:</i> 64075 <i>Call No:</i> 667.63 FI <i>ISBN:</i> 0815508204 <i>LCCN:</i> 80-19212 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1980 <i>Price:</i> \$36.00
	Coatings -- Testing Paint -- Testing	809	Failure Analysis of Paints and Coatings <i>Author:</i> Weldon, Dwight G. <i>Publish.:</i> John Wiley & Sons <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©2001 <i>Subject:</i> Paint -- Testing <i>Desc:</i> xii, 285 p., illus., 24 cm.	<i>Dynix:</i> 99413 <i>Call No:</i> 667.6 We <i>ISBN:</i> 0471490725 <i>LCCN:</i> 00-048592 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$105.00
	Paint industry and trade -- United States	52	Fifty-Five Colorful Years: The Story of Paint in America <i>Author:</i> Trigg, Ernest T., b. 1877. <i>Publish.:</i> Pequot Press <i>- place:</i> Stonington, CT <i>- date:</i> [1954] <i>Subject:</i> Paint industry and trade -- United States <i>Desc:</i> xvi, 307 p., illus., portraits., 22 cm.	<i>Dynix:</i> 12994 <i>Call No:</i> 667.6 Tr <i>ISBN:</i> <i>LCCN:</i> 54-12624 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> [1st edition] <i>Series:</i> <i>Year:</i> 1954 <i>Price:</i> \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	788	Film Formation <i>Author:</i> Wicks, Zeno W., Jr. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1986 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 19 p., illus., 28 cm.	<i>Dynix:</i> 55947-01 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010196 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS1 <i>Year:</i> 1986 <i>Price:</i> \$50.00
	Protective coatings Surfaces (Technology)	917	Film Formation in Coatings: Mechanisms, Properties, and Morphology <i>Author:</i> Provdor, Theodore, 1939- and Marek W. Urban, 1953- (editors) <i>Publish.:</i> American Chemical Society <i>- place:</i> Washington, DC <i>- date:</i> ©2001 <i>Subject:</i> Protective coatings <i>Desc:</i> viii, 304 p., illus., 24 cm.	<i>Dynix:</i> 105710 <i>Call No:</i> 667 Fi <i>ISBN:</i> 0841237123 <i>LCCN:</i> 2001-016046 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> ACS Symposium Series: No. 790 <i>Year:</i> 2001 <i>Price:</i> \$93.50




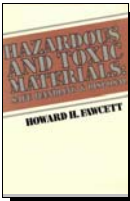

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Finishes and finishing Stains and staining Wood finishing	939	Finishes for Exterior Wood: Selection, Application and Maintenance <i>Author:</i> Williams, R. Sam, Mark T. Knaebe and William C. Feist <i>Publish.:</i> Forest Products Society <i>- place:</i> Madison, WI <i>- date:</i> ©1996 <i>Subject:</i> Wood Finishing <i>Desc:</i> 127 p., illus. (some color), 28 cm.	<i>Dynix:</i> 106363 <i>Call No:</i> 698.12 Wi <i>ISBN:</i> 0935018832 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1996 <i>Price:</i> \$28.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	789	Finishing Exterior Wood <i>Author:</i> Feist, William C. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1996 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 44 p., illus., 28 cm.	<i>Dynix:</i> 55947-27 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010218 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS27 <i>Year:</i> 1996 <i>Price:</i> \$50.00
	Fireproofing agents Fireproofing agents -- Patents Fireproofing of wood Paint, Fireproof	53	Fire Retardant Building Products and Coatings, 1970 <i>Author:</i> Ranney, Maurice William, 1934- <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1970 <i>Subject:</i> Fireproofing agents -- Patents <i>Desc:</i> 186 p., illus., 28 cm.	<i>Dynix:</i> 16503 <i>Call No:</i> 691 Ra <i>ISBN:</i> 0815503121 <i>LCCN:</i> 79-117447 <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Chemical Process Reviews <i>Year:</i> 1970 <i>Price:</i> \$50.00
	Fire resistant materials -- United States -- Patents Fireproofing agents -- United States -- Patents	617	Flame Retardant Coatings and Building Materials <i>Author:</i> Williams, Alec <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1974 <i>Subject:</i> Fireproofing agents -- United States -- Patents <i>Desc:</i> x, 310 p., illus., 25 cm.	<i>Dynix:</i> 34102 <i>Call No:</i> 667.9 Wi <i>ISBN:</i> 081550523X <i>LCCN:</i> 73-76901 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 25 <i>Year:</i> 1974 <i>Price:</i> \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	942	Free Radical Radiation Curing <i>Author:</i> Koleske, Joseph V. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1997 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 29 p., illus., 28 cm.	<i>Dynix:</i> 55947-30 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010226 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> Revised edition <i>Series:</i> Federation Series on Coatings Technology: No. FS2R97 <i>Year:</i> 1997 <i>Price:</i> \$50.00

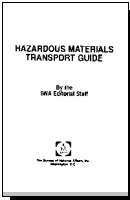



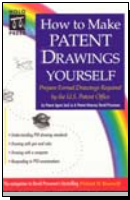
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Polymers	54	Fundamental Principles of Polymeric Materials <i>Author:</i> Rosen, Stephen L., 1937- <i>Publish.:</i> John Wiley & Sons - <i>place:</i> New York, NY - <i>date:</i> ©1982 <i>Subject:</i> Polymers <i>Desc:</i> xvi, 346 p., illus., 24 cm.	<i>Dynix:</i> 13052 <i>Call No:</i> 668.9 Ro <i>ISBN:</i> 0471087041 <i>LCCN:</i> 81-10320 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> SPE (Society of Plastics Engineers) Monographs <i>Year:</i> 1982 <i>Price:</i> \$25.00
	Aerosols	55	Fundamentals of Aerosol Science <i>Author:</i> Shaw, David T. (editor) <i>Publish.:</i> John Wiley & Sons - <i>place:</i> New York, NY - <i>date:</i> ©1978 <i>Subject:</i> Aerosols <i>Desc:</i> ix, 372 p., illus., 24 cm.	<i>Dynix:</i> 00014 <i>Call No:</i> 541.345 Fu <i>ISBN:</i> 0471029491 <i>LCCN:</i> 77-19331 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1978 <i>Price:</i> \$25.00
	Lacquer and lacquering Paint Varnish and varnishing	56	Fundamentals of Paint, Varnish and Lacquer Technology <i>Author:</i> Singer, Elias <i>Publish.:</i> American Paint Journal Company - <i>place:</i> St. Louis, MO - <i>date:</i> [©1957] <i>Subject:</i> Paint <i>Desc:</i> 330 p., 21 cm.	<i>Dynix:</i> 34098 <i>Call No:</i> 667.6 Si <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1957 <i>Price:</i> \$25.00
	Copyright -- Computer programs -- United States Copyright licenses -- United States Online information services -- Law and legislation -- United States	918	Getting Permission: How to License and Clear Copyrighted Materials Online and Off <i>Author:</i> Stim, Richard <i>Publish.:</i> Nolo Press - <i>place:</i> Berkeley, CA - <i>date:</i> ©2001 <i>Subject:</i> Copyright -- Computer programs -- United States <i>Desc:</i> [various pagings], illus., forms, 28 cm., + 1 computer laser optical disc (4 1/4")	<i>Dynix:</i> 105689 <i>Call No:</i> 346.730 St <i>ISBN:</i> 087337536X <i>LCCN:</i> 99-28701 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 1st edition <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$25.00
	Buses -- Cleaning Coating Technology Graffiti Masonry -- Cleaning	57	Getting Rid of Graffiti: A Practical Guide to Graffiti Removal and Anti-Graffiti Protection <i>Author:</i> Whitford, M. J. (Maurice J) <i>Publish.:</i> E & FN Spon (Chapman & Hall) - <i>place:</i> London, UK - <i>date:</i> ©1992 <i>Subject:</i> Masonry -- Cleaning <i>Desc:</i> xvi, 160 p., [16] p. of plates (some color) illus., 24 cm.	<i>Dynix:</i> 31811 <i>Call No:</i> 667 Wh <i>ISBN:</i> 0442314906 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 1st edition <i>Series:</i> <i>Year:</i> 1992 <i>Price:</i> \$25.00

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Color -- Dictionaries	638	Glossary of Color Terms <i>Author:</i> Inter-Society Color Council Committee, Federation of Societies for Coat <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1981 <i>Subject:</i> Color -- Dictionaries <i>Desc:</i> vii, 87 p., 23 cm.	<i>Dynix:</i> 44466 <i>Call No:</i> 535.6 GI <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1981 <i>Price:</i> \$25.00
	Hazardous wastes Solvents	58	Guide to Solvent Waste Reduction Alternatives: Final Report <i>Author:</i> <i>Publish.:</i> ICF Consulting Associates, Inc. <i>- place:</i> Los Angeles, CA <i>- date:</i> [1986] <i>Subject:</i> Solvents <i>Desc:</i> 272 p. in various pagings, 28 cm.	<i>Dynix:</i> 41634 <i>Call No:</i> 363.728 Gu <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1986 <i>Price:</i> \$25.00
	Adhesives	675	Handbook of Adhesive Raw Materials <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1982 <i>Subject:</i> Adhesives <i>Desc:</i> xxx, 303 p., 24 cm.	<i>Dynix:</i> 33820 <i>Call No:</i> 668.411 F1 <i>ISBN:</i> 0815508972 <i>LCCN:</i> 82-2251 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1982 <i>Price:</i> \$45.00
	Adhesives	59	Handbook of Adhesives <i>Author:</i> Skeist, Irving (editor) <i>Publish.:</i> Van Nostrand Reinhold Company <i>- place:</i> New York, NY <i>- date:</i> ©1977 <i>Subject:</i> Adhesives <i>Desc:</i> xviii, 921 p., illus., 27 cm.	<i>Dynix:</i> 13021 <i>Call No:</i> 668.3 Sk <i>ISBN:</i> 0442276346 <i>LCCN:</i> 76-18057 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1977 <i>Price:</i> \$25.00
	Analytical toxicology -- Laboratory manuals Poisons	60	Handbook of Analytical Toxicology <i>Author:</i> Sunshine, Irving (editor) <i>Publish.:</i> CRC (Chemical Rubber Company) Press <i>- place:</i> Cleveland, OH <i>- date:</i> [1969] <i>Subject:</i> Analytical toxicology -- Laboratory manuals <i>Desc:</i> xiv, 1081 p., illus., 28 cm.	<i>Dynix:</i> 44570 <i>Call No:</i> 547.33 Ha <i>ISBN:</i> 0849335515 <i>LCCN:</i> 69-20046 <i>Shelf</i> Reference	<i>Edition:</i> 1st edition <i>Series:</i> CRC Handbook Series <i>Year:</i> 1969 <i>Price:</i> \$50.00

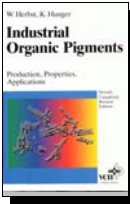
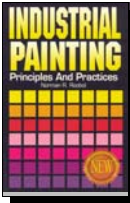

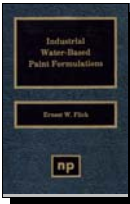

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Chemical spills -- Reporting -- Handbooks, manuals, etc. Hazardous substances -- Accidents -- Handbooks, manuals, etc. Hazardous substances -- Safety measures -- Handbooks, manuals, etc.	61	Handbook of Emergency Response to Toxic Chemical Releases: A Guide to Compliance <i>Author:</i> Cheremisinoff, Nicholas P. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1995 <i>Subject:</i> Hazardous substances -- Safety measures -- Handbooks, manuals, etc. <i>Desc:</i> x, 315 p., illus., 28 cm.	<i>Dynix:</i> 50457 <i>Call No:</i> 363.17 Ch <i>ISBN:</i> 0815513658 <i>LCCN:</i> 94-31268 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1995 <i>Price:</i> \$64.00
	Fillers (Materials) -- Handbooks, manuals, etc. Plastics -- Additives -- Handbooks, manuals, etc.	62	Handbook of Fillers and Reinforcements for Plastics <i>Author:</i> Katz, Harry S. and John V. Milewski (editors) <i>Publish.:</i> Van Nostrand Reinhold Company <i>- place:</i> New York, NY <i>- date:</i> ©1978 <i>Subject:</i> Plastics -- Additives -- Handbooks, manuals, etc. <i>Desc:</i> viii, 652 p., illus., 26 cm.	<i>Dynix:</i> 13025 <i>Call No:</i> 668.4 Ha <i>ISBN:</i> 0442253729 <i>LCCN:</i> 77-22335 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1978 <i>Price:</i> \$25.00
	Coating Technology Fire resistant materials -- Catalogs Fire resistant materials industry -- United States -- Directories Materials testing laboratories -- United States -- Directories Paint Technology	63	Handbook of Fire Retardant Coatings and Fire Testing Services <i>Author:</i> <i>Publish.:</i> Technomic Publishing Company, Inc. <i>- place:</i> Lancaster, PA <i>- date:</i> ©1990 <i>Subject:</i> Fire resistant materials -- Catalogs <i>Desc:</i> v, 255 p., illus., 29 cm.	<i>Dynix:</i> 21899 <i>Call No:</i> 667.69 Ha <i>ISBN:</i> 0877626901 <i>LCCN:</i> 90-70537 <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1990 <i>Price:</i> \$50.00
	Surface active agents	810	Handbook of Industrial Surfactants <i>Author:</i> Ash, Michael and Irene Ash (compilers) <i>Publish.:</i> Synapse Information Resources, Inc. <i>- place:</i> Endicott, NY <i>- date:</i> ©2000 <i>Subject:</i> Surface active agents <i>Desc:</i> xiii, 2129 p., 28 cm.	<i>Dynix:</i> 101997 <i>Call No:</i> 620 As <i>ISBN:</i> 1890595217 <i>LCCN:</i> 00-190127 <i>Shelf</i> Reference	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$395.00


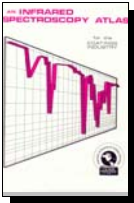
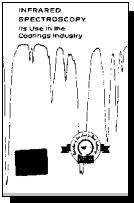


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Plastic coatings -- Handbooks, manuals, etc.		64 Handbook of Organic Coatings: A Comprehensive Guide for the Coatings Industry <i>Author:</i> Seymour, Raymond Benedict, 1912- and Herman F. Mark <i>Publish.:</i> Elsevier Science Publishing Company, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1990 <i>Subject:</i> Plastic coatings -- Handbooks, manuals, etc. <i>Desc:</i> ix, 350 p., illus., 24 cm.	<i>Dynix:</i> 23956 <i>Call No:</i> 667.92 Se <i>ISBN:</i> 0444015191 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1990 <i>Price:</i> \$25.00
	Coatings -- Handbooks, manuals, etc. Paint -- Handbooks, manuals, etc.	Vol 1: Trade Name Products Vol 2: Chemical Products	811 Handbook of Paint and Coating Raw Materials <i>Author:</i> Ash, Michael and Irene Ash (editors) <i>Publish.:</i> Gower Publishing Limited <i>- place:</i> Aldershot, [Hampshire], UK <i>- date:</i> ©1996 <i>Subject:</i> Paint -- Handbooks, manuals, etc. <i>Desc:</i> (v.1: xvi, 1000 p.); (v.2: xvi, 589 p.), 24 cm.	<i>Dynix:</i> 100255 <i>Call No:</i> 667.9 Ha <i>ISBN:</i> 0566077876 <i>LCCN:</i> 96-704 <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1996 <i>Price:</i> \$575.00
	Paint materials		65 Handbook of Paint Raw Materials <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1989 <i>Subject:</i> Paint materials <i>Desc:</i> xxvii, 998 p., 25 cm.	<i>Dynix:</i> 07912 <i>Call No:</i> 667.6 Fl <i>ISBN:</i> 0815511841 <i>LCCN:</i> 89-30275 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1989 <i>Price:</i> \$25.00
	Elastomers -- Handbooks, manuals, etc. Plastics -- Handbooks, manuals, etc.		919 Handbook of Plastics, Elastomers and Composites <i>Author:</i> Harper, Charles A. (editor-in-chief) <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Plastics -- Handbooks, manuals, etc. <i>Desc:</i> xii, 884 p., illus., 24 cm.	<i>Dynix:</i> 105711 <i>Call No:</i> 668.4 Ha <i>ISBN:</i> 0071384766 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 4th edition <i>Series:</i> McGraw-Hill Handbooks <i>Year:</i> 2002 <i>Price:</i> \$103.50
	Plastics -- Testing Polymers -- Testing		66 Handbook of Polymer Testing: Physical Methods <i>Author:</i> Brown, Roger P. (editor) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Plastics -- Testing <i>Desc:</i> x, 845 p., illus., 26 cm.	<i>Dynix:</i> 89755 <i>Call No:</i> 620.13 Ha <i>ISBN:</i> 0824701712 <i>LCCN:</i> 98-45735 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Plastics Engineering: No. 50 <i>Year:</i> 1999 <i>Price:</i> \$193.50

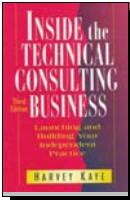
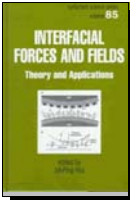



Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Adhesives	67	Handbook of Pressure-Sensitive Adhesive Technology <i>Author:</i> Satas, Donatas (editor) <i>Publish.:</i> Van Nostrand Reinhold Company - <i>place:</i> New York, NY - <i>date:</i> ©1982 <i>Subject:</i> Adhesives <i>Desc:</i> xvi, 620 p., illus., 24 cm.	<i>Dynix:</i> 00015 <i>Call No:</i> 668.3 Ha <i>ISBN:</i> 0442257244 <i>LCCN:</i> 81-10455 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1982 Price: \$25.00
	Solvents -- Handbooks, manuals, etc.	813	Handbook of Solvents <i>Author:</i> Wypych, George (editor) <i>Publish.:</i> ChemTec Publishing - <i>place:</i> Toronto, Canada - <i>date:</i> ©2001 <i>Subject:</i> Solvents -- Handbooks, manuals, etc. <i>Desc:</i> xxix, 1675 p., illus., 24 cm.	<i>Dynix:</i> 99414 <i>Call No:</i> 660 Ha <i>ISBN:</i> 1895198240 <i>LCCN:</i> 00-106798 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Year: 2001 Price: \$213.50
	Polymers -- Solubility Solution (Chemistry) Thin films	68	Hansen Solubility Parameters: A User's Handbook <i>Author:</i> Hansen, Charles M. <i>Publish.:</i> CRC (Chemical Rubber Company) Press - <i>place:</i> Boca Raton, FL - <i>date:</i> ©2000 <i>Subject:</i> Solution (Chemistry) <i>Desc:</i> 208 p., illus., 26 cm.	<i>Dynix:</i> 89761 <i>Call No:</i> 547.7 Ha <i>ISBN:</i> 0849315255 <i>LCCN:</i> 99-26234 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 2000 Price: \$108.50
	Hazardous wastes -- United States -- Safety measures	69	Hazardous and Toxic Materials: Safe Handling and Disposal <i>Author:</i> Fawcett, Howard H. <i>Publish.:</i> John Wiley & Sons - <i>place:</i> New York, NY - <i>date:</i> ©1984 <i>Subject:</i> Hazardous wastes -- United States -- Safety measures <i>Desc:</i> xi, 296 p., illus., 24 cm.	<i>Dynix:</i> 02760 <i>Call No:</i> 615.902 Fa <i>ISBN:</i> 0471804835 <i>LCCN:</i> 84-5148 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1984 Price: \$25.00
	Hazardous substances Toxicology	920	Hazardous Chemicals Desk Reference <i>Author:</i> Lewis, Richard J., Sr. (editor) <i>Publish.:</i> John Wiley & Sons - <i>place:</i> New York, NY - <i>date:</i> ©2002 <i>Subject:</i> Hazardous substances <i>Desc:</i> xx, 1695 p., 26 cm.	<i>Dynix:</i> 105718 <i>Call No:</i> 604.7 Le <i>ISBN:</i> 0471441651 <i>LCCN:</i> 2001-045614 <i>Shelf:</i> Reference	<i>Edition:</i> 5th edition <i>Series:</i> Wiley-Interscience Publication Year: 2002 Price: \$165.00


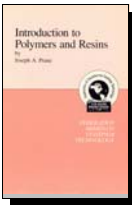
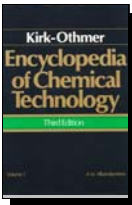
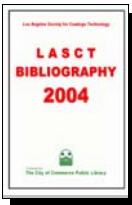

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Hazardous substances	70	Hazardous Materials Transport Guide <i>Author:</i> BNA (Bureau of National Affairs) Staff <i>Publish.:</i> Bureau of National Affairs, Inc. <i>- place:</i> Washington, DC <i>- date:</i> ©1984 <i>Subject:</i> Hazardous substances <i>Desc:</i> x, 366 p., 23 cm.	<i>Dynix:</i> 30113 <i>Call No:</i> 344.73 Ha <i>ISBN:</i> 0871794624 <i>LCCN:</i> 84-19919 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1984 <i>Price:</i> \$25.00
	Pigments	814	High Performance Pigments <i>Author:</i> Smith, Hugh MacDonald (editor) <i>Publish.:</i> Wiley - VCH <i>- place:</i> Weinheim, Germany <i>- date:</i> ©2002 <i>Subject:</i> Pigments <i>Desc:</i> xv, 435 p., illus. (some color), 25 cm.	<i>Dynix:</i> 99417 <i>Call No:</i> 667.29 Hi <i>ISBN:</i> 3527302042 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2002 <i>Price:</i> \$93.50
	Adhesives, Hot melt Adhesives, Hot melt -- Patents Patents -- United States	71	Hot Melt Adhesives <i>Author:</i> Bateman, D. L. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1978 <i>Subject:</i> Adhesives, Hot melt <i>Desc:</i> xiv, 494 p., illus., 25 cm.	<i>Dynix:</i> 13017 <i>Call No:</i> 668.3 Ba <i>ISBN:</i> 0815507046 <i>LCCN:</i> 78-55526 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> Chemical Technology Review: No. 109 <i>Year:</i> 1978 <i>Price:</i> \$25.00
	Automobiles -- Equipment and supplies Chemicals Household supplies	72	Household, Automotive and Industrial Chemical Formulations <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1984 <i>Subject:</i> Chemicals <i>Desc:</i> xxii, 360 p., 25 cm.	<i>Dynix:</i> 01020 <i>Call No:</i> 660.272 FI <i>ISBN:</i> 0815509707 <i>LCCN:</i> 83-22115 <i>Shelf:</i> Reference	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1984 <i>Price:</i> \$50.00
	Patents -- United States	73	How to Make Patent Drawings Yourself <i>Author:</i> Lo, Jack and David Pressman <i>Publish.:</i> Nolo Press <i>- place:</i> Berkeley, CA <i>- date:</i> ©1999 <i>Subject:</i> Patents -- United States <i>Desc:</i> 1 v. (various pagings) illus., 28 cm.	<i>Dynix:</i> 89754 <i>Call No:</i> 608.022 Lo <i>ISBN:</i> 0873374916 <i>LCCN:</i> 98-25849 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$18.50



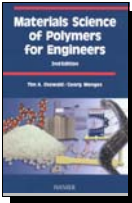
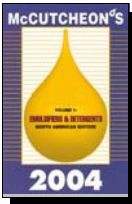
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Hydrophile-lipophile balance Surface active agents	921	Hydrophile-Lipophile Balance of Surfactants and Solid Particles: Physicochemical Aspects and Appl <i>Author:</i> Kruglyakov, Pyotr M. (Maksimovich) <i>Publish.:</i> Elsevier Science B.V. <i>- place:</i> Amsterdam, The Netherlands <i>- date:</i> ©2000 <i>Subject:</i> Hydrophile-lipophile balance <i>Desc:</i> xii, 391 p., illus., 25 cm.	<i>Dynix:</i> 105712 <i>Call No:</i> 541.3 Kr <i>ISBN:</i> 0444502572 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 1st edition <i>Series:</i> Studies in Interface Science Vol. 9 <i>Year:</i> 2000 <i>Price:</i> \$165.00
	Coatings	74	Industrial Coatings: Properties, Applications Quality and Environmental Compliance <i>Author:</i> ASM/ESD Advanced Coatings Technology Conference (2-5 Nov 1992) <i>Publish.:</i> ASM International <i>- place:</i> Materials Park, OH <i>- date:</i> ©1992 <i>Subject:</i> Coatings <i>Desc:</i> vi, 170 p., illus., 29 cm.	<i>Dynix:</i> 49546 <i>Call No:</i> 667.9 In <i>ISBN:</i> 0871704617 <i>LCCN:</i> 92-82926 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1992 <i>Price:</i> \$83.00
	Cleaning Cleaning compounds	75	Industrial Detergency <i>Author:</i> Niven, William W. <i>Publish.:</i> Reinhold Publishing Corporation <i>- place:</i> New York, NY <i>- date:</i> [1955] <i>Subject:</i> Cleaning compounds <i>Desc:</i> 340 p., illus., 24 cm.	<i>Dynix:</i> 34103 <i>Call No:</i> 668.1 Ni <i>ISBN:</i> <i>LCCN:</i> 54-11032 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1955 <i>Price:</i> \$25.00
	Pigments	76	Industrial Inorganic Pigments <i>Author:</i> Buxbaum, Gunter (editor) <i>Publish.:</i> Wiley - VCH, Verlag GmbH & Co. <i>- place:</i> New York, NY <i>- date:</i> ©1998 <i>Subject:</i> Pigments <i>Desc:</i> xiii, 289 p., illus. (some color), 25 cm.	<i>Dynix:</i> 73389 <i>Call No:</i> 667.29 In <i>ISBN:</i> 3527288783 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> 2nd edition, Completely revised <i>Series:</i> <i>Year:</i> 1998 <i>Price:</i> \$184.00
	Organic compounds Pigments	1549	Industrial Organic Pigments: Production, Properties, Applications <i>Author:</i> Herbst, Willy and Klaus Hunger <i>Publish.:</i> Wiley - VCH, Verlag GmbH & Co. KGaA <i>- place:</i> Weinheim, Germany <i>- date:</i> ©2004 <i>Subject:</i> Pigments <i>Desc:</i> xviii, 660 p., illus. (some color), 25 cm.	<i>Dynix:</i> 111667 <i>Call No:</i> 667 He <i>ISBN:</i> 3527305769 <i>LCCN:</i> 2004-274313 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition, Completely revised <i>Series:</i> <i>Year:</i> 2004 <i>Price:</i> \$198.50





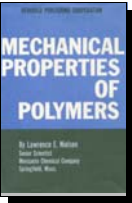
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Organic compounds Pigments	77	Industrial Organic Pigments: Production, Properties, Applications <i>Author:</i> Herbst, Willy and Klaus Hunger <i>Publish.:</i> VCH, Verlagsgesellschaft mbH <i>- place:</i> Weinheim, Germany <i>- date:</i> ©1997 <i>Subject:</i> Pigments <i>Desc:</i> xvi, 652 p., illus. (some color), 25 cm.	<i>Dynix:</i> 73390 <i>Call No:</i> 667.29 He <i>ISBN:</i> 3527288368 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> 2nd edition, Completely revised <i>Series:</i> <i>Year:</i> 1997 <i>Price:</i> \$288.75
	Painting, Industrial	78	Industrial Painting: Principles and Practices <i>Author:</i> Roobol, Norman R. <i>Publish.:</i> Hanser Gardner Publications, Inc. <i>- place:</i> Cincinnati, OH <i>- date:</i> ©1997 <i>Subject:</i> Painting, Industrial <i>Desc:</i> xii, 340 p., illus., 26 cm.	<i>Dynix:</i> 78748 <i>Call No:</i> 667 Ro <i>ISBN:</i> 1569902151 <i>LCCN:</i> 96-38488 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1997 <i>Price:</i> \$49.95
	Plastics Plastics -- Handbooks, manuals, etc.	1095	Industrial Plastics: Theory and Applications <i>Author:</i> Lokensgard, Erik <i>Publish.:</i> Thomson Delmar Learning <i>- place:</i> Albany, NY <i>- date:</i> ©2004 <i>Subject:</i> Plastics <i>Desc:</i> xvii, 528 p., illus., 28 cm.	<i>Dynix:</i> 111666 <i>Call No:</i> 668.4 Ri <i>ISBN:</i> 1401804691 <i>LCCN:</i> 2003-042609 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 4th edition <i>Series:</i> <i>Year:</i> 2004 <i>Price:</i> \$76.50
	Emulsion paint	79	Industrial Water-Based Paint Formulations <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1988 <i>Subject:</i> Emulsion paint <i>Desc:</i> xvi, 277 p., 25 cm.	<i>Dynix:</i> 64073 <i>Call No:</i> 667.63 FI <i>ISBN:</i> 0815511469 <i>LCCN:</i> 87-31531 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1988 <i>Price:</i> \$42.00
	Chemistry, Organic Infrared spectroscopy	80	Infrared Absorption Spectroscopy <i>Author:</i> Nakanishi, Koji, 1925- and Philippa H. Solomon <i>Publish.:</i> Holden-Day, Inc. <i>- place:</i> San Francisco, CA <i>- date:</i> ©1977 <i>Subject:</i> Infrared spectroscopy <i>Desc:</i> x, 287 p., illus., 26 cm.	<i>Dynix:</i> 44141 <i>Call No:</i> 535.842 Na <i>ISBN:</i> 0816262519 <i>LCCN:</i> 76-27393 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1977 <i>Price:</i> \$25.00




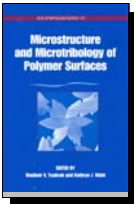
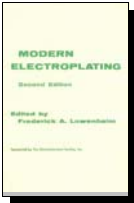
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Infrared spectroscopy -- Atlases Plastic coatings -- Spectra -- Atlases	815	Infrared Spectroscopy Atlas for the Coatings Industry <i>Author:</i> Chicago Society for Coatings Technology (Infrared Spectroscopy Atlas) <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1991 <i>Subject:</i> Plastic coatings -- Spectra -- Atlases <i>Desc:</i> Vol 1: vi, pp. 1-510, illus., 29 cm. --- Vol 2: vi, pp. 511-1001, illus., 29 cm.	<i>Dynix:</i> 100378 <i>Call No:</i> 667.9 In <i>ISBN:</i> 093401003X <i>LCCN:</i> 91-72765 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 4th edition <i>Series:</i> FSCT Item No. TV2 <i>Year:</i> 1991 <i>Price:</i> \$150.00
	Plastic coatings -- Spectra	13	Infrared Spectroscopy Atlas for the Coatings Industry <i>Author:</i> Chicago Society for Coatings Technology (Infrared Spectroscopy Com) <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1980 <i>Subject:</i> Plastic coatings -- Spectra <i>Desc:</i> xi, 896 p., illus., 29 cm.	<i>Dynix:</i> 02019 <i>Call No:</i> 667.9 Ch <i>ISBN:</i> 0934010005 <i>LCCN:</i> 79-52815 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1980 <i>Price:</i> \$25.00
	Coatings -- Spectra Infrared spectroscopy Polymers and polymerization -- Spectra	81	Infrared Spectroscopy: Its Use in the Coatings Industry <i>Author:</i> Chicago Society for Paint Technology (Infrared Spectroscopy Committ) <i>Publish.:</i> Federation of Societies for Paint Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1969 <i>Subject:</i> Infrared spectroscopy <i>Desc:</i> x, 456 p. chiefly graphs, 29 cm.	<i>Dynix:</i> 44140 <i>Call No:</i> 535.842 Ch <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1969 <i>Price:</i> \$25.00
	Pigments -- Patents	82	Inorganic Pigments: Manufacturing Processes <i>Author:</i> Gutcho, M. H. (Marcia Halpern), 1924- (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1980 <i>Subject:</i> Pigments -- Patents <i>Desc:</i> xvi, 488 p., illus., 25 cm.	<i>Dynix:</i> 12984 <i>Call No:</i> 667.29 In <i>ISBN:</i> 0815508115 <i>LCCN:</i> 80-16319 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 166 <i>Year:</i> 1980 <i>Price:</i> \$25.00
	Pigments Primers (Coating)	790	Inorganic Primer Pigments <i>Author:</i> Smith, Alan <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1988 <i>Subject:</i> Pigments -- Periodicals <i>Desc:</i> 26 p., illus., 28 cm.	<i>Dynix:</i> 55947-11 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010234 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS11 <i>Year:</i> 1988 <i>Price:</i> \$50.00

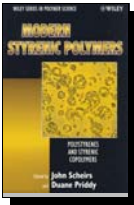


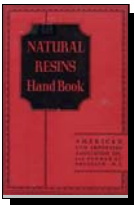
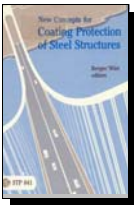
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Consulting engineers Engineering firms -- Management	922	Inside the Technical Consulting Business: Launching and Building Your Independent Practice <i>Author:</i> Kaye, Harvey <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1998 <i>Subject:</i> Consulting engineers <i>Desc:</i> xvii, 366 p., illus., 24 cm.	<i>Dynix:</i> 105713 <i>Call No:</i> 620 Ka <i>ISBN:</i> 0471183415 <i>LCCN:</i> 97-22690 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1998 <i>Price:</i> \$71.50
	Interfaces (Physical sciences) Surface chemistry	84	Interfacial Forces and Fields: Theory and Applications <i>Author:</i> Jyh-Ping, Hsu (editor) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Surface chemistry <i>Desc:</i> xi, 671 p., illus., 24 cm.	<i>Dynix:</i> 89750 <i>Call No:</i> 541.33 In <i>ISBN:</i> 0824719646 <i>LCCN:</i> 99-30737 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Surfactant Science Series: Vol. 85 <i>Year:</i> 1999 <i>Price:</i> \$193.50
	Emulsion paint	670	Interior Water-Based Trade Paint Formulations <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1980 <i>Subject:</i> Emulsion paint <i>Desc:</i> xvii, 364 p., 25 cm.	<i>Dynix:</i> 13000 <i>Call No:</i> 667.63 Fl <i>ISBN:</i> 0815508034 <i>LCCN:</i> 80-12814 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1980 <i>Price:</i> \$25.00
	Coatings	791	Introduction to Coatings Technology <i>Author:</i> Brandau, Alan H. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1990 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 46 p., illus., 28 cm.	<i>Dynix:</i> 55947-15 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010242 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS15 <i>Year:</i> 1990 <i>Price:</i> \$50.00
	Paint	85	Introduction to Paint Chemistry and Principles of Paint Technology <i>Author:</i> Turner, G. P. A. (Gerald Patrick Anthony) <i>Publish.:</i> Chapman and Hall <i>- place:</i> New York, NY <i>- date:</i> ©1980 <i>Subject:</i> Paint <i>Desc:</i> 229 p., illus., 23 cm.	<i>Dynix:</i> 12996 <i>Call No:</i> 667.6 Tu <i>ISBN:</i> 041216180X <i>LCCN:</i> 80-40558 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1980 <i>Price:</i> \$25.00

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Pigments	792	Introduction to Pigments <i>Author:</i> Braun, Juergen H. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1993 <i>Subject:</i> Pigments -- Periodicals <i>Desc:</i> 34 p., illus., 28 cm.	<i>Dynix:</i> 55947-19 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010269 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS19 <i>Year:</i> 1993 <i>Price:</i> \$50.00
	Polymers	793	Introduction to Polymers and Resins <i>Author:</i> Prane, Joseph W. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1986 <i>Subject:</i> Polymers -- Periodicals <i>Desc:</i> 35 p., illus., 28 cm.	<i>Dynix:</i> 55947-03 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010285 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS3 <i>Year:</i> 1986 <i>Price:</i> \$50.00
	Chemistry, Technical -- Dictionaries	45	Kirk-Othmer Encyclopedia of Chemical Technology <i>Author:</i> Grayson, Martin (executive editor) <i>Publish.:</i> Wiley - Interscience Publishers <i>- place:</i> New York, NY <i>- date:</i> ©1984, 1978 <i>Subject:</i> Chemistry, Technical -- Dictionaries <i>Desc:</i> 24 v., illus., diagrams., 27 cm.	<i>Dynix:</i> 16482 <i>Call No:</i> 660.3 En 1984 ind <i>ISBN:</i> 0471041548 <i>LCCN:</i> 77-15820 <i>Shelf</i> Reference	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1978 <i>Price:</i> \$50.00
	Coating Technology Coatings	87	LASCT Bibliography 2004 <i>Author:</i> City of Commerce (California) Public Library <i>Publish.:</i> City of Commerce Public Library <i>- place:</i> City of Commerce, CA <i>- date:</i> 2004 <i>Subject:</i> Coating technology <i>Desc:</i> 1090 p., 28 cm.	<i>Dynix:</i> 58625 <i>Call No:</i> 016.5 Ci 2004 <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> November 2004 <i>Series:</i> LASCT Bibliography <i>Year:</i> 2004 <i>Price:</i> \$50.00
	License agreements -- United States -- Popular Works Patent laws and legislation -- United States -- Popular Works	923	License Your Invention <i>Author:</i> Stim, Richard <i>Publish.:</i> Nolo Press <i>- place:</i> Berkeley, CA <i>- date:</i> ©2002 <i>Subject:</i> License agreements -- United States -- Popular works <i>Desc:</i> [Various pagings], illus., forms, 28 cm., + 1 CD-ROM (4¾")	<i>Dynix:</i> 105688 <i>Call No:</i> 346.730 St <i>ISBN:</i> 0873378571 <i>LCCN:</i> 2002-029398 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 2002 <i>Price:</i> \$28.50





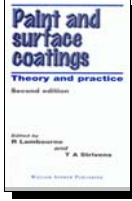
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Macromolecules Polymerization Polymers		928 Macromolecular Symposia: Quo Vadis -- Coatings? <i>Author:</i> Meisel, I. (editor) <i>Publish.:</i> Wiley - VCH, Verlag GmbH & Co. <i>- place:</i> Weinheim, Germany <i>- date:</i> ©2002 <i>Subject:</i> Macromolecules <i>Desc:</i> 958 p., illus., 24 cm.	<i>Dynix:</i> 105719 <i>Call No:</i> 547.7 Ma <i>ISBN:</i> 3527304770 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Macromolecular Symposia: Vol. 187 <i>Year:</i> 2002 <i>Price:</i> \$348.50
	Coatings		794 Marine Coatings <i>Author:</i> Bleile, Henry R. and Stephen Rodgers <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1989 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 28 p., illus., 28 cm.	<i>Dynix:</i> 55947-12 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010293 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS12 <i>Year:</i> 1989 <i>Price:</i> \$50.00
	Plastics Polymers		1014 Materials Science of Polymers for Engineers <i>Author:</i> Osswald, Tim A. and Georg Menges <i>Publish.:</i> Hanser Gardner Publications, Inc. <i>- place:</i> Cincinnati, OH <i>- date:</i> ©2003 <i>Subject:</i> Polymers <i>Desc:</i> xviii, 622 p., illus., 23 cm.	<i>Dynix:</i> 111665 <i>Call No:</i> 620.1 Os <i>ISBN:</i> 1569903484 <i>LCCN:</i> 2003-007497 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$73.50
	Chemical industry -- Catalogs -- Periodicals Detergents -- Catalogs -- Periodicals Intermediates (Chemistry) -- Catalogs -- Periodicals Surface active agents -- Catalogs -- Periodicals	Vol 1: Emulsifiers & Detergents Vol 2: Functional Materials	1583 McCutcheon's Volume 1: Emulsifiers & Detergents <i>Author:</i> <i>Publish.:</i> McCutcheon's Division, Manufacturing Confectioner Publishing Co. <i>- place:</i> Glen Rock, NJ <i>- date:</i> ©2004 <i>Subject:</i> Detergents -- Catalogs -- Periodicals <i>Desc:</i> v.; 28 cm.	<i>Dynix:</i> 92041 <i>Call No:</i> 668.108 Mc <i>ISBN:</i> 094425473X <i>LCCN:</i> 82-644577 <i>Shelf</i> Reference	<i>Edition:</i> North American edition <i>Series:</i> <i>Year:</i> 2004 <i>Price:</i> \$75.00

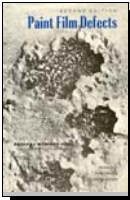
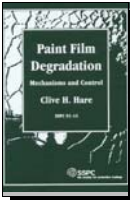



Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Chemicals -- Catalogs -- Periodicals	Vol 1: Emulsifiers & Detergents Vol 2: Functional Materials	1584 McCutcheon's Volume 2: Functional Materials <i>Author:</i> <i>Publish.:</i> McCutcheon's Division, Manufacturing Confectioner Publishing Co. <i>- place:</i> Glen Rock, NJ <i>- date:</i> ©2004 <i>Subject:</i> Chemicals -- Catalogs -- Periodicals <i>Desc:</i> v.; 28 cm.	<i>Dynix:</i> 2528 <i>Call No:</i> 668.108 Mc <i>ISBN:</i> 0944254977 <i>LCCN:</i> 82-644577 <i>Shelf</i> Reference	<i>Edition:</i> North American edition <i>Series:</i> <i>Year:</i> 2004 <i>Price:</i> \$75.00
	Color Colorimetry		169 Measurement of Colour <i>Author:</i> Wright, W. D. (William David), 1906- <i>Publish.:</i> D. Van Nostrand Company, Inc. <i>- place:</i> Princeton, NJ <i>- date:</i> [1964] <i>Subject:</i> Color <i>Desc:</i> x, 291 p., illus. (part color), 22 cm.	<i>Dynix:</i> 44136 <i>Call No:</i> 535.6 Wr <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1964 <i>Price:</i> \$25.00
	Color		88 Measuring Colour <i>Author:</i> Hunt, R. W. G. (Robert William Gainer), 1923- <i>Publish.:</i> Ellis Horwood, Ltd.; John Wiley & Sons <i>- place:</i> Chichester, [West Sussex], UK / New York, NY <i>- date:</i> ©1987 <i>Subject:</i> Color <i>Desc:</i> 221 p., [8] p. of plates, illus. (some color);, 25 cm.	<i>Dynix:</i> 06130 <i>Call No:</i> 535.6 Hu <i>ISBN:</i> 0745801250 <i>LCCN:</i> 87-21441 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1987 <i>Price:</i> \$25.00
	Coatings		756 Mechanical Properties of Coatings <i>Author:</i> Hill, Loren W. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1987 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 25 p., illus., 28 cm.	<i>Dynix:</i> 55947-06 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010315 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS6 <i>Year:</i> 1987 <i>Price:</i> \$50.00
	Polymers and polymerization		89 Mechanical Properties of Polymers <i>Author:</i> Nielsen, Lawrence E. <i>Publish.:</i> Van Nostrand Reinhold Company <i>- place:</i> New York, NY <i>- date:</i> ©1962 <i>Subject:</i> Polymers and polymerization <i>Desc:</i> ix, 274 p., illus., 24 cm.	<i>Dynix:</i> 43968 <i>Call No:</i> 547.84 Ni <i>ISBN:</i> <i>LCCN:</i> 62-18939 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1962 <i>Price:</i> \$25.00




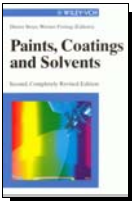

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Metal cleaning	90	Metal Cleaning <i>Author:</i> Spring, S. (Samuel), 1916- <i>Publish.:</i> Reinhold Publishing Corporation - <i>place:</i> New York, NY - <i>date:</i> [1963] <i>Subject:</i> Metal cleaning <i>Desc:</i> 234 p., illus., 24 cm.	<i>Dynix:</i> 29240 <i>Call No:</i> 671.7 Sp <i>ISBN:</i> <i>LCCN:</i> 63-18353 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1963 Price: \$25.00
	Surface chemistry	757	Metal Surface Characteristics Affecting Organic Coatings <i>Author:</i> Perfetti, Bruno M. <i>Publish.:</i> Federation of Societies for Coatings Technology - <i>place:</i> Philadelphia, PA - <i>date:</i> ©1994 <i>Subject:</i> Surface chemistry <i>Desc:</i> 70 p., illus., 28 cm.	<i>Dynix:</i> 55947-21 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010323 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS21 Year: 1994 Price: \$50.00
	Coatings	758	Methodologies for Predicting the Service Lives of Coating Systems <i>Author:</i> Martin, Jonathan W., Sam C.Saunders, F. Louis Floyd and John P. <i>Publish.:</i> Federation of Societies for Coatings Technology - <i>place:</i> Philadelphia, PA - <i>date:</i> ©1996 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 34 p., illus., 28 cm.	<i>Dynix:</i> 55947-24 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010331 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS24 Year: 1996 Price: \$50.00
	Contact mechanics Contact mechanics -- Congresses Polymers -- Surfaces Tribology	91	Microstructure and Microtribology of Polymer Surfaces <i>Author:</i> Tsukruk, Vladimir V. and Kathryn J. Wahl (editors) <i>Publish.:</i> American Chemical Society [Distributed by Oxford University Press] - <i>place:</i> Washington, DC / New York, NY - <i>date:</i> ©2000 <i>Subject:</i> Polymers -- Surfaces <i>Desc:</i> xiv, 526 p., illus., 24 cm.	<i>Dynix:</i> 89758 <i>Call No:</i> 547.7 Mi <i>ISBN:</i> 0841236828 <i>LCCN:</i> 99-16494 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> ACS Symposium Series: No. 741 Year: 2000 Price: \$105.00
	Electroplating	92	Modern Electroplating <i>Author:</i> Lowenheim, Frederick A. (editor) <i>Publish.:</i> John Wiley & Sons - <i>place:</i> New York, NY - <i>date:</i> [©1963] <i>Subject:</i> Electroplating <i>Desc:</i> xvi, 769 p., illus., diagrams, tables, 24 cm.	<i>Dynix:</i> 14902 <i>Call No:</i> 671.732 E1 <i>ISBN:</i> <i>LCCN:</i> 63-18619 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Electrochemical Society Series Year: 1963 Price: \$25.00


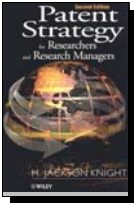
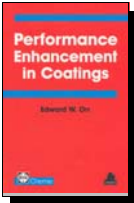


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Polystyrene	1528	Modern Styrenic Polymers: Polystyrenes and Styrenic Copolymers <i>Author:</i> Scheirs, John and Duane B. Priddy (editors) <i>Publish.:</i> John Wiley & Sons, Ltd. - <i>place:</i> Chichester, [West Sussex], UK - <i>date:</i> ©2003 <i>Subject:</i> Polystyrene <i>Desc:</i> xxxi, 757 p., illus., 24 cm.	<i>Dynix:</i> 111664 <i>Call No:</i> 668.4 Mo <i>ISBN:</i> 0471497525 <i>LCCN:</i> 2002-029638 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Wiley Series in Polymer Science Year: 2003 Price: \$285.00
	Adhesion Surface chemistry	1360	Molecular Adhesion and Its Applications: The Sticky Universe <i>Author:</i> Kendall, Kevin <i>Publish.:</i> Kluwer Academic / Plenum Publishers - <i>place:</i> New York, NY - <i>date:</i> ©2001 <i>Subject:</i> Adhesion <i>Desc:</i> xix, 429 p., illus., 24 cm.	<i>Dynix:</i> 111663 <i>Call No:</i> 541.3 Ke <i>ISBN:</i> 0306465205 <i>LCCN:</i> 00-049771 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 2001 Price: \$98.50
	Pigments	170	Natural Pigments <i>Author:</i> Bentley, K. W. (Kenneth Walter) <i>Publish.:</i> Interscience Publishers, Inc. - <i>place:</i> New York, NY - <i>date:</i> ©1960 <i>Subject:</i> Pigments <i>Desc:</i> vii, 306 p., 24 cm.	<i>Dynix:</i> 12997 <i>Call No:</i> 667.623 Be <i>ISBN:</i> <i>LCCN:</i> 60-8490 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemistry of Natural Products: Vol. 4 -- Texts on the Constitution of Natural Products Year: 1960 Price: \$25.00
	Gums and resins Varnish and varnishing	93	Natural Resins Handbook <i>Author:</i> Mantell, C. L. (editor) <i>Publish.:</i> American Gum Importers' Association, Inc. - <i>place:</i> Brooklyn, NY - <i>date:</i> [©1939] <i>Subject:</i> Gums and resins <i>Desc:</i> 96 p. (incl. tables, diagrams), 29x22 cm.	<i>Dynix:</i> 44587 <i>Call No:</i> 553.29 Na <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Year: 1939 Price: \$50.00
	Protective coatings	94	New Concepts for Coating Protection of Steel Structures: ASTM Symposium, Lake Buena Vista, FL <i>Author:</i> Symposium on Paint and Related Coatings and Materials and Steel Str <i>Publish.:</i> American Society for Testing and Materials - <i>place:</i> Philadelphia, PA - <i>date:</i> ©1984 <i>Subject:</i> Protective coatings <i>Desc:</i> 135 p., illus., 23 cm.	<i>Dynix:</i> 01990 <i>Call No:</i> 667.9 Ne <i>ISBN:</i> 0484100014 <i>LCCN:</i> 83-82647 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> ASTM Special Technical Publication: No. 841 Year: 1984 Price: \$25.00

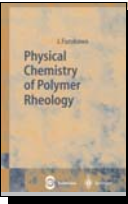

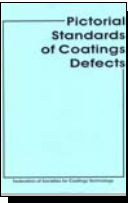


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	New products -- Planning Product management	1529	New Product Development: From Initial Idea to Product Management <i>Author:</i> Annacchino, Marc A. <i>Publish.:</i> Elsevier / Butterworth-Heinemann <i>- place:</i> Amsterdam, The Netherlands <i>- date:</i> ©2003 <i>Subject:</i> New products -- Planning <i>Desc:</i> xxxi, 567 p., illus., 24 cm. + CD-ROM (4¾")	<i>Dynix:</i> 111662 <i>Call No:</i> 658.5 An <i>ISBN:</i> 0750677325 <i>LCCN:</i> 2003-051881 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$71.50
	Surface active agents	1119	Novel Surfactants: Preparation, Applications, and Biodegradability <i>Author:</i> Holmberg, I. Krister (editor) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©2003 <i>Subject:</i> Surface active agents <i>Desc:</i> 643 p., illus., 24 cm.	<i>Dynix:</i> 111661 <i>Call No:</i> 668 No <i>ISBN:</i> 0824743008 <i>LCCN:</i> 2003-283091 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition, Revised and expanded <i>Series:</i> Surfactant Science Series: Vol. 114 <i>Year:</i> 2003 <i>Price:</i> \$168.50
	Protective coatings	96	Organic Coating Technology: Pigments and Pigmented Coatings <i>Author:</i> Payne, Henry Fleming <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1961 <i>Subject:</i> Protective coatings <i>Desc:</i> viii, pp. 675-1399, illus., 24 cm.	<i>Dynix:</i> 34097 <i>Call No:</i> 667.6 Pa v.2 <i>ISBN:</i> <i>LCCN:</i> 54-5971 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1961 <i>Price:</i> \$25.00
	Organic compounds Plastic coating Polymers Protective coatings	97	Organic Coatings for Corrosion Control <i>Author:</i> Bierwagen, Gordon P. (editor) <i>Publish.:</i> American Chemical Society <i>- place:</i> Washington, DC <i>- date:</i> ©1998 <i>Subject:</i> Protective coatings <i>Desc:</i> xiii, 448 p., illus. (some color), 24 cm.	<i>Dynix:</i> 73388 <i>Call No:</i> 620.1 Or <i>ISBN:</i> 084123549X <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> ACS Symposium Series: No. 689 <i>Year:</i> 1998 <i>Price:</i> \$144.95
	Coatings Plastic coatings	98	Organic Coatings: Science and Technology <i>Author:</i> Wicks, Zeno W., Jr. <i>Publish.:</i> Wiley - Interscience Publishers <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Plastic coatings <i>Desc:</i> xxi, 630 p., illus., 26 cm.	<i>Dynix:</i> 78749 <i>Call No:</i> 667 Wi <i>ISBN:</i> 0471245070 <i>LCCN:</i> 98-25870 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> SPE (Society of Plastics Engineers) Monographs <i>Year:</i> 1999 <i>Price:</i> \$125.00

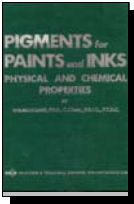


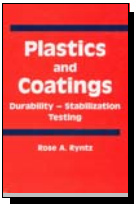
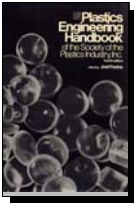
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Pigments	759	Organic Pigments <i>Author:</i> Lewis, Peter A. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1995 <i>Subject:</i> Pigments -- Periodicals <i>Desc:</i> 43 p., illus., 28 cm.	<i>Dynix:</i> 55947-10 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010358 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> 2nd edition <i>Series:</i> Federation Series on Coatings Technology: No. FS10R95 <i>Year:</i> 1995 <i>Price:</i> \$50.00
	Phosphorus organic compounds Polymers and polymerization	99	Organophosphorus Monomers and Polymers <i>Author:</i> Gefter, Eugenii Leonidovich <i>Publish.:</i> Pergamon Press, Ltd. <i>- place:</i> Oxford, UK / New York, NY <i>- date:</i> ©1962 <i>Subject:</i> Phosphorus organic compounds <i>Desc:</i> vii, 302 p., illus., 26 cm.	<i>Dynix:</i> 43965 <i>Call No:</i> 547.84 Ge <i>ISBN:</i> <i>LCCN:</i> 62-9698 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> Authorized edition <i>Series:</i> International Series of Monographs on Organic Chemistry: No. 6 <i>Year:</i> 1962 <i>Price:</i> \$25.00
	Paint	667	Outlines of Paint Technology <i>Author:</i> Morgans, W. M. (Wilfred Morley), 1907- <i>Publish.:</i> Halstead Press <i>- place:</i> New York, NY <i>- date:</i> ©1990 <i>Subject:</i> Paint <i>Desc:</i> xv, 503 p., illus., 24 cm.	<i>Dynix:</i> 07925 <i>Call No:</i> 667.62 Mo <i>ISBN:</i> 0470216549 <i>LCCN:</i> 89-71361 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1990 <i>Price:</i> \$25.00
	Paint materials -- Analysis Paint materials -- Testing	816	Paint and Coating Testing Manual <i>Author:</i> Koleske, Joseph V. (editor) <i>Publish.:</i> American Society for Testing and Materials <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1995 <i>Subject:</i> Paint materials -- Testing <i>Desc:</i> xvii, 925 p., illus., 29 cm.	<i>Dynix:</i> 100254 <i>Call No:</i> 667.6 Pa <i>ISBN:</i> 0803120605 <i>LCCN:</i> 95-10632 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 14th edition <i>Series:</i> ASTM Manual Series: MNL 17 (ASTM Publ Code No: 28-017095-14) <i>Year:</i> 1995 <i>Price:</i> \$220.00
	Paint Protective coatings	100	Paint and Surface Coatings: Theory and Practice <i>Author:</i> Lambourne, R. and T. A. Strivens (editors) <i>Publish.:</i> William Andrew Publishing Company <i>- place:</i> Norwich, NY <i>- date:</i> ©1999 <i>Subject:</i> Paint <i>Desc:</i> xii, 784 p., illus., 25 cm.	<i>Dynix:</i> 89751 <i>Call No:</i> 667.6 Pa <i>ISBN:</i> 1884207731 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$25.00

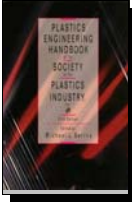


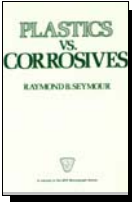

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Paint	102	Paint Film Defects: Their Causes and Cure <i>Author:</i> Hess, Manfred (editor) <i>Publish.:</i> Reinhold Publishing Corporation <i>- place:</i> New York, NY <i>- date:</i> ©1965 <i>Subject:</i> Paint <i>Desc:</i> xvi, 604 p., illus., 60 plates, tables, 24 cm.	<i>Dynix:</i> 25331 <i>Call No:</i> 667.6 He <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1965 <i>Price:</i> \$25.00
	Paint Paint -- Testing	944	Paint Film Degradation: Mechanisms and Control <i>Author:</i> Hare, Clive H., 1941- <i>Publish.:</i> SSPC: The Society for Protective Coatings <i>- place:</i> Pittsburgh, PA <i>- date:</i> ©2001 <i>Subject:</i> Paint <i>Desc:</i> viii, 631 p., illus., 29 cm.	<i>Dynix:</i> 108664 <i>Call No:</i> 667.6 Ha <i>ISBN:</i> 1889060666 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> SSPC Publication: No. 01-14 <i>Year:</i> 2001 <i>Price:</i> \$195.00
	Paint -- Handbooks, manuals, etc.	103	Paint Handbook <i>Author:</i> Weismantel, Guy E. (editor) <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> ©1981 <i>Subject:</i> Paint -- Handbooks, manuals, etc. <i>Desc:</i> 754 p. in various pagings, illus., 24 cm.	<i>Dynix:</i> 08387 <i>Call No:</i> 667 Pa <i>ISBN:</i> 0070690618 <i>LCCN:</i> 80-12093 <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1981 <i>Price:</i> \$50.00
	Paint Paint mixing Painting, Industrial -- Handbooks, manuals, etc.	940	Paint Problem Solver <i>Author:</i> <i>Publish.:</i> Paint & Decorating Retailers Association <i>- place:</i> St. Louis, MO <i>- date:</i> ©2000 <i>Subject:</i> Painting, Industrial -- Handbooks, manuals, etc. <i>Desc:</i> 136 p., color illus., 30 cm. + 1 "Exterior/Interior Paint Solutions" booklet	<i>Dynix:</i> 106366 <i>Call No:</i> 667.6 Pa <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 7th edition <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$82.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	104	Paint Red Book: Comprehensive Directory of the Formulators & Suppliers to the Paint, Coatings and Varnish Industry <i>Author:</i> D'Amico, Esther (editor) <i>Publish.:</i> Cygnus Publishing Company <i>- place:</i> Melville, NY <i>- date:</i> ©1999 <i>Subject:</i> Paint -- Periodicals <i>Desc:</i> 284 p., illus., 29 cm.	<i>Dynix:</i> 10571 <i>Call No:</i> 667.6 Pa 1999 Dir <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> Volume 88, Number 13 <i>Series:</i> Modern Paint and Coatings Magazine -- ISSN: 0098-7786 <i>Year:</i> 1999 <i>Price:</i> \$89.95






Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Paint materials -- Analysis Paint materials -- Testing	105	Paint Testing Manual: Physical and Chemical Examination of Paints, Varnishes, Lacquers and Colors <i>Author:</i> Sward, G. G. (editor) <i>Publish.:</i> American Society for Testing and Materials <i>- place:</i> Philadelphia, PA <i>- date:</i> [1972] <i>Subject:</i> Paint materials -- Testing <i>Desc:</i> xii, 599 p., illus., 29 cm.	<i>Dynix:</i> 16489 <i>Call No:</i> 667.6 Pa <i>ISBN:</i> <i>LCCN:</i> 75-186850 <i>Shelf:</i> Reference	<i>Edition:</i> 13th edition <i>Series:</i> ASTM Special Technical Publication: No. 500 <i>Year:</i> 1972 <i>Price:</i> \$50.00
	Coatings -- Dictionaries Paint -- Dictionaries	106	Paint/Coatings Dictionary <i>Author:</i> Federation of Societies for Coatings Technology (Definitions Committee) <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1978 <i>Subject:</i> Paint -- Dictionaries <i>Desc:</i> xviii, 613 p., 24 cm.	<i>Dynix:</i> 16490 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> <i>LCCN:</i> 78-72941 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1978 <i>Price:</i> \$50.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	760	Painting of Plastics <i>Author:</i> Ryntz, Rose Ann <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1994 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 32 p., illus., 28 cm.	<i>Dynix:</i> 55947-20 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010366 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS20 <i>Year:</i> 1994 <i>Price:</i> \$50.00
	Coatings Paint Solvents	817	Paints, Coatings and Solvents <i>Author:</i> Stoye, Dieter and Werner Freitag (editors) <i>Publish.:</i> Wiley - VCH <i>- place:</i> Weinheim, Germany <i>- date:</i> ©1998 <i>Subject:</i> Paint <i>Desc:</i> xvii, 414 p., illus., 25 cm.	<i>Dynix:</i> 99415 <i>Call No:</i> 667.6 Pa <i>ISBN:</i> 3527288635 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition, Completely revised <i>Series:</i> <i>Year:</i> 1998 <i>Price:</i> \$118.50
	Paper coatings	107	Paper Coating Trends in the Worldwide Paper Industry <i>Author:</i> Patrick, Ken L. (editor) <i>Publish.:</i> Miller Freeman Publications <i>- place:</i> San Francisco, CA <i>- date:</i> ©1991 <i>Subject:</i> Paper coatings <i>Desc:</i> 164 p., illus., 28 cm.	<i>Dynix:</i> 53690 <i>Call No:</i> 676.235 Pa <i>ISBN:</i> 087930247X <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Pulp & Paper Focus Books <i>Year:</i> 1991 <i>Price:</i> \$58.00


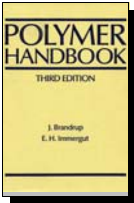

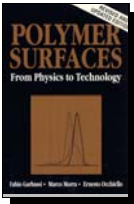

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Paper coatings -- Patents	108	Paper Coatings <i>Author:</i> Harper, Donald T. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1976 <i>Subject:</i> Paper coatings -- Patents <i>Desc:</i> xii, 335 p., illus., 24 cm.	<i>Dynix:</i> 14919 <i>Call No:</i> 676.235 Ha <i>ISBN:</i> 0815506406 <i>LCCN:</i> 76-24145 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 79 <i>Year:</i> 1976 <i>Price:</i> \$25.00
	Patent laws and legislation -- United States -- Popular Works	1337	Patent Strategy: For Researchers and Research Managers <i>Author:</i> Knight, H. Jason <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2001 <i>Subject:</i> Patent laws and legislation -- United States -- Popular works <i>Desc:</i> xvi, 201 p., illus., 24 cm.	<i>Dynix:</i> 111659 <i>Call No:</i> 346.730 Kn <i>ISBN:</i> 0471492612 <i>LCCN:</i> 00-067213 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$56.50
	Coatings -- Additives	109	Performance Enhancement in Coatings <i>Author:</i> Orr, Edward W. <i>Publish.:</i> Hanser Gardner Publications, Inc. <i>- place:</i> Cincinnati, OH <i>- date:</i> ©1998 <i>Subject:</i> Coatings -- Additives <i>Desc:</i> xviii, 292 p., illus., 25 cm.	<i>Dynix:</i> 78750 <i>Call No:</i> 667 Or <i>ISBN:</i> 1569902631 <i>LCCN:</i> 98-30429 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1998 <i>Price:</i> \$98.00
	Elastomers -- Permeability -- Tables Plastics -- Permeability -- Tables	818	Permeability and Other Film Properties of Plastics and Elastomers <i>Author:</i> <i>Publish.:</i> Plastics Design Library <i>- place:</i> Norwich, NY <i>- date:</i> ©1995 <i>Subject:</i> Plastics -- Permeability -- Tables <i>Desc:</i> x, 706 p., illus., 29 cm.	<i>Dynix:</i> 99416 <i>Call No:</i> 745 Pe <i>ISBN:</i> 1884207146 <i>LCCN:</i> 94-66586 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Plastics Design Library Handbook Series <i>Year:</i> 1995 <i>Price:</i> \$205.00
	Elastomers -- Permeability Plastics -- Permeability	1027	Permeability Properties of Plastics and Elastomers: A Guide to Packaging and Barrier Materials <i>Author:</i> Massey, Liesl K. <i>Publish.:</i> Plastics Design Library / William Andrew Publishing <i>- place:</i> Norwich, NY <i>- date:</i> ©2003 <i>Subject:</i> Plastics -- Permeability <i>Desc:</i> xiv, 601 p., illus., 29 cm.	<i>Dynix:</i> 111660 <i>Call No:</i> 620.1 Ma <i>ISBN:</i> 1884207979 <i>LCCN:</i> 2002-153335 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> PDL (Plastics Design Library) Handbook Series <i>Year:</i> 2003 <i>Price:</i> \$208.50


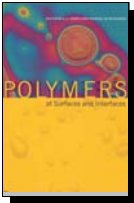
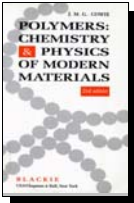


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Polymers -- Rheology		1517 Physical Chemistry of Polymer Rheology <i>Author:</i> Furukawa, Junji <i>Publish.:</i> Kodansha Ltd. / Springer-Verlag <i>- place:</i> Tokyo, Japan / Berlin, Germany <i>- date:</i> ©2003 <i>Subject:</i> Polymers -- Rheology <i>Desc:</i> xv, 278 p., illus., 24 cm.	<i>Dynix:</i> 111658 <i>Call No:</i> 530 Fu <i>ISBN:</i> 3540000534 <i>LCCN:</i> 2002-042922 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Springer Series in Chemical Physics: Vol. 72 <i>Year:</i> 2003 <i>Price:</i> \$86.50
	Chemistry, Physical and theoretical Surface chemistry		110 Physical Chemistry of Surfaces <i>Author:</i> Adamson, Arthur W. <i>Publish.:</i> Interscience Publishers, Inc. <i>- place:</i> New York, NY <i>- date:</i> [1967] <i>Subject:</i> Surface chemistry <i>Desc:</i> xx, 747 p., illus., 24 cm.	<i>Dynix:</i> 43932 <i>Call No:</i> 541.3453 Ad <i>ISBN:</i> <i>LCCN:</i> 67-13941 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1967 <i>Price:</i> \$25.00
	Protective Coatings -- Defects		819 Pictorial Standards of Coatings Defects <i>Author:</i> Philadelphia Society for Coatings Technology (Pictorial Standards Sub <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1979 <i>Subject:</i> Protective coatings -- Defects <i>Desc:</i> 1 volume, (looseleaf), illus., 29 cm.	<i>Dynix:</i> 100379 <i>Call No:</i> 667.9 Pi <i>ISBN:</i> 9991165231 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 7th printing <i>Series:</i> FSCT Item No. PS-CPM <i>Year:</i> 1979 <i>Price:</i> \$100.00
	Pigments	Vol 1-Properties and Economics Vol 2-Applications and Markets Vol 3-Characterization and Physical Relationships	111 Pigment Handbook <i>Author:</i> Lewis, Peter A. (editor, v1); Patton, Temple C. (editor, v2, v3) <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1988 (v1), ©1973 (v2,v3) <i>Subject:</i> Pigments <i>Desc:</i> v1(xxvi, 945 p.) v2(viii, 455 p.) v3(viii, 538 p.) illus., 26 cm.	<i>Dynix:</i> 08255 <i>Call No:</i> 667.29 Pi <i>ISBN:</i> 0471828335 <i>LCCN:</i> 87-13358 <i>Shelf:</i> Reference	<i>Edition:</i> 2nd edition <i>Series:</i> Wiley-Interscience Publication <i>Year:</i> 1988 <i>Price:</i> \$50.00
	Pigments Printing ink		113 Pigments for Inkmakers <i>Author:</i> Sanders, J. D. <i>Publish.:</i> SITA (Selective Industrial Training Associates) Technology, Ltd. <i>- place:</i> London, UK <i>- date:</i> ©1989 <i>Subject:</i> Printing ink <i>Desc:</i> vii, 238 p., 24 cm.	<i>Dynix:</i> 21207 <i>Call No:</i> 667.29 Sa <i>ISBN:</i> 0947798072 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1989 <i>Price:</i> \$25.00






Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Pigments	114	Pigments for Paints and Inks: Physical and Chemical Properties <i>Author:</i> Morgans, W. M. (Wilfred Morley), 1907- <i>Publish.:</i> Selection & Industrial Training Administration Ltd. - <i>place:</i> Manchester, UK - <i>date:</i> [1977] <i>Subject:</i> Pigments <i>Desc:</i> [8], 140 p., illus., 27 cm.	<i>Dynix:</i> 12986 <i>Call No:</i> 667.29 Mo <i>ISBN:</i> 0905716027 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1977 Price: \$25.00
	Pigments	115	Pigments in Paint <i>Author:</i> Preuss, Harold P. <i>Publish.:</i> Noyes Data Corporation - <i>place:</i> Park Ridge, NJ - <i>date:</i> ©1974 <i>Subject:</i> Pigments <i>Desc:</i> viii, 134 p., illus., 29 cm.	<i>Dynix:</i> 12998 <i>Call No:</i> 667.623 Pr <i>ISBN:</i> 0815505132 <i>LCCN:</i> 73-87114 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1974 Price: \$25.00
	Plasticizers	116	Plasticizer Technology: Volume 1 <i>Author:</i> Bruins, Paul F. (editor) <i>Publish.:</i> Reinhold Publishing Corporation - <i>place:</i> New York, NY - <i>date:</i> ©1965 <i>Subject:</i> Plasticizers <i>Desc:</i> viii, 248 p., illus., diagrams, 24 cm.	<i>Dynix:</i> 13028 <i>Call No:</i> 668.41 Br v.1 <i>ISBN:</i> <i>LCCN:</i> 65-13905 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1965 Price: \$25.00
	Plastic coatings -- Deterioration Plastics -- Deterioration	820	Plastics and Coatings: Durability, Stabilization, Testing <i>Author:</i> Ryntz, Rose Ann (editor) <i>Publish.:</i> Hanser Gardner Publications, Inc. - <i>place:</i> Cincinnati, OH - <i>date:</i> ©2001 <i>Subject:</i> Plastics -- Deterioration <i>Desc:</i> ix, 243 p., illus., 25 cm.	<i>Dynix:</i> 99419 <i>Call No:</i> 620.1 PI <i>ISBN:</i> 1569902909 <i>LCCN:</i> 00-039564 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 2001 Price: \$81.50
	Plastics -- Handbooks, manuals, etc.	119	Plastics Engineering Handbook of the Society of the Plastics Industry, Inc. <i>Author:</i> Frados, Joel (editor) <i>Publish.:</i> Van Nostrand Reinhold Company - <i>place:</i> New York, NY - <i>date:</i> ©1976 <i>Subject:</i> Plastics -- Handbooks, manuals, etc. <i>Desc:</i> xvi, 909 p., illus., 27 cm.	<i>Dynix:</i> 07918 <i>Call No:</i> 668.41 So <i>ISBN:</i> 0442224699 <i>LCCN:</i> 75-26508 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 4th edition <i>Series:</i> Year: 1976 Price: \$25.00


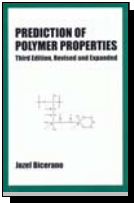
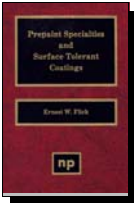


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Plastics -- Handbooks, manuals, etc.	118	Plastics Engineering Handbook of the Society of the Plastics Industry, Inc. <i>Author:</i> Berins, Michael L. (editor) <i>Publish.:</i> Van Nostrand Reinhold Company - <i>place:</i> New York, NY - <i>date:</i> ©1991 <i>Subject:</i> Plastics -- Handbooks, manuals, etc. <i>Desc:</i> xvi, 845 p., illus., 26 cm.	<i>Dynix:</i> 08308 <i>Call No:</i> 668.41 So <i>ISBN:</i> 0442317999 <i>LCCN:</i> 90-22784 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 5th edition <i>Series:</i> Year: 1991 <i>Price:</i> \$25.00
	Plastics -- Extrusion	120	Plastics Extrusion Technology <i>Author:</i> Griff, Allan L. <i>Publish.:</i> Reinhold Publishing Corporation - <i>place:</i> New York, NY - <i>date:</i> [1968] <i>Subject:</i> Plastics -- Extrusion <i>Desc:</i> xi, 352 p., illus., 24 cm.	<i>Dynix:</i> 13035 <i>Call No:</i> 668.413 Gr <i>ISBN:</i> <i>LCCN:</i> 67-31124 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Reinhold Plastics Applications Series Year: 1968 <i>Price:</i> \$25.00
	Plastics industry and trade -- Safety measures	122	Plastics Industry Safety Handbook <i>Author:</i> Society of the Plastics Industry <i>Publish.:</i> Cahners Books - <i>place:</i> Boston, MA - <i>date:</i> [1973] <i>Subject:</i> Plastics industry and trade -- Safety measures <i>Desc:</i> xi, 333 p., illus., 24 cm.	<i>Dynix:</i> 07904 <i>Call No:</i> 668.4 So <i>ISBN:</i> 084361207X <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Cahner's Practical Plastics Series Year: 1973 <i>Price:</i> \$25.00
	Corrosion and anti-corrosives Plastic coating	123	Plastics vs. Corrosives <i>Author:</i> Seymour, Raymond Benedict, 1912- <i>Publish.:</i> John Wiley & Sons - <i>place:</i> New York, NY - <i>date:</i> ©1982 <i>Subject:</i> Plastic coatings <i>Desc:</i> xii, 285 p., illus., 24 cm.	<i>Dynix:</i> 00012 <i>Call No:</i> 620.192 Se <i>ISBN:</i> 0471081825 <i>LCCN:</i> 81-21996 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> SPE (Society of Plastics Engineers) Monographs Year: 1982 <i>Price:</i> \$25.00
	Metal coating -- Patents Plastic coatings -- Patents	124	Plating of Plastics with Metals <i>Author:</i> McDermott, John <i>Publish.:</i> Noyes Data Corporation - <i>place:</i> Park Ridge, NJ - <i>date:</i> ©1974 <i>Subject:</i> Plastic coatings -- Patents <i>Desc:</i> x, 278 p., illus., 25 cm.	<i>Dynix:</i> 66106 <i>Call No:</i> 668.41 Ma <i>ISBN:</i> 0815505264 <i>LCCN:</i> 74-75006 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 27 Year: 1974 <i>Price:</i> \$36.00

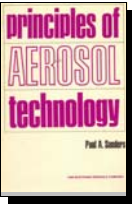




Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Plastic coating -- Patents	125	Plating of Plastics: Recent Developments <i>Author:</i> Domino, Francis A. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1979 <i>Subject:</i> Plastic coatings -- Patents <i>Desc:</i> xi, 385 p., illus., 25 cm.	<i>Dynix:</i> 13047 <i>Call No:</i> 668.49 Do <i>ISBN:</i> 0815507704 <i>LCCN:</i> 79-15918 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 138 <i>Year:</i> 1979 <i>Price:</i> \$25.00
	Plastics	126	Polyamide Resins <i>Author:</i> Floyd, Don Edgar <i>Publish.:</i> Reinhold Publishing Corporation <i>- place:</i> New York, NY <i>- date:</i> [1966] <i>Subject:</i> Plastics <i>Desc:</i> viii, 227 p., illus., 24 cm.	<i>Dynix:</i> 08484 <i>Call No:</i> 668.41 FI <i>ISBN:</i> <i>LCCN:</i> 66-20811 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Reinhold Plastics Applications Series <i>Year:</i> 1966 <i>Price:</i> \$25.00
	Composite materials Plastics Polymers	Formulation - vol. 2 Performance - vol. 2	127 Polymer Blends <i>Author:</i> Paul, D. R. and C. B. Bucknall (editors) <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2000 <i>Subject:</i> Polymers <i>Desc:</i> xiv, 600 p., illus., 25 cm.	<i>Dynix:</i> 89757 <i>Call No:</i> 668.9 Po <i>ISBN:</i> 0471352799 <i>LCCN:</i> 99-36533 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$245.00
	Plastics -- Analysis Polymers -- Analysis		1498 Polymer Characterization Techniques and Their Application to Blends <i>Author:</i> Simon, George P. (editor) <i>Publish.:</i> American Chemical Society / Oxford University Press <i>- place:</i> Washington, DC / Oxford, England <i>- date:</i> ©2003 <i>Subject:</i> Polymers -- Analysis <i>Desc:</i> xiii, 516 p., [2] p. of plates: illus. (some color), 25 cm.	<i>Dynix:</i> 111657 <i>Call No:</i> 668.9 Po <i>ISBN:</i> 0841238189 <i>LCCN:</i> 2001-056652 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$208.50
	Polymer colloids -- Congresses		937 Polymer Colloids: Science and Technology of Latex Systems <i>Author:</i> Daniels, Eric S., E. David Sudol and Mohamed S. El-Aasser (editors) <i>Publish.:</i> American Chemical Society <i>- place:</i> Washington, DC <i>- date:</i> ©2001 <i>Subject:</i> Polymer colloids -- Congresses <i>Desc:</i> xii, 413 p., illus., 24 cm.	<i>Dynix:</i> 105714 <i>Call No:</i> 668.9 Po <i>ISBN:</i> 084123759X <i>LCCN:</i> 2001-046085 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> ACS Symposium Series: No. 801 <i>Year:</i> 2001 <i>Price:</i> \$131.50


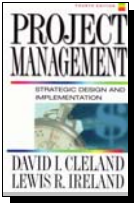
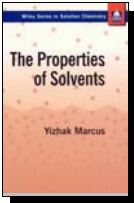


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Polymers	128	Polymer Fractionation <i>Author:</i> Cantow, Manfred J. R. <i>Publish.:</i> Academic Press <i>- place:</i> New York, NY <i>- date:</i> ©1967 <i>Subject:</i> Polymers <i>Desc:</i> xii, 527 p., illus., 24 cm.	<i>Dynix:</i> 12957 <i>Call No:</i> 660.2844 Ca <i>ISBN:</i> <i>LCCN:</i> 66-30024 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1967 <i>Price:</i> \$25.00
	Polymerization -- Tables Polymers -- Tables	130	Polymer Handbook <i>Author:</i> Brandrup, J. and E. H. Immergut (editors) <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1989 <i>Subject:</i> Polymers -- Tables <i>Desc:</i> 1 v. (various pagings) illus., 29 cm.	<i>Dynix:</i> 07926 <i>Call No:</i> 547.84 Po <i>ISBN:</i> 0471812447 <i>LCCN:</i> 88-1258 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> Wiley-Interscience Publication <i>Year:</i> 1989 <i>Price:</i> \$25.00
	Polymerization -- Tables Polymers -- Tables	129	Polymer Handbook <i>Author:</i> Brandrup, J., E. H. Immergut and E. A. Grulke (editors) <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Polymers -- Tables <i>Desc:</i> 1 v. (various pagings) illus., 29 cm.	<i>Dynix:</i> 79968 <i>Call No:</i> 547.84 Po <i>ISBN:</i> 0471166286 <i>LCCN:</i> 98-37261 <i>Shelf:</i> Reference	<i>Edition:</i> 4th edition <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$350.00
	Polymers -- Surfaces	131	Polymer Surfaces: From Physics to Technology <i>Author:</i> Garbassi, Fabio, Marco Morra and Ernesto Occhiello <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1998 <i>Subject:</i> Polymers -- Surfaces <i>Desc:</i> ix, 486 p., illus., 23 cm.	<i>Dynix:</i> 89760 <i>Call No:</i> 547.7 Ga <i>ISBN:</i> 0471971006 <i>LCCN:</i> 97-24708 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> Revised and updated edition <i>Series:</i> <i>Year:</i> 1998 <i>Price:</i> \$78.50
	Polymerization Polymers	1543	Polymer Yearbook 18 <i>Author:</i> Pethrick, Richard A. and Gennady E. Zaikov (editors) <i>Publish.:</i> Rapra Technology Limited <i>- place:</i> Shrewsbury, UK <i>- date:</i> ©2003 <i>Subject:</i> Polymers <i>Desc:</i> v., illus, 24 cm.	<i>Dynix:</i> 111656 <i>Call No:</i> 547.7 Po v.18 <i>ISBN:</i> 1859573835 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$166.50



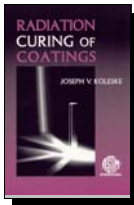
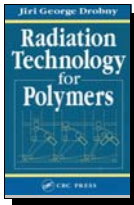
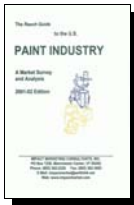
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Polymers	924	Polymeric Materials: Structure, Properties, Applications <i>Author:</i> Ehrenstein, Gottfried Wilhelm <i>Publish.:</i> Hanser Gardner Publications, Inc. - <i>place:</i> Cincinnati, OH - <i>date:</i> ©2001 <i>Subject:</i> Polymers <i>Desc:</i> xviii, 27 p., illus., 23 cm.	<i>Dynix:</i> 105715 <i>Call No:</i> 620.1 Eh <i>ISBN:</i> 1569903107 <i>LCCN:</i> 00-046239 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 2001 Price: \$36.50
	Interfaces (Physical sciences) Polymers -- Surfaces	132	Polymers at Surfaces and Interfaces <i>Author:</i> Jones, Richard A. L. (Richard Anthony Lewis), 1961- and Randal W. Ri <i>Publish.:</i> Cambridge University Press - <i>place:</i> Cambridge, UK - <i>date:</i> ©1999 <i>Subject:</i> Polymers -- Surfaces <i>Desc:</i> ix, 377 p., illus., 26 cm.	<i>Dynix:</i> 79969 <i>Call No:</i> 620.1 Jo <i>ISBN:</i> 052147440X <i>LCCN:</i> 98-6554 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Year: 1999 Price: \$90.00
	Polymers	133	Polymers: Chemistry and Physics of Modern Materials <i>Author:</i> Cowie, J. M. G. (John MacKenzie Grant) <i>Publish.:</i> Chapman and Hall - <i>place:</i> New York, NY - <i>date:</i> ©1991 <i>Subject:</i> Polymers <i>Desc:</i> ix, 436 p., illus., 23 cm.	<i>Dynix:</i> 09715 <i>Call No:</i> 547.7 Co <i>ISBN:</i> 0412031213 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Year: 1991 Price: \$25.00
	Polypropylene	134	Polypropylene <i>Author:</i> Kresser, Theodore O. J. <i>Publish.:</i> Reinhold Publishing Corporation - <i>place:</i> New York, NY - <i>date:</i> ©1960 <i>Subject:</i> Polypropylene <i>Desc:</i> xi, 268 p., illus., 20 cm.	<i>Dynix:</i> 13041 <i>Call No:</i> 668.423 Kr <i>ISBN:</i> <i>LCCN:</i> 60-53435 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Reinhold Plastics Applications Series Year: 1960 Price: \$25.00
	Aminoplastics Phenolic resins Plastic coatings Polyamides Polyurethanes	823	Polyurethanes, Polyamides, Phenoplasts, Aminoplasts, Maleic Resins <i>Author:</i> Oldring, P.K.T. and N. Tuck (editors) <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited - <i>place:</i> Chichester, [West Sussex], UK - <i>date:</i> ©2001 <i>Subject:</i> Plastic coatings <i>Desc:</i> v, 399 p., illus., 24 cm.	<i>Dynix:</i> 99644 <i>Call No:</i> 660 OI <i>ISBN:</i> 0471978965 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 3: Resins for Surface Coatings] Year: 2001 Price: \$135.00


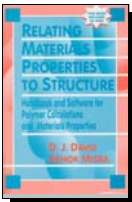

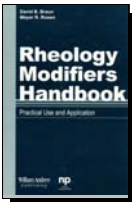
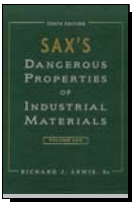
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Polyurethanes	Chemistry - vol. 1 Technology - vol 2	135 Polyurethanes: Chemistry and Technology <i>Author:</i> Saunders, J. H. (James Henry), 1923- and K. C. Frisch <i>Publish.:</i> Interscience Publishers, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1962 <i>Subject:</i> Polyurethanes <i>Desc:</i> xv, 368 p., illus., 24 cm.	<i>Dynix:</i> 13043 <i>Call No:</i> 668.423 Sa <i>ISBN:</i> <i>LCCN:</i> 62-18932 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> High polymers: Vol. 16, parts. 1-2 <i>Year:</i> 1962 <i>Price:</i> \$25.00
	Coating processes Plastic coating Plastic powders		821 Powder Coating: A Practical Guide to Equipment, Processes and Productivity at a Profit <i>Author:</i> Cowley, Mike <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©1999 <i>Subject:</i> Plastic coating <i>Desc:</i> vii, 222 p., illus., 24 cm.	<i>Dynix:</i> 99421 <i>Call No:</i> 667.9 Co <i>ISBN:</i> 0471979007 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 2: Powder Coatings] <i>Year:</i> 1999 <i>Price:</i> \$78.50
	Powder coatings		761 Powder Coatings <i>Author:</i> Jilek, Josef H. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1991 <i>Subject:</i> Powder coatings <i>Desc:</i> 35 p., illus., 28 cm.	<i>Dynix:</i> 55947-18 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010374 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS18 <i>Year:</i> 1991 <i>Price:</i> \$50.00
	Coating processes -- Patents Patents -- United States Plastic coating -- Patents Powders -- Patents		136 Powder Coatings Technology <i>Author:</i> Ranney, Maurice William, 1934- <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1975 <i>Subject:</i> Coating processes -- Patents <i>Desc:</i> xii, 426 p., illus., 28 cm.	<i>Dynix:</i> 13012 <i>Call No:</i> 667.9 Ra <i>ISBN:</i> 0815505647 <i>LCCN:</i> 75-530 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 45 <i>Year:</i> 1975 <i>Price:</i> \$25.00
	Plastics		137 Practical Guide to Plastics Applications <i>Author:</i> Crosby, Edward G. and Stephen N. Kochis <i>Publish.:</i> Cahners Books <i>- place:</i> Boston, MA <i>- date:</i> [1972] <i>Subject:</i> Plastics <i>Desc:</i> xiv, 191 p., illus., 24 cm.	<i>Dynix:</i> 34104 <i>Call No:</i> 668.4 Cr <i>ISBN:</i> 0843612053 <i>LCCN:</i> 77-156477 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Cahner's Practical Plastics Series <i>Year:</i> 1972 <i>Price:</i> \$25.00



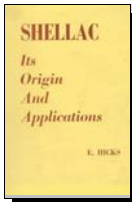


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Chemical engineering Chemical processes Chemical processes -- Design	138	Practical Process Research & Development <i>Author:</i> Anderson, Neal G. <i>Publish.:</i> Academic Press <i>- place:</i> San Diego, CA <i>- date:</i> ©2000 <i>Subject:</i> Chemical processes <i>Desc:</i> xxiii, 354 p., illus., 24 cm.	<i>Dynix:</i> 88637 <i>Call No:</i> 660.282 An <i>ISBN:</i> 0120594757 <i>LCCN:</i> 99-67291 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$89.95
	Polymers	925	Prediction of Polymer Properties <i>Author:</i> Bicerano, Jozef, 1952- <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Polymers <i>Desc:</i> xviii, 756 p., [4] p. of plates, illus. (some color), 27 cm.	<i>Dynix:</i> 105717 <i>Call No:</i> 668.9 Bi <i>ISBN:</i> 0824708210 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition, Revised and expanded <i>Series:</i> Plastics Engineering: No. 65 <i>Year:</i> 2002 <i>Price:</i> \$168.50
	Coatings Primers (Coating) Protective coatings Sealing compounds	139	Prepaint Specialties and Surface Tolerant Coatings <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1991 <i>Subject:</i> Primers (Coating) <i>Desc:</i> xxvi, 614 p., 25 cm.	<i>Dynix:</i> 09716 <i>Call No:</i> 667.9 Fl <i>ISBN:</i> 0815512732 <i>LCCN:</i> 91-8702 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1991 <i>Price:</i> \$25.00
	Polymerization Polymers	926	Preparative Methods of Polymer Chemistry <i>Author:</i> Sorenson, Wayne R. (Richard), Fred (Wilfred) Sweeny and Tod W. Ca <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2001 <i>Subject:</i> Polymers <i>Desc:</i> xvi, 488 p., illus., 24 cm.	<i>Dynix:</i> 105716 <i>Call No:</i> 547 So <i>ISBN:</i> 0471589926 <i>LCCN:</i> 00-047989 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> Wiley-Interscience Publication <i>Year:</i> 2001 <i>Price:</i> \$73.50
	Adhesives -- Patents	140	Pressure Sensitive Adhesives: Formulations and Technology <i>Author:</i> Dunning, Henry R. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1977 <i>Subject:</i> Adhesives -- Patents <i>Desc:</i> xii, 428 p., illus., 25 cm.	<i>Dynix:</i> 13019 <i>Call No:</i> 668.3 Du <i>ISBN:</i> 0815506724 <i>LCCN:</i> 74-75900 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Chemical Technology Review: No. 95 <i>Year:</i> 1977 <i>Price:</i> \$25.00

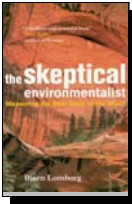
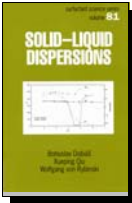



Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Aerosols	141	Principles of Aerosol Technology <i>Author:</i> Sanders, Paul A. (Paul Amsdon), 1913- <i>Publish.:</i> Van Nostrand Reinhold Company <i>- place:</i> New York, NY <i>- date:</i> [1970] <i>Subject:</i> Aerosols <i>Desc:</i> x, 418 p., illus., 24 cm.	<i>Dynix:</i> 64296 <i>Call No:</i> 660 Sa <i>ISBN:</i> <i>LCCN:</i> 76-108650 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1970 <i>Price:</i> \$25.00
	Color	142	Principles of Color Technology <i>Author:</i> Billmeyer, Fred W. and Max Saltman <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1981 <i>Subject:</i> Color <i>Desc:</i> xv, 240 p., illus., [4] leaves of plates (some color), 29 cm.	<i>Dynix:</i> 50827 <i>Call No:</i> 535.6 Bi <i>ISBN:</i> 047103052X <i>LCCN:</i> 80-21561 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1981 <i>Price:</i> \$25.00
	Chemistry, Technical	143	Principles of Industrial Chemistry <i>Author:</i> Clausen, Chris A., 1940- and Guy C. Mattson <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1978 <i>Subject:</i> Chemistry, Technical <i>Desc:</i> xiv, 412 p., illus., 24 cm.	<i>Dynix:</i> 12953 <i>Call No:</i> 660 Ci <i>ISBN:</i> 047102774X <i>LCCN:</i> 78-9450 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1978 <i>Price:</i> \$25.00
	Dyes and dyeing -- Textile fibers, Synthetic -- Patents Printing on plastics -- Patents Textile printing -- Patents	144	Printing and Dyeing of Fabrics and Plastics <i>Author:</i> James, Ronald W. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1974 <i>Subject:</i> Dyes and dyeing -- Textile fibers, synthetic -- Patents <i>Desc:</i> x, 275 p., illus., 25 cm.	<i>Dynix:</i> 34094 <i>Call No:</i> 667.3 Ja <i>ISBN:</i> 0815505337 <i>LCCN:</i> 74-75901 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 29 <i>Year:</i> 1974 <i>Price:</i> \$25.00
	Patents -- United States Printing ink -- Patents	145	Printing Inks: Developments Since 1975 <i>Author:</i> Duffy, J. I. (Joan Irene), 1950- <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1979 <i>Subject:</i> Printing ink -- Patents <i>Desc:</i> xii, 336 p., illus., 24 cm.	<i>Dynix:</i> 12989 <i>Call No:</i> 667.5 Du <i>ISBN:</i> 0815507720 <i>LCCN:</i> 79-16231 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 139 <i>Year:</i> 1979 <i>Price:</i> \$25.00

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Printing ink -- Patents	146	Printing Inks: Recent Developments <i>Author:</i> Wells, Andrew M. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1976 <i>Subject:</i> Printing ink -- Patents <i>Desc:</i> xii, 328 p., illus., 25 cm.	<i>Dynix:</i> 12990 <i>Call No:</i> 667.502 We <i>ISBN:</i> 0815506058 <i>LCCN:</i> 75-34761 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 61 <i>Year:</i> 1976 <i>Price:</i> \$25.00
	Project management	927	Project Management: Strategic Design and Implementation <i>Author:</i> Cleland, David I. and Lewis R. Ireland, 1937- <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Project management <i>Desc:</i> xx, 656 p., illus., 24 cm.	<i>Dynix:</i> 105698 <i>Call No:</i> 658.4 CI <i>ISBN:</i> 0071393102 <i>LCCN:</i> 2002-070294 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 4th edition <i>Series:</i> <i>Year:</i> 2002 <i>Price:</i> \$58.50
	Solution (Chemistry) Solvents	171	Properties of Solvents <i>Author:</i> Marcus, Y. <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1998 <i>Subject:</i> Solvents <i>Desc:</i> xiv, 239 p., illus. 24 cm.	<i>Dynix:</i> 79970 <i>Call No:</i> 541.3 Ma <i>ISBN:</i> 0471983691 <i>LCCN:</i> 98-18212 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Wiley Series in Solution Chemistry: Vol. 4 <i>Year:</i> 1998 <i>Price:</i> \$170.00
	Coatings Protective coatings	998	Protective Coatings: Fundamentals of Chemistry and Composition <i>Author:</i> Hare, Clive H., 1941- <i>Publish.:</i> SSPC: The Society for Protective Coatings <i>- place:</i> Pittsburgh, PA <i>- date:</i> ©1998 <i>Subject:</i> Protective coatings <i>Desc:</i> vi, 514 p., illus., 29 cm.	<i>Dynix:</i> 108665 <i>Call No:</i> 667.9 Ha <i>ISBN:</i> 0938477900 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> SSPC Publication: No. 94-17 <i>Year:</i> 1998 <i>Price:</i> \$195.00
	Polyvinyl chloride	147	PVC Technology <i>Author:</i> Penn, W. S. <i>Publish.:</i> Wiley - Interscience Publishers <i>- place:</i> New York, NY <i>- date:</i> [1972, ©1971] <i>Subject:</i> Polyvinyl chloride <i>Desc:</i> xii, 545 p., illus., 23 cm.	<i>Dynix:</i> 13042 <i>Call No:</i> 668.423 Pe <i>ISBN:</i> 0471679305 <i>LCCN:</i> 77-39501 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1971 <i>Price:</i> \$25.00


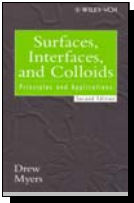
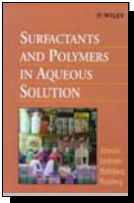
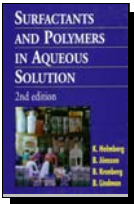

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Electroplating -- Testing	148	Quality Control in Metal Finishing: Based on a Symposium at the Borough Polytechnic, London <i>Author:</i> Isserlis, G. (editor) <i>Publish.:</i> Columbine Press <i>- place:</i> Manchester, UK / London, UK <i>- date:</i> ©1967 <i>Subject:</i> Electroplating -- Testing <i>Desc:</i> x, 118 p., illus., [16] plates, tables, diagrams, 23 cm.	<i>Dynix:</i> 14900 <i>Call No:</i> 671.73 Qu <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1967 <i>Price:</i> \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	762	Radiation Cured Coatings <i>Author:</i> Costanza, John R., A. P. Silveri and Joseph A. Vona <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1986 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 24 p., illus., 28 cm.	<i>Dynix:</i> 55947-29 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> <i>LCCN:</i> 87-405265 <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS29 <i>Year:</i> 1986 <i>Price:</i> \$50.00
	Plastic coating Radiation -- Industrial applications Radiation curing Ultraviolet radiation -- Industrial applications	911	Radiation Curing of Coatings <i>Author:</i> Koleske, Joseph V., 1930- (ASTM Committee D-1 on Paint and Relate <i>Publish.:</i> ASTM International <i>- place:</i> West Conshohocken, PA <i>- date:</i> ©2002 <i>Subject:</i> Radiation curing <i>Desc:</i> vii, 244 p., illus., 23 cm.	<i>Dynix:</i> 105699 <i>Call No:</i> 668.4 Ko <i>ISBN:</i> 0803120958 <i>LCCN:</i> 2002-016401 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> ASTM Manual Series: MNL 45 <i>Year:</i> 2002 <i>Price:</i> \$79.00
	Plastic coating Radiation -- Industrial applications Radiation curing Ultraviolet radiation -- Industrial applications	929	Radiation Technology for Polymers <i>Author:</i> Drobny, Jiri George <i>Publish.:</i> CRC (Chemical Rubber Company) Press <i>- place:</i> Boca Raton, FL <i>- date:</i> ©2003 <i>Subject:</i> Radiation curing <i>Desc:</i> 206 p., illus., 24 cm.	<i>Dynix:</i> 105700 <i>Call No:</i> 668.9 Dr <i>ISBN:</i> 1587161087 <i>LCCN:</i> 2002-074164 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$135.00
	Paint industry and trade -- United States Paint industry and trade -- United States -- Directories	822	Rauch Guide to the U. S. Paint Industry: A Market Survey and Analysis -- 2001-02 Edition <i>Author:</i> <i>Publish.:</i> Impact Marketing Consultants, Inc. <i>- place:</i> Manchester Center, VT <i>- date:</i> ©2001 <i>Subject:</i> Paint industry and trade -- Directories <i>Desc:</i> x, 274 p., illus, 28 cm.	<i>Dynix:</i> 97813 <i>Call No:</i> 338.4 Ra 2001-20 <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> 5th edition <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$445.00


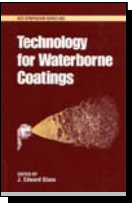
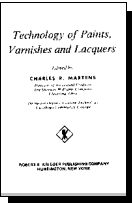


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Plastics Polymers	930	Reactive Polymer Blending <i>Author:</i> Baker, W. (Warren E.), C. (Chris E.) Scott and G.-H. (Guo-Hua) Hu (ed) <i>Publish.:</i> Hanser Gardner Publications, Inc. <i>- place:</i> Cincinnati, OH <i>- date:</i> ©2001 <i>Subject:</i> Polymers <i>Desc:</i> xvi, 289 p., illus., 25 cm.	<i>Dynix:</i> 105701 <i>Call No:</i> 668.9 Ba <i>ISBN:</i> 1569903123 <i>LCCN:</i> 2001-024627 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Progress in Polymer Processing Series <i>Year:</i> 2001 <i>Price:</i> \$115.00
	Ceramics -- Mechanical properties Polymers -- Mechanical properties	644	Relating Materials Properties to Structure: Handbook and Software for Polymer Calculations and Mat <i>Author:</i> David, D. J. (Donald Joseph), 1930- <i>Publish.:</i> Technomic Publishing Company, Inc. <i>- place:</i> Lancaster, PA <i>- date:</i> ©1999 <i>Subject:</i> Polymers -- Mechanical properties <i>Desc:</i> xxviii, 689 p., illus., 23 cm. + 1 computer optical disc (4¾ in.)	<i>Dynix:</i> 90422 <i>Call No:</i> 620.1 Da <i>ISBN:</i> 1587160889 <i>LCCN:</i> 99-63892 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	763	Rheology <i>Author:</i> Schoff, Clifford K. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1997 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 42 p., illus., 28 cm.	<i>Dynix:</i> 55947-17 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010390 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> Reprint <i>Series:</i> Federation Series on Coatings Technology: No. FS17 <i>Year:</i> 1997 <i>Price:</i> \$50.00
	Rheology	149	Rheology Modifiers Handbook: Practical Use and Application <i>Author:</i> Braun, David B. and Meyer R. Rosen <i>Publish.:</i> William Andrew Publishing Company <i>- place:</i> Norwich, NY <i>- date:</i> [1999?] <i>Subject:</i> Rheology <i>Desc:</i> ix, 505 p., illus., 25 cm.	<i>Dynix:</i> 82249 <i>Call No:</i> 660 Br <i>ISBN:</i> 0815514417 <i>LCCN:</i> 99-32076 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$285.00
	Hazardous substances -- Handbooks, manuals, etc.	931	Sax's Dangerous Properties of Industrial Materials <i>Author:</i> Lewis, Richard J., Sr. (editor) [Sax, N. Irving (Newton Irving)] <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2000 <i>Subject:</i> Hazardous substances -- Handbooks, manuals, etc. <i>Desc:</i> 3 v. (v1: xxvi, 950 p.; v2: xxvi, 1-1900p.; v3: xxvi, 1901-3735), 29 cm.	<i>Dynix:</i> 105720 <i>Call No:</i> 604.7 Sa <i>ISBN:</i> 0471354074 <i>LCCN:</i> 99-39820 <i>Shelf:</i> Reference	<i>Edition:</i> 10th edition <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$475.00

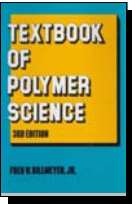


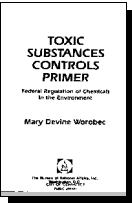

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Coatings technology Paint materials Powder coatings	173	Science of Powder Coatings: Chemistry, Formulation and Application (Vol. 1) <i>Author:</i> Bate, David A. <i>Publish.:</i> SITA (Selective Industrial Training Associates) Technology, Ltd. <i>- place:</i> London, UK <i>- date:</i> ©1990 <i>Subject:</i> Powder coatings <i>Desc:</i> viii, 321 p., illus., 24 cm.	<i>Dynix:</i> 23727 <i>Call No:</i> 667.9 Ba <i>ISBN:</i> 0947798005 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1990 <i>Price:</i> \$25.00
	Coatings -- Periodicals Paint -- Periodicals Varnish and varnishing -- Periodicals	764	Sealants and Caulks <i>Author:</i> Prane, Joseph W. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1989 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 28 p., illus., 28 cm.	<i>Dynix:</i> 55947-13 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010404 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS13 <i>Year:</i> 1989 <i>Price:</i> \$50.00
	Shellac	150	Shellac: Its Origin and Applications <i>Author:</i> Hicks, Edward <i>Publish.:</i> Chemical Publishing Company, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1961 <i>Subject:</i> Shellac <i>Desc:</i> 272 p., illus., 23 cm.	<i>Dynix:</i> 34099 <i>Call No:</i> 667.79 Hi <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1961 <i>Price:</i> \$25.00
	Silicones Surface active agents	151	Silicone Surfactants <i>Author:</i> Hill, Randal M. (editor) <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Surface active agents <i>Desc:</i> viii, 360 p., illus., 24 cm.	<i>Dynix:</i> 89762 <i>Call No:</i> 668.1 Si <i>ISBN:</i> 0824700104 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Surfactant Science Series: Vol. 86 <i>Year:</i> 1999 <i>Price:</i> \$128.00
	Coatings Silicones	765	Silicones in Coatings <i>Author:</i> Finzel, William A. and Harold L. Vincent <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1996 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 34 p., illus., 28 cm.	<i>Dynix:</i> 55947-25 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010412 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS25 <i>Year:</i> 1996 <i>Price:</i> \$50.00




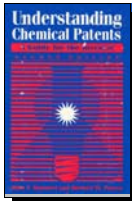
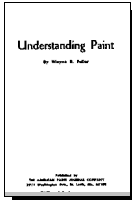
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Global environmental change Human ecology Pollution	932	Skeptical Environment: Measuring the Real State of the World <i>Author:</i> Lomborg, Bjorn, 1965- <i>Publish.:</i> Cambridge University Press <i>- place:</i> Cambridge, UK <i>- date:</i> ©2001 <i>Subject:</i> Global environmental change <i>Desc:</i> xxiii, 515 p., illus., 26 cm.	<i>Dynix:</i> 105702 <i>Call No:</i> 363.7 Lo <i>ISBN:</i> 0521010683 <i>LCCN:</i> 00-068915 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> Revised and updated edition <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$21.50
	Colloids	641	Solid-Liquid Dispersions <i>Author:</i> Dobias, Bohuslav, Xueping Qiu and Wolfgang von Rybinski <i>Publish.:</i> Marcel Dekker, Inc. <i>- place:</i> New York, NY <i>- date:</i> 1999 <i>Subject:</i> Colloids <i>Desc:</i> vii, 562 p., illus., 24 cm.	<i>Dynix:</i> 88635 <i>Call No:</i> 541.345 Do <i>ISBN:</i> 0824700147 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Surfactant Science Series: Vol. 81 <i>Year:</i> 1999 <i>Price:</i> \$195.00
	Hazardous wastes -- California -- Congresses Solvents -- Congresses	152	Solvent Waste Reduction Alternatives Symposia: Conference Proceedings <i>Author:</i> Solvent Waste Reduction Alternatives Symposia (1986: Santa Clara an <i>Publish.:</i> ICF Consulting Associates, Inc. <i>- place:</i> Los Angeles, CA <i>- date:</i> [1986?] <i>Subject:</i> Solvents -- Congresses <i>Desc:</i> vi, 186 p., illus., 28 cm.	<i>Dynix:</i> 41635 <i>Call No:</i> 363.728 So <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1986 <i>Price:</i> \$25.00
	Finishes and finishing -- Patents High solids coatings -- Patents	616	Solventless and High Solids Industrial Finishes: Recent Developments <i>Author:</i> Gillies, M. T. (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1980 <i>Subject:</i> High solids coatings -- Patents <i>Desc:</i> x, 342 p., illus., 24 cm.	<i>Dynix:</i> 13013 <i>Call No:</i> 667.9 So <i>ISBN:</i> 081550828X <i>LCCN:</i> 80-21553 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 179 <i>Year:</i> 1980 <i>Price:</i> \$48.00
	Solvents	766	Solvents <i>Author:</i> Stout, Ron L. and William H. Ellis <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1998 <i>Subject:</i> Solvents <i>Desc:</i> 36 p., illus., 28 cm.	<i>Dynix:</i> 55947-28 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010439 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> 2nd edition <i>Series:</i> Federation Series on Coatings Technology: No. FS28 <i>Year:</i> 1998 <i>Price:</i> \$50.00



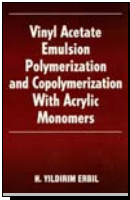
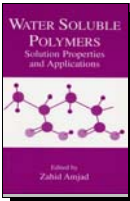

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Curing -- Patents	153	Specialized Curing Methods for Coatings and Plastics: Recent Advances <i>Author:</i> Ranney, Maurice William, 1934- <i>Publish.:</i> Noyes Data Corporation - <i>place:</i> Park Ridge, NJ - <i>date:</i> ©1977 <i>Subject:</i> Curing -- Patents <i>Desc:</i> xi, 244 p., illus., 25 cm.	<i>Dynix:</i> 13011 <i>Call No:</i> 667.9 Ra <i>ISBN:</i> 0815506600 <i>LCCN:</i> 77-71928 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 88 <i>Year:</i> 1977 <i>Price:</i> \$25.00
	Surface active agents Surface chemistry	1501	Structure - Performance Relationships in Surfactants <i>Author:</i> Esumi, Kunio and Minoru Ueno (editors) <i>Publish.:</i> Marcel Dekker, Inc. - <i>place:</i> New York, NY - <i>date:</i> ©2003 <i>Subject:</i> Surface active agents <i>Desc:</i> viii, 802 p., illus., 24 cm.	<i>Dynix:</i> 111655 <i>Call No:</i> 668 St <i>ISBN:</i> 0824740440 <i>LCCN:</i> 2003-272251 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition, Revised and expanded <i>Series:</i> Surfactant Science Series: Vol. 112 <i>Year:</i> 2003 <i>Price:</i> \$171.50
	New products	154	Successful Product Development: Speeding from Opportunity to Profit <i>Author:</i> Rosenau, Milton D., 1931- <i>Publish.:</i> John Wiley & Sons - <i>place:</i> New York, NY - <i>date:</i> ©2000 <i>Subject:</i> New products <i>Desc:</i> xi, 151 p., illus., 24 cm.	<i>Dynix:</i> 89748 <i>Call No:</i> 658.5 Ro <i>ISBN:</i> 047131532X <i>LCCN:</i> 99-30972 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$38.50
	Surface active agents Surface chemistry	155	Surface Activity: Principles, Phenomena and Applications <i>Author:</i> Tsujii, Kaoru <i>Publish.:</i> Academic Press - <i>place:</i> San Diego, CA - <i>date:</i> ©1998 <i>Subject:</i> Surface active agents <i>Desc:</i> x, 245 p., illus., 24 cm.	<i>Dynix:</i> 82250 <i>Call No:</i> 668 Ts <i>ISBN:</i> 0127022805 <i>LCCN:</i> 97-51306 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Series in Polymers, Interfaces and Biomaterials <i>Year:</i> 1998 <i>Price:</i> \$79.00
	Interfaces (Physical sciences) Surface chemistry	156	Surface Characterization Methods: Principles, Techniques and Applications <i>Author:</i> Milling, Andrew J. (editor) <i>Publish.:</i> Marcel Dekker, Inc. - <i>place:</i> New York, NY - <i>date:</i> ©1999 <i>Subject:</i> Surface chemistry <i>Desc:</i> viii, 412 p., illus., 24 cm.	<i>Dynix:</i> 89763 <i>Call No:</i> 541.3 Su <i>ISBN:</i> 0824773365 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Surfactant Science Series: Vol. 87 <i>Year:</i> 1999 <i>Price:</i> \$138.50




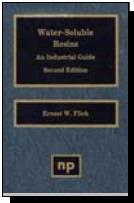
Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Coatings Finishes and finishing Paint materials Protective coatings	Paints and Their Applications - vol. 2 Raw Materials and Their Usage - vol. 1	158 Surface Coatings <i>Author:</i> Oil and Colour Chemists' Association, Australia <i>Publish.:</i> Chapman and Hall <i>- place:</i> New York, NY <i>- date:</i> ©1983 <i>Subject:</i> Protective coatings <i>Desc:</i> viii, 408 p., illus., 25 cm.	<i>Dynix:</i> 00866 <i>Call No:</i> 667.9 Su <i>ISBN:</i> 0412256606 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition, Revised <i>Series:</i> <i>Year:</i> 1983 <i>Price:</i> \$25.00
	Colloids Interfaces (Physical sciences) Surface chemistry		159 Surfaces, Interfaces and Colloids: Principles and Applications <i>Author:</i> Myers, Drew, 1946- <i>Publish.:</i> Wiley - VCH, Verlag GmbH & Co. <i>- place:</i> New York, NY <i>- date:</i> ©1999 <i>Subject:</i> Surface chemistry <i>Desc:</i> xx, 501 p., illus., 24 cm.	<i>Dynix:</i> 82251 <i>Call No:</i> 541.3 My <i>ISBN:</i> 0471330604 <i>LCCN:</i> 98-38906 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$94.95
	Polymers Solution (Chemistry) Surface active agents		160 Surfactants and Polymers in Aqueous Solution <i>Author:</i> Jonsson, Bo <i>Publish.:</i> John Wiley & Sons <i>- place:</i> Chichester, [West Sussex], UK / New York, NY <i>- date:</i> 1999 <i>Subject:</i> Surface active agents <i>Desc:</i> xii, 438 p., illus., 23 cm.	<i>Dynix:</i> 82252 <i>Call No:</i> 668.1 Jo <i>ISBN:</i> 0471974226 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$75.00
	Polymers Solution (Chemistry) Surface active agents		933 Surfactants and Polymers in Aqueous Solution <i>Author:</i> Holmberg, I. Krister, Bo Jonsson, Bengt Kronberg and Bjorn Lindman <i>Publish.:</i> John Wiley & Sons, Ltd. <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©2003 <i>Subject:</i> Surface active agents <i>Desc:</i> xvi, 545 p., illus., 24 cm.	<i>Dynix:</i> 105703 <i>Call No:</i> 668 Su <i>ISBN:</i> 0471498831 <i>LCCN:</i> 2002-072621 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$111.50
	Surface active agents Surfactants		1510 Surfactants in Polymers, Coatings, Inks, and Adhesives <i>Author:</i> Karsa, David R. (editor) <i>Publish.:</i> Blackwell Publishing / CRC (Chemical Rubber Company) Press <i>- place:</i> Oxford, England / Boca Raton, FL <i>- date:</i> ©2003 <i>Subject:</i> Surface active agents <i>Desc:</i> xi, 306 p., illus., 24 cm.	<i>Dynix:</i> 111654 <i>Call No:</i> 668 Su <i>ISBN:</i> 084932808X <i>LCCN:</i> 2003-008647 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Applied Surfactant Series: Vol. 1 <i>Year:</i> 2003 <i>Price:</i> \$135.00




Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Surface active agents	824	Surfactants: A Practical Handbook <i>Author:</i> Lange, K.Robert (editor) <i>Publish.:</i> Hanser Gardner Publications, Inc. - <i>place:</i> Cincinnati, OH - <i>date:</i> ©1999 <i>Subject:</i> Surface active agents <i>Desc:</i> xiii, 237 p., illus., 25 cm.	<i>Dynix:</i> 99424 <i>Call No:</i> 668.1 Su <i>ISBN:</i> 1569902704 <i>LCCN:</i> 99-24733 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1999 Price: \$73.50
	Emulsion paint -- Congresses	161	Technology for Waterborne Coatings <i>Author:</i> Glass, Edward J. (editor) <i>Publish.:</i> American Chemical Society - <i>place:</i> Washington, DC - <i>date:</i> ©1997 <i>Subject:</i> Emulsion paint -- Congresses <i>Desc:</i> viii, 304 p., illus., 24 cm.	<i>Dynix:</i> 72301 <i>Call No:</i> 667.9 Te <i>ISBN:</i> 0841235015 <i>LCCN:</i> 97-5741 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> ACS Symposium Series: No. 663 Year: 1997 Price: \$115.00
	Lacquer and lacquering Paint Varnish and varnishing	162	Technology of Paints, Varnishes and Lacquers <i>Author:</i> Martens, Charles R. (editor) <i>Publish.:</i> Robert E. Kreiger Publishing Company - <i>place:</i> Huntington, NY / Malabar, FL - <i>date:</i> 1974 [©1968] <i>Subject:</i> Paint <i>Desc:</i> viii, 744 p., illus., 24 cm.	<i>Dynix:</i> 12995 <i>Call No:</i> 667.6 Te <i>ISBN:</i> 0882751549 <i>LCCN:</i> 73-92865 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1968 Price: \$36.50
	Plastic coatings Plastic powders	825	Technology, Formulation and Application of Powder Coatings <i>Author:</i> Howell, David M. <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited - <i>place:</i> Chichester, [West Sussex], UK - <i>date:</i> ©2000 <i>Subject:</i> Plastic powders <i>Desc:</i> xx, 361 p., illus., 24 cm.	<i>Dynix:</i> 99420 <i>Call No:</i> 660 Ho <i>ISBN:</i> 047197899X <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 1: Powder Coatings] Year: 2000 Price: \$118.50
	Protective coatings	615	Testing of Organic Coatings <i>Author:</i> Gaynes, Norman I. <i>Publish.:</i> Noyes Data Corporation - <i>place:</i> Park Ridge, NJ - <i>date:</i> ©1977 <i>Subject:</i> Protective coatings -- Testing <i>Desc:</i> viii, 275 p., illus., 25 cm.	<i>Dynix:</i> 13007 <i>Call No:</i> 667.9 Ga <i>ISBN:</i> 0815506503 <i>LCCN:</i> 76-24148 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Year: 1977 Price: \$25.00


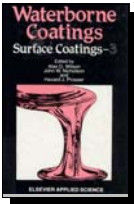
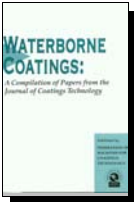

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Polymers and polymerization	163	Textbook of Polymer Science <i>Author:</i> Billmeyer, Fred W. <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1984 <i>Subject:</i> Polymers and Polymerization <i>Desc:</i> xviii, 578 p., illus., 24 cm.	<i>Dynix:</i> 07933 <i>Call No:</i> 541.7 Bi <i>ISBN:</i> 0471031968 <i>LCCN:</i> 83-19870 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1984 <i>Price:</i> \$25.00
	Paint -- Abstracting and indexing Paint industry and trade Technology Technology -- Abstracting and indexing	174	Thesaurus of Paint and Allied Technology: A Guide to Technical Terms Employed in the United State <i>Author:</i> Federation of Societies for Paint Technology <i>Publish.:</i> Federation of Societies for Paint Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> [1968] <i>Subject:</i> Technology <i>Desc:</i> 264 p., 22 cm.	<i>Dynix:</i> 36216 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1968 <i>Price:</i> \$50.00
	Hazardous wastes -- Management -- United States	175	Toward Pollution-Free Manufacturing <i>Author:</i> Institute for Local Self-Reliance <i>Publish.:</i> AMA Membership Publications Division, American Management Associ <i>- place:</i> New York, NY <i>- date:</i> ©1986 <i>Subject:</i> Hazardous wastes -- Management -- United States <i>Desc:</i> 122 p., 23 cm.	<i>Dynix:</i> 26250 <i>Call No:</i> 363.72 To <i>ISBN:</i> 0814423272 <i>LCCN:</i> 86-17424 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> AMA Management Briefing <i>Year:</i> 1986 <i>Price:</i> \$25.00
	Chemicals -- Law and legislation Hazardous substances -- Law and legislation	176	Toxic Substances Controls Primer: Federal Regulation of Chemicals in the Environment <i>Author:</i> Worobec, Mary Devine <i>Publish.:</i> Bureau of National Affairs, Inc. <i>- place:</i> Washington, DC <i>- date:</i> ©1984 <i>Subject:</i> Chemicals -- Law and legislation <i>Desc:</i> xi, 224 p., 23 cm.	<i>Dynix:</i> 30112 <i>Call No:</i> 344.73 Wo <i>ISBN:</i> 0871794586 <i>LCCN:</i> 84-16787 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1984 <i>Price:</i> \$25.00
	Poisoning Poisons Toxicology	177	Toxicology: The Basic Science of Poisons <i>Author:</i> Casarett, Louis J. and John Doull (editors) <i>Publish.:</i> Macmillan Publishing Company, Inc. <i>- place:</i> New York, NY <i>- date:</i> [1975] <i>Subject:</i> Toxicology <i>Desc:</i> xiii, 768 p., illus., 26 cm.	<i>Dynix:</i> 14476 <i>Call No:</i> 615.9 Ca <i>ISBN:</i> 0023199601 <i>LCCN:</i> 74-7704 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1975 <i>Price:</i> \$25.00

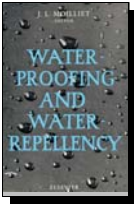
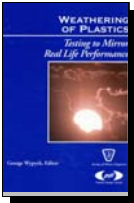



Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Business names -- United States Trademarks -- Law and legislation -- United States	178	Trademark: Legal Care for Your Business & Product Name <i>Author:</i> Elias, Stephen <i>Publish.:</i> Nolo Press <i>- place:</i> Berkeley, CA <i>- date:</i> ©2001 <i>Subject:</i> Trademarks -- Law and legislation -- United States <i>Desc:</i> 1 v. (various pagings) illus., forms, 28 cm.	<i>Dynix:</i> 89740 <i>Call No:</i> 346.73 EI <i>ISBN:</i> 0873375793 <i>LCCN:</i> 99-088318 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 5th edition <i>Series:</i> <i>Year:</i> 2001 <i>Price:</i> \$39.95
	Business names -- United States Trademarks -- Law and legislation -- United States	1195	Trademark: Legal Care for Your Business & Product Name <i>Author:</i> Elias, Stephen <i>Publish.:</i> Nolo Press <i>- place:</i> Berkeley, CA <i>- date:</i> ©2003 <i>Subject:</i> Trademarks -- Law and legislation -- United States <i>Desc:</i> 1 v. (various pagings), illus., 23 cm.	<i>Dynix:</i> 111653 <i>Call No:</i> 346.730 EI <i>ISBN:</i> 0873379454 <i>LCCN:</i> 2003-042153 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 6th edition <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$18.50
	Japanning Varnish and varnishing	2	Treatise of Japanning and Varnishing: 1688 <i>Author:</i> Stalker, John and George Parker <i>Publish.:</i> Alec Tiranti, Ltd. <i>- place:</i> London, UK <i>- date:</i> ©1960 <i>Subject:</i> Japanning <i>Desc:</i> xvi, 84 p., 24 plates, 26 cm.	<i>Dynix:</i> 13005 <i>Call No:</i> 667.8 St <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1960 <i>Price:</i> \$25.00
	Chemistry -- Patents Patents	826	Understanding Chemical Patents: A Guide for the Inventor <i>Author:</i> Maynard, John T. and Howard M. Peters <i>Publish.:</i> American Chemical Society <i>- place:</i> Washington, DC <i>- date:</i> ©1991 <i>Subject:</i> Patents <i>Desc:</i> xvi, 183 p., illus., 24 cm.	<i>Dynix:</i> 100381 <i>Call No:</i> 660.027 Ma <i>ISBN:</i> 0841219982 <i>LCCN:</i> 91-24124 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> ACS Professional Reference Books <i>Year:</i> 1991 <i>Price:</i> \$40.00
	Paint	179	Understanding Paint <i>Author:</i> Fuller, Wayne R. <i>Publish.:</i> American Paint Journal Company <i>- place:</i> St. Louis, MO <i>- date:</i> ©1965 <i>Subject:</i> Paint <i>Desc:</i> 135 p., 21 cm.	<i>Dynix:</i> 34096 <i>Call No:</i> 667.6 Fu <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1965 <i>Price:</i> \$25.00


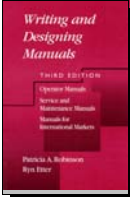


Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Copolymers Elastomers Thermoplastics	936	Understanding Thermoplastic Elastomers <i>Author:</i> Holden, Geoffrey <i>Publish.:</i> Hanser Gardner Publications, Inc. <i>- place:</i> Cincinnati, OH <i>- date:</i> ©2000 <i>Subject:</i> Elastomers <i>Desc:</i> vii, 110 p., illus., 23 cm.	<i>Dynix:</i> 105704 <i>Call No:</i> 678 Ho <i>ISBN:</i> 1569902895 <i>LCCN:</i> 99-047357 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Hanser Understanding Books (A Series of Mini-Tutorials) <i>Year:</i> 2000 <i>Price:</i> \$36.50
	Hazardous wastes -- Law and legislation -- United States	180	Using the Hazardous Waste Manifest: A Manual of Federal and State Requirements <i>Author:</i> <i>Publish.:</i> Inter/Face Associates, Inc. <i>- place:</i> Middleton, CT <i>- date:</i> ©1985 <i>Subject:</i> Hazardous wastes -- Law and legislation -- United States <i>Desc:</i> 1 v. (various pagings) illus., 30 cm.	<i>Dynix:</i> 30439 <i>Call No:</i> 363.728 Us <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1985 <i>Price:</i> \$50.00
	Emulsion polymerization Vinyl acetate	934	Vinyl Acetate Emulsion Polymerization and Copolymerization With Acrylic Monomers <i>Author:</i> Erbil, H. Yildirim <i>Publish.:</i> CRC (Chemical Rubber Company) Press <i>- place:</i> Boca Raton, FL <i>- date:</i> ©2000 <i>Subject:</i> Vinyl acetate <i>Desc:</i> 324 p., illus. 25 cm.	<i>Dynix:</i> 105705 <i>Call No:</i> 668.4 Er <i>ISBN:</i> 0849323037 <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$141.50
	Water-soluble polymers -- Congresses Water-soluble polymers -- Industrial applications -- Congresses	181	Water Soluble Polymers: Solution Properties and Applications <i>Author:</i> Amjad, Zahid (editor) <i>Publish.:</i> Plenum Press <i>- place:</i> New York, NY <i>- date:</i> ©1998 <i>Subject:</i> Water-soluble polymers -- Congresses <i>Desc:</i> xii, 259 p., illus., 26 cm.	<i>Dynix:</i> 78751 <i>Call No:</i> 547 Wa <i>ISBN:</i> 0306459310 <i>LCCN:</i> 98-39451 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1998 <i>Price:</i> \$125.00
	Coating processes -- Patents Emulsion paint -- Patents	182	Water-Based Industrial Finishes: Recent Developments <i>Author:</i> Gillies, M. T. (editor) <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1980 <i>Subject:</i> Coating processes -- Patents <i>Desc:</i> xii, 435 p., 25 cm.	<i>Dynix:</i> 64074 <i>Call No:</i> 667.63 Gi <i>ISBN:</i> 0815508123 <i>LCCN:</i> 80-17520 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 167 <i>Year:</i> 1980 <i>Price:</i> \$48.00

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Paint -- Patents	183	Water-Based Paint Formulations <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> 1975-<@1994 @1997 > <i>Subject:</i> Paint -- Patents <i>Desc:</i> v. <3, 4 > 25 cm.	<i>Dynix:</i> 50461 <i>Call No:</i> 667 FI <i>ISBN:</i> 0815513453 <i>LCCN:</i> 75-2939 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1994 <i>Price:</i> \$144.00
	Emulsion paint	669	Water-Based Trade Paint Formulations <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1988 <i>Subject:</i> Emulsion paint <i>Desc:</i> xxv, 697 p., 25 cm.	<i>Dynix:</i> 07902 <i>Call No:</i> 667.63 FI <i>ISBN:</i> 0815511477 <i>LCCN:</i> 87-31532 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1988 <i>Price:</i> \$25.00
	Water-soluble polymers -- Patents	184	Water-Soluble Polymers: Recent Developments <i>Author:</i> Meltzer, Yale L. <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1979 <i>Subject:</i> Water-soluble polymers -- Patents <i>Desc:</i> xiv, 496 p., illus., 25 cm.	<i>Dynix:</i> 51469 <i>Call No:</i> 668.4 Me <i>ISBN:</i> 0815507429 <i>LCCN:</i> 78-68940 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> Chemical Technology Review: No. 126 <i>Year:</i> 1979 <i>Price:</i> \$25.00
	Gums and resins Gums and resins, Synthetic Water-soluble polymers	185	Water-Soluble Resins: An Industrial Guide <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1991 <i>Subject:</i> Gums and resins <i>Desc:</i> xiv, 436 p., 25 cm.	<i>Dynix:</i> 50462 <i>Call No:</i> 668 FI <i>ISBN:</i> 0815512740 <i>LCCN:</i> 91-8368 <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1991 <i>Price:</i> \$64.00

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Acrylic Resins	Vol 1: Waterborne & Solvent Based Acrylics and..	186 Waterborne & Solvent Based Acrylics and Their End User Applications <i>Author:</i> Oldring, Peter and Peter Lam (editors) <i>Publish.:</i> SITA (Selective Industrial Training Associates) Technology, Ltd. <i>- place:</i> London, UK <i>- date:</i> ©1996 <i>Subject:</i> Acrylic resins <i>Desc:</i> 1 v. (xiii, 490 p.) illus., 26 cm.	<i>Dynix:</i> 70138 <i>Call No:</i> 667.9 Wa v.1 <i>ISBN:</i> 0947798447 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i>
	Thermoplastic resins	Vol 2: Waterborne & Solvent Based Epoxies and..			<i>Series:</i> Wiley/SITA Series in Surface Coatings Technology
	Thermosetting resins	Vol 3: Waterborne & Solvent Based Surface Coating Resins and..			<i>Year:</i> 1996
	Waterborne acrylics	Vol 4: Waterborne & Solvent Based Saturated Polyesters and..			<i>Price:</i> \$130.00
	Epoxy resins	Vol 1: Waterborne & Solvent Based Acrylics and..	187 Waterborne & Solvent Based Epoxies and Their End User Applications <i>Author:</i> Oldring, Peter (editor) <i>Publish.:</i> SITA (Selective Industrial Training Associates) Technology, Ltd. <i>- place:</i> London, UK <i>- date:</i> ©1996 <i>Subject:</i> Epoxy resins <i>Desc:</i> xii, 516 p., illus., 24 cm.	<i>Dynix:</i> 70139 <i>Call No:</i> 667.9 Wa v.2 <i>ISBN:</i> 0947798498 <i>LCCN:</i> <i>Shelf</i> Reference	<i>Edition:</i>
	Protective coatings	Vol 2: Waterborne & Solvent Based Epoxies and..			<i>Series:</i> Wiley/SITA Series in Surface Coatings Technology
		Vol 3: Waterborne & Solvent Based Surface Coating Resins and..			<i>Year:</i> 1996
		Vol 4: Waterborne & Solvent Based Saturated Polyesters and..			<i>Price:</i> \$130.00
	Coating processes	Vol 1: Waterborne & Solvent Based Acrylics and..	827 Waterborne & Solvent Based Saturated Polyesters and Their End User Applications [Vol. 4: Polyester] <i>Author:</i> Sanders, Don (editor) <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©1999 <i>Subject:</i> Coating processes <i>Desc:</i> xiii, 577 p., illus., 24 cm.	<i>Dynix:</i> 99427 <i>Call No:</i> 667.9 Wa v.4 <i>ISBN:</i> 0471978884 <i>LCCN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i>
		Vol 2: Waterborne & Solvent Based Epoxies and..			<i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 4: Polyesters]
		Vol 3: Waterborne & Solvent Based Surface Coating Resins and..			<i>Year:</i> 1999
		Vol 4: Waterborne & Solvent Based Saturated Polyesters and..			<i>Price:</i> \$123.50

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Polyurethanes	<p>Vol 1: Waterborne & Solvent Based Acrylics and..</p> <p>Vol 2: Waterborne & Solvent Based Epoxies and..</p> <p>Vol 3: Waterborne & Solvent Based Surface Coating Resins and..</p> <p>Vol 4: Waterborne & Solvent Based Saturated Polyesters and..</p>	<p>828 Waterborne & Solvent Based Surface Coating Resins and Their Applications [Vol. 3: Polyurethanes]</p> <p><i>Author:</i> Thomas, Paul (editor)</p> <p><i>Publish.:</i> John Wiley & Sons - SITA Technology Limited</p> <p><i>- place:</i> Chichester, [West Sussex], UK</p> <p><i>- date:</i> ©1998</p> <p><i>Subject:</i> Polyurethanes</p> <p><i>Desc:</i> xv, 443 p., illus., 24 cm.</p>	<p><i>Dynix:</i> 99425</p> <p><i>Call No:</i> 667.9 Wa v.3</p> <p><i>ISBN:</i> 0471978868</p> <p><i>LCCN:</i></p> <p><i>Shelf</i> Adult Non-Fiction</p>	<p><i>Edition:</i></p> <p><i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 3: Polyurethanes]</p> <p><i>Year:</i> 1998</p> <p><i>Price:</i> \$133.50</p>
	Coatings Protective coatings		<p>157 Waterborne Coatings [Vol. 3 -- Surface Coatings]</p> <p><i>Author:</i> Wilson, Alan D., John W. Nicholson and Havard J. Prosser (editors)</p> <p><i>Publish.:</i> Elsevier Applied Science</p> <p><i>- place:</i> London, UK / New York, NY</p> <p><i>- date:</i> ©1990</p> <p><i>Subject:</i> Coatings</p> <p><i>Desc:</i> x, 304 p., illus., 25 cm.</p>	<p><i>Dynix:</i> 23559</p> <p><i>Call No:</i> 667.9 Su v.3</p> <p><i>ISBN:</i> 1851665188</p> <p><i>LCCN:</i> 87-8892</p> <p><i>Shelf</i> Adult Non-Fiction</p>	<p><i>Edition:</i></p> <p><i>Series:</i></p> <p><i>Year:</i> 1990</p> <p><i>Price:</i> \$25.00</p>
	Coatings Paint Protective coatings		<p>941 Waterborne Coatings: A Compilation of Papers from the Journal of Coatings Technology</p> <p><i>Author:</i> FSCT Publications Committee (editors)</p> <p><i>Publish.:</i> Federation of Societies for Coatings Technology</p> <p><i>- place:</i> Philadelphia, PA</p> <p><i>- date:</i> ©2001</p> <p><i>Subject:</i> Protective coatings</p> <p><i>Desc:</i> xv, 796 p., illus., 28 cm.</p>	<p><i>Dynix:</i> 107321</p> <p><i>Call No:</i> 667.9 Wa</p> <p><i>ISBN:</i> 0934010528</p> <p><i>LCCN:</i></p> <p><i>Shelf</i> Adult Non-Fiction</p>	<p><i>Edition:</i></p> <p><i>Series:</i></p> <p><i>Year:</i> 2001</p> <p><i>Price:</i> \$255.00</p>
	Emulsions Paint		<p>189 Waterborne Coatings: Emulsion and Water-Soluble Paints</p> <p><i>Author:</i> Martens, Charles R.</p> <p><i>Publish.:</i> Van Nostrand Reinhold Company</p> <p><i>- place:</i> New York, NY</p> <p><i>- date:</i> ©1981</p> <p><i>Subject:</i> Emulsions</p> <p><i>Desc:</i> x, 316 p., illus., 24 cm.</p>	<p><i>Dynix:</i> 03813</p> <p><i>Call No:</i> 667.63 Ma</p> <p><i>ISBN:</i> 0442251378</p> <p><i>LCCN:</i> 80-17143</p> <p><i>Shelf</i> Adult Non-Fiction</p>	<p><i>Edition:</i></p> <p><i>Series:</i></p> <p><i>Year:</i> 1981</p> <p><i>Price:</i> \$25.00</p>

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Waterproofing Waterproofing of fabrics	673	Waterproofing and Water-Repellency <i>Author:</i> Moilliet, John Lewis (editor) <i>Publish.:</i> Elsevier Publishing Company <i>- place:</i> New York, NY <i>- date:</i> ©1963 <i>Subject:</i> Waterproofing <i>Desc:</i> x, 502 p., illus., 24 cm.	<i>Dynix:</i> 14927 <i>Call No:</i> 677.682 Mo <i>ISBN:</i> <i>LCCN:</i> 62-13020 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1963 <i>Price:</i> \$25.00
	Plastics -- Deterioration -- Testing Plastics -- Testing Weathering	190	Weathering of Plastics: Testing to Mirror Real Life Performance <i>Author:</i> Wypych, George (editor) <i>Publish.:</i> Plastics Design Library <i>- place:</i> Norwich, NY <i>- date:</i> ©1999 <i>Subject:</i> Plastics -- Testing <i>Desc:</i> x, 320 p., illus., 23 cm.	<i>Dynix:</i> 89764 <i>Call No:</i> 668.4 We <i>ISBN:</i> 1884207758 <i>LCCN:</i> 98-89318 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1999 <i>Price:</i> \$118.50
	Coating Technology Paint materials	191	Western Coatings Symposium, 1985 (sound recording) <i>Author:</i> <i>Publish.:</i> Cassette Productions Unlimited, Inc. <i>- place:</i> Pasadena, CA <i>- date:</i> 1985 <i>Subject:</i> Coating technology <i>Desc:</i> 22 sound cassettes [Tapes #4 and #9 not available]	<i>Dynix:</i> 56827 <i>Call No:</i> 667.9 We Parts 1 <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1985 <i>Price:</i> \$80.00
	Coating Technology	192	Western Coatings Symposium, Technical Excellence and Innovations for 1987 <i>Author:</i> <i>Publish.:</i> Technical Program, Steinbeck Forum <i>- place:</i> Pasadena, CA <i>- date:</i> 23 Feb. 1987 <i>Subject:</i> Coating technology <i>Desc:</i> 2 videorecordings, VHS format	<i>Dynix:</i> 53696 <i>Call No:</i> 667.9 We Parts 1 <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 1987 <i>Series:</i> <i>Year:</i> 1987 <i>Price:</i> \$20.00
	Pigments	767	White Pigments <i>Author:</i> Braun, Juergen H. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1995 <i>Subject:</i> Pigments -- Periodicals <i>Desc:</i> 43 p., illus., 28 cm.	<i>Dynix:</i> 55947-23 <i>Call No:</i> 667.9 Fe <i>ISBN:</i> 0934010447 <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS23 <i>Year:</i> 1995 <i>Price:</i> \$50.00

Cover	Subjects	Volumes	Title	Location	Edition / Series / Misc.
	Hazardous Substances -- standards Industrial toxicology Pollutants, Chemical Pollution Threshold limit values (Industrial toxicology)	193	World-Wide Limits for Toxic and Hazardous Chemicals in Air, Water and Soil <i>Author:</i> Sittig, Marshall <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1994 <i>Subject:</i> Threshold limit values (Industrial toxicology) <i>Desc:</i> xxxiv, 792 p., 26 cm.	<i>Dynix:</i> 50478 <i>Call No:</i> 615.9 Si <i>ISBN:</i> 0815513445 <i>LCCN:</i> 94-9107 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1994 <i>Price:</i> \$98.00
	Technical writing	829	Writing and Designing Manuals <i>Author:</i> Robinson, Patricia A. and Ryn Etter <i>Publish.:</i> CRC (Chemical Rubber Company) Press <i>- place:</i> Boca Raton, FL <i>- date:</i> ©2000 <i>Subject:</i> Technical writing <i>Desc:</i> 202 p., illus., 24 cm.	<i>Dynix:</i> 99426 <i>Call No:</i> 808.066 Ro <i>ISBN:</i> 1566703786 <i>LCCN:</i> 99-08627 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 2000 <i>Price:</i> \$55.00
	Coatings -- Directories	194	Year Book: F.S.C.T. Membership Directory <i>Author:</i> Federation of Societies for Coatings Technology <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©2002 <i>Subject:</i> Coatings -- Directories <i>Desc:</i> 400 p., illus., 21 cm.	<i>Dynix:</i> 10231 <i>Call No:</i> 667.5 Fe 2002 <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2002 <i>Price:</i> \$150.00
	Coatings -- Directories	195	Yearbook and Directory: 2002-2003 <i>Author:</i> Los Angeles Society For Coatings Technology <i>Publish.:</i> Group Administrative Services <i>- place:</i> Los Alamitos, CA <i>- date:</i> ©2002 <i>Subject:</i> Coatings -- Directories <i>Desc:</i> 146 p., illus., 21 cm.	<i>Dynix:</i> 57894 <i>Call No:</i> 667.9 Lo 2002-200 <i>ISBN:</i> <i>LCCN:</i> <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 2002 <i>Price:</i> \$12.00

324 items in listing

02-Oct-04

Filter: None (324 books selected)

Title	Location	Edition / Series / Misc.
830 Acrylic Resins Author: Horn, Milton B. Publish.: Reinhold Publishing Corporation - place: New York, NY - date: ©1960 Subject: Acrylic resins Desc: vii, 184 p., illus., 20 cm.	Dynix: 91500 Call No.: 668.423 Ho ISBN: Shelf Adult Non-Fiction	Edition: Series: Reinhold Plastics Applications Series: No. 14 Year: 1960 Price: \$30.00

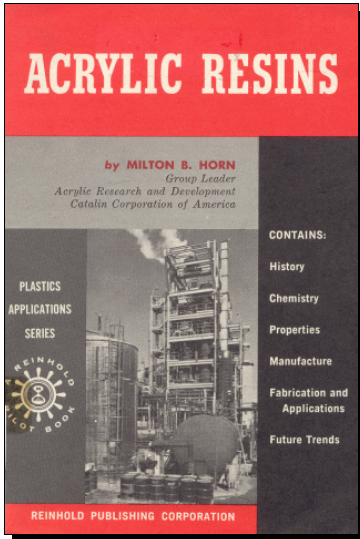


Table of Contents

INTRODUCTION
 PREFACE
 1. INTRODUCTION
 2. CHEMISTRY OF ACRYLIC MONOMERS AND POLYMERS
 3. CAST ACRYLICS: MANUFACTURE AND PROPERTIES
 4. FABRICATION AND APPLICATION OF CAST ACRYLICS
 5. MOLDING POWDERS: THEIR MANUFACTURE AND USE
 6. ACRYLIC EMULSIONS: MANUFACTURE
 7. MANUFACTURE OF SOLUTION POLYMERS
 8. APPLICATIONS OF EMULSIONS AND SOLUTIONS
 9. MISCELLANEOUS ACRYLIC MONOMERS AND APPLICATIONS
 10. FUTURE TRENDS
 APPENDIX: SELECTED READING MATERIAL
 INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Describes the four types of acrylics in respect to their manufacture, fabrication and applications. These types include cast products, molding compounds, emulsion and solution compounds and this is the first coverage of all types in one book. The author explains raw materials and manufacture of these polymers sufficient to an understanding of the problems involved in fabrication and application. Then he covers the current and future developments in terms of potential use in a great variety of products. All in material presented in the book is available in the literature. As a result chemists, sales personnel and executives have a complete guide to the additional information on every aspect of acrylics in addition to a broad understanding of uses and future trends.

Subjects

214 . Acrylic Resins

REINHOLD PLASTICS APPLICATIONS SERIES:

This series was started in 1957 with sixteen titles in prospect. The present volume on Acrylic Resins is the fourteenth of the series. However, the series has been lengthened as new plastics materials have appeared on the scene, and seven more books are now in preparation. These include volumes on polyesters, polystyrene, polycarbonates and polypropylene.

The theme of the series is guidance in application. The optimum application of a plastic in a very real sense determines its true worth. Most of the books in the series describe the properties, the chemistry and the application of a single plastic or of a single family of plastics. A few describe fabrications of plastics.

The books are semi-technical—that is, one does not need to be a research chemist to understand the various volumes. The authors have kept in mind as probable readers such industrial men and women as design engineers, equipment manufacturers, producers of packages, manufacturers of packaging machinery, students at technical schools and, of course, all people in the plastics industry—material manufacturers, molders, extruders, fabricators.

In addition to the above, it is hoped that each title will appeal to readers in specialized categories. Plastics from which fibers are made may be of interest to tire and fabric manufacturers. One book, for instance, may describe materials favorable for production of sheets used for handbags and luggage. Similarly, other titles may appeal to manufacturers of paints, magnetic tapes, upholstery, plywood and furniture.

With the series now about two-thirds complete, and with encouragement from its wide acceptance in industry, it is with enthusiasm that this fourteenth book is presented.

PREFACE

Acrylic resins, in one or another form, have found their way into most of our homes, factories, commercial buildings and vehicles. The purpose of this book is to classify these resins as to basic types and then to give full application in formation. Data are included on the raw materials and manufacturing processes used in making the resins, to provide the user with a better understanding of the product with which he is concerned.

The rate of growth of the plastics industry over the past twenty-five years has precluded the possibility of any one person having a comprehensive knowledge of more than a very few facets of the industry. A person will usually concentrate on one phase. He may be an emulsion chemist, a textile applications man or a sales engineer. The businessman and the technical man will find this book of value as it gives a bird's-eye view of the industry.

The book is, of necessity, general in nature. However, a little generalization in this age of specialization may help to broaden our horizons.

The author wishes to acknowledge the many industrial organizations that patiently answered his many queries and permitted the use of their charts, tables and illustrations. Thanks are due to Mr. Joseph B. Hyman and Mr. Stanley Kordzinski for their assistance, and to Mr. Robert Raetz for his help in gathering information on suspension polymerization.

Title	Location	Edition / Series / Misc.
795 Acrylics & Epoxies <i>Author:</i> Coyard, H., P. Deligny and N. Tuck <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited <i>- place:</i> Chichester, [West Sussex], UK <i>- date:</i> ©2001 <i>Subject:</i> Plastic coatings <i>Desc:</i> ix, 365 p., illus., 24 cm.	<i>Dynix:</i> 99422 <i>Call No.:</i> 668.4 Co <i>ISBN:</i> 0471978949 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 1: Resins for Surface Coatings] <i>Year:</i> 2001 <i>Price:</i> \$95.00

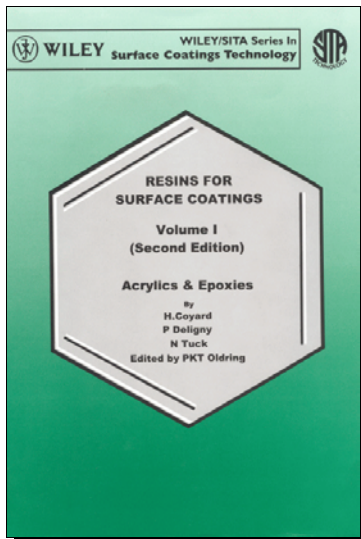


Table of Contents

TABLE OF CONTENTS

Chapter 1: Introduction
 Introduction
 1. Drying of Paint Films
 2. Chemical Crosslinking
 3. Degree of Cure —Extent of Reaction

Chapter 2: Acrylic Resins
 1. Introduction
 2. Monomers and Factors Affecting their Selection
 (i) Monomers
 (ii) Comonomer Distribution
 (iii) Glass Transition Temperature
 (iv) Functional Monomers
 3. Polymerisation
 (1) Initiators
 a) Formation of Radicals and Initiation
 b) Propagation
 c) Transfer Reactions (chain transfer reactions)
 d) Termination
 (ii) Factors affecting physical properties
 a) Molecular Weight
 b) Viscosity
 4. Production Methods
 (i) Polymerisation in solution in organic solvents
 (ii) Polymerisation in aqueous emulsion
 (iii) Suspension Polymerisation
 (iv) Bulk Polymerisation
 (v) 100% non-volatile content liquid polymerisation
 5. Different types of acrylic resins for different end uses
 (i) Thermoplastic acrylic resins
 a) Road Paints
 b) Paints for plastic materials
 c) Paints for automobile repair
 d) Other uses - various products
 (ii) Thermosetting acrylic resins
 a) Automobile finishing varnishes
 b) Opaque automobile finishing paints
 c) Opaque, metallised or pearl automobile bases
 d) Paints for electrical equipment
 (iii) Self-Crosslinking Resins
 (iv) Hydroxylated Acrylic Resins
 a) Automobile repairs
 b) Paints for machine tools
 c) All types of industrial paints
 d) Aviation paints
 e) Paints for military equipment
 1) Paints for nuclear power station
 g) Paint for transport vehicles
 h) Automobile
 (v) Acrylic Emulsions

Subjects

214 .	Acrylic Resins
297 .	Plastic coatings
517 .	Epoxy coatings

- (vi) Acrylic Resins for Electrodeposition
- 6. Typical Resin and Paint Formulations
 - (i) Thermoplastic Acrylic Resin
 - a) Road marking paints Resin Example 1
 - Formulation for road paint
 - Resin Example 2
 - Formulation for road paint
 - h) Facade paints
 - Resin Example 3
 - Formulation for facade paint
 - c) Temporary protection varnish
 - Resin Example 4
 - Formulation for temporary protection varnish
 - d) Cold weather plastic paint
 - (ii) Thermosetting Acrylic resins
 - Resin Example 5
 - Formulation for cycle finishing paint
 - Formulation for brilliant white lacquer for automobile finishing
 - Resin Example 6
 - Formulation for automobile finishing varnish
 - Resin Example 7
 - Formulation for metallised base for automobile finishing
- 7. Special Materials as Agents for Improved Application Properties
 - (i) SCA's Sagging Control Agents
 - Resin Example 8
 - Resin Example 9
 - Formulation for non-drip automobile paint
 - (ii) Waterborne Products
 - Resin Example 10
 - Formulation for varnish in aqueous phase
 - (iii) Self-Crosslinking Resins
 - Resin Example 11
 - Formulation for a high gloss white single coat for household appliances
 - Resin Example 12
 - Formulation for paint for washing machines
 - (iv) Hydroxylated Acrylic Resins
 - Resin Example 13
 - Formulation of a 2-component varnish
 - Formulation for a 2 pack, single coat black paint for polypropylene
 - Resin Example 14
 - Formulation for a 2-component primer for light grey metal
 - Formulation for 2-component anticorrosion primer
 - Resin Example 15
 - Formulation for 2-component white finish
 - Resin Example 16
 - Formulation for high solids varnish
 - Formulation for high solids white finishing paint
 - Resin Example 17
 - Formulation for aviation paint formulation
 - (v) Acrylic Resins in Aqueous Emulsion
 - Resin Example 18
 - Formulation for architectural paint
 - Resin Example 19
 - Formulation for temporary protection varnish
 - (vi) Acrylic Resins for Cationic Electrodeposition
 - Resin Example 20
 - Cationic Resin - Example 21
 - Formulation for Cationic Paint

Chapter 3: Epoxy Resins

Introduction

2. Chemistry of Epoxy Resins

(i) Epoxy Resins Based on Bisphenol 'A'

a) Phenoxy Resins

- (ii) Epoxy Resins Not Based on Bisphenol 'A'
 - a) Bisphenol 'F' Based Epoxy Resins
 - b) Epoxy Novolac Resins
 - c) Halogenated Epoxy Resins
 - d) Hydrogenated Bisphenol 'A' Epoxy Resins
- (iii) Reactive Diluents
- (iv) Epoxidised Vegetable Oils
- (v) Epoxy Resins for Cationically Cured Coatings
- (vi) Epoxy Curing Agents for Powder Coating Resins
- (vii) Unsaturated Epoxy Containing Materials
- 3. Chemistry of Modified Epoxy Resins
 - (i) Epoxy Esters
 - Typical process for an epoxy ester
 - Formulation for DCO epoxy ester D-4 type
 - Formulation for long oil length epoxy ester L8 type
 - Formulation for coconut oil fatty acid epoxy ester YC-3 type
 - Formulation for air drying medium length DCOFA YD-6 type epoxy ester
 - (ii) Epoxy Modified Polyesters
 - (iii) The Use of Monofunctional Epoxy Resins as Modifiers
 - (iv) Epoxy Acrylates - UV & EB Radiation Curable Oligomers
 - (v) The Chemistry of Water Based Epoxy Coatings
 - (a) Emulsifying Epoxy Resins
 - i) 'Self Emulsifying' Systems
 - ii) Epoxy Emulsions
 - Formulation for epoxy resin emulsion
 - iii) Emulsion Polymerisation
 - (b) Neutralisation of Acid or Base Rich Resins
 - i) Neutralisation of Acid Rich Resins
 - ii) Neutralisation of Base Rich Resins
 - (vi) Epoxy Phosphates
 - (vii) Epoxy Amine Adducts
 - Formulation of an epoxy adduct of a polyamine epoxy resin
 - Formulation of an in-situ adduct
- 4. The Chemistry of Epoxy Curing
 - (i) Polyamine Curing Agents or Materials Containing These Structures
 - (ii) Comparison of Different Amine Crosslinked Systems
 - a) Pot Life
 - i) Pot Life of Solvent Based Epoxy Polyamine Based Systems
 - ii) Pot Life of Waterborne Epoxy Polyamine Based Systems
 - b) Amount of Epoxy / Polyamine / Polyamide to Use
 - Formulation for gloss topcoat, polyamide cured
 - c) Accelerators and Solvent Selection for Epoxy Polyamide Systems
 - (iii) Tertiary Amines
 - (iv) Inorganic Bases
 - (v) Mannich Base Curing Agents
 - (vi) Dicyandiamide and Modified Dicyandiamides
 - (vii) Aminoplasts
 - (viii) Phenolic Resins
 - (ix) Anhydride Curing Agents
 - (x) Cure Mechanisms for Modified Epoxy Resins
 - (a) Isocyanate Curing of Epoxy Resins and Epoxy Esters
 - (b) Air Drying Epoxy Esters
- 5. Heavy Duty Coatings
 - (i) Introduction
 - (a) Marine
 - (b) Off-Shore
 - (c) Protective
 - (d) Flooring and Concrete
 - (ii) Traditional Solvent Based Systems
 - (a) Amine Cured Epoxy Finishes
 - (b) Amine Adduct Cured Paints
 - Formulation for semi-gloss topcoat, in-situ adduct cured
 - (c) Polyamide Cured Epoxy Finishes
 - Formulation for gloss top coat, polyamide cured

- (d) Epoxy Blast (Shop) Primers
 - Formulation for red oxide epoxy blast primer
 - (e) Zinc Rich Epoxy Primers
 - Formulation for zinc rich epoxy primer
 - (iii) Higher Solid Amine Systems
 - Formulation for very high solids finish
 - Formulation for high solids high build white epoxy finish
 - (iv) Waterborne Heavy Duty Epoxy Coatings General Principles
 - (a) Materials
 - i) Epoxy Resins
 - ii) Curing Agents
 - iii) Epoxy/Hardener Ratio
 - iv) Anti-Corrosive Pigments
 - v) Pigment Volume Concentration
 - vi) Prime Pigments
 - vii) Extender Pigments
 - viii) Cosolvents
 - ix) Additives
 - a) Antifoaming/Defoaming Agents
 - b) Biocides
 - c) Dispersing Agents
 - d) Substrate Wetting Agents
 - e) Flash Rusting Agents
 - f) Rheology Modifiers
 - (b) Film Formation of Waterbased Epoxy Polyamine Based Systems
 - (c) Formulations for Waterborne Epoxy Polyamine Coatings
 - i) Anticorrosive Primers
 - Formulation for red oxide/non-toxic inhibitive pigment primers
 - Formulation for white epoxy acrylic primer
 - ii) Topcoats
 - Formulation for white gloss topcoats, modified amine adduct cured
 - Formulation for semi-gloss & matt topcoats, polyamide cured
 - Formulation for white gloss epoxy acrylic topcoat
 - (v) Solvent-Free Epoxy Based Coatings
 - (a) Flooring Systems
 - Formulation for solvent-free self leveling flooring, grey
 - Formulation for solvent-free trowelling screed flooring, red
 - (b) Linings
 - Formulation for solvent-free conductive tank lining, grey
 - (vi) Coal Tar Epoxies
 - Formulation for coal tar epoxy
 - Formulation for solvent-free coal tar epoxy
 - Formulation for high solids coal tar epoxy
 - Formulation for light coloured hydrocarbon (bleached-tar) epoxy
 - Formulation for isocyanate cured coal tar epoxy
 - (vii) Epoxy Esters
 - Formulation for zinc-rich epoxy ester primer
6. The Use of Epoxy Resins in Industrial and Coil Coatings
 - (i) Epoxy Resins in Coil Coating
 - (a) Introduction
 - (b) Coil Coating Epoxy Primers
 - i) Original Epoxy Primers
 - ii) Modern Epoxy Primers
 - Formulation for modern epoxy coil coating primer
 - iii) Chromate-free Coil Coating Epoxy Primers
 - Formulation for chromate-free epoxy coil coating primer
 - (c) Coil Coating Epoxy Backing Lacquers
 - Formulation for epoxy coil coating backing lacquer
 - (d) Minor Uses of Epoxy Resins in Coil Coatings
 - i) Non-Stick Bakeware
 - ii) Zinc-rich Weldable Primers
 - iii) Flexible Polyesters
 - iv) Epoxy Esters - Stock Primers
 - (ii) Epoxy Based Systems in General Industrial Paints

- (a) Agricultural and Construction Equipment Industry
 - Formulation for case poclairn tan two component epoxy primer
 - Formulation for caterpillar yellow epoxy ester primer
- (iii) Information Technology
 - Formulation for pearl white two pack epoxy spatter finish
- (iv) Machine Tools
 - Formulation for cedar green two component epoxy finish
- (v) The Food Processing Equipment
 - Formulation for white high solids food processor coating
- 7. Epoxy Resin Based Coatings for Automotives Market
 - (i) Electrophoretic Primers
 - (ii) Cationic Binders
 - (iii) Binders for Cationic Primers
 - Formulation for main binder - epoxy ether
 - Formulation for main binder - poly-epoxy ester
 - (iv) Grinding Vehicles
 - Formulation for grinding vehicle
 - (v) Formulation of Cationic Primers
 - Formulation for pigmented paste
 - Formulation for polymer emulsion
 - Formulation for bath coating composition
 - (a) Specifications of Cationic Primers
 - (vi) Primer Surfacer
 - (a) Solvent Borne Primers Surfacer
- 8. Metal Decorating Applications for Epoxy and Modified Epoxy Resins
 - (i) Introduction
 - (ii) Overview of epoxy based internal coatings
 - (a) BADGE, BFDGE, NOGE, BPA, BPF and European direct food contact regulations affecting epoxy based internal lacquers
 - (iii) Beverage cans
 - (a) Internal spray for beverage cans
 - (b) Beverage end coatings
 - (c) External beverage can coatings
 - Formulation for acrylic white basecoat
 - Formulation for acrylic modified polyester white basecoat
 - (iv) Food cans
 - (a) Epoxy phenolics
 - Formulation for generic epoxy phenolic
 - Formulation for typical epoxy phenolic lacquer
 - Formulation for epoxy phenolic internal gold lacquer
 - Formulation for epoxy phenolic gold lacquer
 - Formulation for beige internal epoxy phenolic can coating
 - (b) Side stripe lacquers
 - Formulation for epoxy phenolic side stripe lacquer
 - (c) Precondensed epoxy phenolics
 - (d) Epoxy anhydride coatings
 - Formulation for generic epoxy anhydride white coating for food cans
 - (e) Organosols
 - Formulation for generic organosol
 - Formulation for organosol side seam stripe lacquer
 - Formulation for clear cx ternal organosol lacquer
 - (f) Epoxy, aminoplast coatings
 - Formulation for epoxy, phenolic, amino coating
 - Formulation for epoxy urea side stripe
 - (v) Closures
 - (a) Internal closures
 - (b) Closure externals
 - Formulation for epoxy phenolic size for tinplate closures
 - Formulation for epoxy amino closure varnish
 - Formulation for sterilisable epoxy-ester varnish
 - Formulation for epoxy ester crown varnish
 - References

Index

Reviews - Synopsis - Dust Jacket

The aim of this series of books is to give a general overview, including the necessary background information required to ensure that coating formulators understand the resins with which they work and the principles of crosslinking. This volume explains the chemistries of epoxy and acrylic resins. Coating formulations are given to illustrate the use of different types of resins.

The section on acrylic resins addresses topics such as polymerization, production methods, the different types of acrylic resins used for various end use applications, and the use of special agents for improved application properties. The section on epoxies opens with discussions of the chemistry of epoxy resins, of modified epoxy resins and of epoxy curing. Heavy duty, industrial, and coil coatings are considered, as are automotive and metal decorating applications.

Target Audience: Anyone requiring a basic understanding of acrylic and epoxy resins and their applications, including upper-level students, bench chemists and formulators, and technical sales personnel.

Title	Location	Edition / Series / Misc.
796 ACS Style Guide: A Manual for Authors and Editors		Edition: 2nd edition
Author: Dodd, Janet S. (editor)	Dynix: 100382	Series:
Publish.: American Chemical Society	Call No.: 808.066 Ac	
- place: Washington, DC	ISBN: 0841234620	
- date: ©1997	Shelf Adult Non-Fiction	Year: 1997
Subject: Chemical literature -- Authorship -- Handbooks, manuals, etc.		Price: \$27.00
Desc: xii, 460 p., illus., 24 cm.		

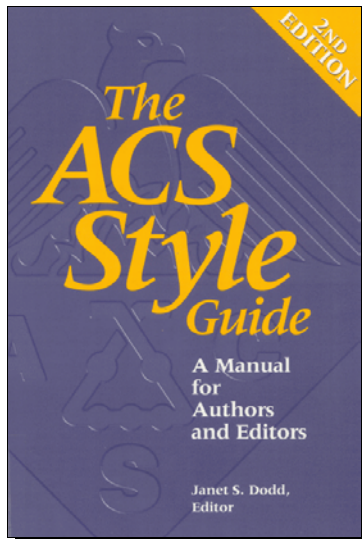


Table of Contents

Preface

CHAPTER 1: Writing a Scientific Paper
Getting Started
Writing Style and Word Usage
Components of a Paper
Types of Presentations
Bibliography

CHAPTER 2: Communicating in Other Formats: Posters, Letters to the Editor, and Press Releases
Tips for Effective Poster Presentations
Letters to the Editor
Press Releases for the Lay Media

CHAPTER 3: Grammar, Punctuation, and Spelling
Grammar
Punctuation
Spelling
Seven To Watch
Bibliography

CHAPTER 4: Editorial Style
Hyphenation
Capitalization
Surnames
Special Typefaces
Computer-Related Usage
Trademarks
Abbreviations and Acronyms
Bibliography
Ten To Watch
Supplement: Abbreviations, Acronyms, and Symbols in All Categories

CHAPTER 5: Numbers, Mathematics, and Units of Measure
Numbers
Mathematics
Units of Measure
Bibliography

CHAPTER 6: References
Citing References in Text
Style for Reference Lists
A Sample CASSI Entry
Publishers Often Cited
Supplement: 1000+ Journals Most Commonly Cited

CHAPTER 7: Names and Numbers for Chemical Compounds
Components of Chemical Names
Capitalization of Chemical Names
Punctuation in Chemical Names
End-of-Line Hyphenation of Chemical Names
Polymers

Subjects

518 .	Chemical literature -- Authorship -- Handbooks, manuals, etc
519 .	Chemistry
520 .	English language -- Style -- Handbooks, manuals, etc.
521 .	Writing

Amino Acids
Chemical Abstracts Service Registry Numbers
Bibliography
Acknowledgment
How Many Words?
Which Words?

CI-IAPTER 8: Conventions in Chemistry
Subatomic Particles and Quanta
Electronic Configuration
Chemical Elements and Formulas
Reference to the Periodic Table
Atoms and Molecules
Isotopes
Radicals
Bonds
Crystallography
Chirality
Concentration
Chemical Reactions
Reporting Analytical Data
Symbols for Commonly Used Physical Quantities
Acknowledgments

CHAPTER 9: Illustrations and Tables
Illustrations
Type Size and Font
Tables
Lists
Reproducing Previously Published Materials
Bibliography

CHAPTER 10: Peer Review

CHAPTER 11: Copyright and Permissions
Definitions and General Copyright Questions
How Copyright Affects Us: Specific Cases
ACS Copyright Policy
Copyright Clearance Center
Copyright Credit
Sources of Copyright Information
Bibliography

CHAPTER 12: Making Effective Oral Presentations
The Oral Presentation
Proactive Preparation
Achieving Focus
Organizing the Presentation
Using Language Effectively
Achieving Speaking Excellence
Visual Aids
Checklist for Physical Arrangements
Conclusion
Bibliography

APPENDIX I: ACS Publications
Editorial Procedures
ACS Books
Journals and Magazines
Special Projects
Chemical Abstracts Service

APPENDIX II: ACS Divisions

APPENDIX III: Ethical Guidelines to Publication of Chemical Research

Preface
Guidelines

APPENDIX IV: The Chemist's Code of Conduct

APPENDIX V: Proofreaders' Marks

Index

Reviews - Synopsis - Dust Jacket

The essential desk reference for authors, editors, and publishers of scientific research, the ACS Style Guide is a complete stylistic handbook. Topics include grammar, style, usage, illustrations, tables, lists, and units of measure, as well as the conventions used in chemistry. It also covers numerous related topics, from peer review and copyrights to oral presentations and the ACS ethical guidelines for publication. Lively and practical, this reference will help any chemist communicate effectively.

Provides editorial style guidelines that can be used for scientific papers published worldwide, with sections on format, grammar, and usage as well as the use and preparation of illustrations, chemical structures, and tables in scientific papers. Overviews copyright law as it relates to publishing, and outlines basics of planning and preparing poster and oral presentations. This edition contains expanded material on editorial styles, and new chapters on numbers and math, references, chemical compounds, conventions in chemistry, and the peer review process. Annotation c. by Book News, Inc., Portland, Or.

FROM THE DUST JACKET:

What do I need to know before I . . . write a paper. . . prepare a poster presentation...write a letter to the editor. . . peer-review a manuscript... create a graph. . . use previously published art?

These and other important questions are answered in this second edition of the best-selling The ACS Style Guide: A Manual for Authors and Editors. In this must-have volume, you will find guidelines for editorial style that can be used for scientific papers published worldwide. The book discusses format, grammar, and usage as well as the use and preparation of illustrations, chemical structures, and tables in scientific papers. It also provides an overview of copyright as it relates to publishing and reviews the basics of planning and preparing poster and oral presentations.

In this edition, editorial style has been expanded into a full chapter. There are also new chapters on numbers and math, references, chemical compounds, conventions in chemistry, and the peer review process. An essential addition to every library, this book will help authors, editors, and reviewers understand their roles in the publication process.

PREFACE:

Publishing has always involved numerous editorial decisions, and now decisions about technology have been added. Computers have changed everything. It is hard to think of one aspect of life that has not been touched by computers in some way. Certainly the publishing industry has been greatly affected by computer technology, from the authors writing their papers in their offices to the editors carrying out the production process in publishing offices. The printing process itself has undergone enormous changes, and the final version of a paper may be an electronic product and not a printed product. Authors and editors are performing functions now that they never imagined 10 years ago. What's more, it seems that as soon as they get accustomed to one of technology, it changes significantly, and they need to be learning constantly.

In the midst of all this change, the comforting thought is that one goal of authors and editors has not changed: to communicate information in the most understandable and expedient fashion in publications of the highest quality. To accomplish that goal, we need guidelines. This book is intended to guide and answer questions for authors and editors, to save them time, and to ensure clarity and consistency. In any publication, quality cannot exist without consistency, and consistency helps readers focus on content as opposed to style. By lessening the burden of one type of decision, this style guide will make the publishing process faster and more efficient. The book is addressed to both authors and editors because, essentially, authors start the process and editors finish it.

Editors and authors need each other, they need to cooperate, and they need clear guidelines. At ACS, we would like to achieve good author—editor relationships so that we will publish readable and well-read scientific literature. We hope that this book will help us to accomplish that goal.

Title	Location	Edition / Series / Misc.
3 Addition Polymers: Formation and Characterization		<i>Edition:</i>
<i>Author:</i> Smith, Derek A. (editor)	<i>Dynix:</i> 07919	<i>Series:</i>
<i>Publish.:</i> Plenum Press	<i>Call No.:</i> 547.84 Sm	
<i>- place:</i> New York, NY	<i>ISBN:</i>	
<i>- date:</i> [1968]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1968
<i>Subject:</i> Addition polymerization		<i>Price:</i> \$25.00
<i>Desc:</i> vii, 492 p., illus., 23 cm.		

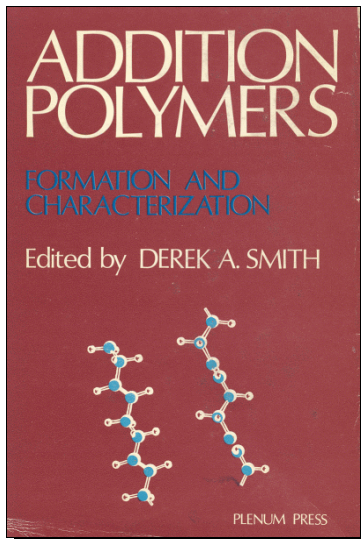


Table of Contents

PREFACE

1. POLYMER STRUCTURES AND POLYMERIZATION TECHNIQUES
2. FREE RADICAL POLYMERIZATION
3. IONIC POLYMERIZATION
4. INDUSTRIAL ASPECTS OF ADDITION POLYMERIZATION
5. MOLECULAR WEIGHT DETERMINATION
6. POLYMER FRACTIONATION
7. POLYMER MICRO-STRUCTURE
8. THE CHARACTERIZATION OF CRYSTALLINITY IN ADDITION POLYMERS
9. POLYMER CHARACTERIZATION BY DEGRADATION
10. CHARACTERIZATION OF STRUCTURE BY MEASUREMENT OF BULK PROPERTIES

APPENDIX I
APPENDIX II

Reviews - Synopsis - Dust Jacket

PREFACE

This book is intended primarily for students with a reasonable knowledge of chemistry together with elementary physics and mathematics, more particularly for those who elect to specialize in polymer studies during their undergraduate course or who continue after a first-degree in science to take a post-graduate course in polymer science and technology, or to undertake polymer research.

It is hoped that it may also prove helpful to practising polymer chemists and technologists whose specialized industrial work makes it difficult for them to keep track of general developments in this field but who feel the need for a broadly-based yet not over-detailed refresher course.

While the text of most of the book is concerned with polymer science, some efforts have been made to indicate relationships between fundamental studies and industrial practices, the technologies, which are (or should be) based upon them. However, the newcomer to this field needs to be warned that, particularly for rubber, it was the technology which came first, more than a century before serious scientific studies of polymers were commenced, and establishment of the mode of formation and detailed chemical structures of the raw materials can hardly be expected to influence immediately the more traditional processes used in the polymer-manufacturing industries. In fact, a sizeable gap still exists between polymer science and the more empirical polymer technology, a gap which is only slowly being closed by the application of established fundamental principles and by the discovery of new ones.

An attempt has been made to present a live account of the subject-matter by inclusion of some reasonably detailed descriptions of selected instrumental techniques as well as the theories under-lying them, by descriptions of practical exercises which yield real values of the general parameters discussed in the body of each chapter, and by inclusion in the chapter on molecular-weight determination of worked examples, the study of which should be regarded as essential to a proper understanding of this subject.

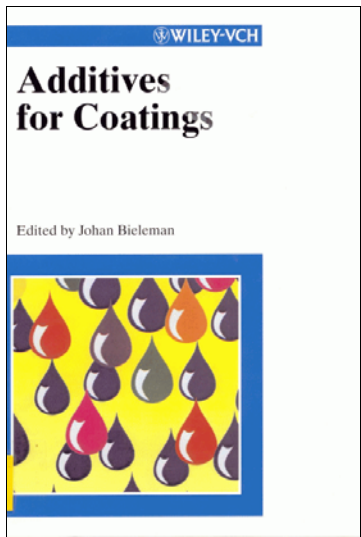
While the general level of the book is intended to correspond roughly to that required for Honours B.Sc., no attempt has been made to equalize the depth of treatment in the various chapters. Some of these serve merely as introductory surveys to prepare the reader for a plunge into the deeper but well-charted waters of the relevant bibliography; in other chapters we have preferred to include more detail, often because relevant 'advanced reviews' either do not exist or are, we feel, not readily comprehensible at first-degree level. Like considerations have led to deliberate non-uniformity in the number of individual references quoted in each chapter.

The authors are all members of the polymer chemistry teaching staff of the National College of Rubber Technology, Northern Polytechnic, London, and we are pleased to acknowledge here the interest shown by the College authorities in the preparation of this book.

Subjects

215 .	Addition polymerization
316 .	Polymers and polymerization

Title	Location	Edition / Series / Misc.
797 Additives for Coatings Author: Bieleman, Johan H. (editor) Publish.: Wiley - VCH - place: Weinheim, Germany - date: ©2000 Subject: Coatings -- Additives Desc: xviii, 372 p., illus., 25 cm.	Dynix: 99408 Call No.: 667.9 Ad ISBN: 3527297855 Shelf Adult Non-Fiction	Edition: Series: Year: 2000 Price: \$148.50



Subjects

240 . Coatings -- Additives

Table of Contents

Introduction (J. Bieleman)
1.1 Additives in Coating Materials
1.2 Definitions
1.3 Classification According to Function
1.4 Quantities Used
1.5 Economic Significance of Coating Additives
References
2 Basics (J. Bieleman)
2.1 Introduction
2.2 Interactions
2.3 Chemical Composition
2.4 Effectiveness of Additives
2.5 Applications
References
3 Thickeners (J. Bieleman and G. Kroon)
3.0 Basics
3.0.1 Introduction
3.0.2 Rheology and Viscosity
3.0.3 Viscosity Measurement
3.1 Inorganic Thickeners
3.1.1 Introduction
3.1.2 Organoclays
3.1.3 Production of the Organoclays
3.1.4 Rheology and Organoclays
3.1.5 Influence of Organoclays on Various Coating Properties
3.1.5.1 Sedimentation
3.1.5.2 Sagging
3.1.5.3 Flow and Levelling
3.1.6 Incorporation Procedures
3.1.6.1 Powder Method
3.1.6.2 Paste Method
3.1.6.3 Easily Dispersable Organoclays
3.1.7 Trade Products
3.2 Organic Thickeners
3.2.0 Introduction
3.2.0.1 Organic Thickeners for Water-Borne Paints
3.2.0.2 Thickeners for Solvent-Based Paints
3.2.1 Cellulose Derivatives
3.2.1.1 The Chemistry of Cellulose Derivatives
3.2.1.2 The Addition of Cellulose Ethers to Paints
3.2.1.3 Paint Properties Influenced by Cellulose Ethers
3.2.1.4 Associative Cellulose Ethers
3.2.1.5 Commercial Products
3.2.1.6 New Developments
3.2.1.7 Toxicology and Disposal
3.2.2 PUR Thickeners
3.2.2.1 Introduction
3.2.2.2 Chemical Composition and Delivery Form
3.2.2.3 Thickening Mechanism

- 3.2.2.4. Application Properties of PUR Thickeners
- 3.2.2.5. Applications
- 3.2.2.6. Formulation of Coating Materials with PIJR Thickeners
- 3.2.2.7. Coating Properties
- 3.2.2.8. Commercial Products
- 3.2.3. Organic Thickeners for Solvent-Borne Coatings
 - 3.2.3.1. Introduction
 - 3.2.3.2. Product Survey
 - 3.2.3.3. Hydrogenated Castor-Oil-Based Thickeners
 - 3.2.3.4. Polyamides
 - 3.2.3.5. Overbased Sulphonates
 - 3.2.3.6. Polyolefins
 - 3.2.3.7. Commercial Products
- References
- 4. Surface-Active Agents (J. Bieleman, W. Heilen, S. Silber, M. Ouch, and W. Scholz)
 - 4.1. Wetting and Dispersing Agents
 - 4.1.1. Introduction
 - 4.1.2. Definitions
 - 4.1.3. The Dispersion Process
 - 4.1.3.1. Pigment Wetting
 - 4.1.3.2. Mechanical Disruption
 - 4.1.3.3. Stabilization
 - 4.1.3.4. Stabilization in Polar Media: Practical Evaluation
 - 4.1.3.5. Stabilization in Nonpolar Media: Practical Evaluation
 - 4.1.4. Chemical Composition of Wetting and Dispersing Agents
 - 4.1.4.1. Polymeric Dispersing Agents
 - 4.1.5. Problem-Solving
 - 4.1.6. Procedures for Determining Dispersion Efficiency
 - 4.1.6.1. Surface-Charge Measurement
 - 4.1.6.2. Dispersant Demand
 - 4.1.6.3. Monitoring the Dispersion Process
 - 4.1.6.4. Degree of Dispersion
 - 4.1.6.5. Degree of Flocculation
 - 4.1.6.6. Flooding: Rub-Out Test
 - 4.1.7. Biological and Toxicological Properties
 - 4.1.7.1. Surfactants
 - 4.1.7.2. Polymers
 - 4.1.8. Commercial Products
 - 4.2. Defoaming of Aqueous Paint Materials
 - 4.2.1. Introduction
 - 4.2.2. Foam Formation in Aqueous Paints
 - 4.2.3. Causes of Foam Stabilization
 - 4.2.3.1. Stability-Reducing Parameters
 - 4.2.3.2. Parameters That Promote Foam Stability
 - 4.2.4. Composition and Effect of Defoamers and Foam Inhibiting Agents
 - 4.2.4.1. Defoamers
 - 4.2.4.2. Foam Inhibiting Agents
 - 4.2.5. Formulation of the Active Substances
 - 4.2.6. Test Methods for the Evaluation of Defoamers
 - 4.3. Adhesion Promoters
 - 4.3.1. Definition
 - 4.3.2. Models for Interpreting Adhesion Phenomena
 - 4.3.3. Adhesive Strength in the Bond
 - 4.3.4. Adhesion Promoters
 - 4.3.4.1. General Remarks
 - 4.3.4.2. Organofunctional Silanes
 - 4.3.4.3. Organometallic Compounds
 - 4.3.4.4. Chlorinated Polyolefins
 - 4.3.4.5. Special Condensates
 - 4.3.4.6. Phosphates
 - 4.3.4.7. Polyethylenimine
 - 4.3.4.8. Silicones and Silicone-Modified Polymers
 - 4.3.4.9. Miscellaneous

- 4.3.4.10 Summary
- 4.4 Additives to Improve Substrate Wetting
 - 4.4.1 Importance of Surface Tension for Substrate Wetting
 - 4.4.2 Influencing the Surface Tension of Coatings
 - 4.4.3 Measurement of Surface Tension
 - 4.4.4 Chemistry of Silicone Additives
 - 4.4.5 Usage of Silicone Additives
- References
- 5 Additives for Surface Modification (J. Bieleman, W. Scholz, W. Heilen, U. Fernei and G. Lüers)
 - 5.1 Additives to Improve Surface Slip
 - 5.1.1 Introduction
 - 5.1.2 Important Terms
 - 5.1.3 Practical Importance of Surface Slip
 - 5.1.4 Factors Influencing Scratch Resistance
 - 5.1.5 Slip Ability
 - 5.1.6 Influencing the Surface Slip
 - 5.1.7 Silicone Additives
 - 5.1.8 Waxes
 - 5.1.9 Measuring Surface Slip
 - 5.2 Matting
 - 5.2.1 Basic Physical Principles of Matting
 - 5.2.1.1 Methods for the Characterization of Surfaces
 - 5.2.1.2 Gloss and Sheen
 - 5.2.1.3 Surface Roughness
 - 5.2.1.4 Properties Not Influenced by the Matting Agent
 - 5.2.1.5 Mechanism of Matting
 - 5.2.2 Matting Agents
 - 5.2.2.1 Introduction
 - 5.2.2.2 Economical Importance
 - 5.2.2.3 Requirements for Modern Matting Agents
 - 5.2.2.4 Amorphous Silica
 - 5.2.2.5 Natural Silica and Fillers
 - 5.2.2.6 Organic Matting Agents
 - 5.2.3 Application of Matting Agents
 - 5.2.3.1 General Parameter That Influence Matting
 - 5.2.3.2 Solventborne Systems
 - 5.2.3.3 Waterborne Systems
 - 5.2.3.4 High-Solids/Radiation-Curing Systems
 - 5.2.3.5 Powder Coatings
 - 5.2.4 Commercial Products
 - References
- 6 Flow-Leveling and Coalescing Agents (J. Bieleman, J. Hajas, and K. Dören)
 - 6.1 Leveling Additives
 - 6.1.1 Introduction
 - 6.1.1.1 Definition and Measurement of Leveling
 - 6.1.1.2 Physical Factors Influencing Leveling
 - 6.1.1.3 Improvement of Leveling: Mode of Action of Leveling Additives
 - 6.1.2 Commercially Available Leveling Additives
 - 6.1.2.1 Polymers
 - 6.1.2.2 Silicones
 - 6.1.2.3 Fluorosurfactants
 - 6.1.2.4 Solvents
 - 6.1.2.5 Other Additives
 - 6.1.3 Properties of Leveling Additives
 - 6.1.4 Application of Leveling Additives
 - 6.1.4.1 Polymers
 - 6.1.4.2 Silicones
 - 6.1.4.3 Fluorosurfactants
 - 6.1.4.4 Solvents
 - 6.1.4.5 Other Additives
 - 6.1.5 Practical Experiences with Leveling
 - 6.1.6 Toxicology and Waste Disposal

- 6.2. Coalescing Agents
 - 6.2.1. Introduction
 - 6.2.2. Polymer Dispersions: Structure/Film Formation
 - 6.2.3. Coalescing Agents: Mode of Action
 - 6.2.4. Coalescing Agents: Product Overview
 - 6.2.5. Performance Aspects
 - 6.2.6. Ecology/Toxicology
 - 6.2.7. Manufacturers/Tradenames (Selection)
 - References
- 7. Catalytically Active Additives (J. Bieleman and R. Lomöcler)
 - 7.1. Driers
 - 7.1.1. Introduction
 - 7.1.2. Historical Overview of the Application of Driers
 - 7.1.3. Composition
 - 7.1.4. Manufacturing
 - 7.1.4.1. Precipitation
 - 7.1.4.2. Fusion
 - 7.1.4.3. Direct Metal Reaction
 - 7.1.5. Autooxidation Drying and the Function of Driers
 - 7.1.6. Drier Metals
 - 7.1.6.1. Active Driers
 - 7.1.6.2. Auxiliary Driers
 - 7.1.7. Combination Driers
 - 7.1.8. Loss of Drying Ability
 - 7.1.9. Lead-Free Drier Systems
 - 7.1.9.1. Lead-Containing Drier Systems
 - 7.1.9.2. Substitution of a Lead Drier
 - 7.1.9.10. Waterborne Coatings
 - 7.1.10.1. Characteristic Drying Phenomena of Air-Drying Waterborne Coatings
 - 7.1.10.2. Coordination Effect on Driers
 - 7.1.10.3. Precomplexed Driers
 - 7.1.11. High-Solids Coatings
 - 7.1.12. Analysis Procedures
 - 7.1.13. Biological and Toxicological Properties
 - 7.1.14. Trade Names
 - 7.2. Catalysts
 - 7.2.1. Introduction
 - 7.2.2. Melamine Cross Linking Systems
 - 7.2.2.1. Introduction
 - 7.2.2.2. Catalysis of HMM-Based Systems — Cross Linking
 - 7.2.2.3. Catalysis of Reactive Melamine Systems — Self-Condensation
 - 7.2.2.4. Formulation Advice
 - 7.2.3. Polyurethane Systems
 - 7.2.3.1. Introduction
 - 7.2.3.2. 2K-PUR Systems
 - 7.2.3.3. Blocked 1 K-PUR Systems
 - 7.2.3.4. PUR Powder Coatings
 - 7.2.3.5. Moisture-Curing 1 K-PUR Systems
 - 7.2.4. Epoxy Systems
 - 7.2.4.1. Introduction
 - 7.2.4.2. Epoxy/Amine Systems
 - 7.2.4.3. Epoxy/Carboxy Systems
 - 7.2.4.4. Epoxy/Phenol/Formaldehyde Resin Systems
 - References
- 8. Additives for Special Functions (J. Bieleman, T. Bolle, A. Braig, J. K. Glase, R. Spang, M. Kohler and A. Valet)
 - 8.1. Anti-Skinning Agents
 - 8.1.1. Introduction
 - 8.1.2. Definitions
 - 8.1.3. Causes of Skinning
 - 8.1.4. Consequences of Skinning
 - 8.1.5. Avoiding Skinning
 - 8.1.5.1. Antioxidants

- 8.1.5.2 Blocking Agents for Polymerization Catalysts
- 8.1.5.3 Solvents
- 8.1.5.4 Retention Agents
- 8.1.6 Practical Hints
- 8.1.7 Toxicological Properties of MEKO
- 8.1.8 Commercial Products
- 8.2 Light Stabilizers
 - 8.2.1 Introduction
 - 8.2.1.1 Environmental Influences on Coatings
 - 8.2.1.2 Photooxidation of Polymers
 - 8.2.1.3 Stabilization Possibilities
 - 8.2.1.4 Economic Importance
 - 8.2.2 Basic Principles
 - 8.2.2.1 UV Absorbers
 - 8.2.2.2 Hindered-Amine Light Stabilizers (HALS)
 - 8.2.3 Properties of Light Stabilizers
 - 8.2.3.1 Requirements for Light Stabilizers
 - 8.2.3.2 Solubility and Compatibility of Light Stabilizers
 - 8.2.3.3 Volatility of Light Stabilizers
 - 8.2.3.4 Influence of the Own Colour of a Light Stabilizer
 - 8.2.3.5 Interaction of LJV Absorbers with Other Coating Components
 - 8.2.3.6 Permanence of UV Absorbers
 - 8.2.3.7 Side Reactions of HALS
 - 8.2.4 Use of Light Stabilizers
 - 8.2.4.1 Stabilization of Clear Coatings/Colour Coatings
 - 8.2.4.2 Stabilization of One-Coat Solid Shades
 - 8.2.4.3 Stabilization of Powder Coatings
 - 8.2.4.4 Stabilization of UV-Curable Clear Coatings
 - 8.2.4.5 Stabilization of Wood Coatings
 - 8.2.5 Guidelines for the Use of Light Stabilizers
 - 8.2.5.1 Evaluation Methods
 - 8.2.5.2 Recommendations for the Use of Light Stabilizers
 - 8.2.6 Trade Names
 - 8.2.7 Toxicology and Waste Treatment
 - 8.3 Corrosion Inhibitors
 - 8.3.1 Introduction
 - 8.3.1.1 Basics
 - 8.3.1.2 Electrochemical Corrosion Processes
 - 8.3.1.3 Corrosion Protection by Organic Coatings
 - 8.3.2 Corrosion Inhibitors
 - 8.3.2.1 Definition
 - 8.3.2.2 Inhibition Mechanisms
 - 8.3.2.3 Inhibitor Classes/Characteristics
 - 8.3.3 Products and Product Characteristics
 - 8.3.3.1 Flash-Rust Inhibitors
 - 8.3.3.2 Inhibitors for Long-Term Corrosion Protection
 - 8.3.4 Practical Hints, Formulation Guidelines
 - 8.3.4.1 Flash-Rust Inhibitors
 - 8.3.4.2 Inhibitors for Long-Term Protection
 - 8.3.5 Toxicology and Disposal
 - 8.3.6 Manufacturers and Trade Names
 - 8.4 Biocides
 - 8.4.1 Introduction
 - 8.4.2 Definitions
 - 8.4.3 In-Can or In-Tank Preservation
 - 8.4.4 Plant Hygiene
 - 8.4.5 In-Can Preservatives
 - 8.4.5.1 Formaldehyde
 - 8.4.5.2 Formaldehyde-Releasing Compounds
 - 8.4.5.3 Glutaraldehyde
 - 8.4.5.4 Phenol Derivatives
 - 8.4.5.5 Acids
 - 8.4.5.6 Carbonic Acid Amides
 - 8.4.5.7 Quaternary Ammonium Compounds (QACs)

- 8.4.5.8 Isothiazolinone Derivatives
- 8.4.5.9 Alcohols
- 8.4.6 Film Preservation
- 8.4.7 Restoration of Surfaces
- 8.4.8 Film-Preserving Substances
 - 8.4.8.1 Benzimidazoles
 - 8.4.8.2 Carbamates and Dithiocarbamates
 - 8.4.8.3 N-Haloalkylthio Compounds
 - 8.4.8.4 2-n-Octyl-4-isothiazolin-3-one (OIT)
 - 8.4.8.5 Zinc Pyrithione
 - 8.4.8.6 Diuron
- 8.4.9 Conclusion
- 8.4.10 Commercial Products
- 8.5 Flame Retardants
 - 8.5.1 General Information
 - 8.5.1.1 Flammability Classification and Testing Methods
 - 8.5.1.2 The Combustion Process
 - 8.5.1.3 Mechanism of Flame Retardance
 - 8.5.2 Common Flame Retardants — Structure, Mode of Action, Properties
 - 8.5.2.1 Inorganic Flame Retardants
 - 8.5.2.2 Halogen-Containing Flame Retardants
 - 8.5.2.3 Phosphorus-Containing Flame Retardants
 - 8.5.2.4 Char—Forming Flame Retardants
 - 8.5.2.5 Intumescent Systems
 - 8.5.3 Use and Consumption
 - 8.5.4 Suppliers, Commercial Products
- 8.6 Photoinitiators as Additives in UV-Curable Lacquers
 - 8.6.1 Introduction
 - 8.6.1.1 Difference Between Photoinitiators and Other Coating Additives
 - 8.6.1.2 Development of UV Curing
 - 8.6.2 Main Components of UV-Curable Coatings
 - 8.6.2.1 Photoinitiators
 - 8.6.2.2 Reactive Resins and Diluents
 - 8.6.3 Radical Photocuring
 - 8.6.3.1 Mechanism
 - 8.6.3.2 Investigating the Reaction Kinetics
 - 8.6.4 UV-Curing Technique
 - 8.6.5 Examples of Photoinitiator Use
 - 8.6.5.1 Clear Coatings
 - 8.6.5.2 Pigmented Coatings
 - 8.6.6 Toxicology and Disposal
 - 8.6.7 Trade Names References
- 9 Industrial Hygiene and Environmental Management (A. Postma)
 - 9.1 Introduction
 - 9.2 Commonly Used Terms
 - 9.3 Biological and Toxicological Properties
 - 9.4 Safety Data
 - 9.5 Industrial Hygiene
 - 9.6 Waste Disposal and Packaging References
- 10 Quality Assurance (A. Postma)
 - 10.1 Introduction
 - 10.2 Commonly Used Concepts
 - 10.3 The Quality Standard ISO 9001
 - 10.4 Environment Protection and Industrial Hygiene.
 - 10.5 Quality Control of Additives
- References

Subject Index

Reviews - Synopsis - Dust Jacket

There is no doubt: A perfect coating must look brilliant! But other properties of coatings are also of paramount importance. Coatings have to be durable, tough, and easy to apply. Additives are the key to success in achieving these

characteristics, even though the amounts used in coatings formulations are small. It is not trivial to select the best additives. In practice, many series of tests are often necessary, and the results do not explain why a certain additive improves the quality of a coating whereas another one impairs its performance.

Additives for Coatings describes the effects which can be produced in various coatings by the use of a wide range of additives. Theoretical considerations are addressed, but the emphasis is on practical applications and end-use properties such as appearance and protection. It will answer the following questions: How do the most important groups of additives act? And, which effects can be achieved by their addition?

From the Preface: "...The primary goal of this book is to inform the coating technician who works with the formulation and application of coating materials such as paints, varnishes, inks, and related products, about the effects that can be obtained with additives. The main classes of additives and the advantages associated with their proper application in coating materials are emphasized..."

Target Audience: Developers and applicants of coatings working in research or production.

Editorial Reviews

Book Description

Additives are a crucial component in the composition of paints and coatings, dramatically affecting the most important properties of the final product (appearance, gloss, stability, application properties, corrosion prevention). This practical manual provides developers and applicants of coatings with much-needed guidance for their daily work.

Book Info

Dedicated to developers and applicants of coatings working in research or production, and aimed at providing a manual for their daily work.

PREFACE

Coating additives comprise an extremely important class of coating raw materials that are used for the formulation of paints and coating materials, as well as for applications closely related to coating materials.

Quality, as well as various coating-application properties are determined to a large extent by the coating additives used. Selecting the correct additives from the wide range available is therefore very important.

In practice, it rather often happens that the coating technician literally only 'finds' the right additive for the application after experimentally testing a large range of products. With this type of method, an explanation of why one additive works, and another does not, is rarely found.

The primary goal of this book is to inform the coating technician who works with the formulation and application of coating materials such as paints, varnishes, inks, and related products, about the effects that can be obtained with additives. The main classes of additives and the advantages associated with their proper application in coating materials are emphasized.

The chemical composition and basic properties of the main groups of additives, such as thickening agents, surface-active agents, surface modifiers, catalysts, biocides, etc., are explained in detail. Not only the theoretical aspects are covered, the greater part of the information is directed at practical applications and properties, such as the influence on film properties such as appearance and protection.

The book is an ideal source of information for those working as coating technicians or chemical engineers in industry and trade; however, it is also suitable for those who work in professions that deal with coatings, for instance, in schools, colleges, universities, and public institutions.

Although, in a few cases, commercial names were used to support clear information, the aim of this book is not to list or describe additives according to their trade names.

This book also does not describe all related theories and publications on coating additives in detail, without presenting connections to practical conditions.

In editing this book, I had the support of various specialists in different subjects related to coatings, and I thank them all for the professional and pleasant cooperation. My sincere thanks are particularly extended to Dr. Stoye, Dorsten, Germany, for his stimulating ideas, and to Prof. Dr. Funke, Leonberg, Germany, for his very helpful advice and corrections. A special acknowledgment goes to the management of CONDEA Servo B.V., Delden, the Netherlands, for

their support and for providing the technical means.

INTRODUCTION

Additives in Coating Materials

A coating material may be defined to be a product in liquid, paste, or powder form that, when applied to a substrate, forms a film which has protective, decorative, and/or other specific properties. The following main components are found in coating materials such as paints:

- binders
- pigments and extenders
- solvents
- additives

The binder determines most of the primary properties of the dried paint film, such as adhesion, various optical and mechanical properties, as well as the resistance against specific exposure conditions.

The other solid components of the paint layer, such as the pigments and extender, are fixed in the binder matrix. The selection of the pigment determines not only the colour, but is also largely responsible for other properties such as the opacity and corrosion resistance of the paint.

Although the main contribution of the extenders is to reduce the raw-material costs of the paint formulation, they may also have some influence on various other paint properties.

The role of the solvent or diluent is, in the first place, to enable the processing of the solid or highly viscous components of the paint during manufacture, application, and film formation.

In addition to the indicated main ingredients, the additives in a paint composition have a major influence on the various paint properties. Additives may also modify the properties of the three main ingredients of a paint — binder, pigment/extender, and solvent — significantly.

Definitions

It is very difficult to give a clear and exact definition of a coating additive — they make up a very nonhomogeneous group. A wide range of additives is known, with various and widely differing functions in a coating formulation.

A possible definition is the following:

Coating additives are any substances that are added in small quantities to a coating material to improve or to modify certain properties of the finished coating or of the coating material during its manufacture, storage, transport, or application.

Classification According to Function

The expression "to improve or to modify certain properties" refers not only to technical properties, it also includes economical aspects such as the reduction of manufacturing costs or the pigment yield optimization.

The amount of additives in a coating formulation is seldom more than 5% by weight. The average proportion of a single additive in a formulation is usually around 1.5% of the total quantity of the coating formulation.

There is a large variety of coating additives; they are classified according to their function below.

Thickening Agents

These additives influence the rheological properties of a paint by increasing the viscosity.

Surface-Active Agents

This group is subdivided into:

- wetting and dispersing agents
- anti-foaming agents
- adhesion promoters

Surface Modifiers

This group is subdivided into:

- slip additives
- matting agents

Leveling Agents and Coalescing Agents
 The group of leveling agents includes flow agents.

Catalytically Active Additives
 This group includes:
 — driers
 — catalysts

Special-Effect Additives
 The remaining additives are included in this group, e. g.:
 — anti-skinning agents
 — light stabilizers
 — corrosion inhibitors
 — biocides
 — flame retardants
 — photoinitiators

Quantities Used
 In terms of quantities used, the catalytically active additives make up the largest product group, as seen from the relative amounts of additives used (Table 1.4-1). Next in used quantities are the surface-active additives, followed by the thickeners. The indicated percentages are of each specific group of additives, and are based on the volume of additives used globally; there may be considerable regional variations.

Driers, used as drying catalysts in oxidatively drying paints, make up the main part of the catalytically active additives. However, the use of driers is declining: firstly, more concentrated driers are being used (less solvent), and secondly, the market share of air-drying systems is declining in favour of physically drying paints.

Table 1.4-1. Relative amounts additives used according to group

Additive group	Usage in % of the total amount of applied additives
Catalytically active additives	28
Surface modifiers	12
Thickeners	16
Surface-active agents	19
Leveling- and coalescing agents	10
Special-effect additives	15

Economic Significance of Coating Additives
 Although additives make up a small proportion of paint formulations, the total world consumption of additives is estimated to be more than 350000 metric tons annually!

The relative importance of additives is not simply expressed by total quantities or sales volumes, most important is the technical impact of the additives on the paint properties. The significance of an additive in a specific coating material is best expressed in terms of its contribution to the improvement in the quality of the paint. However, this economic contribution is not easily quantifiable into an "economic figure".

If one were to base the economic importance of additives on the raw material costs for the production of paints, it would be found to be rather moderate (Table 1.4-2).

Table 1.4-2. Average contributions of the various ingredients in paints

Paint raw material	Quantity in %	Value in %
Binder	29.5	31.7
Solvent	27.4	15.5
Water	10.6	--
Pigments	18.7	45.9
Extenders	12.3	3.5
Additives	1.5	3.4
Total	100	100

Obviously the average amount of additives in paints is rather small by weight. Additives contribute more to the total raw material costs because the various additives are more expensive than the average raw material costs of a paint.

Nevertheless, the data from Table 1.4-2 show that additives make up a very modest contribution to the total raw material

costs of a coating material. The argument f the use of an additive is therefore mainly determined by the effect that the additive has on the quality of the coating material or the dried film.

Additives for Water-Based Coatings: The Proceedings of a Symposium Organized by the North West Region of the

LASCT Holdings - maximum detail by Title

A

Title	Location	Edition / Series / Misc.
671 Additives for Water-Based Coatings: The Proceedings of a Symposium Organized by the North West		Edition:
Author: Karsa, David R. (editor)	Dynix: 07899	Series: Special Publication: No 76
Publish.: Royal Society of Chemistry	Call No.: 667.9 Ad	
- place: Cambridge, UK	ISBN: 0851866077	
- date: ©1990	Shelf Adult Non-Fiction	Year: 1990
Subject: Protective coatings -- Additives		Price: \$25.00
Desc: viii, 283 p., illus., 21 cm.		

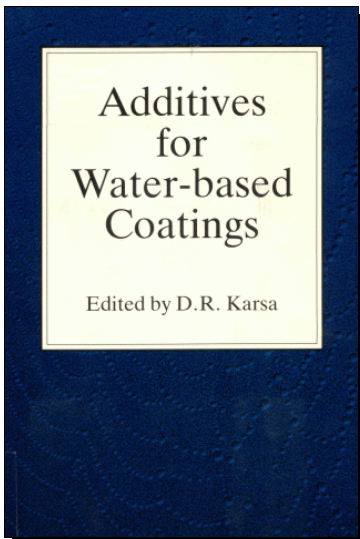


Table of Contents

- The Formulation of Water-based Coatings - A Polymer Chemists View (J. C. Padgett)
- The Role of Acetylenic Glycols in the Growth of Water-based Coatings (R. Derby and H. J. Kleintjes)
- Applications of Specialty Attapulgite and Kaolin Products in Water-based Coatings (D. M. Dixon)
- The Use of Amino Hydroxy Compounds in Water-based Coatings (A. S. Doyle)
- Role of Coalescing Aids in Latex Paints (K. R. Walker)
- New Polypropylene Glycol-based Solvents for Aqueous Coating Systems (J. Spauwen, R. Ziegler and J. Zwinselman)
- Microbicides for Water-based Systems (R.A. Oppermann and D. L. Dalton)
- Applications of Microbial Polysaccharides in Water-based Coatings (B. Lockwood)
- Zirconium-based Crosslinkers for Water-based Coatings (P. J. Moles)
- The Application of Urethane-based Polymeric Thickeners in Aqueous Coating Systems (J. H. Bieleman, F. J. J. Riesthuis and P. M. van der Velden)
- Some Property Aspects of Aqueous Polyurethane Ionomer Dispersions (W. D. Davies)
- Approaches to the Study of Corrosion Inhibition Under Water-based Coatings (S. Turgoose)
- Pigment Dispersing Agents for Water-based Coatings (J. B. Clarke)
- Foam Control Agents for Surface Coatings (D. Clarke)
- Water-borne Finishes for Exterior Timbers (D. Raj and D. S. J. Atkin)
- Speciality Carbonates for Water Borne Coatings (A. L. Rutherford)
- Subject Index

Subjects

498 .	Protective coatings -- Additives
499 .	Emulsion paint -- Additives

Reviews - Synopsis - Dust Jacket

The proceedings of a conference organized by the North West Region of the Industrial Division of the Royal Society of Chemistry at the University of Liverpool. These papers focus on the practical applications of water-borne coatings and on some of the basic formulation principles.

Water-borne industrial coatings in western Europe, are predicted to have an average annual growth rate of nearly 7.5%. In 1987, this sector had a value of \$650 million. Much has been written about the resin types used in this area, whether they be acrylics, vinyl, alkyd, urethane, epoxy- or polyester based. Less has been presented concerning the practical advantages and uses of the many additives and extenders used in these systems.

This conference was devised to review a representative cross-section of these additives to both explain their practical application and also to underline some of the basic formulation principles involved in water-borne coating technology.

Products considered include urethane and polysaccharide-based rheology modifiers, microbicides, corrosion inhibitors, co-solvents and coalescing agents, cross-linking agents, antifoams and polymeric additives and extenders. Each

material represents a separate area of technology and it is hoped that the following papers will afford a greater understanding of the complex interactions which occur when these materials are formulated into water-based coatings.

From Book News, Inc.

Authors' typescripts of 16 papers from a September 1988 symposium in Liverpool, UK, organized by the Royal Society of Chemistry to review a representational cross-section of the practical advantages and uses of the many additives and extenders used in acrylics, vinyl, alkyd, urethane, epoxy, or polyester. Reviews some of the basic formulation principles involved in water-borne coating technology, and considers such products as urethane and polysaccharide-based rheology modifiers, microbiocides, corrosion inhibitors, co-solvents and coalescing agents, cross-linking agents, antifoams, and polymeric additives and extenders. Annotation copyright Book News, Inc. Portland, Or.

FROM THE DUST JACKET:

Water-based coatings are with a variety of chemical additives, many of which result in complex interactions. This new book provides a useful introduction to the formulation of water-borne coatings and looks at a variety of additives and extenders from a practical viewpoint. It emphasizes their performance and advantages in use, covers their methods of formulation, and gives an explanation of their physico-chemical interactions.

The market for water-based coatings continues to show significant signs of growth. Additives for Water-based Coatings will be of great interest to both technologists in and suppliers of additives to the 'surface coating' industries.

INTRODUCTION

The Western European Paint Market which represents approximately 5 million tonnes of product is currently exhibiting an average annual growth of approximately 1%. However, water-borne industrial coatings in Western Europe, although still a minor part of this market, are predicted to have an average annual growth rate of nearly 7.5% (1987-1992). In 1987, this sector had a value of \$650 million. The reasons for this substantial growth pattern are based on the following advantages afforded by water-based systems.

- * Compliance with environmental legislation.
- * They are of a lower order of toxicity and easy to clean down.
- * They provide a broad range of film-forming properties.
- * When applied by electrodeposition, they provide excellent corrosion protection.

However, it should also be noted that with water-borne systems it is

- * Difficult to obtain gloss films.
- * High energy costs are associated with film drying.
- * In general, higher thickness films are required to meet dry film performance standards.
- * Stainless steel equipment is usually essential for mixing and blending processes.

Nevertheless, along with Radiation Cure and Powder coatings, water-borne coatings seem set for growth.

Much has been written about the resin types used in this area, whether they be acrylics, vinyl, alkyd, urethane, epoxy or polyester based. Less has been presented concerning the practical advantages and uses of the many additives and extenders used in these systems. This conference was devised to review a representative cross-section of these additives to both explain their practical application and also to underline some of the basic formulation principles involved in water-borne coating technology.

Products considered include urethane and polysaccharide-based rheology modifiers, microbiocides, corrosion inhibitors, co-solvents and coalescing agents, cross-linking agents, antifoams and polymeric additives and extenders. Each material represents a separate area of technology and it is hoped that the following papers will afford a greater understanding of the complex interactions which occur when these materials are formulated into water-based coatings.

Title	Location	Edition / Series / Misc.
752 Adhesion Aspects of Polymeric Coatings		Edition:
Author: Baghdachi, Jamil A.	Dynix: 55947-26	Series: Federation Series on Coatings
Publish.: Federation of Societies for Coatings Technology	Call No.: 667.9 Fe	Technology: No. FS26
- place: Philadelphia, PA	ISBN: 0934010064	
- date: ©1996	Shelf Reference	Year: 1996
Subject: Coatings -- Periodicals		Price: \$50.00
Desc: 34 p., illus., 28 cm.		

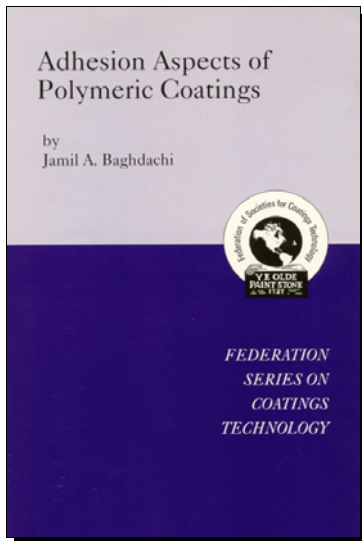


Table of Contents

- I. INTRODUCTION
- II. FUNDAMENTALS OF ADHESION
 - A. Adhesion Theories and Mechanisms
 - 1. Mechanical Theory
 - 2. Chemical Bonding Theory
 - 3. Electrostatic Theory
 - 4. Diffusion Theory
 - B. Mechanics of Adhesion Development
 - 1. Wettability and Surface Energetics
 - 2. Interfacial Thermodynamics
 - 3. Contact Angle and Critical Surface Tension
- III. FACTORS AFFECTING ADHESION
 - A. Chemical, Physical and Mechanical Effects
 - 1. Chemical and Physical Effects
 - 2. Mechanical Effects
 - B. Paint Composition and Adhesion
 - 1. Vehicle and Additives
 - 2. Solvents and Diluents
 - 3. Pigments
- IV. METHODS OF PROMOTING AND MAINTAINING ADHESION
 - A. Surface Preparation
 - 1. Metals
 - a. Mechanical Pretreatments
 - b. Chemical Pretreatments
 - 2. Plastics
 - a. Solvent Treatment
 - b. Chemical Treatment
 - c. Modification by Corona Discharge Treatment
 - d. Plasma Treatment
 - e. Flame Treatment
 - B. Intercoat Adhesion (ICA) and Recoat Adhesion Improvement
- V. ADHESION PROMOTING PRIMERS AND COUPLING AGENTS
 - A. Silane Coupling Agents
 - 1. Mechanism of Adhesion Promotion Via Silane Coupling Agents
 - B. Organic Titanate Coupling Agents
 - C. Other Adhesion Promoters
- VI. ADHESION FAILURE AND ITS MECHANISMS
 - A. Adhesion Loss Due to Chemical Instability of Coating Vehicle
 - B. Adhesion Loss Due to Corrosion
 - C. Adhesion Failure Due to Factors Other Than Corrosion
- VII. MEASURING ADHESION OF ORGANIC COATINGS
 - A. Adhesion Test Methods
 - B. Nondestructive Evaluations
- VIII. SUMMARY

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

IX. ACKNOWLEDGMENT

X. REFERENCES

Reviews - Synopsis - Dust Jacket

FS26 : Adhesion Aspects of Polymeric Coatings

Adhesion Aspects of Polymeric Coatings examines fundamental theories and mechanisms; factors affecting adhesion; and methods for promoting primers and coupling agents. Published as part of the FSCT Series on Coatings Technology, this booklet also describes adhesion failure and its mechanisms and measuring adhesion for organic coatings.

INTRODUCTION:

Since coatings function by surface attachment only, the knowledge of adhesion of polymeric coatings is of paramount importance to both formulators and processors. Except for temporary and stripable protective coatings, all other types of surface coatings must adhere tenaciously to the substrate so that the protection or decoration can be achieved. An important factor controlling this property is the adhesion between the substrate, primer, or previous coating and the topcoat. Similarly, one of the aims of using a coating is the protection of a metal substrate from corrosion. This aim can only be achieved by adequate and durable adhesion of the coating. Since most coatings during weathering and service undergo swelling, shrinkage, and other chemical or physical changes, the measurement of adhesion soon after application and after appropriate aging provides valuable information about its corrosion protection capabilities.

In a practical sense, that which is called adhesion is not an intrinsic property of any polymer or coating, but rather the response of the coated article to some destructive deformation and stresses caused by environmental exposure. Perceptions of "good" and "bad" adhesion depend on what the article is made of, the type of coating used, how the layers of coating are put together and tested, and on the expectations of its response to the test conditions. When we bend, twist, scratch, dent, or expose a coated article to environmental conditions, we are testing the adhesion and strength of several interfaces, the substrate, primer, fillers, and pigments in the coatings, and various known and unknown monomeric and polymeric agents. In evaluating adhesion, therefore, all factors —regardless of how remotely they might be related — must be considered. This is a very difficult and challenging task, if at all possible, and for these reasons and perhaps many more, there is no universally acceptable definition of adhesion phenomena and methods of measuring the adhesion.

Title	Location	Edition / Series / Misc.
943 Adhesion Aspects of Polymeric Coatings: Vol. 2		Edition:
Author: Symposium on Adhesion Aspects of Polymeric Coatings (2nd: 2000: N	Dynix: 106792	Series:
Publish.: VSP BV	Call No.: 677 Sy	
- place: Utrecht, The Netherlands / Boston, MA	ISBN: 9067643777	
- date: ©2003	Shelf Adult Non-Fiction	Year: 2003
Subject: Polymers -- Congresses		Price: \$131.00
Desc: viii, 213 p., illus., 25 cm.		

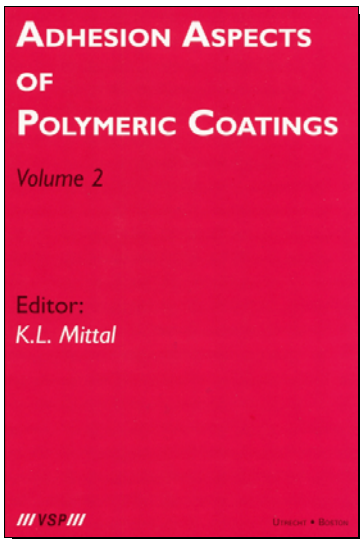


Table of Contents

- Preface
- Interphase: Formation, characterization and relevance to practical adhesion
- Depletion, a key factor in polymer adhesion
- Attaining adhesion/cohesion within painted plastics
- Scanning electric potential microscopy (SEPM) and electric force microscopy (EFM) imaging of polymer surfaces
- The residue (smut) formed on aluminum alloys during hydrofluoric acid etching and its effect on a coating process
- Surface modification of metals by silanes
- Application of X-ray photoelectron spectroscopy in assessing the adsorption of siloxane polymers onto E-glass fibers
- Surface modification of polyphenylene sulfide plastics to improve their adhesion to a dielectric adhesive
- Metal surface conditioning concepts for resin bonding in dentistry
- Measurement of internal stresses in polymeric coatings using time resolved fluorescence
- Adhesion of an alkyd paint to cold rolled steel sheets: Effect of steel surface composition
- Analysis of the wet adhesion of coatings on wood
- Modified tape test: Measurement of adhesion of insulator films to low dielectric constant organic polymers

Reviews - Synopsis - Dust Jacket

PREFACE:

This volume documents the proceedings of the Second International Symposium on Adhesion Aspects of Polymeric Coatings held under the auspices of MST Conferences in Newark, New Jersey, May 25-26, 2000. The premier symposium on this topic was held under the aegis of the Electrochemical Society in Minneapolis, Minnesota in 1981, the proceedings of which were properly documented in a hard-bound book.

As almost 20 years had passed since the first symposium was held so we decided to organize the second event on this topic. In the interim, there had been a great deal of research activity relative to the adhesion aspects of polymeric coatings, so this symposium was both timely (rather overdue) and needed.

Polymeric coatings are used for a variety of purposes, e.g., decorative, protective, functional (as dielectrics or insulators) and a special application of polymeric coatings is their use as lithographic materials for making integrated circuit elements. Irrespective of the intended purpose of the coating, it must adequately adhere to the underlying substrate, otherwise delamination and other undesirable phenomena can occur. So the need to understand the factors which influence adhesion of polymeric coatings and to control it to a desirable level is quite patent. In the last 20 years there have been new theoretical developments and advancements in instrumentation which have helped immensely in the arena of polymeric coatings. The acid-base theory of adhesion has found particular application in controlling the adhesion behavior of coatings.

The technical program for this symposium consisted of 23 papers covering many subtopics dealing with adhesion aspects of polymeric coatings. There were lively and illuminating — not exothermic — discussions, both formally and informally, throughout the symposium. The presenters hailed from many corners of the globe and represented varied disciplines and research interests.

Now coming to this volume (called Volume 2) it contains a total of 13 papers (others are not included for a variety of reasons) addressing many different issues. It must be recorded that all manuscripts were rigorously peer reviewed and suitably revised (some twice or thrice) before inclusion in this volume. So this book is not a mere collection of unreviewed papers — which is commonly the case with many symposia proceedings — rather it represents information which has passed peer scrutiny. Also it should be pointed out that, for a combination of reasons, the publication of this book got delayed but the authors were asked and given the opportunity to update their manuscripts. So the information contained in this book should be current and fresh.

The topics covered in this volume include: factors influencing adhesion of polymeric coatings; ways to improve adhesion;

Subjects

216 .	Adhesion -- Congresses
596 .	Polymers -- Congresses
597 .	Plastic coating -- Congresses

formation and relevance of inter-phase in practical adhesion; adhesion/cohesion in painted plastics; imaging of polymer surfaces; effect of substrate residue (smut) on coating process; surface treatment of metals and glass by silanes; surface modification of polyphenylene sulfide plastics; resin bonding in dentistry; measurement of internal stresses in polymeric coatings; effect of steel surface composition on adhesion of paint; wet adhesion of coatings on wood; and modified tape test to measure adhesion of coatings.

Yours truly sincerely hopes that this book will be of interest to everyone interested or involved in the arena of polymeric coatings. Also it should provide some new ideas as to how to control adhesion durability of coatings in different environments.

Adhesion Measurement of Thin Films, Thick Films, and Bulk Coatings: ASTM Symposium Philadelphia, PA

LASCT Holdings - maximum detail by Title

A

Title	Location	Edition / Series / Misc.
4 Adhesion Measurement of Thin Films, Thick Films, and Bulk Coatings: ASTM Symposium Philadelph		Edition:
Author: Symposium on Adhesion Measurement of Thin Films, Thick Films, and	Dynix: 13009	Series: ASTM Special Technical Publication:
Publish.: American Society for Testing and Materials	Call No.: 667.9 Mi	No. 640
- place: Philadelphia, PA	ISBN: 0464000025	
- date: ©1978	Shelf Adult Non-Fiction	Year: 1978
Subject: Adhesion -- Congresses		Price: \$25.00
Desc: 402 p., illus., 24 cm.		

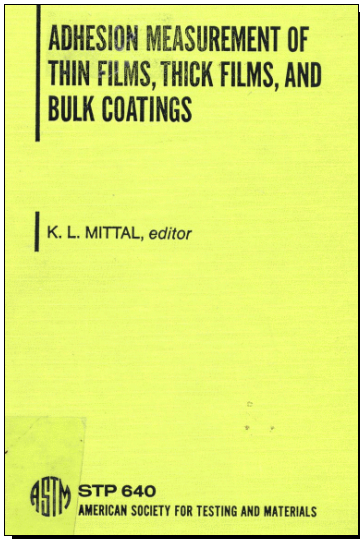


Table of Contents

Introduction

GENERAL PAPERS RELATED TO ADHESION MEASUREMENT

Adhesion Measurement: Recent Progress, Unsolved Problems, and Prospects — K. L. Mittal

Locus of Failure and Its Implications for Adhesion Measurements — R. J. Good

Problems in Adhesion Measurement — J. J. Bikerman

Experimental Methods to Determine Locus of Failure and Bond Failure Mechanism in Adhesive Joints and Coating-Substrate Combinations — W. L. Baun

Thin-Film Adhesion and Adhesive Failure: A Perspective — D. M. Mattox

Use of Fracture Mechanics Concepts in Testing of Film Adhesion — W. D. Bascom, P. F. Becher, J. L. Bitner, and I. S. Murday

Techniques for Measuring Adhesive Energies in Metal/Ceramic Systems — L. E. Murr

ADHESION MEASUREMENT OF THIN FILMS

Adhesion of Thin Plasma Polymer Films to Plastics — L. W. Crane and C. L. Hamermesh

Electromagnetic Tensile Adhesion Test Method — Sol Krongelb

Measurements of Film-Substrate Bond Strength by Laser Spallation — J. L. Vossen

Hardness and Adhesion of Filmed Structures as Determined by the Scratch Technique — J. Ahn, K. L. Mittal, and R. H. MacQueen

Threshold Adhesion Failure: An Approach to Thin-Film Adhesion Measurement Using the Stylus Method — J. Oroshnik and W. K. Croll

Adhesion of Granular Thin Films — Roland Faure

Adhesion Measurement on Thin Evaporated Films — Kaizo Kuwahara, Hidenori Hirota, and Nobuo Umemoto

ADHESION MEASUREMENT OF THICK FILMS

Adhesion Measurements on Thick-Film Conductors — T. T. Hitch

Adhesion of Thick Films to Ceramic and Its Measurement by Both Destructive and Nondestructive Means — R. L. Morey

Evaluation of Methods for Performing Adhesion Measurements of Thick-Film Terminations on Chip Components — G. J. Ewell

Adhesion Measurement Technique for Soldered Thick-Film Conductors — S. S. Levin

Adhesion of Flame-Sprayed Coatings — H. S. Ingham, Jr.

Adherence Measurements and Evaluation of Thick-Film Platinum-Gold — S. Schroter

Subjects

216 .	Adhesion -- Congresses
421 .	Thin films -- Congresses
463 .	Thick films -- Congresses
473 .	Coatings -- Congresses

ADHESION MEASUREMENT OF DEPOSITS AND COATINGS

Adhesion Testing of Deposit-Substrate Combinations — J. W. Dini and H. R. Johnson

Methods for Evaluating Adhesion of Photoresist Materials to Semiconductor Devices — C. A. Deckert

Effect of Aspect Ratio on Tensile Bond Strength for Butt Joint of Internal Fracture: Theoretical and Experimental Analysis — Mineo Masuoka and Kazumune Nakao

Measuring the Temperature Dependence of the Strength of Metal-Polymer Joints — N. I. Egorenkov and V. A. Belyi

Peel Test for Determining the Adhesion of Electrodeposits on Metallic Substrates — O. J. Klingensmaier and S. M. Dobrash

SUMMARY

INDEX

Reviews - Synopsis - Dust Jacket

FOREWARD

The symposium on Adhesion Measurement of Thin Films, Thick Films, and Bulk Coatings was held at the headquarters of the American Society for Testing and Materials, Philadelphia, Pa., 2-4 Nov. 1976. The ASTM Publications Committee sponsored the symposium. K. L. Mittal, IBM Corporation, presided as symposium chairman and editor of this publication.

INTRODUCTION

This volume chronicles the proceedings of the Symposium on Adhesion Measurement of Thin Films, Thick Films, and Bulk Coatings, held under the auspices of the American Society for Testing and Materials, 2-4, Nov. 1976, in Philadelphia, Pa. Thin films (<1 μm), thick films (>1 μm), and bulk coatings (>25 μm) are used for a variety of purposes in electronic, engineering, optical, biomedical, nuclear, space, and other applications. Whatever their intended use may be, the properties, structure, functional characteristics, and performance all depend, inter alia, on adhesion between the coating and the substrate. So the need for reliable and quantitative techniques for measuring cohesion is quite patent. Furthermore, the quantitative determination of adhesion is important to discriminate between the acceptable and nonacceptable parts or products, to optimize process variables, for example, during film deposition, and to settle disputes between the vendor and the buyer regarding adhesion-related performance of products.

In the past no common forum had been provided to discuss the many and varied so-called adhesion measurement techniques comprehensively. However, a considerable amount of effort had been and was being devoted to the development of new or the improvement of existing methods of measuring adhesion. So I approached ASTM with the proposal that a symposium on adhesion measurement was very timely and highly needed, and the response to my proposal was both warm and affirmative.

The symposium was organized to review and assess current measurement techniques, to provide a forum for the exchange of ideas, to define problem areas which needed intensified efforts, and to galvanize increased interest in developing better and more versatile techniques. The leitmotif of the symposium was Adhesion Measurement Techniques: Their Potentialities and Limitations. So the authors were prevailed upon to discuss clearly the merits and limitations of the techniques they used, and also to focus on the factors which interfere with the reliability and reproducibility of the technique; and it is a pleasure to acknowledge their cooperation in this regard.

The technical program contained 33 papers by 49 authors from seven countries, but, unfortunately, three papers were not presented. The program attracted about 80 people from Canada, Denmark, France, Germany, Japan, Switzerland, and the United States. The papers dealt with a host of adhesion measurement techniques for a variety of adherend-adherate combinations. The authors represented a broad spectrum of professional affiliations, backgrounds, and interests. The technical program consisted of both invited and contributed papers covering reviews and original research contributions.

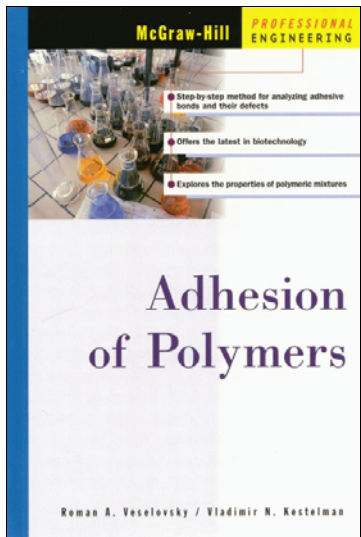
This volume contains a total of 25 papers, divided into four sections, as eight papers are not included for a variety of reasons. The first section comprises seven papers dealing with such questions as are germane to adhesion measurement. The topics addressed include: What is meant by adhesion? What are the mechanisms of adhesion between different adherend-adherate combinations? What exactly is measured when one attempts to measure adhesion? How does the measured adhesion relate to fundamental or basic adhesion? What is the nature and the

importance of locus of failure? and, What are the experimental difficulties and interpretational complexities in adhesion measurement? The second section embodies papers dealing with adhesion of thin films; adhesion of thick films constitutes the third section. The final section contains papers concerning adhesion measurement of deposits and coatings. The salient aspects or findings of all these papers are embodied in the Summary at the end of the volume. Each paper was followed by a discussion; the queries raised by the discussers and author(s)' closure are appended at the end of the respective papers.

The symposium banquet was held in the evening of November 3rd, and it was a distinct pleasure to have Dr. Harvey Alter as the banquet speaker. He spoke on "The Material Science of Waste." The technical program was followed by a panel discussion (the panelists were W. D. Bascom, J. J. Bikerman, D. M. Mattox, K. L. Mittal and L. H. Sharpe) in which some of the relevant topics were discussed.

It is hoped that both the uninitiated and the veteran in the area of adhesion measurement will find this volume a ready source of information and guidance.

Title	Location	Edition / Series / Misc.
908 Adhesion of Polymers		Edition:
Author: Veselovsky, R. A. (Roman Aleksandrovich) and Vladimir N.(Nikolaevich)	Dynix: 105686	Series: McGraw-Hill Professional Engineering Series
Publish.: McGraw-Hill Book Company	Call No.: 668 Ve	
- place: New York, NY	ISBN: 0071370455	
- date: ©2002	Shelf Adult Non-Fiction	Year: 2002
Subject: Adhesives		Price: \$78.50
Desc: xi, 397 p., illus., 24 cm.		



Subjects

217 .	Adhesives
313 .	Polymers

Table of Contents

Preface

Chapter 1. The Process of Adhesive-Bonded Joint Formation

Chapter 2. Adhesive Properties Control by Surface-Active Substances

2.1 Alteration of Properties of Polymeric Composites under the Influence of Surface-Active Substances

2.2 Colloid-Chemical Properties of Surfactants in Heterochain Oligomers

2.3 Surface Tension of Heterochain Oligomers with Surfactant Additives

2.4 Surface Tension of Curing Oligomers

2.5 Effect of Surface-Active Substances on the Thermodynamic and Physical-Chemical Properties of Solid Polymers

2.6 Oligomer-Metal Interphase Tension

2.7 Control of Polymer Adhesion Strength by Means of Surfactant

2.8 Influence of Surfactants on the Structure of Polymers

2.8.1 Influence of Surfactants on the Structure of Polyurethanes

2.8.2 Influence of Surfactants on the Structure of Polyepoxides

2.8.3 Influence of Surfactants on Curing Processes and Structure of Unsaturated Polyesters

Chapter 3. Properties of Adhesives Based on Polymeric Mixtures

3.1 General

3.2 Adhesives Based on Interpenetrating Polymer Networks

3.2.1 Properties of Sprut-5M Adhesive-Based Reinforced Coatings

3.3 Adhesives Based on Thermodynamically Incompatible Polymeric Mixtures

3.3.1 Adhesives Based on Acrylic Polymer Mixtures

3.3.2 Controlling the Properties of Adhesives Based on Epoxy Rubber Polymeric Mixtures

3.3.3 Modification of EP-20 Epoxy-Diane Resin by Epoxidized Polypropylene Glycol (Laproxides 503M and 703)

3.3.4 Influence of Surfactants on Structure and Properties of Polyurethanes Based on Oligomer Mixtures

3.4 Organo-Mineral Composites

3.4.1 Consumption of Polyisocyanate Isocyanate Groups in OMC Formation Processes

3.4.2 Influence of "Silica Modulus" on OMC End Product Composition

3.4.3 The Role of MGF-9 Oligoetheracrylate in the OMC Formation Process

3.4.4 Influence of Hydroxyl Anion on the Processes Occurring in the inorganic Component During OMC Formation

3.4.5 Strength Characteristics of Organo-Mineral Composites

Chapter 4. Internal Stresses in Adhesive-Bonded Joints and Ways of Decreasing Them

4.1 Effects of Internal Stresses on Properties of Adhesive-Bonded Joints

4.2 Determination of Internal Stresses in Adhesive-Bonded Joints

4.2.1 Thermal Stresses in Adhesive-Bonded Joints

4.2.2 Shrinkage Internal Stresses in Adhesive-Bonded Joints

4.2.3 Calculation of Internal Stresses by the Lattice Cell Method

4.2.4 Edge Internal Stresses in Adhesive-Bonded Joints

4.3 Method of Decreasing Internal Stresses in Adhesive-Bonded Joints

4.3.1 Effect of Surfactant on Internal Stresses in Adhesive-Bonded Joints

4.3.2 Controlling Internal Stresses in Adhesive-Bonded Joints by Taking Account of the Separation in Time of the Formation of Linear and Crosslinked Polymers

4.3.3 Decrease of Internal Stresses in Adhesive-Bonded Joints Using Adhesives Based on Interpenetrating Networks

4.3.4 Methods of Decreasing Edge Internal Stresses in Adhesive-Bonded Joints

Chapter 5. Cementing and Operation of Adhesive-Bonded Joints in Liquid Media

- 5.1 Cementing in Liquid Media
- 5.2 Effect of Liquids on the Properties of Adhesive-Bonded Joints

- Chapter 6. Adhesion and Molecular Mobility of Filled Polymers
 - 6.1 Control of Polymer-to-Solid Surface Adhesive Bond Strength by Addition of Fillers
 - 6.2 Influence of the Molecular Size of the Filler Surface Modifier on the Strength of Adhesive Bonds with Solid Substrates and the Molecular Mobility of the Filled Polyurethane
 - 6.3 Molecular Mobility in Filled Polyurethanes and Their Adhesion Properties at Different Filler Concentrations
 - 6.4 Influence of Aerosil Modification on the Aggregation of Particles in Oligomer Medium
 - 6.5 Structure of the Filled Polyurethane Interphase Layer at the Metal Substrate Boundary

- Chapter 7. Criteria of Adhesive Joint Strength
 - 7.1 Adhesive Joint Strength under Combined Action of Various Stresses
 - 7.2 Analysis of Strength Criteria as Applied to Adhesive Joints
 - 7.3 Applicability of the Limited Stressed States Theories for Materials Unequally Resistant to Tension and Compression
 - 7.4 Analysis of Design and Experimental Diagrams of the Limiting Stressed State

- Chapter 8. Control of Polymer Properties for Impregnation of Porous Materials
 - 8.1 Introduction
 - 8.2 Physical-Chemical Aspects of the Impregnation of Porous Materials
 - 8.2.1 Adhesion of the Composition to Impregnated Materials
 - 8.2.2 Selective Adsorption of Components of the Composition
 - 8.2.3 Impregnation of Wet Materials
 - 8.3 One-Component Organic Compositions for Impregnation of Porous Materials
 - 8.4 Influence of Impregnation on Material Properties

- Chapter 9. Practical Applications of Polymer Adhesion Studies
 - 9.1 Adhesives for In-situ Maintenance and Repair Work
 - 9.1.1 Ship Repairs
 - 9.1.2 Damage Control in the Oil and Gas Industry
 - 9.1.3 Reconstruction of Structural Units and Buildings
 - 9.2 Manufacture of Pressware from Cellulose-Containing Materials
 - 9.3 Adhesive for Fixing Organic Soft Tissues: KL-3
 - 9.3.1 Biodegradation of KL-3 Polyurethane Adhesive
 - 9.3.2 Use of KL-3 in Experimental and Clinical Surgery
 - 9.4 Cyanoacrylate Adhesive
 - 9.5 Use of Polymer Compositions for Nuclear Energy Applications
 - 9.6 Quality Enhancement for Articles Made of Porous Materials
 - 9.7 Brick and Concrete Paints
 - 9.8 Manufacture of Floors
 - 9.9 Manufacture of Heat Insulation Panels
 - 9.10 Strengthening and Sealing of Rocks

- References
- Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Create polymeric adhesives and sealants that are stronger, more versatile, more durable, and that work in challenging environments.

"Makes a science out of a technology...may well become a classic in the field." -Stan Bumble, Ph.D., Author of Computer Generated Physical Properties

"No other books...can match this book in comprehensive coverage." -James G. Speight, Ph.D., Editor of Process Chemistry and Engineering and Fuel Science and Technology International

This valuable sourcebook gives you the tools to create stronger, more cost-effective polymeric bonds and seals between materials of all types, in a variety of circumstances. Providing in-depth coverage of properties, techniques, and step-by-step methods, ADHESION OF POLYMERS gives you the most comprehensive coverage available for professionals who create, apply, and analyze these critically important substances. This guide can help you:

- . Create stronger and more cost-effective bonds between materials of all types
- . Manipulate the properties and behavior of polymeric mixtures for improved performance in a variety of environments, and with a variety of substances
- . Choose the most successful, efficient, and economical surface treatments for state-of-the-art sealing and bonding
- . Repair or seal underwater pipes and cables, and repair ships at sea
- . Discover the latest biotechnical methods for bonding and sealing organs and tissues
- . Apply step-by-step methods for analyzing adhesive bonds and their defects

Written by world-class experts, this unmatched reference provides the most comprehensive and up-to-date coverage of polymeric bonding available. Whether you want to develop specialized polymeric adhesives and sealants, discover the latest in applications and scientific developments, or find step-by-step help with polymer forensics, ADHESION OF POLYMERS is simply the best. For serious help with polymeric adhesives, put this book in the place you work.

PREFACE:

The development of contemporary technology and industry is closely related to the creation of new polymeric materials, among which adhesives are playing an increasing role. Their production is being increased at higher rates than that of other polymeric materials. Adhesives find wide application in novel fields of technology. Such enhanced interest in adhesives can be attributed to several factors:

1. Modern technology involves new types of materials that cannot be joined by means of traditional mechanical methods such as welds, rivets, screws, and bolts. These materials include different types of ceramics, glass ceramics, alloys, composites, etc.
2. Newly developed adhesives characterized by strength, heat resistance, and noncombustibility better meet the requirements of the technology.
3. Adhesion is frequently the most effective way of joining very different materials in ways that can be achieved using relatively simple equipment. The range of materials that can be cemented is practically unlimited.
4. Application of adhesives results in valuable properties of the article produced, such as improved strength, waterproofness, resistance to vibration, and decreased weight.

The problem of improving adhesion strength is paramount not only for adhesive-bonded joints. Filled and reinforced polymers are of primary significance among new polymeric materials. These include glass-reinforced plastics, laminated plastics, coatings, woodchip boards, and compounded and reinforced rubbers. The properties of these materials are determined mainly by interaction of the polymer with the filling and reinforcing materials.

At present, there are many hypotheses in the theory of adhesive phenomena but they cannot be practically applied for developing new adhesives insofar as these hypotheses mostly explain different phenomena that occur in the course of cementing and fracture of adhesive-bonded joints. This is essentially related to the fact that the process of formation of an adhesive-bonded joint is a complex set of closely interrelated phenomena. It is necessary to clearly differentiate two concepts -- adhesion and adhesive strength. Generally, adhesion strength, defined as the adhesion work determined by the experimental data on mechanical failure of the adhesive-bonded joint, differs considerably from the adhesion work determined by means of the thermodynamic equations or by the interaction energy between surface layers of atoms of the adhesive and the substrate. One of the reasons for such incongruence is the fact that the formation of the adhesive-bonded joint involves a great number of factors, which in the course of loading of the joint facilitate its premature failure. Among these factors must be included the formation of weak layers of different types between the adhesive and the substrate, and of the internal stresses in the adhesive layer.

All of this complicates the study of adhesion phenomena, hinders the scientific approach to the problem of controlling the adhesive properties, and is one of the reasons why, despite the great scientific and practical importance of research on creation of new, efficient adhesive compounds, progress in this field has been achieved mainly empirically.

This book generalizes the results of studies performed in the Department of Adhesion and Adhesives of the Institute of Macromolecular Chemistry of the Ukrainian National Academy of Sciences. It considers some regularities of the formation of adhesive-bonded joints, presents thermodynamic and physical-chemical substantiation of new principles of controlling the adhesion strength and other important properties of polymeric adhesives, and describes application of these principles in the course of developing adhesives for various fields of engineering and medicine.

One of the basic principles of controlling the properties of adhesives considered here is inclusion of surface-active substances (surfactants) capable of chemical interaction with the adhesive components and entering into the adhesives' composition. Such reactive surface-active (RS) substances differ radically from chemically indifferent surface-active (IS)

substances. In the course of polymerization of oligomers containing IS substances there is a decrease of the critical concentration for micelle formation (CCMF) and formation of substantial quantities of large micelles of surfactant, which results in weak layers on the boundary between the adhesive and substrate and in decrease of the adhesion strength.

RS substances react chemically with molecules of the polymerizing oligomers to form macromolecules that contain both oligomers and the surface-active substance, which permits the decrease of CCMF and breakdown of RS micelles without damage to the adsorption layer on the substrate surface. Thus, application of RS substances provides for controlling the properties of the polymer boundary layers without initiating deleterious side effects. Use of RS substances allows an increase in the adhesion strength and water resistance of adhesive-bonded joints, making adhesives capable of cementing metals and other materials in water and petroleum products.

Of great interest is the application as adhesive compounds of polymeric blends, such as thermodynamically incompatible polymers one of which has a high modulus of elasticity and the other a low modulus. When the adhesive cures, the second polymer is liberated as a separate finely dispersed phase. Such separation of the blend into high- and low-modulus phases provides for controlling the relaxation properties of the adhesive while maintaining its high strength.

A special type of polymeric blends is interpenetrating networks (IPN), which represent a system formed in the course of building up one crosslinked polymer inside the ready-made network-matrix of another under conditions of no chemical reaction between the networks. Such IPN-based adhesive compounds are noted for considerable long-term strength, which is explained by features of the deformation processes that occur in the IPN layer when it is loaded.

The application of these principles of increasing the adhesion strength and of controlling other properties of adhesives provides for development of polymeric compounds with a number of valuable features: for example, structural adhesives with high short-term and long-term strength even when cementing untreated surfaces in various liquids; sealing adhesives that combine high adhesion strength and elasticity of the adhesive layer; foaming adhesives; medical-purpose adhesives capable of bonding biological tissues in an environment, of tissue fluids, of being infiltrated by living tissues, and of being excreted from the organism at prescribed times; photopolymeric compounds; binders for forming glass-reinforced plastics in liquids; and others. Compounds can be cured both at high and at subzero temperatures; their adhesion strength is of low dependence on air humidity or pressure during cementing, on adhesive layer thickness, or on treatment of the surfaces to be bonded. These stipulations for high efficiency of adhesive compounds permit their application in fields of engineering where adhesives have not so far been used, for example, when repairing underwater oil and gas pipelines, oil tanks, ships on the high seas, and so on.

Title	Location	Edition / Series / Misc.
5 Adhesion Promotion Techniques: Technological Applications		<i>Edition:</i>
<i>Author:</i> Mittal, K. L. and A. Pizzi (editors)	<i>Dynix:</i> 89759	<i>Series:</i> Materials Engineering: No. 14
<i>Publish.:</i> Marcel Dekker, Inc.	<i>Call No.:</i> 620.1 Ad	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0824702391	
<i>- date:</i> ©1999	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1999
<i>Subject:</i> Surfaces (Technology)		<i>Price:</i> \$168.50
<i>Desc:</i> ix, 404 p., illus., 24 cm.		

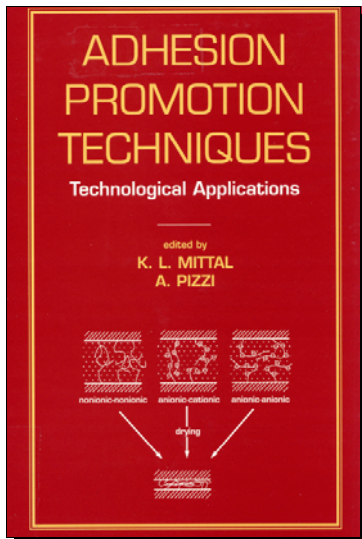


Table of Contents

- Preface
- Theories and Mechanisms of Adhesion --- J. Schultz and M. Nardin
 - Harnessing Acid-Base Interactions to Improve Adhesion --- Mohamed Mehdi Chehimi
 - Molecular Mechanics-Dynamics Modeling and Adhesion --- A. Pizzi
 - Application of Atomic Force Microscopy in Fundamental Adhesion Studies --- Robert A. Hayes and John Ralston
 - Plasma Treatment of Polymers to Improve Adhesion --- Michael R. Wertheimer, Ludvik Martinu, Jolanta E. Klemberg-Sapieha, and Gregory Czeremuszkin
 - Flame Treatment of Polymers to Improve Adhesion --- Derek McHardy Brewis and Isla Mathieson
 - Corona Discharge Treatment of Polymers --- Tohru Uehara
 - Laser Surface Treatment to Improve Adhesion --- Alisa Buchman and Hanna Dodiuk-Kenig
 - Adhesion Enhancement of Metallic Films to Ceramic Substrates Using UV Lasers and Low-Energy Ions A. J. Pedraza
 - Surface Graft Copolymerization and Grafting of Polymers for Adhesion Improvement --- E. T. Kang, Koon Gee Neoh, Kuang Lee Tan, and Der-Jang Liaw
 - Microbial Treatment of Polymer Surfaces to Improve Adhesion --- Elena V. Pisanova
 - Silanes on Glass Fibers-Adhesion Promoters for Composite Applications --- Leanne Britcher, Scott Kempson, and Janis Matisons
- Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

A highly pragmatic guide to advanced methods for improving adhesion, Adhesion Promotion Techniques presents the state of the art in improving bond strength between different materials for many manufacturing processes -- reviewing the suitable chemistry or morphology for enhanced adhesion to metal, plastic, and wood surfaces. Explores up-to-date, high-quality adhesion technologies for a wide variety of materials, thoroughly explaining current capabilities of adhesion promotion for both students and seasoned researchers.

Adhesion Promotion Techniques discusses mechanisms such as viscoelastic energy dissipation, weak boundary layers and interphase...mechanical interlocking, and those based on electrostatic, thermodynamic, diffusion, and chemical bonding theories...considers cleaning, ablation, cross-linking, and chemical modification of organic polymers...illustrates analytical methods such as the laser microprobe mass analyzer, Auger electron spectroscopy, X-ray fluorescence, inverse gas chromatography, X-ray photoelectron spectroscopy, and atomic force microscopy...demonstrates applications of ultraviolet, CO₂, and IR lasers...investigates uses of energy-saving, ecologically clean anticorrosion microorganisms in treatment of polymer surfaces...explores acid-base interactions in adhesion...and more!

Containing over 1000 references and more than 300 helpful graphs, equations, drawings, and photographs, Adhesion Promotion Techniques is required reading for materials scientists; organic, physical, polymer, and surface chemists; chemical engineers; adhesion scientists and adhesive technologists; and upper-level undergraduate and graduate students in these disciplines.

REVIEWS:

This excellent book, offered by noted adhesion expert and book editor Kash Mittal and Professor A. Pizzi, comprehensively covers adhesion promotion by plasma, flame, corona, laser, less energetic ion, chemical, silane, and microbe treatments.— Polymer News

The chapters are well written, clear and informative; they reflect the considerable expertise of the authors... a useful monograph for anyone interested in adhesion. — E-Streams

This guide to advanced methods presents the state of the art in improving bond strength between different materials for

Subjects

314 .	Polymers -- Surfaces
334 .	Surfaces (Technology)
343 .	Adhesion
477 .	Composite materials -- Surfaces

many manufacturing purposes, and reviews the suitable chemistry or morphology for enhanced adhesion to metal, plastic, and wood surfaces. Some of the 12 contributions discuss mechanisms, such as viscoelastic energy dissipation, weak boundary layers and interphase, mechanical interlocking, and those based on electrostatic, thermodynamic, diffusion, and chemical bond theories. Others consider cleaning, ablation, cross-linking, and chemical modification of organic polymers; demonstrate applications of ultraviolet, CO₂, and IR lasers; and explore acid-base interactions in adhesion. — Book News, Inc.®, Portland, OR

Title	Location	Edition / Series / Misc.
6 Adhesive Bonding: Techniques and Applications		<i>Edition:</i>
<i>Author:</i> Cagle, Charles V.	<i>Dynix:</i> 13018	<i>Series:</i>
<i>Publish.:</i> McGraw-Hill Book Company	<i>Call No.:</i> 668.3 Ca	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0070095868	
<i>- date:</i> [1968]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1968
<i>Subject:</i> Adhesives		<i>Price:</i> \$25.00
<i>Desc:</i> ix, 351 p., illus., 23 cm.		

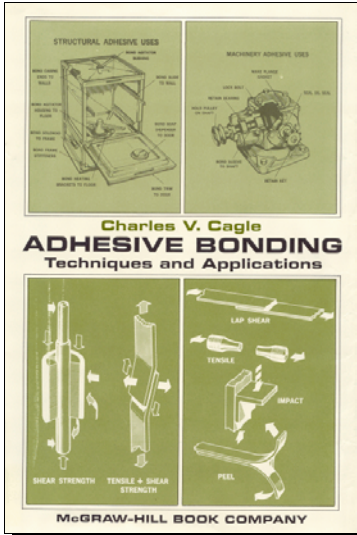


Table of Contents

Preface

1. Background of Adhesives
2. Adhesive Properties and General Characteristics
3. Applying Adhesives
4. Design Criteria and Joint Design
5. Surface Preparation
6. Adhesive Tooling and Fabrication Techniques

1. Testing Adhesives
8. Environmental Testing
9. Quality Control of Adhesive Joints
10. Nondestructive Testing of Adhesives
11. Adhesives Literature and Information Files
12. Specifications Applicable to Adhesive Bonding

A List of Manufacturers and Adhesive Suppliers for the Aerospace Industry
Glossary of Terms Associated with Adhesive Bonding
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Representing a valuable contribution to the field of structural adhesives, this unique volume provides—for the first time—an extremely practical and down-to-earth treatment of the complex area of adhesive technology.

Based on a study of thirty-five companies actively engaged in adhesive bonding, the book details the very latest bonding techniques—stressing problem areas and employee training.

Here you'll find complete coverage of all essential factors involved in adhesive bonding, from the adhesive supplier to the finished bonded hardware. And to ensure maximum usefulness as well as ease of comprehension, theoretical considerations have been largely played down while realistic "how-to-do-it" presentations are given the greatest possible emphasis. To illustrate, you'll benefit from "Adhesive Bonding's"...

- descriptions of the various chemical types of adhesives and their general mechanical and handling characteristics.
- coverage of the applications and mixing techniques for the more widely used adhesives.
- treatment of adhesive joint design—including explanations of each type of joint, how it is stressed, and why it is used.
- discussion of the better-known methods of non destructive testing their applications, and their limitations.

Yet these are only random samples of the kind of guidance you'll gain from this exceptionally authoritative working guide.

Other vital and timely presentations include cleaning techniques for the various types of adherends, both metals and nonmetals . . . tooling for adhesive bonding. . . today's most accepted mechanical and environmental tests for adhesive evaluation, and what can be expected from them . . . a general method of quality control covering every phase from receiving inspection to the final product... and the storage and retrieval of adhesive data, and how it maybe computerized.

The book also features one of the most complete glossaries of adhesive bonding terms ever published, along with important specifications—including military, federal, and ASTM—with numerical listings by number and a brief description of their coverage.

In short, "Adhesive Bonding "is easily the most helpful and specific guide currently available to those concerned with the actual use of modern structural adhesives.

Subjects

217 . Adhesives

PREFACE:

This textbook was written because a definite need existed for a book geared to the basic fundamentals pertinent to adhesive bonding, and be cause of the encouragement of my very good friend Dr. Henry Lee. Having personally experienced the need for a book in this particular area, I accepted the challenge to write such a text. I am hopeful that the by product of that decision will fill a gap which exists between the highly scientific publications available and the fine books that resulted from various adhesive symposiums, which do not have the continuity that is desirable for a good instruction text.

I have attempted to present factual information, in an honest and simple manner, which would be of interest to various adhesive activities. This book is geared primarily to the needs of the shop man, technician, or professional engineer who is not familiar with adhesive bonding.

Much emphasis has been placed on cleanliness, surface preparation, and training, which, in my opinion, hold the golden key to success in adhesive bonding. If I can enlighten but a small number, my two years of work will not have been in vain.

It would be impossible for a single individual to write a text of this nature without the cooperation and assistance of others. After visiting approximately 35 U. S. firms and posing rather embarrassing questions to their leadership, I received some rather frank and disturbing answers. The results of these visits and observations fully supported and confirmed my own thoughts on the subject which were formulated as a result of 14 years of experience that have been frustrating at times, to say the least; yet I would not exchange one day of my experiences because, in the field of adhesives, a new challenge arises every day, and the old ones are never completely conquered. The answer which I treasure came from an individual in a small Midwest bonding shop. I walked over to him with an air of importance and posed this question, "What is your job?" He quickly replied, "I am a bondsman." I thought for a moment and then offered the following comment, "The dictionary defines a bondsman as a subject who is held against his wishes, bound to service without wages, in other words, a male slave." He was silent for a few moments and then I received this solemn reply, "That's very close to my present status!"

I have borrowed from the works of many, and to these dedicated and talented people I am forever indebted. I wish to express a special "thank you" to Hector M. Gonzalez and Dr. Sidney Wiener, whose constructive criticism and leadership have meant very much to me. A special thanks to Joyce Tockar for her untiring efforts in typing the manuscript and to Donald A. Stowe for his contributions at the drawing board. To Mr. John Maliek is extended a sincere note of appreciation for his contributions.

Title	Location	Edition / Series / Misc.
7 Adhesive Technology: Developments Since 1977		<i>Edition:</i>
<i>Author:</i> Torrey, S. (editor)	<i>Dynix:</i> 13023	<i>Series:</i> Chemical Technology Review: No. 148
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 668.3 To	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815507879	
<i>- date:</i> ©1980	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1980
<i>Subject:</i> Adhesives -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> xii, 500 p., illus., 24 cm.		

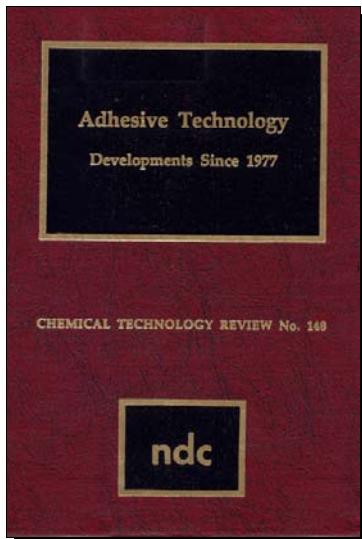


Table of Contents

HOT MELT ADHESIVES
 - Polyolefin
 Having High Strength at Elevated Temperatures
 Binding of Fibrous or Porous Materials
 Tackifier of Petroleum Resin
 Graft Copolymer of Polyethylene
 With High Resistance to Prolonged Immersion in Water
 Having Improved High Temperature Shear Properties
 - Polyester
 Containing Spheroidal Metal Powder
 For Polyester Fibers, Films and Other Shaped Articles
 Thermoplastic Copolyesters Made Under Mild Conditions
 Amorphous Polyolefin Added for Lower Melt Viscosities
 - Polyamide
 For Garment Interlinings
 Polyoxamide from Polyoxypropylene Polyamine
 For Use on Metal Substrates
 Laminates for Auto Interiors
 Formulations for Bonding at Low Temperatures
 Containing Caprolactam and Substituted Caproic Acids
 - Pressure Sensitive
 With Good Resistance to Plasticizer Migration
 Single-Component Adhesive
 Based on Rubbery Block Copolymers
 With Polymers at Least Partially Crosslinked
 Substantially Amorphous Polyolefins
 Polyacrylics
 - Radiation-Cured
 Containing Acrylate or Methacrylate Coupling Agent
 - Additional Formulations
 For Use at Higher Temperatures
 For Substrates with Low Surface Energies
 Adhesive for Holding a Workpiece
 - Special Applications
 On-Line Binding System to Make a Multipage Document

PRESSURE SENSITIVE ADHESIVES
 - Acrylic Polymers
 Containing Polymerized Alkoxyalkyl Ester of Unsaturated Acid
 Water-Activatable Adhesive Tape
 Aqueous Dispersions for Bonding Polyolefin Plastics
 Curing on Contact with an Amine-Aldehyde Condensation Product
 Improved Stability in Contact with Iron
 Alkyl Acrylate Polymer with both Random and Terminal Hydroxyls
 Containing Acrylic Functional Aminocarboxylic Acids and Derivatives
 - Rubber-Based
 Sulfobutyl Rubbers plus Tackifiers
 Elastomers from C5-Hydrocarbons
 Silicate, Borate, or Carbonate Adhesion Promoters
 Using a Thermoplastic Elastomeric Styrene-Butadiene Block Polymer
 Treatment with Peroxides

Subjects

218 . Adhesives -- Patents

Based on A-B-A Block Copolymers
With Low Volatile Liquid Content
Antistatic Composition
Combined with Aromatic Hydrocarbon Resin
Teleblock Copolymers
Unmilled Chloroprene Polymer Preparation
Copolymer of Butadiene, Styrene and Acrylonitrile
- Radiation-Cured Polymers
Containing Quinone Ultraviolet Sensitizers
Polyoxyalkylene Polymers plus Carbamoyloxy Alkyl Acrylate
Halogenated Polymerizable Compounds Containing Acrylic Radicals
Acrylic and Methacrylic Ester Derivatives as Photoinitiators
With a Benzoin C Hydrocarbon Alkyl Ether
Containing Poly(Vinyl Alkyl Ether)
- Additional Formulations
Polyester Self-Adhesive Films
With CH-Acidic Compounds Masking Polyisocyanates
Anaerobically Cured
Silicone Composition Requiring No Curing
Addition of Silane
Vinyl Acetate-Ethylene Copolymer Aqueous Emulsion Base
Modified Phenol Resin to Increase Cohesion
Containing an Anionic Surface Active Agent
- Applications
Printable Release Coats for Adhesive Tapes
Drafting Films for Use in Electrostatic Copiers
Switch-Proof Label
Rubbery Cushion with Adhesive Layer for Automotive Use
Clear Sheet to Protect Signs from Vandalism
Transfer Adhesives
Heat-Activated Adhesive Coating
Backing of Polypropylene Having Specific Characteristics
To Attach Emblems or Trim to Auto Bodies
Mixing a Polysiloxane with the Adhesive

ADHESIVES FOR RUBBER

- Rubber to Tire Cord Adhesion
Metal Deactivators as Adhesive Promoters
Two-Dip Adhesive System
Adding Metal Compound to Adhesive
Addition of Epoxytrialkoxysilane to Silicone Elastomers
Containing Resorcinol-Aldehyde and Catechol-Aldehyde Resins
Incorporation of Microcrystalline Wax in Formulation
Adhesive Particularly Useful for High-Modulus Yarns
Adhesive-Coated Glass Fibers
- Tire Sealants
Butyl Rubber-Based Composition Cured Using Special Method
Carbon-Reinforced, Partially Crosslinked Butyl Rubber
Butyl Rubber plus Saturated Hydrocarbon Polymer
- Tackifiers
For Use in Sulfur-Curable Alpha-Olefin Polymers
Phenolic Tackifiers Which Enhance Adhesion to Reinforcing Elements
- Other Formulations
One-Coat, Single-Package, Storage-Stable Adhesives
Organopolysiloxane Resin as Adhesion Promoter for Silicone Rubbers
Improving Adhesion of Rubbery Ethylene Copolymers

WOOD, CORRUGATED BOARD AND PAPER ADHESIVES

- Wood Adhesives
Flame-Resistant Adhesive
Amylaceous Extender for Plywood Adhesive
Premixed Catalyzed Vinyl Acetate Polymer
Extender of Powdered Tree Foliage
Phenol-Formaldehyde Resin for Waferboard Production

Solid Particulate Adhesives Obtained by Spray Drying
Use of Lignin Derivatives
Rapid Hardening at Room Temperature
Addition of Powdered Green Tea
Bark-Extended Adhesives
Use of Lignosulfonate to Replace Some Phenol
Curable Amino Resin Binder System for Fiberboard
For Joining Untreated Wood to Wood Treated with Fire Retardant
Containing Sulfur
- Corrugated Board Adhesives
For Increasing Production Rates of Heavyweight Board
For Bonding Paraffin-Modified Corrugated Board
Based on a Vinyl Alcohol Polymer
Addition of Silica to Improve Thermal Stability
Starch Carrier Composition
- Paper Adhesives
Glue Stick
For Temporary Attachment of Coupons to Cartons
Delayed-Tack Adhesives
Pressure-Sensitive Adhesive Tapes and Labels
Containing Triethanolamine Plasticizer to Prevent Paper Curl
Adhesives Usable in Products Which May Be Repulped
Suitable for Bookbinding or Making Paper Bags
Hot Melt Bookbinding Adhesive
- Special Processes
For Producing Urea-Formaldehyde Adhesives
Manufacture of Paper Envelopes with Microencapsulated Glue

ADHESIVES FOR TEXTILES AND PLASTICS

- Adhesives for Textiles
Tape for Use on Cloth Diapers
Hot Melt Adhesives for Bonding Fabrics
Modified Polyamide Hot Melt Adhesive Powders
Heat Curable Multilayer Composite Adhesive Sheet
Partially Crystalline Copolyesters for Fusion of Textiles
Electron-Beam Curing of Adhesives for Flocking
Hot Melt Linear Block Copolyether-Polyester Compounds
Bonding Hydrophobically Treated Substrates
"Breathing" Lining Material Fused to a Garment by Hot Pressing
Powder Adhesives Suitable for Fusible Interlinings
Process for Patterned Deposition of Thermoplastic Adhesive
- Adhesives for Plastics
For Bonding Vinyl Coverings
Two-Package Organopolysiloxane Systems
Aqueous Vinyl Ester Emulsions plus Allyl Carbamate
Adhesive for Protective Vinyl Film on Gym Mat
Containing a Substituted Silane
Adhesive for Laminated Film for Packaging
Improving Adhesion of Aluminum to Polysulfides
For Use in Diazo Duplicating Material
Laminates Having an Adhesive Barrier Layer
Utilizing Toluene Diisocyanate Residue
Calcium or Magnesium Chloride Added to Polyolefin Adhesive
For Thermosetting Layers Containing Mold Release Agents
Improvement of Adhesion of PVC to Metals
Adhesive for Vinyl Film to Wood
For Polyvinyl Fluoride Sheets

METAL ADHESIVES

- Epoxy Compositions
Primary Amine-Terminated Polyamides as Curing Agents
With High Heat Distortion Temperatures and Longer Pot Lives
Containing Two Diglycidyl Ethers
Method for Sealing High-Pressure Piping

Containing Certain Polyether Diureide Additives
Containing Certain Polyether Diamide Additives
Addition of Amino-Terminated Polyether Succinimides
Diamides of Polyoxyalkylenepolyamine-Urea Condensates
Epoxy-Amine Composition Curable at Low Temperatures
Containing Amino-Terminated Polyether Ureylene Additives
Aromatic Amine Curing Agent
Addition of Polymercaptans and Polyenes
Having Long Pot Life
Containing a Rosin-Based Tackifier
Addition of Compounds to Reduce Moisture Sensitivity
- Anaerobically Cured Compositions
Pressure Sensitive Adhesive
Containing a Monomer Mixture of Various Methacrylates
Containing Reaction Products of Glycidyl Methacrylate and Half Esters of Dicarboxylic Acids
Stabilization of Acrylate Adhesives
Containing Polycarbonates Terminated by Methacrylic Ester Groups
- Additional Formulations
Butadiene Copolymers plus PVP plus Anionic Compounds
One-Liquid Adhesive with Encapsulated Initiator
Anaerobic Sealant
Block Copolymer Extended with an Anhydride
Polyesters Containing a Tertiary Amino Group
Homopolyamide-Copolyamide Adhesive for Metal Cans
Adhesion Promoter for 2-Cyanoacrylates
Water-Based Sealants for Sealing Can Ends

ADHESIVES FOR CONSTRUCTION MATERIALS

- Concrete and Cement Adhesives
Vinyl Chloride Resin-Coal Tar Pitch Joint Sealant
Styrene-Butadiene Interpolymer Latex
Vinylidene Chloride Polymer Latex
Composition for Highway Marking
Slurries Including a Polymer Latex
Epoxide Resin with Amine Hardeners
- Sealants
Silicon-Modified Polyurethane Polymers
Hot Melt Butyl Rubber Compositions
One Pack Moisture-Curable Polysulfide
Thermoplastic Elastomer plus Mixed Modifying Resins
Fast-Curing Phenolic-Acrylic System
Hot Melt High-Temperature-Resistant Composition
Sealant with Good Flexibility Able to Withstand Weathering
Gasket Material of Polyacrylated Polyurethane
Epoxy Composition for Improving Wear of Concrete Surfaces
- Construction Applications
Cementitious Facing Material for Smooth-Skinned Foam
Weather-Resistant Polyethylene Terephthalate Adhesive Film
Roofing and Surfacing Material
Cold Crosslinking Dispersion Adhesive
For Installation of Wall and Floor Coverings

GLASS AND ALL-PURPOSE ADHESIVES

- Adhesives for Glass
Aqueous Acrylate Dispersions
Rapid-Curing Two-Part Acrylic-Based Adhesive
Ultraviolet Light-Curable Diacrylate Hydantoin Compositions
Adhesive Films for Transparent Laminates for Aircraft Windshields
- Glass-to-Plastic Adhesives
Solar Control Film
Use of Silanes Having Capped Functional Groups
- Sealants for Glass
In Situ Curable Sealant for Multiple-Glazed Windows
Based on Mercapto-Terminated Polymers and Quick Hardening

Nonaqueous Rubber Sealant for Use on Wet or Dry Substrate
Using PTFE Fibers
- Adhesives for Fiber Glass
Sand able Polyurethane Composition
- All-Purpose Adhesives
Photocurable Compositions Containing Group Va Onium Salts
Chlorosulfonated Polyethylene
Modified with Certain Phenolic Resins
Catalyst Activator as a Separate Ingredient
Carboxylic Acid or Ester plus Metal Salt plus Olefin Polymer
Anaerobically-Cured Compositions

ADHESIVES FOR MEDICAL AND DENTAL USES

- Dermatological Adhesive Tapes
Containing Tretinoin
Acrylic Ester Polymers with Improved Cohesion
Highly Tacky Pressure-Sensitive Adhesive
With Improved Long Term Skin Adhesion
With Total Adhesive Mass Being Microporous
Vapor-Permeable Substrate
Reduction of Skin Damage on Tape Removal
Showing Improved Adhesion in Water
- Adhesives for Dental Uses
Dental Restorative Composite
Allyl 2-Cyanoacrylate Adhesive for Orthodontic Brackets
Polycarboxylate Cement
- Adhesives for Medical Uses
Bio-Event Electrode Material

ADHESIVES FOR ELECTRICAL AND PHOTOGRAPHIC USES For Electrical Uses .

- Hydantoin Diglycidyl Compounds
Addition of Adduct of Epoxide with a Novolak Resin to Polyurethane
Atactic Tape for Repairing Seals in Secondary Batteries
High Temperature Refractory Adhesive
Fluid-Permeable Adhesive Tape for Binding Electrical Conductors
Electrically Conductive Sulfur-Bearing Adhesive
For Connecting Flexible Heating Resistors to Electrodes
For Bonded Covering of Fire Extinguishing Materials in Appliances
Electrically and Thermally Conductive Adhesive
- Adhesives for Photographic Use
Adhesive Layer for X-Ray Intensifying Screen
Amorphous Polyester Adhesives
Film Adhesive Layer Containing No Gelatin
Low Temperature Adhesives for Film Units
Heat-Activatable Adhesives with High Bonding Strengths Above 50 C

SPECIALTY APPLICATIONS

- For Shoe Manufacture
Carbon Blacks Added to Adhesive Used for Shoe Cap Stiffening
Polyurethane Adhesive for Bonding Shoe Soles to Uppers
Reinforcing Adhesives for Box-Toe Construction Resins
Polyurethane Adhesives Having Uniform Molecular Weights
- Adhesives for Ski Manufacture
Containing an ABS Graft Polymer
Containing a Substituted Pyrazine
- For Decalcomanias
For Glass and Ceramic Decoration
- Additional Applications
Adhesive Coated with Powdered Deliquescent Material for Wall Covering
Adhesive Type-Correcting Material
Adhesive Coating for Graphite Crucibles
Cyanoacrylate Adhesives for Consumer Use
For Installing Artificial Turf
For Use ma Petrochemical Medium

For Installing Resin Bonded Rock Bolts in Mining Operations
Adhesive Strip for Sanitary Napkin or Diaper
Preparation of Paper for Use in an Electrostatic Recording System
Grout Dressings
Forming of Endless Abrasive Belts
Lamp Capping Cement

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWARD:

This book is a data-based publication, providing information retrieved and made available from the U.S. patent literature. It thus serves a double purpose in that it supplies detailed technical information and can be used as a guide to the patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, commercially oriented review of adhesive technology based on about 280 U.S. patents issued since January 1978. This title contains all new developments since our previous title Adhesives Technology Annual, published in 1978.

As was its predecessor, this is a practical, useful manual. It reflects the efforts and skills of many talented inventors. Its continuing purpose is to present the necessary chemistry, as well as changing technology and applications, notably the replacement of organic solvents by less toxic and less polluting carriers, to serve the varied interests of the makers and users of adhesives.

While the information is taken from U.S. patents, the coverage is actually world wide in scope, as nowadays over 35% of all processes patented in the U.S. are developed by foreign investigators from practically every industrial nation.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Title	Location	Edition / Series / Misc.
8 Adhesives Technology: Developments Since 1979		<i>Edition:</i>
<i>Author:</i> Gutcho, M. H. (Marcia Halpern), 1924- (editor)	<i>Dynix:</i> 00090	<i>Series:</i> Chemical Technology Review: No. 215
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 668.302 Gu	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815509219	
<i>- date:</i> ©1983	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1983
<i>Subject:</i> Adhesives		<i>Price:</i> \$25.00
<i>Desc:</i> xii, 452 p., illus., 24 cm.		

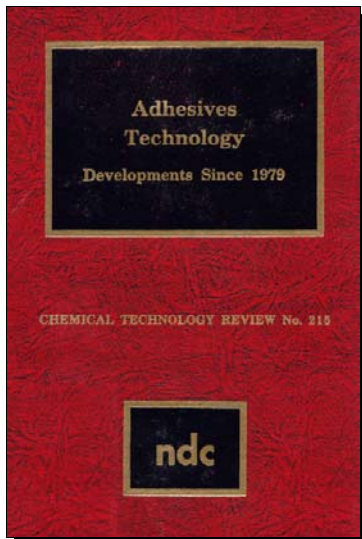


Table of Contents

INTRODUCTION

PRESSURE SENSITIVE ADHESIVES

- Acrylic Polymers
- Interpolymers Crosslinked with Esters of Orthotitanic Acid
- Acrylic Interpolymers Reacted with a Polymetaloxane
- Plurality of Superimposed Adhesive Strata
- Surfactant-Free Process for Adhesive Latexes
- Use of Monoethyl Acid Phosphate as Adhesion Improver to Plastic
- Acrylic Ester Formals
- Primer Compositions for Acrylate Layer on Polyolefin
- Heat Activatable Pressure-Sensitive Tape
- Polymer Dispersion Obtained by Emulsion Polymerization
- Copolymers from Acrylic Esters, Vinyl Acetate, Acrylamide, Ethylene
- Polyurethane Adhesives from Hydroxyl-Containing Liquid Polymers and Isocyanate-Terminated Prepolymers
- Alkyl Acrylate Liquid Polymer Polymerized with Mercaptan
- Alkyl Acrylate Polymer Contains Polymerized N-Vinyl-2-Pyrrolidone
- Alkyl Acrylate Liquid Polymer Made with Disulfide-Trisulfide
- Radiation Cured
- Three Terpolymers of Butyl Acrylate, Vinyl Acetate and Acrylic Acid
- Cyclic Acrylate, Tackifier, Elastomer, Initiator
- Free Radical Polymerization of Acrylic Type Monomers
- Liquid Modified Urethane Oligomer, Nonreactive Tackifier
- Rubber Based
- A-B-A Block Copolymer, Copolyester, Tackifier Resin
- Unvulcanized Block and Styrene/Isoprene Polymer, Tackifier
- Carboxylated SB R Polymer Emulsion, Emulsified Tackifier
- Low MW Polyisoprene Prepared by Using Lithium Catalyst
- Liquid Rubber Component
- Unvulcanized cis-1,4-Polybutadiene as Modifier
- Hot Melt Pressure-Sensitive Adhesive
- Weather Resistant Adhesive
- C5-Tackifier for Use with Block Copolymer Adhesives
- Resinous Polyelectrolyte Tackifier for Latex Adhesive
- Stabilized Rosin Ester as Tackifier
- Ambient Hydrocurable Adhesives
- Resin Forming Polyepoxide Mixed with Cyclic Oxazolidinyl Groups
- Oxazolidine Polymer and Polyfunctional Acryloxy Component
- Release Coatings
- Polysilicone-Polybutadienediol Blends
- Epoxy polysiloxane
- Low Tack Pressure Sensitive Correction Composition for Typed Images
- PE, Tackifier, Isobutylene, Olefin Copolymer, Carboxylic Acid
- Paraffinic Wax, Tackifier, Isobutylene Polymer, Olefin Copolymer
- Other Formulations
- Graft Copolymer
- Silicone Adhesives
- Polymer of Dicyclopentadiene and Aromatic Hydrocarbon
- Release on Demand Tape
- Segmented Copolyether-Esters
- Applications

Subjects

217 . Adhesives

Composite Pressure-Sensitive Adhesive for Temporary Seal
 Polyisobutylene Adhesive Seal for Temperature-Indicating Device
 Pressure-Sensitive Decorative Plastic Film
 Electrical Insulating Tape

HOT MELT ADHESIVES

- Contain Modified Polyethylene Resin
 Modified Polyethylene Rosin Ester
 Filled Composition: Modified Polyethylene, Talc, Hydrocarbon Resin
 Modified PE, EVA Copolymer, Tackifier, Microcrystalline Wax
 Modified PE, EVA Copolymer, Tackifier, Ethylene/Propylene Rubber
 - Olefin Copolymers for Pressure-Sensitive Adhesives
 Propylene/1-Butene/Higher 1-Olefin Copolymer
 Compatible Tackifiers and Plasticizers for Olefin Copolymers
 Blend of Olefin Copolymers
 C3-5 a-Olefin/C6-10 a-Olefin Copolymer
 Other C3-5 a-Olefin C6-10 a-Olefin Copolymers
 - Contain Copolymers of Ethylene and Acrylic or Methacrylic Acid
 Wax-Free Composition
 Alkali Metal Ionomer
 Copolymer of Ethylene and 7-9% Acrylic Acid
 - Polyamide
 Branched Diamines and Straight Chain Dicarboxylic Acids
 From Dimer Acids, Wax, Aromatic Tackifier, Rubber Modifier
 - Ethylene-Vinyl Acetate Copolymer
 Extending Molten Stability by Addition of Lithium Ion
 Fluoroelastomer, Ethylene Copolymer, Tackifier
 Succinic Anhydride, Ethylene Copolymer, Terpene-Urethane Resin
 Tackifying Resin Reaction Product of Cyclopentadiene and Indene
 - Sulfonated Polymers
 Unsaturated Hydrocarbon Rubber, Sulfonated Polystyrene, Tackifier
 Neutralized Sulfonated EPDM Terpolymer and Hydrocarbon Resin
 - Other Formulations
 Polyester/Polystyrene Blend
 Propylene Polymer Fibers
 Modified Polyurethane Containing Carbamate Ester Additive
 Allyl Acrylate Copolymerized with Acrylic Monomer
 Water Activated Polyhydroxy Plasticizer
 Anhydride Modified Thermoplastic Segmented Copolyester Elastomer
 Improving Holding Power of Diene/Monovinyl Aromatic Copolymer
 Blend of Wood Rosin and Thermoplastic Graft Copolymer
 Improving Adhesion Between Resins and Inorganic Oxides
 Foamed Thermoplastic Adhesives Stabilized with Surfactants
 Use of Acetylene-Substituted Reactive Diluent
 Carene Modified Petroleum Resins as Tackifiers
 - Block Copolymer Adhesives for Filling Voids in Metal Substrates
 Block Copolymer, Aluminum Powder, Glass Fibers
 Copolymer, Reinforcing Agent, Glass Fibers, Silicate Microspheres
 Block Copolymer, Mineral Reinforcing Agent, Glass Fibers
 Block Copolymer, Al Powder, Glass Fibers, Silicate Microsphere
 - Apparatus and Special Applications
 Apparatus for Melting and Applying Hot Melt Adhesive
 Applying Foamed Adhesive Pattern to Moving Substrate
 PET Bottle Assembly Based on ABA Block Copolymer
 PET Bottle Assembly: EVA, Ethylene-Ethyl Acrylate, Modifiers
 Self-Adhesive Plastic Wall Tile

ADHESIVES FOR CELLULOSIC MATERIALS

- Phenol-Aldehyde Condensate Adhesives for Wood
 Hydroxybenzene-Formaldehyde Concentrate, NaOH, Bentonite
 Lignin-Phenol-Formaldehyde Resin
 Mixture of Chlorolignin and Synthetic Resin
 Sequential Condensation of Melamine and Urea
 Thermosetting Condensation Resin and Modified PVA

Vegetable Cellulosic Filler for Thermosetting Resin
- Urea-Formaldehyde Resin Adhesives for Wood
Alkali Glass Powder or Microcapsules to Improve Water Resistance
Inorganic Salt Incorporated in Polymerization Reaction
Plus Sulfite Spent Liquor
- Wood Binders from Chemical Pulping Processes
Aqueous Polyisocyanate-Lignin Adhesive
Resins from Sulfite Waste Liquors
- Other Adhesives for Wood
Premixed, Catalyzed Vinyl Acetate Copolymer Adhesive
Aqueous Acrylic Contact Adhesive for Decorative Laminate
- Starch Based Corrugating Adhesives
No Carrier Adhesive
High Speed Adhesive Based on Cornstarch Acetate Succinate
Lyophilic Colloid, Partially Gelatinized Starch, Water
- Sealing Tapes for Corrugated Cardboard Containers
Four Layer Laminate
Three Layer Laminate
- Remoistenable Adhesives for Gummed Tapes
Oxidized Waxy Starch Acetate or Succinate
Acid Hydrolyzed Waxy Maize Starch-Acrylamide Graft Copolymer.
Low Amylose Starch-Acrylamide Graft Copolymer
- Adhesives for Paper
Paper Laminates
Polyester Gel Stick
Cationic Water-Dispersible Resin plus Hydrocarbon Resin

ADHESIVES FOR RUBBER

- Rubber to Tire Cord Adhesion
Urea Modified Phenolic Aldehyde Resin
Long-Chain Thermoplastic Resorcinol Formaldehyde Resin
Diene Copolymer and Lignin Amine-Formaldehyde Reaction Product
Vinylpyridine-Styrene-Butadiene, Amino Acid, Sulfur Donor
- Rubber to Metal
Tellurium as Bonding Aid
Heat Activatable Adhesive
- Rubber to Rubber
Resins Based on Novolaks
Linear Dihydroxypolyurethanes
Ionomer Resin plus p-Dinitrosobenzene
- Plasticizer for Polysulfide Rubber Sealant
Chlorinated C16-20 Alpha Olefins
Chlorinated Paraffins Containing 15 Carbon Atoms

METAL ADHESIVES

- Reactive Fluid Adhesives
Acrylate Monomer, Chlorosulfonated Polyethylene, Activator
Acrylic Monomer, Sulfonyl Chloride, Catalyst, Accelerator
Chlorosulfonated Amide or Imide as Adhesion Promoter
Nontoxic Tertiary Amine Activators for Peroxy Catalysts
- Anaerobic Curing Adhesives
Ethylene Glycol Dimethacrylate, Peroxide, Trichloroacetic Acid
Dicyclopentenylxyethyl Acrylate, Hydroperoxide, Accelerator
Ester of BTA plus Urethane Prepolymer
Addition of Copolymer to Ethoxylated Bisphenol A Dimethacrylate
Based on Triallylisocyanurate Monomer
Adhesion Promoter
Hydroxy Diesters of Unsaturated Dicarboxylic Acids as Plasticizers
Cyclic Sulfimide and Aromatic Tertiary Amine Accelerator System
Isocyanatoethyl Methacrylate-Polyol Reaction Product
Inhibiting Precipitation of Amine Phosphate Salts
- Urethane-Acrylate Capped Prepolymers
Based on Polymeric Alkylene Ether Polyol
Based on Polybutadiene Polyol

- Cyanoacrylates
- Sealing and Thread Locking Composition
- a-Cyanoacrylate-Trichlorotrifluorethane
- Additives for Improving Impact Strength
- Epoxy Compositions
- One Package Stable Adhesive
- Photopolymerizable Film Adhesive
- Other Metal Adhesives
- High Temperature Adhesive
- Low Temperature, One Package, Brominated Rubber Adhesive
- Inorganic Adhesive
- Blend of Poly(Arylene Sulfide) and Polytetrafluoroethylene
- Thermoplastic Adhesive for Copper Containing Metals
- Thermosetting Adhesive
- Sealing Material for Spot Welding Two Sheets
- Self-Bonding Silicone Compositions
- Graft Modified Polyolefins
- Structural Adhesive

CONSTRUCTION ADHESIVES, SEALANTS AND ADHESIVE-COATED ARTICLES

- Building Sheets
- Attaching Foamed Polystyrene Sheets to Substrates
- Self-Adhesive Tape for Joining and Sealing PVC Sheets
- Adhering Aluminum Foil to Fiber Glass in Duct Board
- Insulating Structural Panel
- Joint Sealing
- Jointing of Concrete Structures
- Joint Sealant Compatible with Portland Cement and Asphalt
- Adhesive Joining of Pipes
- Noncurable Joint Sealant
- Sealants
- Weather Resistant, Nontacky Sealant
- Monoalkenyl Arene/Conjugated Diene Block Copolymer
- Polyurethane Sealant
- Expandable Sealant Tape
- Silicon-Containing Polymer and Photocurable Substance
- Applications
- Pourable Grout for Mining Operations
- Channel Sealant for Aircraft Integral Fuel Tanks
- Sealing Joints at Edges of Fire Protection Doors
- Sealing Coke Oven Doors
- Manufacture of Double Glazing Units
- Sealing Acrylic Plastic Skylights in Aluminum Frames
- Adhesive Coatings
- Polysiloxane Resin Coated Metallic Cooking Surfaces
- Silicone Composition for Plastic, Paper and Rubber
- Other Processes
- Binding Agent for Foundry Sands
- Rubber Stopper for Sealing
- Polyols for Use in Production of Heat Sealable Foams

TEXTILE ADHESIVES

- Hot Melt Textile Adhesives
- Polymeric Fatty Acid Terpolyamide
- Polyamide Copolymers
- Caprolactam Copolyamides
- Polyester Amide
- Linear Thermoplastic Polyesters from Carboxylated Polyolefins
- Polyurethane Urea
- Hot Melt for Elastic Banding
- Method of Hemming Fabrics
- Fusible Interlining Adhesives
- Blend of Polyester and Polyamide
- Copolyester

Semicrystalline Polyester/Low Viscosity Polyethylene Blend
- Carpet Adhesives
Polyethylene-Containing Hot Melt Adhesive for Carpet Tapes
Latex Backing
Carpet Backing Adhesive

ADHESIVES FOR PLASTICS

- Plastic to Plastic
Plastic Film Laminates
Laminated Films
For Flexible Polymers
Heat Sealable Oriented Polypropylene Film
Bonding Thermoplastic Elastomer to Aramid Fiber
Polyvinylidene Fluoride-Polyvinyl Chloride Composite
Gap Filling Adhesive
- Plastic to Metal
Synthetic Resin Foil to Metal
Laminating Vinyl Film to Metal at Low Temperatures
Vinyl to Metal
Vinyl Polymer to Metal or Wood
Promoter for Enhancing Adhesion of Vinyl Polymer Plastisol to Steel
a-Cyano Acrylate, Polyalkyl Ether, Polyhydroxybenzoic Acid
Fire Retardant Adhesive for Bonding to Aluminum
Polyamic Acid of Improved Adhesion to Metals and Alloys
Improving Adhesion Between Metal Layer and Polymer
- Other Adhesives for Plastics
Flame Retardant Copolyester Adhesive
Polyacrylic Acid Ester Based Adhesive
Vinyl Film on Wood

ADDITIONAL ADHESIVE FORMULATIONS

- Multipurpose Adhesives
Water Redisposable Polyvinyl Acetate Emulsion Adhesive
Solid Polyvinyl Alcohol-Crystalline Solvent Based Adhesive
Linear Random Copolyester Resins
Copolyamide Resins from Piperazine and Polyoxyalkylene Diamine
Fused Ring Anhydride Graft Copolymer, Elastomer, PE Resin
Stabilized Latex Polymer, Amine Gelling Agent, Zinc Donor
EDA-Aminolysis Product, Diacryl Ester of Bisphenol A Epoxy Resin
Liquid Adhesive
Instant Settling Adhesive
Alkoxyalkyl 2-Cyanoacrylate
Polymerization Inhibitor for 2-Cyanoacrylate Adhesives
Polyfunctional Acrylate plus Inhibitor Irradiated by Laser
Alkanediamide-Linked Polyphthalocyanine
Glue Stick
- Adhesives for Glass
Glass to Aluminum
Glass to Plastic
- Urethane Adhesives
Ricinoleate Urethane Polyol and Chlorinated Rubber
Isocyanate-Terminated Ricinoleate Prepolymer, Chlorinated Rubber
For Endless Abrasive Belts
Storable, Liquid Polyurethane Adhesive
- Organosilicon Adhesives
Organopolysiloxanes
Crosslinked Organopolysiloxanes
Curable Organopolysiloxanes

SPECIALTY APPLICATIONS

- Medical
Pressure-Sensitive Paper Surgical Tape
Ostomy Adhesive I
Ostomy Adhesive II

- Dental
Tinted Pit and Fissure Sealant
Two-Package Adhesive
Cementing Orthodontic Brackets to Tooth Enamel
Denture Adhesive: Gum Base plus Hydrophilic Polymer
- Photography
Amorphous Polyester—Phthalic Acid, Aliphatic Glycol Components
Bis-Amide-Group-Containing Polyesters
Pressure-Sensitive Adhesive Toner
- Circuit Boards
Hydroxy Terminated 1,2-Polybutadiene, Diisocyanate, Styrene
Nonflowing Water-Soluble Composition
Acrylonitrile-Butadiene Copolymer Crosslinked with Organic Peroxide
Poly(Parabanic Acid) Film Coated with Acrylic Adhesive
- Shoes
Bonding Tread Members to Shoes
Continuous Strand of Polyamide for Gluing Gun
Water Vapor Absorbing and Transmitting Adhesive
- Plastic-Metal Foil Composites for Packaging Foodstuffs
Aluminum Hydroxide Modified Copolymer
Glycol or Polyol, Silane Coupling Agent, Organic Polyisocyanate
- Energy Control Sheets
Water-Activatable Crosslinked Adhesive
Acrylate Polymer, Isooctyl Acrylate Monomer, Rosin Tackifier
- Other Substrates
Wall Coverings
Battery Labels
Greenware
Skis
Side-View Mirror Assembly with Butyl Rubber Adhesive
Adhesive Bonding of Fiber Optic Elements
Joining Synthetic Thermoplastic Materials for Electrolytic Cells
Floor Coverings

COMPANY INDEX
U.S. PATENT NUMBER INDEX
INVENTOR INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD:

The detailed, descriptive information in this book is based on U.S. patents, issued between January 1980 and March 1982 that relate to adhesives technology. This title contains new developments since our previous title Adhesive Technology— Developments Since 1977 published in 1980.

This book is a data-based publication, providing information retrieved and made available from the U.S. patent literature. It thus serves a double purpose in that it supplies detailed technical information and can be used as a guide to the patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced commercially oriented review of recent developments in the field of adhesives technology.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open

up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The table of contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION:

Adhesives are substances which are able to hold materials together by surface attachment. The materials so bonded are called substrates or adherends.

Older adhesives (collagens, starches, dextrans, casein, rubber, plastic resins, etc.) are derived from natural sources. Many of these organic adhesives and their modified natural products are still widely used today.

In the last thirty years much work has been accomplished toward the development of synthetic adhesives. These include the synthetic rubber, block copolymer, thermosetting resin, and thermoplastic resin adhesives.

Some synthetic adhesives (i.e., polyvinyl acetate) bond by solvent evaporation. Others (urea-formaldehyde, resorcinol-formaldehyde, epoxy resins) depend on a chemical crosslinking. Reactive fluid adhesives cure by polymerization of monomeric components (i.e., polymerizable acrylate) to form strong adhesive bonds.

Anaerobic compositions remain liquid in the presence of air, but cure to a strong adhesive bond when air is excluded (such as in the assembly of a mated nut and bolt to which the adhesive has been applied).

Hot melt adhesives are solid at room temperature but soft and fluid at elevated temperature and can readily be applied to a substrate in the molten form. On cooling, a strong adhesive bond is formed which requires no curing.

Pressure-sensitive adhesives when coated on a suitable substrate are permanently tacky at room temperature, and adhere to surfaces by the application of manual pressure.

Important industrial uses of adhesives are in the areas of construction (plywood, laminates, insulation board, gypsum board, furniture, window and door sealing) and in packaging corrugated board, paper tapes, paper laminates, etc.).

The adhesives discussed in this book represent the most recent advances in adhesive technology. The adhesives are organized by chemical composition (acrylates, polyolefins, condensation resins, etc.), by substrate bonded (textile, plastic, metals, rubber, cellulose, construction-related, etc.), as well as by conditions of use (hot melt, pressure sensitive), Included also are specific specialty applications (dental, medical, circuit boards, shoes, etc.).

For best results the selection of an adhesive must be tailored to the adherend and to its end use.

Title	Location	Edition / Series / Misc.
9 Adhesives, Sealants and Coatings for the Electronics Industry		<i>Edition:</i>
<i>Author:</i> Flick, Ernest W.	<i>Dynix:</i> 02814	<i>Series:</i>
<i>Publish.:</i> Noyes Publications	<i>Call No.:</i> 668.302 FI	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815510551	<i>Year:</i> 1986
<i>- date:</i> ©1986	<i>Shelf:</i> Adult Non-Fiction	<i>Price:</i> \$25.00
<i>Subject:</i> Electronics -- Materials -- Catalogs		
<i>Desc:</i> xviii, 197 p., 24 cm.		

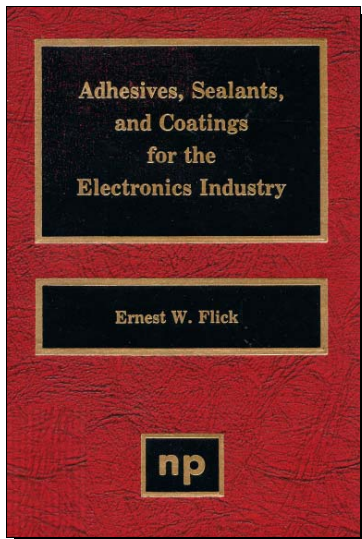


Table of Contents

PREFACE INTRODUCTION

SECTION I: ADHESIVES, SEALANTS, AND COATINGS

- Ablestik
- Ambroid
- American Chemical & Engineering
- Apple Adhesives
- Aremco
- Bacon Industries
- Bostik
- Cal Polymers
- Chomerics
- Ciba-Geigy
- Conap
- Copps Industries
- Crest Products
- Devcon
- Dow Corning
- Dynaloy
- Epo-Tek
- Fenwal
- Formulated Resins
- H.B. Fuller
- General Electric
- Goal Chemical
- Hardman
- Hemon Manufacturing
- Hexcel Chemical
- Hysol
- Kendall
- Krazy Glue
- Loctite
- Lord Chemical
- Mactac
- Magnolia Plastics
- Master Bond
- Oneida
- Oxo Adhesives
- Pacer Technology
- Permabond
- Power Adhesive Machines
- Quadrant Chemical
- Sterling
- SWS Silicones
- Thermoset
- 3M
- Transworld Adhesive & Chemical

Subjects

238 .	Coating Technology
253 .	Electronics -- Materials -- Catalogs
344 .	Adhesives -- Handbooks, manuals, etc.
488 .	Sealing (Technology) -- Handbooks, manuals, etc.

SECTION II: SUPPLIERS' ADDRESSES

Reviews - Synopsis - Dust Jacket

Book Description

The second edition of this widely accepted industrial guide contains descriptions of more than 2,500 adhesives, sealants, and coatings, which are available to the electronics and related industries. The book, greatly expanded from the previous edition, is the result of information received from 80 manufacturers and distributors of these products. The data, including product specifications, represent selections from the manufacturers' descriptions made at no cost to, nor influence from, the makers or distributors of these materials. Only the most recent information has been included. It is believed that all of the products listed are currently available, which will be of interest to readers concerned with product discontinuances. The market for electronics adhesives, sealants and coatings continues to be an expanding one, with sales showing consistently strong growth. A large segment of the demand is for surface mount technology and other miniaturization efforts. Diverse products such as printed circuit boards, camcorders, VCRs and desktop computers are constantly being upgraded with new and better adhesive agents, often made of high-performance specialty materials. As "environmentally friendly" products have become more desirable, the industry is working toward using less solvents, removing them completely where possible, and replacing them waterborne, hot-melt, or totally solid products. In addition, the industry is always seeking stronger and/or faster products. Automotive electronics have also created a niche for silicon-based adhesives which can withstand broad temperature fluctuations and corrosive environments. Each product in the book lists the following information as available, in the manufacturer's own words: (1) Company name and product category; (2) Tradename and product number; (3) Product description/specification. A description of the product's main features, as described by the supplier. Typical and uses may also be included.

PREFACE:

This edition contains descriptions of more than 1,600 up-to-date contemporary adhesives, sealants, coatings and other products which are available to the electronics and related industries. It will be of value to industry technical and managerial personnel involved in the manufacture of the final products, as well as to those companies which supply raw materials or services to electronics manufacturers.

The data consist of selections of manufacturers' literature made at no cost to, nor influence from, the makers or distributors of these materials.

The table of contents is organized in such a way as to serve as a subject index.

My fullest appreciation is expressed to the companies and organizations who supplied the information for this book. All of their addresses are listed in Section II.

INTRODUCTION:

This book is a collection of more than 1,600 contemporary adhesives, sealants, coatings and related products, which are available to the electronics and related industries. It is the result of information received from numerous industrial companies and other organizations. The data represent selections from manufacturers' descriptions made at no cost to, nor influence from, the makers or distributors of these materials. Only the most recent information has been included. It is believed that all of the products listed here are currently available, which will be of utmost interest to readers concerned with product discontinuances.

Companies are listed alphabetically by name and their products listed in alphabetical order. The reader seeking a product for a specific end use will have numerous selections, in most cases.

In addition to the above, there is a section which lists the main office addresses of the suppliers whose products are listed in this book.

Each product in this book lists the following information, which has been standardized as much as possible:

- (1) Company name and product category as the heading of the page.
- (2) Tradenames, if applicable.
- (3) Product number. If a catalyst is used, it appears after the colon. (The next numbers in parentheses represent the product: catalyst ratio by weight.)
- (4) Product description: A description of the product's main features, as described by the supplier. Typical end uses may also be included.

Title	Location	Edition / Series / Misc.
10 Adhesives: Recent Developments		<i>Edition:</i>
<i>Author:</i> Herman, Bernard S.	<i>Dynix:</i> 13020	<i>Series:</i> Chemical Technology Review: No. 65
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 668.3 He	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815506139	
<i>- date:</i> ©1976	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1976
<i>Subject:</i> Adhesives -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> x, 302 p., 25 cm.		

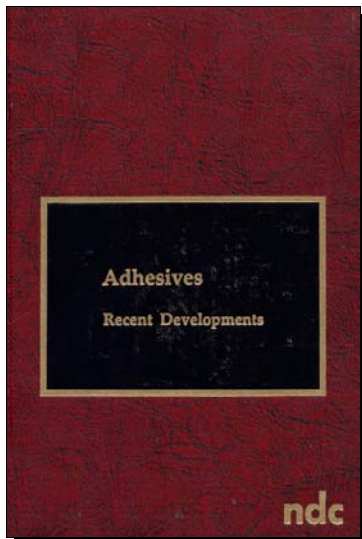


Table of Contents

INTRODUCTION

PRESSURE SENSITIVE ADHESIVES

- Acrylic Polymers
- Alkyl Acrylates, Unsaturated Acids and Hydroxylated Amides
- Ionomeric Copolymers
- Interpolymers Containing Enolizable Keto Group and Orthotitanic Acid Chelate
- Interpolymers Containing Acid-Epoxy Groups and 1,3-Bis(Dimethyl-amino)-2-Hydroxypropane
- Electron Radiation Technique
- Rubber Base
- Polypentenamers
- Polystyrene-Polyisoprene-Polystyrene Block Copolymers
- Tackifier for Butadiene-Styrene Copolymers
- Pressure Sensitive Hot Melt
- Urethane Base with Diene Polymer
- Adhesive Strip for Automotive Trim
- Vinyl Acetate Copolymers
- Ethylene-Vinyl Acetate-Trialkyl Cyanurate Copolymer Dispersions
- Maleic Anhydride-Alkyl Acrylate Copolymers in EVA Systems
- Fumaric Diester-Vinyl Acetate Polymers

Subjects

218 . Adhesives -- Patents

HOT MELT ADHESIVES

- Ethylene-Vinyl Acetate
- Oxidized Low Molecular Weight Polypropylene
- Amorphous Polypropylene and Petroleum Resin
- Isopropenyltoluene Copolymers as Tackifiers
- Chlorinated Polyphenyl, Chlorinated Polyisoprene and Nitroso Compound
- Carpet Backing Formulation
- Other Polyolefin Compositions
- Amorphous Polypropylene
- Amorphous Polyolefin and Styrene-Butadiene Block Copolymers
- a-Methylstyrene-tert-Butylstyrene-Olefin Terpolymers
- Alkoxyethylene-Acrylonitrile Copolymers
- Boric Acid as Viscosity Stabilizer in Ethylene-Propylene Adhesives
- Thermoplastic Polymer and Chelate of Aminoacetic Acid
- Acrylic Acid Grafted Polyolefins
- Coal Tar Pitch and Ethylene-Acrylic Acid Copolymer
- Water-Moistenable Vinyl Pyrrolidone-Vinyl Acetate Product
- Additional Formulations
- Block Polyester-Polyamides and Polystyrene
- Segmented Thermoplastic Copolyesters
- Water-Dispersible Hot Melt

PLYWOOD, PARTICLE BOARD AND PAPER ADHESIVES

- Phenol-Formaldehyde Resins for Plywood
- Polymerized Lignosulfonate
- Kraft or Soda Black Liquors
- Pulp Mill Paper Making Waste Sludge as Extender
- Dried Animal Blood as Foaming Agent
- Disubstituted Bis(Aryl Amine) Curing Agents
- Finely Divided Aluminum Powder as Acid Scavenger

- Urea-Formaldehyde Resins for Particle Board
- Latent Catalyst
- Alkali Metal Salts
- Three-Stage Resin Production Process
- Other Wood Bonding Processes
- Acid-Modified Olefin Polymer, Polyvalent Metal Salt and Diepoxide
- Polymerization Accelerators for Cyanoacrylate Compositions
- Wood Fibers Impregnated with Complex of Styrene and Maleic Anhydride
- Starch Adhesives for Paper Bonding
- Grinding Procedure for Starch-Clay Mixtures
- Phenol, Alkaline Dispersed Starch and an Oxazolidine
- Water-Resistant, Short Tack Starch Adhesive
- Continuous Production of Starch-Based Adhesive
- Other Water-Soluble Adhesives
- Solid Water-Soluble Product Containing Stearoyl Isethionate Ester
- Grafted Water-Soluble Cellulose Ether
- Pullulan Ester

TEXTILE ADHESIVES AND PLASTICS BONDING

- Textile Adhesives
- Diacetone Acrylamide and Aminoplasts
- Lactam Copolyamides
- Polyurethane
- Thixotropic Polyurethane Adhesive for Carpets
- Polyvinyl Chloride Bonding
- Ethylene-Vinyl Acetate
- Hydroxyethyl Methacrylate Capped Urethanes
- Vinyl Acetate-Polyvinyl Alcohol-Monocarboxylic Acid
- Poly(Ethyl Acrylate), Ethylene-Acrylic Acid Copolymer and Epoxy Resins
- FRP Bonding
- Urethane Adduct Primer for FRP Bonding
- Polyurethane Adhesive

RUBBER ADHESION

- Tire Cord—Fabric Adhesion
- Resol-Type Resin
- Polyester Fiber-Rubber Bonding with Polynucleus Halophenol Compound
- Ethylene-Propylene-Diene Terpolymers and Resorcinol-Aldehyde Resin
- Aqueous Polyurea Adhesive
- Polyamide-Rubber Bonding
- Tire Cord—Steel Wire
- Styrene-Butadiene-Carboxylic Acid Latex and Epoxy
- Cobalt Naphthenate Promoter
- Rubber-to-Metal Bonding
- Polymethylene Polyphenylisocyanate and Chlorosulfonated Polyethylene
- Polydiene-Aminosilane Compositions
- Chlorosulfonated Polyethylene, Nitroso Compound and Polyisocyanate
- Polyurethanes for Rubber-to-Rubber Bonding
- Aromatic Nitro Compounds as Additives
- Nitro and Chloronitroalkanes as Additives

METAL-TO-METAL ADHESION

- Epoxysilane Additive for Epoxy Resins
- Divinyl Compounds and Rubber Material as Two-Component Adhesives
- Ethylene-Acrylic Acid Copolymer and Phenolic Resin
- Polyurethane Cured with Polyamine-Acid Anhydride Adduct
- Chlorosulfonated Polyethylene and Vinyl Monomers
- Cyanoacrylate Adhesive Containing Maleic Anhydride
- Anaerobic Adhesive Containing Diazonium Salt
- Carboxy-Modified Olefin Copolymer for Can Seams

SPECIALTY APPLICATIONS

- Dental Formulations
- Cationic Polymer and Anionic Compounds

Polyacrylic Acid, Zinc Oxide and Stannous Fluoride
Refractory Protective Composition
1,3-Bis[2,3-Di(Methacryloxy)Propoxy] Benzene
Orthodontic Bonding Agent
- Circuit Boards
Flexible Printed Circuit
Phenoxy and Epoxy Resin with Chelate Crosslinker
- Underwater Adhesives
Epoxy Adhesive
Cyanoacrylic Acid Esters
- High-Temperature Composites
Aromatic Dicyanate Added to Epoxy
Aromatic Polyamic Acid and Aluminum Oxide
Polybenzothiazote-Based Adhesive
- Other Applications
Abietate-Terminated Polysulfide Sealants
Adhesive Liner for Flare
Water-Resistant Labels for Glass Bottles
Oil Well Sealer
Phenolic Resins and Silanes for Foundry Sands
Acetoxysilicon Adhesion Promoter for Silicon Elastomers
- Polychloroprene-Based Adhesives
Latex Mastic
Latex with Phenol-Formaldehyde Resin
Fire-Resistant Compositions for Building Construction
Single-Phase Polymerization Process

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket**FOREWORD**

The detailed, descriptive information in this book is based on U.S. patents issued since 1974 and relating to the technology of adhesives.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of recent developments in the adhesives industry.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas to research and development. The information contained in this book will allow you to establish a sound background before launching into research in the field.

Advanced composition and production methods developed by Noyes Data are employed to bring our new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION

While solvent-based adhesives will continue to be used in some parts of the world, particularly in the developing nations, it is expected that antisolvent legislation will have a major impact in the major adhesive consuming countries. With the advent of the EPA Clean Air Act of 1970, OSHA, worker safety concerns and the Arab oil embargo, the need for solvent-free adhesives has been dramatically accelerated.

In 1974, it was estimated that Europe and North America consumed some 300 million gallons of solvent-based adhesives, with over fifty percent of the total being consumed for the manufacture of pressure sensitive labels and tapes.

Major replacements for solvent-based adhesives over the next decade are expected to be two-component reactive adhesives, hot melt, photoreactive and water-based systems.

An adhesive bonding agent is generally characterized as a material capable of bonding separate articles together by adhering to the surfaces of both articles. The selection of an adhesive bonding agent for a particular use is governed by the chemical and physical properties of the adhesive bonding agent composition and the chemical and physical properties of the surfaces of the articles to be bonded.

Some of the chemical and physical properties to be considered when an adhesive — bonding agent is selected are:

- the affinity of the surfaces to be bonded to the adhesive bonding agent
- the ability of the adhesive bonding agent to adequately wet the surface to be bonded
- the ability of the adhesive bonding agent to be placed in intimate contact with the surface to be bonded
- the cohesive strength of the adhesive bonding agent itself
- the chemical reactivity of the adhesive agent with the surface to be bonded

Hence, the degree of difficulty in selecting or producing an adhesive bonding agent for adhering a plurality of surfaces to each other is directly proportional to the diversity of compositions of surfaces to be bonded and the bonding characteristics of the surfaces themselves.

Generally, adhesive bonding agents are organic polymers having functionality which is adapted to the surfaces to be bonded. Organic polymers are usually employed due to their wide degree of variation in chemical and physical properties.

In addition to the bonding characteristics of adhesive bonding agents, many uses for such agents require sealing characteristics. Thus, the bonding agent must form a continuous mass between the bonded articles which is minimally permeable, if not impermeable to the flow of gases and liquids through the adhesive bonding agent portion of the bonded article. Therefore, adhesive bonding agents having sealing characteristics are generally designated as adhesive-sealants.

In recent years, synthetic polymers have been developed for a wide variety of adhesive applications ranging from the tires we ride on to the many highly demanding uses in space vehicles. In the 1970s particular attention has been devoted to thermoplastic polymer research and formulation techniques for pressure sensitive and hot melt adhesives. Additionally, adhesive systems for plywood impregnation, textile bonding and a number of rubber-to-metal and metal-to-metal structural adhesives, have been optimized to provide environmentally safe products which afford handling ease, rapid cure and processing and, of course, durable composites.

Specialty adhesives and sealants have been developed for dental and prosthetic use, underwater application, electronic components and high temperature composites for a wide variety of modern fabrication techniques.

This book describes over one hundred different bonding processes and provides hundreds of adhesive formulations as noted in the U.S. Patent literature since 1974.

Title	Location	Edition / Series / Misc.
1454 Adsorption and Aggregation of Surfactants in Solution		<i>Edition:</i>
<i>Author:</i> Mittal, K. L. and Dinesh O. Shah (editors)	<i>Dynix:</i> 111670	<i>Series:</i> Surfactant Science Series: Vol. 109 -- International Symposium on Surfactants in Solution (13th: 2000: Gainesville, FL)
<i>Publish.:</i> Marcel Dekker, Inc.	<i>Call No.:</i> 541.3 In	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0824708431	<i>Year:</i> 2003
<i>- date:</i> ©2003	<i>Shelf:</i> Adult Non-Fiction	<i>Price:</i> \$195.00
<i>Subject:</i> Surface active agents		
<i>Desc:</i> xvii, 697 p, illus., 24 cm.		

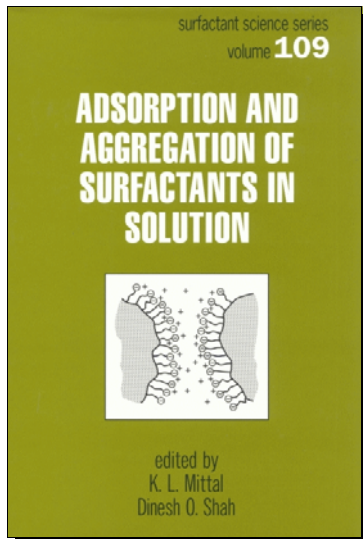


Table of Contents

PREFACE

CONTRIBUTORS

1. Highlights of Research on Molecular Interactions at Interfaces from the University of Florida -- Dinesh O. Shah and Brij M. Moudgil
2. Interaction Between Surfactant-Stabilized Particles: Dynamic Aspects -- J. Lykiema
3. Solid Particles at Liquid Interfaces, Including Their Effects on Emulsion and Foam Stability -- Robert Aveyard and John H. Clint
4. From Polymeric Films to Nanocapsules -- Helmuth Möhwald, Heinz Lichtenfeld, Sergio Moya, A. Voight, G. B. Sukhorukov, Stefano Leporatti, L. Dahne, Igor Radtchenko, Alexei A. Antipov, Changyou Gao, and Ethvin Donath
5. Investigation of Amphiphilic Systems by Subzero Temperature Differential Scanning Calorimetry -- Shmaryahu Ezrahi, Abraham Aserin, and Nissim Garti
6. Aggregation Behavior of Dimeric and Gemini Surfactants in Solution: Raman, Selective Decoupling C-13 NMR, and SANS Studies -- Hirofumi Okabayashi, Norikatsu Hattori, and Charmian J. O'Connor
7. Snared by Trapping: Chemical Explorations of Interfacial Compositions of Cationic Micelles -- Laurence S. Romsted
8. Effect of Surfactants on Pregastric Enzyme-Catalyzed Hydrolysis of Triacylglycerols and Esters -- Charmian J. O'Connor, Douglas T. Lai, and Cynthia Q. Sun
9. Effect of Benzyl Alcohol on the Properties of CTAB/KBr Micellar Systems -- Ganzuo Li, Weican Zhang, Li-Qiang Zheng, and Qiang Shen
10. Vesicle Formation by Chemical Reactions: Spontaneous Vesicle Formation in Mixtures of Zwitterionic and Catanionic Surfactants -- Klaus Horbaschek, Michael Gradzielski, and Heinz Hoffmann
11. Mechanism of the Clouding Phenomenon in Surfactant Solutions -- C. Manohar
12. Atomic Force Microscopy of Adsorbed Surfactant Micelles -- William A. Ducker
13. A Simple Model to Predict Nonlinear Viscoelasticity and Shear Banding Flow of Wormlike Micellar Solutions -- I. E. Puig, F. Bautista, J. H. Pérez-López, J. F. A. Soltero, and Octavio Manero
14. Preparation and Stabilization of Silver Colloids in Aqueous Surfactant Solutions -- Dae-Wook Kim, Seung-II Shin, and Seong-Geun Oh
15. Silver and Palladium Nanoparticles Incorporated in Layer Structured Materials -- Rita Patakfalvi, Szilvia Papp, and Imre Dékány
16. Water-in-Carbon Dioxide Microemulsions Stabilized by Fluorosurfactants -- Julian Eastoe, Alison Paul, David Steytler Emily Rumsey, Richard K. Heenan, and Jeffrey Penfold
17. Organic Synthesis in Microemulsions: An Alternative or a Complement to Phase Transfer Catalysis -- Krister Holmberg and Maria Häger

Subjects

332 .	Surface active agents
506 .	Adsorption

18. Physicochemical Characterization of Nanoparticles Synthesized in Microemulsions -- J. B. Nagy, L. Jeunieu, F. Debuigne, and I. Ravet-Bodart
19. Phase Behavior of Microemulsion Systems Based on Optimized Nonionic Surfactants -- Wolfgang von Rybinski and Matthias Wegener
20. Microemulsions in Foods: Challenges and Applications -- Anilkumar G. Gaonkar and Rahul Prabhakar Bagwe
21. Microemulsion-Based Viscosity Index Improvers -- Surekha Devi and Naveen Kumar Pokhriyal
22. Foams, Foam Films, and Monolayers -- Dominique Langevin
23. Role of Entry Barriers in Foam Destruction by Oil Drops -- Asen D. Hadjiiski, Nikolai D. Denkov, Slavka S. Tcholakova, and Ivan B. Ivanov
24. Principles of Emulsion Formulation Engineering -- Jean-Louis Salager, Laura Márquez, Isabel Mira, Alejandro Peña, Eric Tyrode, and Noelia B. Zambrano
25. Nano-Emulsions: Formation, Properties, and Applications -- Conxita Solans, Jordi Esquena, Ana Maria Forgiarini, Núria Usón, Daniel Morales, Paqui Izquierdo, Núria Azemar and María José García-Celma
26. Surface Modifications of Liposomes for Recognition and Response to Environmental Stimuli -- Jong-Duk Kim, Soo Kyoung Bae, Jin-Chul Kim, and Eun-Ok Lee
27. Specific Partition of Surface-Modified Liposomes in Aqueous PEO/Polysaccharide Two-Phase Systems -- Eui-Chul Kang, Kazunari Akiyoshi, and Junzo Sunamoto
28. Novel Cationic Transfection Lipids for Use in Liposomal Gene Delivery -- Rajkumar Banerjee, Prasanta Kumar Das, Gollapudi Venkata Srilakshmi, Nalam Madhusudhana Rao, and Arabinda Chaudhuri
29. Combinatorial Surface Chemistry: A Novel Concept for Langmuir and Langmuir-Blodgett Films Research -- Qun Huo and Roger M. Leblanc
30. Oscillating Structural Forces Reflecting the Organization of Bulk Solutions and Surface Complexes -- Per M. Claesson and Vance Bergeron
31. Effect of Polymeric Surfactants on the Behavior of Polycrystalline Materials with Special Reference to Ammonium Nitrate -- Arun Kumar Chattopadhyay
32. Surface Tension Measurements with Top-Loading Balances -- Brian Grady, Andrew R. Slagle, Linda Zhu, Edward E. Tucker, Sherril D. Christian, and John F. Scamehorn

INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This reference investigates the role and dynamics of surfactants and their solution properties in the formulation of paints, printing inks, paper coatings, pharmaceuticals, personal care products, cosmetics, liquid detergents, and lubricants — offering the latest research and developments in the understanding of surfactant behavior in solutions.

“Adsorption and Aggregation of Surfactants in Solution” describes methods to solve problems of reactant incompatibility. . . model and control the mechanisms of gas-liquid, liquid-liquid, and solid-liquid systems. . . improve emulsion stability against sedimentation, flocculation, Ostwald ripening, coalescence, and phase inversion. . . and examine the clouding phenomenon in surfactant solutions. . . and explores the relationship between surfactant chemical composition and aggregate shape. . . the properties, structures, and forces affecting suspensions, emulsions, and foams. . . the adsorption of surfactants and polymers at various interfaces. . . the effect of surface charge on micellar structure. . . the impact of additives on micellar size and shape. . . the phase behavior of microemulsions. . . and the reactions in micelles and microemulsions.

PREFACE:

This volume embodies, in part, the proceedings of the 13th International Symposium on Surfactants in Solution (SIS) held in Gainesville, Florida, June 11-16, 2000. The theme of this particular SIS was “Surfactant Science and Technology

for the New Millennium." The final technical program comprised 360 papers, including 96 poster presentations, which was a testimonial to the brisk research activity in the arena of surfactants in solution. In light of the legion of papers, to chronicle the total account of this event would have been impractical, so we decided to document only the plenary and invited presentations. The contributors were asked to cover their topics in a general manner; concomitantly, this book reflects many excellent reviews of a number of important ramifications of surfactants in solution.

Chapters 1-4 document the plenary lectures, including the written account of the special "Host Lecture" by one of us (DOS) and Professor Brij Moudgil. Chapters 5-32 embody the text of 28 invited presentations covering many aspects of surfactants in solution. Among the topics covered are: surfactant-stabilized particles; solid particles at liquid interfaces; nanocapsules; aggregation behavior of surfactants; micellar catalysis; vesicles and liposomes; the clouding phenomenon; viscoelasticity of micellar solutions; phase behavior of microemulsions; reactions in microemulsions; viscosity index improvers; foams, foam films, and monolayers; principles of emulsion formulation engineering; nano-emulsions; liposome gene delivery; polymeric surfactants; and combinatorial surface chemistry.

As surfactants play an important role in many and diverse technologies, ranging from high-tech (microelectronics) to low-tech (washing clothes) applications, an understanding of their behavior in solution is of paramount importance. Also, as we learn more about surfactants and devise new surfactant formulations, novel and exciting applications will emerge.

The present compendium of excellent overviews and research papers provides a bounty of up-to-date information on the many and varied aspects of surfactants in solution. It also offers a commentary on current research activity regarding the behavior of surfactants in solution. We hope that anyone involved or interested—centrally or tangentially—in surfactants will find this book useful. Further, we trust that both veteran researchers and those embarking on their maiden voyage in the wonderful world of surfactants will find this treatise valuable.

To put together a symposium of this magnitude and quality requires dedication and unflinching help from a battalion of people, and now it is our pleasure and duty to acknowledge those who helped in many and varied manners in this endeavor. First and foremost, we express our heartfelt and most sincere thanks to Professor Brij Moudgil, Director of the Engineering Research Center for Particle Science and Technology, University of Florida, for helping in more ways than one. He wore many different hats ? as cochairman, as troubleshooter, as local host — and he was always ready and willing to help with a smile. Next we are thankful to faculty members, postdoctoral associates, graduate students, and administrative staff of both the Center for Surface Science and Engineering and the Engineering Research Center for Particle Science and Technology, University of Florida.

We acknowledge the generous support of the following organizations: the Florida Institute of Phosphate Research, the National Science Foundation, and the University of Florida. Many individual industrial corporations helped us by providing generous financial support and we are grateful to them. We also thank the exhibitors of scientific instruments and books for their contribution and support.

We are grateful to the authors for their interest, enthusiasm, and contribution without which this book would not have seen the light of day. Last, we are appreciative of the efforts of the staff at Marcel Dekker, Inc. for giving this book a body form.

Title	Location	Edition / Series / Misc.
11 Aerosols: Science and Technology		<i>Edition:</i>
<i>Author:</i> Shepherd, Herman R. (editor)	<i>Dynix:</i> 43931	<i>Series:</i>
<i>Publish.:</i> Interscience Publishers, Inc.	<i>Call No.:</i> 541.345 Sh	
<i>- place:</i> New York, NY	<i>ISBN:</i> 1124046038	
<i>- date:</i> [1961]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1961
<i>Subject:</i> Aerosols		<i>Price:</i> \$25.00
<i>Desc:</i> xiv, 548 p., illus., 24 cm.		

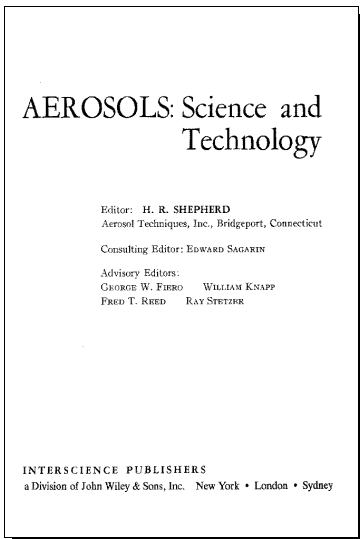


Table of Contents

1. Aerosols in Modern Industry [H. R. Shepherd]
2. Theory and Practice of Aerosols [Ralph C. Downing]
3. The Metal Container [Robert A. Foresman, Jr]
4. Glass and Plastic Containers [Ralph H. Thomas]
5. Valves [Walter C. Beard, Jr]
6. Propellants [Fred T. Reed]
7. Laboratory Techniques [Montfort A. Johnsen]
8. Factors in Formulation Design [Morris J. Root]
9. The Odor of Aerosol Products [Edward Sagarin]
10. Cosmetics: Fragrance and Personal Hygiene Products [Samuel Prussin]
11. Hair Cosmetics [Martin G. Brookins]
12. Pharmaceutical Products [Irving Porush]
13. Food Aerosols [W.E. Graham]
14. Pesticides [George W. Fiero]
15. Coating Compositions [F. A. Bower and F. S. Palmer]
16. Household and Industrial Specialties [N.J. Froot]

Appendix. Summary of Aerosol Shipping Regulations

Index

Subjects

220 . **Aerosols**

Reviews - Synopsis - Dust Jacket

PREFACE

Although the history of aerosol technology is traced back to the early years of the twentieth century, the industry that has developed from this technology is but a few years old. Historically speaking, it is an industry still in its infancy, yet one that has made scientific and commercial progress at an enviable pace. Literally millions, nay billions, of units of food products and pharmaceuticals, cosmetics and household specialties, insecticides and industrial aids are being manufactured and sold in the form of aerosols each year.

Just as a new industry is born out of the scientific developments that have made it possible, so the commercial growth takes place simultaneously with new advances in its technology. These advances in aerosols are particularly striking, covering as they do valves, propellants, chemical raw materials and new finished products, and countless other improvements and inventions on the part of scientific personnel. This progress is of course reflected in the scientific literature, scattered as it is in numerous patents, in reports before scientific and trade associations, in professional and even occasionally in laymen publications, in bulletins and other literature published by the companies active in the field.

As the industry grows and with it the scientific literature progresses, the need for a compendium that gathers this information into a single volume becomes more apparent. This is certainly the case with aerosols, for industrial and technological developments have been so rapid in the past twenty years that one can hardly keep pace with this rapid-changing and ever-improving field of activity.

As an individual who was privileged to be active in the early stages of aerosol development, I have observed this phenomenal growth; and as the technology developed, it became clear to me that a work summarizing these developments would be of lasting value. Thus, some twenty years after the first major modern aerosols, this work is able to be born.

The future of aerosols, both as science and as industry, is indubitably as promising as its recent past. And it is our hope that just as this book seeks to be the culmination of developments of the past twenty years, so it may serve to catalyze the developments of many years ahead.

Title	Location	Edition / Series / Misc.
755 Aerospace and Aircraft Coatings		<i>Edition:</i>
<i>Author:</i> Chattopadhyay, Ashok K. and Mark R. Zentner	<i>Dynix:</i> 55947-14	<i>Series:</i> Federation Series on Coatings
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Fe	<i>Technology:</i> No. FS14
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0934010080	
<i>- date:</i> ©1990	<i>Shelf</i> Reference	<i>Year:</i> 1990
<i>Subject:</i> Coatings -- Periodicals		<i>Price:</i> \$50.00
<i>Desc:</i> 32 p., illus., 28 cm.		

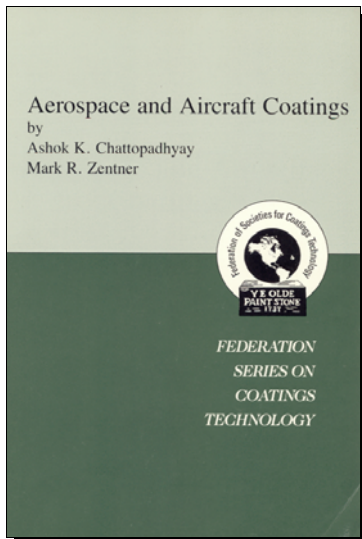


Table of Contents

- I. INTRODUCTION
- II. MARKET
- III. COATING TYPES AND REQUIREMENTS
- IV. SUBSTRATES, PREPARATION, AND CORROSION
 - A. Aluminum
 - B. Protective Methods and Surface Treatments for Aluminum
 - 1. Cladding
 - 2. Anodizing
 - 3. Chromate Conversion Coatings
 - 4. Nonchromate Pretreatments
 - C. Corrosion of Aluminum
 - 1. Intergranular Corrosion
 - 2. Exfoliation Corrosion
 - 3. Stress Corrosion Cracking
 - 4. Galvanic Corrosion
 - 5. Pitting
 - 6. Filiform Corrosion
 - D. Other Substrates
 - 1. Titanium
 - 2. Magnesium
 - 3. Composites
- V. CHEMISTRY AND FORMULATION OF COATINGS
 - A. Primers
 - 1. Wash Primers
 - 2. Epoxy Primers
 - 3. Low Infrared Reflectance Primers
 - 4. Fuel Tank Primers
 - 5. Sealants and Elastomeric Primers
 - 6. Electrodeposition Primers
 - B. Topcoats
 - 1. Polyurethane Topcoats
 - 2. Camouflage Topcoats
 - 3. Polymeric Bead Topcoats
 - 4. Rain Erosion Resistant Topcoats
 - 5. Heat Protective Topcoats
 - 6. Spacecraft Topcoats
 - 7. Radar Absorptive Topcoats
- VI. APPLICATION
 - A. Air Atomized Spray
 - B. Airless Spray
 - C. Air-Assisted Airless Spray
 - D. High Volume Low Pressure Air Spray
 - E. General Application Steps
- VII. TEST METHODS
 - A. Application Test Methods

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

1. Viscosity
2. Pot Life
3. Dry Time
- B. Appearance Test Methods
- C. Performance Test Methods
 1. Adhesion
 2. Fluid Resistance
 3. Flexibility
 4. Impact Resistance
 5. Corrosion Resistance
 6. Weather Resistance
 7. Rain Erosion Resistance

VIII. FUTURE TRENDS

- A. Environmental Regulations and Restrictions
 1. Water-Borne
 2. High Solids
 3. Exempt Organic Solvent
- B. Nonchromate Primers
- C. Coatings for Composites
- D. High Temperature Coatings

IX. ACKNOWLEDGMENTS

X. REFERENCES

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Aerospace coatings serve as protective and decorative finishes for all types of passenger and military aircraft and space vehicles. The annual U.S. market in 1988 for aerospace coatings was estimated to be \$60 million. Coatings for military and large commercial aircraft account for the majority of the market. Primers are used for the interior and exterior of aircraft to protect the substrate, prevent corrosion, and provide adhesion for topcoats. Primers for aircraft must meet several demanding criteria. These include:

- (1) Room temperature cure as ovens are generally not practical except for small parts.
- (2) Long-term corrosion resistance and excellent adhesion to a wide variety of substrates.
- (3) Sufficient crosslink density to resist aggressive hydraulic fluids, lubricating oils, fuels, and other fluids.
- (4) Sufficient flexibility to withstand low temperatures and flexing during pressurization changes.

Primers comprised of epoxy resins cross-linked with amines or polyamides are commonly used to meet the above criteria. Other resin systems are also occasionally used. Corrosion inhibitors such as strontium chromate are often used to promote corrosion resistance.

Topcoats protect the exterior of the aircraft and have other important functions. Specially pigmented low gloss topcoats help to prevent visual and infrared detection of military aircraft. High gloss topcoats for passenger aircraft minimize drag, reduce maintenance, decorate, and identify the aircraft. In general, topcoats must meet the following criteria:

- (1) Room temperature cure.
- (2) Excellent exterior durability.
- (3) Excellent adhesion to primers.
- (4) Sufficient crosslink density to resist softening by aircraft fluids.
- (5) Good flexibility and retention of flexibility after long-term exterior exposure.
- (6) Good appearance. High gloss topcoats must have a 60° gloss of over 90 and good distinctness of image. Low gloss topcoats must be smooth and have a uniform sheen

Two component urethanes are most often used in the U.S. for formulating topcoats. These consist of hydroxyl functional acrylic or polyester resins suitably pigmented and cross-linked with an aliphatic isocyanate prepolymer.

Aluminum is the most common substrate. Reasons for its widespread use include low density combined with good mechanical strength, corrosion resistance, and ease of fabrication. Composites, magnesium, titanium, high-strength steel, and other specialized substrates are also used.

Aerospace coatings are normally applied with hand-held spray equipment. Less labor intensive and more transfer efficient methods are generally not practical because of the large size of finished aircraft and the almost infinite variety of

parts that are coated prior to assembly.

Current efforts are focused on developing coatings that have the performance and application characteristics of conventional solids materials, but are lower in VOC (volatile organic compound). High solids, water-borne, and 1,1,1-trichloroethane (TCE)-containing coatings are three major approaches to developing acceptable systems. High solids and TCE topcoats are currently used to some extent in California and New York. Water-borne and TCE primers are used commercially in many areas of the U.S. with strict air pollution regulations.

The purpose of this monograph is to provide some background on the types of coatings that are used by the U.S. aircraft industry and identify key factors that must be considered in formulating these coatings. Typical substrates, pretreatments, application methods, test methods and future trends are also discussed. An extensive discussion on these items is beyond the scope of this monograph. The reader is encouraged to find additional information and details in the numerous references referred to for specific topics. In addition, the discussion by J. Levin on aircraft finishes used in the United Kingdom is a valuable reference.

Title	Location	Edition / Series / Misc.
1375 Aging and Chemical Resistance		<i>Edition:</i>
<i>Author:</i> Bonten, Christian and Robert Berlich	<i>Dynix:</i> 111729	<i>Series:</i> Plastics Pocket Power
<i>Publish.:</i> Hanser Publishers / Hanser Gardner Publications	<i>Call No.:</i> 620.1 Bo	
<i>- place:</i> Munich, Germany / Cincinnati, OH	<i>ISBN:</i> 1569903328	
<i>- date:</i> ©2001	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2001
<i>Subject:</i> Thermoplastics		<i>Price:</i> \$16.50
<i>Desc:</i> 128 p., illus., charts, 14 cm.		

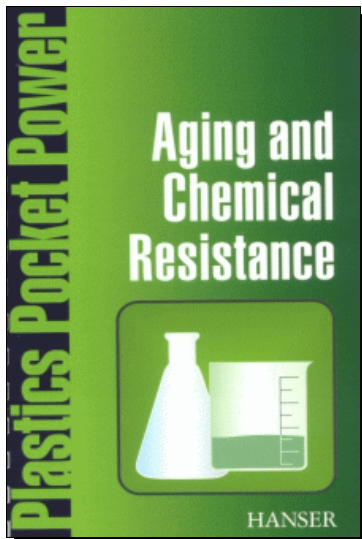


Table of Contents

- 1 Introduction
- 2 Product Lifetime
 - 2.1 Product Requirements
 - 2.2 Product Properties
 - 2.2.1. Function of a Product
 - 2.2.2 Appearance
- 3 Aging Mechanisms
 - 3.1 Mechanical Aging Mechanisms
 - 3.1.1 Static Load
 - 3.1.2 Dynamic Load
 - 3.1.3 Friction
 - 3.2 Physical Aging Mechanisms
 - 3.2.1 Temperature (Physical Influence)
 - 3.2.2 Medium (Physical Influence)
 - 3.3 Chemical Aging Mechanisms
 - 3.3.1 Temperature (Physical Influence)
 - 3.3.2 Oxygen
 - 3.3.3 Electromagnetic Radiation
 - 3.3.4 Medium (Physical Influence)
 - 3.3.5 Water
 - 3.4 Superimposed Influences
- 4 Estimated Lifetime of Plastic Products
 - 4.1 Aging Condition
 - 4.1.1 Structural Properties
 - 4.1.2 Mechanical Properties
 - 4.1.3 Product Properties
 - 4.2 Estimating Lifetime
 - 4.2.1 Arrhenius Formulation
 - 4.2.2 Determining the k-Factor
 - 4.2.3 Estimation
 - 4.2.4 Limitation
- 5 Tables of Chemical Resistance
 - 5.1 General Table
- 6 Further Reading

Subjects

313 .	Polymers
568 .	Elastomers
569 .	Thermoplastics

Reviews - Synopsis - Dust Jacket

PLASTICS POCKET POWER SERIES:

The source that puts answers to your daily questions right at your fingertips, saving time that can be put to productive use. Each volume contains 128 pages, is spiral bound, and measures only three by five inches to fit easily into your shirt pocket — making them perfect to carry with you throughout the day.

FROM THE DUST JACKET:

"Aging and Chemical Resistance" discusses different interacting aging mechanisms and their influence on plastic parts and their properties. It presents and explains the general mechanisms that affect the product's lifetime and performance.

The unique table of chemical resistance delivers information on how the major plastic materials hold up to chemical influences, from acetic acid to zinc chlorides.

"Target Audience: Practicing engineers, designers, technicians, students, managers, and any other professional who will benefit from concise, ready information on the aging and chemical resistance of polymer materials and components. Pocket-sized and condensed – yet clear and comprehensive!"

INTRODUCTION:

Aging and chemical resistance is probably one of the most underestimated parameters influencing the performance of polymer components. Hence, in the concept and design phase of plastic products, this point is often not taken into consideration. However, all plastic products suffer from aging, which means that the plastic material changes its properties with time. Chemical or physical processes, or a combination of the two, are the main causes of aging. For example, poor product design and material choice will lead to early failure.

Aging mechanisms are very complex. During material selection many designers only consider the mechanical properties and, on very few occasions, the chemical resistance of the polymers. The aim of this booklet is to enlighten the designer regarding different interacting aging mechanisms and their influences on plastic parts and their properties. The book presents and explains general mechanisms that influence the product's lifetime and performance. In addition, the book gives advice on how to estimate a product's lifetime with little effort. Presented at the end of the book is a large table of chemical resistances on some of the most widely used polymeric materials.

Title	Location	Edition / Series / Misc.
798 Alkyds & Polyesters		<i>Edition:</i> 2nd edition
<i>Author:</i> Deligny, P. and N. Tuck	<i>Dynix:</i> 99423	<i>Series:</i> Wiley/SITA Series in Surface Coatings
<i>Publish.:</i> John Wiley & Sons - SITA Technology Limited	<i>Call No.:</i> 660 De	Technology [Volume 2: Resins for Surface Coatings]
<i>- place:</i> Chichester, [West Sussex], UK	<i>ISBN:</i> 0471978957	
<i>- date:</i> ©2000	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2000
<i>Subject:</i> Gums and resins		<i>Price:</i> \$135.00
<i>Desc:</i> xi, 204 p., illus., 24 cm.		

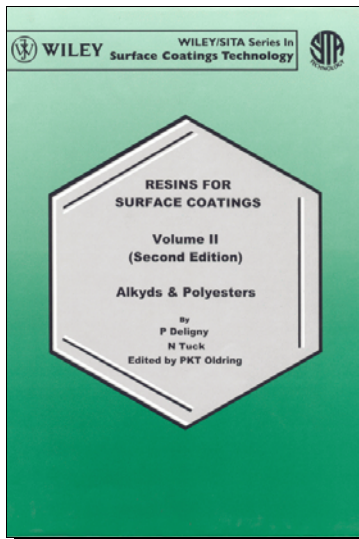


Table of Contents

Introduction

Chapter 1-Paint Technology — Some Important Factors:

Introduction

Principal Tests for Paints and Paint Films

Paint Application Methods

Effects of Pigments and Filler on Film Performance

Effect of Amount of Pigment on Paint Properties

Chapter 2-Alkyd Resins:

Introduction

Alkyds

Raw Materials for Alkyd Resins

Chemistry of Alkyd Resins

Manufacture of Alkyd Resins

Typical Alkyd Formulation and Suggested End Uses

Water-Dilutable Resins

Paint Formulation with Alkyd Resins

Chapter 3-Polyester Resins:

Introduction

Applications for Polyester Resins in Surface Coatings

Raw Materials

Examples of Resin Formulations

Index

Subjects

265 . Gums and resins

Reviews - Synopsis - Dust Jacket

The aim of this series of books is to give a general overview, including the necessary background information required to ensure that coating formulators understand the resins with which they work and the principles of crosslinking. This volume starts with a brief introduction to paint technology, then considers in detail two of the most important classes of resins — alkyds and polyesters.

It addresses a broad range of topics related to alkyd resins, including different types of alkyds, raw materials for alkyd resins, and their chemistry and manufacture. In addition, typical alkyd formulations and suggested end uses are presented. The section on polyesters discusses the applications of polyester resins in surface coatings, the raw materials used (including polyacids and polyols), and different crosslinking systems. Examples of typical polyester resin formulations, with their uses, are also given.

Target Audience: Anyone requiring a basic understanding of alkyd and polyester resins and their applications, including upper-level students, bench chemists and formulators, and technical sales personnel.

INTRODUCTION

Since the 1980's there have been many significant changes in surface coatings which have necessitated major changes in the resins used, even though many may still be referred to by generic names. Thus it is appropriate that a series of books written for graduates new to the resins and surface coatings industries, which became recognized globally as an overview of the technology of resins for surface coatings should be revised and issued in time for the new millennium to reflect the recent advances within these industries, whilst retaining the basic understanding for which this original series of books was renowned.

It is reported that there was a time when the surface coatings industry dealt with a relatively small number of materials and processes for making paints and varnishes. Indeed it is claimed that between 1736 and 1900, Watin's book on varnish formulations was reprinted 14 times with only minor modifications. This was claimed to be the industry standard. Compare that with today's situation. A book which lasts for 200 years to the turn of the century, followed by a series of books published in the 1940's which last 40 years to be superseded by a set which lasts 20 years before needing to undergo major revisions. It is not the writing which is inadequate, but it is a true reflection of the increasing rate of change of the surface coating industry.

Reference to some of the earlier text books written for the surface coatings industry reveal how far this industry has progressed over the last 50 or so years. Examination of a 5-volume set of books published by Wiley will be used to illustrate the changes and progress which have occurred and the approximate dates for introduction of what were considered new technologies over the last hundred or so years. Dates for new technology developments may be the subject of debate, because it was often different between North America and Europe and even within some parts of Europe. Dates are given to try and put this industry and its developments into perspective.

In the early 1900's resins used for surface coatings were based upon naturally occurring materials, albeit with some degree of modification or processing in some cases. Some of the early resins for surface coatings resembled alchemy, with secret ingredients and/or processing techniques being handed down from father to son (at the turn of the century, there were few female resin chemists).

In the opening paragraph of Volume III, Chapter 4 of Mattelio's book written in the early 1940's as reproduced here, the reader will note a lot of similarities to the above paragraph and some would question if the situation had changed. Rest assured it has changed beyond all recognition from the 1940's let alone prior to 1900!

"The art and skill of the old-time varnish maker have yielded slowly to more scientific control and to the developments of the chemists and engineers who have entered the coating-materials industries. The complexity of the organic molecules which they have had to deal with, however, has necessitated the continued use of methods which, although more exact and more scientifically grounded than those of their predecessors, nevertheless are still quite empirical".

"...it is well to remember that the molecular complexity of the drying oils and resins which are now (1943) in commercial use has provided a formidable variety of problems, which have long proved perplexing... Under such circumstances, one hardly need wonder that empiricism has so long prevailed or why there have been so many recorded differences of opinion and conflicting experimental observations".

To quote a recognized industry standard publication 55 years ago, "manufacture was in the hands of untrained men. Chemists or engineers, if there were any in this industry one hundred years ago (ca 1850), were a curiosity. The breadth of science had not yet touched it, and most manufacturers at that time saw no reason why it should."

When resins were processed, early controls consisted of mainly empirical factors, such as string length -- how long a piece of resin could be stretched before breaking. The objective was to process a resin as close to its 'gel point', without actually gelling. Much thermal processing was on gas fired open iron vessels, which resembled a pan on a gas cooking ring. Foam over and associated fires were common place. Indeed, folklore has it that some resin processing was controlled by processing until it "foamed over" or ignited.

Early surface coatings were limited to mainly air drying systems which film formed by either evaporation of solvent, to leave a dried film of the natural resin or oxidative crosslinking of any unsaturation present in vegetable oil based binders. French polish, based upon shellac is an example of the first type of coating, whilst alkyds or oleoresinous based systems are examples of the latter.

Alkyds and oleoresinous based coatings were originally used for many surface coating applications, where there was a performance demand, such as increased durability or resistance to water or alkali, compared to alternative systems. The unsaturation in the vegetable oil portion of the resin enabled crosslinking reactions, induced by oxygen in the air, to form resistant and durable films. Some decorative paints, based on linseed oil, for example, could easily yellow. Other systems (varnishes, rather than coatings), were often based upon solutions of hard, naturally occurring resins.

Today coatings can be divided into thermoplastic and thermoset. Thermoplastic systems primarily form film by evaporation of solvent. As a general rule, thermoplastic coatings are based on high molecular weight polymers. Solutions of high molecular weight thermoplastic resins are normally too high in viscosity for the desired applications solids, hence dispersions of thermoplastic resins are frequently used. A dispersion in water, maybe an acrylic latex or emulsion, typically used home decorative emulsion wall paints. Thermoplastic polymers may also be dispersed in organic solvents, although the solvent is not a solvent for the polymer. An example would be a dispersion of PVC in organic solvents, commonly known as an organosol. Organosol coatings are used for architectural coil for claddings and the internal coatings, mainly coil applied, of easy open ends for beer and beverage cans.

Another approach to obtaining a resistant film of high molecular weight, whilst having good application solids viscosity

relationships is to use thermoset systems. Here relatively low molecular weight resins with chemical functionality are used. Being of low molecular weight, they give relatively low viscosity at the required application solids. Film formulation is induced by either mixing the two components, as in a two pack epoxy, polyamine heavy duty coating, or by the application of heat to a one pack epoxy phenolic can coating. The stability of a thermoset coating, once mixed, is of great importance. Should chemical reaction be prematurely induced, then the viscosity could rapidly and easily increase to a point where the coating is unusable. For one pack coatings the unusable period is referred to as the shelf life, normally measured in months, whilst for two pack coatings it is the pot life, normally measured in hours. The latter is normally taken as the time for the coating to double in viscosity.

Protective coatings have been used for many years. They are no restricted to industrial coatings and include house paints, because the paint or varnish protected the wooden parts of the house. Varnishes are also covered by the term 'protective coatings', because varnishes, such as spar varnishes, protect the spars on sailing ships. .

Not only were the paints and varnishes derived from vegetable oils and natural materials, many of which have disappeared, but they were classified in a way which few resin and paint chemists would recognize today, particularly if they are relatively new to this industry.

Varnishes in the past were divided into two types, with many sub-divisions, as follows:

- Oleresinour varnishes
- Oil plus natural resins
- Oil plus synthetic resin
- Oil
- Oil modified glycerol phthalate
- Oil modified chlorinated rubber

Title	Location	Edition / Series / Misc.
12 Aluminum Paint and Powder		<i>Edition:</i> 3rd edition
<i>Author:</i> Edwards, Junius David, 1890- and Robert I. Wray	<i>Dynix:</i> 13003	<i>Series:</i>
<i>Publish.:</i> Reinhold Publishing Corporation	<i>Call No.:</i> 667.69 Ed	
<i>- place:</i> New York, NY	<i>ISBN:</i> 1124108874	
<i>- date:</i> ©1955	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1955
<i>Subject:</i> Aluminum		<i>Price:</i> \$25.00
<i>Desc:</i> viii, 219 p., illus., diagrams, 24 cm.		

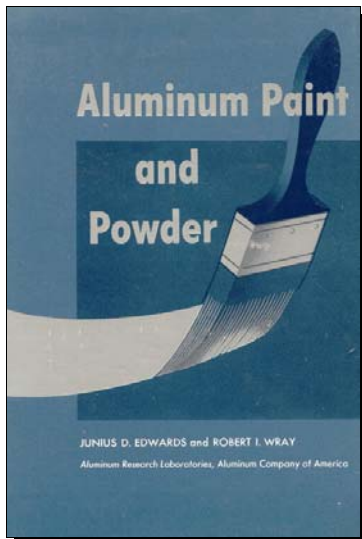


Table of Contents

PREFACE
 CHAPTER 1: MANUFACTURE OF ALUMINUM POWDER
 Manufacture of Bronze Powders
 Aluminum Powder from Stamp Mills
 Stamping Operation
 Polishing
 Aluminum Powder from Ball Mills
 Hametag Process
 Hall Process
 Granular Aluminum Products
 Atomized Aluminum
 Grained Aluminum
 Granulated Aluminum
 Production Data
 References
 CHAPTER 2: PROPERTIES AND TESTING OF ALUMINUM POWDER AND PASTE
 Microscopic Appearance
 Thickness of Flake
 Covering Area on Water
 Screening Tests
 Density and Apparent Density
 Leafing
 Color and Brilliance
 Composition
 Grades of Powder and Paste
 Thermal Conductivity
 Surface Area of Aluminum Powder
 Reactivity of Aluminum Powder
 Handling Aluminum Powder
 References
 CHAPTER 3: COMPOSITION OF ALUMINUM PAINT
 Varnish Vehicles
 Characteristics Desired in Varnish Vehicles
 Composition of Varnish Vehicles
 Lacquer Vehicles
 Other Special Synthetic Resin Vehicles
 Silicone Resin Vehicles
 Bituminous Vehicles
 Grade and Amount of Aluminum Pigment
 Mixing Aluminum Paint
 References
 CHAPTER 4: ALUMINUM PAINT IN THE PROTECTION OF METALS
 American Railway Association
 Ambridge Tank Test
 Aluminum Research Laboratories Tests
 Aluminum Paint for Bridges
 Importance of Film Thickness
 Pigment Concentration

Subjects

221 .	Aluminum
276 .	Paint

Selection of Vehicle
Comparison with Other Paints
Preparing Steel for Painting
Priming Coats for Steel
Painting Steel
Aluminum Paint for Hot Surfaces
Application of Aluminum Paint by Dipping
Painting Aluminum
Painting Aluminum Alloys for Marine Service
Painting Magnesium
Painting Zinc
Tinting Aluminum Paint
Polychrome Metallic Finishes
Baked Coatings
Polished Aluminum Finish
References

CHAPTER 5: SPECIAL PROPERTIES AND USES OF ALUMINUM PAINT

Reflectance
Reflectance for Ultraviolet Radiation
Reflection for Infrared Radiation
Painting Interiors
Visibility
Aluminum Paint on Oil Tanks
Aluminum Paint on Structures
Aluminum Paint on Furnaces
Aluminum Paint on Radiators
Paints for Transformers:
Thermal Conductivity of Aluminum Paint Films
Opacity
Prevention of Bleeding
Painting over Creosoted Wood
Electrical Conductivity
Water Vapor Transfer
Effect of Aging on Permeability
Resistance to Sulfur Compounds
References

CHAPTER 6: ALUMINUM PAINT IN THE PROTECTION OF WOOD

Structure of Wood
Moisture in Wood
Some Advantages of Aluminum Primer
Early Tests on Moisture-Excluding Coatings
Forest Products Laboratory Tests
Tests at Aluminum Research Laboratories
Primer Tests at Forest Products Laboratory
Behavior of Paint on Different Woods
Investigation of Paint Maintenance
New Kensington Test Fence
Vehicles for Use on Wood
Rack Painting of Lumber
Aluminum Paint in Service
Present Painting Practices
References

CHAPTER 7: ALUMINUM POWDER IN THE ARTS

Aluminum Powder in the Graphic Arts
Aluminum Printing Ink
Printing with Aluminum Ink
Wallpaper
Hot Stamping Process with Aluminum Powder
Metallized Paper
Electrosensitive Recording Paper
Aluminum-coated Textiles

Colored Aluminum Powder
 Aluminum Powder on Aircraft Fabrics
 Aluminum Powder in Rubber Compounding
 Metallics
 Aluminum Powder Metallurgy
 Aluminum Powder in Plastics
 Aluminum as a Reducing Agent
 Pyrotechnic Uses of Aluminum Powder
 Aluminum in Explosive Compositions
 Chemical Uses of Aluminum Powder
 Aerated Concrete
 Manufacture of Aerated Concrete
 Properties of Aerated Concrete
 Aluminum Powder as a Lubricant
 Caulking Compounds and Cements
 Mold Washes
 Therapeutic Uses for Aluminum Powder
 Aluminum Powder in Soap
 Miscellaneous Uses of Aluminum Powder
 References

INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

What is the present status of aluminum paint? When and why is it used? Why are its applications increasing? These and many similar questions are answered in this completely revised new edition by two of the country's foremost authorities on the manufacture and use of aluminum paint and powder.

The manufacture, properties and testing of aluminum powder are fully described, with special emphasis on the processes involved, color, brilliance, leafing, density, grading and handling. Full chapters discuss the composition, properties and uses of aluminum paint in a wide variety of industrial and other applications.

Of major interest is the large section on uses of aluminum powder in the arts. Here, the applications of aluminum in printing inks, metallized paper, coated textiles, powder metallurgy, plastics, rubber, explosives, concrete, lubricants, medicine and many other fields are thoroughly explored. Paint technologists, coatings engineers, chemists and metallurgists, will find the complete descriptions of properties and tests of immense value in determining the suitability of aluminum paste and powder for specific applications.

PREFACE

The publication of Aluminum Paint and Powder by Edwards and Wray marks the third appearance of this title. The first edition (1927), "Aluminum Bronze Powder and Aluminum Paint" by Edwards gave notice that this relative newcomer among paint pigments had a combination of useful characteristics that foretold a bright future.

By 1936, a second enlarged edition under a new title, "Aluminum Paint and Powder," was necessary to present the subject in an up-to-date aspect. Since that time, research and technologic progress in the industry have continued at such a pace that a third edition is required. In the preparation of this third edition, the senior author was joined, by his long-time associate in Aluminum Research Laboratories—Robert I. Wray, who is widely known through his many contributions to the literature on aluminum paint and powder.

It is the hope of the authors that users and prospective users of aluminum powder in its various forms will find in this book information needed for present applications and inspiration for the discovery of new uses.

Analysis of Paints and Related Materials: Current Techniques for Solving Coatings Problems

LASCT Holdings - maximum detail by Title

A

Title	Location	Edition / Series / Misc.
14 Analysis of Paints and Related Materials: Current Techniques for Solving Coatings Problems		<i>Edition:</i>
<i>Author:</i> Golton, William C. (editor)	<i>Dynix:</i> 49008	<i>Series:</i> STP (Special Technical Publication): No. 1119
<i>Publish.:</i> American Society for Testing and Materials	<i>Call No.:</i> 667.6 An	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0803114656	
<i>- date:</i> ©1992	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1992
<i>Subject:</i> Paint -- Analysis		<i>Price:</i> \$61.00
<i>Desc:</i> vii, 203 p., illus., 24 cm.		

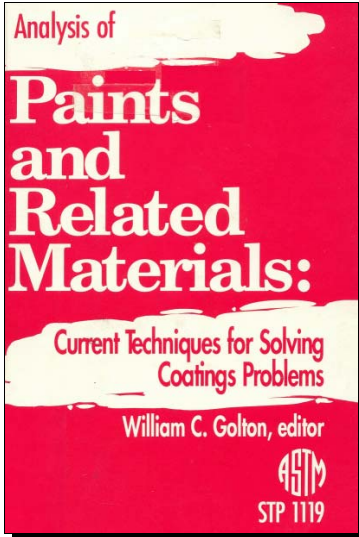


Table of Contents

Overview

ANALYSIS AND CHARACTERIZATION OF WHOLE PAINT

Modern Analytical Techniques for Coating and Coating Materials
ULRICH SCHERNAU, BERNHARD HUESER, AND KARIN WEBER
Mass Spectrometric Techniques for Coatings Characterization
WILLIAM J. SIMONSICK, JR.

ANALYSIS AND CHARACTERIZATION OF PAINT COMPONENTS

HPLC Analysis for Epoxy Coatings Resins
DAVID P. SHEIH AND DONALD E. BENTON
Application of Size Exclusion Chromatography to Polymers and Coatings
CHENG-YIH KUO AND THEODORE PROVIDER
X-Ray Techniques for Coatings Analysis
A. MONROE SNIDER, JR.
Practical Applications of Gas Chromatography in the Paint and Coatings Industry
FRANCIS X. YOUNG

CURE CHARACTERIZATION, DURABILITY, AND COATING PROBLEMS

Applications of FTIR to Paint Analysis
JACK H. HARTSHORN
Chemical Characterization of Cross-Linked Polyurethane Films
L. G. J. VAN DER VEN, G. D. B. VAN HOUWELINGEN, AND R. R. LAMPING
Principles and Applications of Photoelectron and Ion Spectroscopy for the Analysis of Polymer Surfaces
JOSEPH A. GARDELLA, JR.

PAINT FAILURE AND DEFECTS

FTIR Techniques for the Analysis of Coating Problems: Solid Sampling Accessories
ANNE M. MILLON AND JAMES M. JULIAN
Failure Analysis of Applied Coatings
KENNETH B. TATOR AND DWIGHT G. WELDON

Reviews - Synopsis - Dust Jacket

From Book News, Inc.

Papers from an ASTM sponsored symposium (Pittsburgh, Pennsylvania, May 1990) discuss the latest techniques and instruments used to analyze and characterize paints, coatings, and related materials. Participants are from paint research and development laboratories, architectural and engineering firms, and coating/paint testing labs. The eleven papers are divided into sections on analysis and characterization of whole paint and of paint components; cure characterization, durability and coating problems; and paint defects and failures. No index. Annotation copyright Book News, Inc. Portland, Or.

FOREWARD

This publication, "Analysis of Paints and Related Materials: Current Techniques for Solving Coatings Problems", contains papers presented at the symposium of the same name held in Pittsburgh, Pennsylvania on 13-14 May 1990. The symposium was sponsored by ASTM Committee D-1 on Paint and Related Materials and its Subcommittee D01.21 on Chemical Analysis of Paints and Paint Materials. The symposium chairman was William C. Golton, E. I. duPont de Nemours & Company, Inc., Philadelphia. He also served as editor of this publication.

Subjects

277 .	Paint -- Analysis
360 .	Coatings technology

OVERVIEW

The purpose of the two-day symposium was to present and discuss the latest techniques and instruments used to analyze and characterize paints, coatings, and related materials. The symposium was sponsored by ASTM standards-writing Committee D-1 on Paint and Related Coatings and Materials and its Subcommittee DO1.21 on Chemical Analysis of Paints and Paint Materials.

This book is divided into four sections that reflect the order of papers given at the symposium. Section I is Analysis and Characterization of Whole Paint. Two papers were presented in this category: (1) "Modern Analytical Techniques for Coating and Coating Materials," by Ulrich Schernau, Bernhard Hueser, and Karin Weber; and (2) "Mass Spectrometric Techniques for Coatings Characterization," by William J. Simonsick, Jr.

Section II is Analysis and Characterization of Paint Components. Four papers were presented in this category: (1) "HPLC Analysis for Epoxy Coatings Resins," by David P. Sheih and Donald E. Benton; (2) "Application of Size Exclusion Chromatography to Polymers and Coatings," by Cheng-Yih Kuo and Theodore Provder; (3) "X-Ray Techniques for Coatings Analysis," by A. Monroe Snider, Jr.; and (4) "Practical Applications of Gas Chromatography in the Paint and Coatings Industry," by Francis X. Young.

Section III is Cure Characterization, Durability, and Coating Problems. Three papers were presented in this category: (1) "Applications of FTIR to Paint Analysis," by Jack H. Hartshorn; (2) "Chemical Characterization of Cross-Linked Polyurethane Films," by L. G. J. van der Ven, G. D. B. Van Houwelingen, and R. R. Lamping; and (3) "Principles and Applications of Photoelectron and Ion Spectroscopy for the Analysis of Polymer Surfaces," by Joseph A. Gardella, Jr.

Section IV is Paint Failure and Defects. Two papers were presented in this category: (1) "FTIR Techniques for the Analysis of Coating Problems: Solid Sampling Accessories," by Anne M. Millon and James M. Julian; and (2) "Failure Analysis of Applied Coatings," by Kenneth B. Tator and Dwight G. Weldon.

Title	Location	Edition / Series / Misc.
15 Analytical Chemistry of Synthetic Colorants		<i>Edition:</i> 1st edition
<i>Author:</i> Peters, A. T. and H. S. Freeman (editors)	<i>Dynix:</i> 50475	<i>Series:</i> Advances in Color Chemistry Series:
<i>Publish.:</i> Blackie Academic & Professional	<i>Call No.:</i> 547.86 An	Vol. 2.
<i>- place:</i> London, UK / New York, NY	<i>ISBN:</i> 0751402087	
<i>- date:</i> ©1995	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1995
<i>Subject:</i> Dyes and dyeing -- Chemistry		<i>Price:</i> \$75.00
<i>Desc:</i> xi, 212 p., illus., 24 cm.		

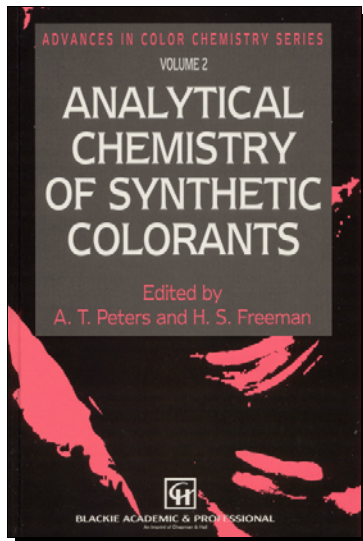


Table of Contents

Preface

1. X-ray powder diffraction of synthetic organic colourants --- A. Whitaker
2. Solid state NMR spectroscopy of synthetic dyes --- A. Lycka, J. Jirman and Jarislav Straka
3. Near IR spectroscopy --- M. Matsouka
4. Mass spectrometry --- Richard B. van Breemen
5. Electrospin resonance spectroscopy --- H.S. Freeman and R.D. Bereman
6. Microspectrophotometry --- H.D. Weigman, Y.K. Kamath and S.B. Ruetsch
7. Emission spectroscopy --- Kenneth P. Ghiggino
8. Identification and analysis of diarylide pigments by spectroscopic and chemical methods --- C. Nicolaou and M. da Rocha.

Index

Reviews - Synopsis - Dust Jacket

The second in a series on colour chemistry, this volume covers the techniques presently in use for identifying and analyzing synthetic colourants. The approach is practical and particular attention is paid to recent developments. This book should be of interest to analytical chemists and colour chemists working in paints, textiles and dyes research in industry and academia.

PREFACE:

More than one and a half decades have passed since the last book was published describing developments in the analytical chemistry of synthetic colorants. In the intervening period, the scope and technical capabilities of instrumentation for analysing dyes and pigments has significantly expanded. It is now possible to rapidly resolve a number of problems whose solutions were previously either unattainable or very difficult to achieve. For instance, the unambiguous assignment of all the signals in the proton NMR spectrum of a trisazo direct dye, and the confirmation of the molecular weight of involatile, and, in particular, sulphonated dyes, without derivatisation, are now routine analytical techniques in many laboratories today. In addition, it is now possible to record the NMR spectrum of a dye molecule on less than 1 mg of material, and we are no longer limited to solution spectra, since solid samples can now be routinely analysed in NMR experiments.

Whilst not attempting to be all encompassing, this volume is intended to bridge the gap between what was covered in the earlier work edited by Professor Venkataraman and the developments which have since ensued in some key areas. It provides important updates in X-ray crystallography, proton NMR, IR spectroscopy and mass spectrometry, and additionally covers topics such as ESR, microspectrophotometry and emission spectroscopy.

The X-ray chapter provides a critical analysis of reports of new crystal forms of various organic pigments and summarises some of the hazards connected with the characterisation of a proposed new form. The NMR chapter contains a review of the fundamental principles of solid state NMR and some examples of the types of problems which can be solved using this technique. The IR chapter focuses on the use of MO techniques to predict the NIR spectrum of a dye molecule not yet synthesised, and includes specific examples of dyes useful for laser printers, optical recording media, and other non-textile areas. The chapters on ESR and microspectrophotometry cover, amongst other matters, the utility of these analytical tools in characterising the diffusion, distribution, and molecular environment of dyes in a polymer matrix. A further chapter illustrates the application of emission spectroscopy to the evaluation of optical brightening agents.

The editors noted in their Preface to the first volume of this series that colour chemistry was very much alive, and expanding into realms totally unenvisaged in the not too distant past. This new volume exemplifies the concurrent developments which have taken place in analytical techniques and structural characterisation. It contains a blend of fundamental concepts and practical applications germane to the topics covered, thus rendering it of interest to scientists involved in teaching and research areas and to practising analytical chemists interested in organic colorants.

Subjects

251 .	Dyes and dyeing -- Chemistry
386 .	Nuclear magnetic resonance spectroscopy

Title	Location	Edition / Series / Misc.
771 Annual Book of ASTM Standards: Section 06 -- Paints, Related Coatings and Aromatics (Volumes 06 <i>Author:</i> American Society for Testing and Materials <i>Publish.:</i> American Society for Testing and Materials <i>- place:</i> Philadelphia, PA <i>- date:</i> ©2003 <i>Subject:</i> ASTM <i>Desc:</i> v. illus., 28 cm.	<i>Dynix:</i> 57279 <i>Call No.:</i> 620.1 Am (Sect. 0) <i>ISBN:</i> 0803135424 <i>Shelf</i> Reference	<i>Edition:</i> 1993, 1994, 1998, 2001 & 2003 <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$50.00

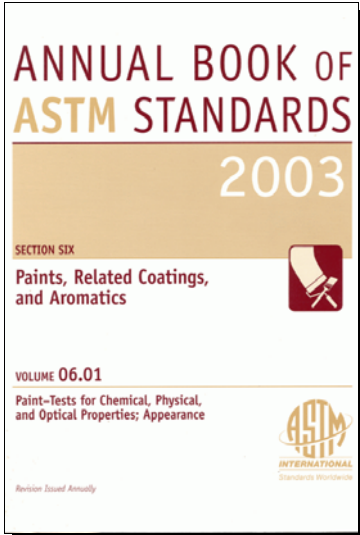


Table of Contents

Reviews - Synopsis - Dust Jacket

This volume features the latest test methods for the chemical, physical, and optical properties of paints.

Includes tests pertaining to the chemical analysis of paints and paint materials, including determination of volatiles, nonvolatiles, pigments, water content, and other constituents.

Test methods detail how to measure the physical properties of applied paint films such as film thickness and adherence, physical strength, resistance to chemicals, and environmental factors.

Standards on the physical and optical properties of liquid paints also appear.

Under the heading of appearance, tests and practices that pertain to the measurement of color and appearance of materials, including several newly developed standards for photoluminescent safety materials used for supplemental markings of escape routes, emergency equipment, and other potentially dangerous objects.

FORWARD:

Organized in 1898, ASTM International has grown into one of the largest voluntary standards development systems in the world. ASTM International is a not-for-profit organization which provides a forum for producers, users, ultimate consumers, and those having a general interest (representatives of government and academia) to meet on common ground and write standards for materials, products, systems, and services.

From the work of 132 standards-writing committees, ASTM International publishes more than 11,300 standards each year. These standards and other related technical information are accepted and used throughout the world.

ASTM International Headquarters has no technical research or testing facilities; such work is done voluntarily by over 30,000 technically qualified ASTM members located throughout the world. Membership in the Society is open to all concerned with the fields in which ASTM is active. A membership application may be obtained from Member and Committee Services, ASTM International, 100 Barr Harbor Drive, P0 Box C700, West Conshohocken, PA 19428-2959; tel. 610-832-9694 or from the ASTM website, www.astm.org under Membership.

2003 Annual Book of ASTM Standards

The 2003 Annual Book of ASTM Standards consists of 77 volumes, divided among 16 sections, of which this volume is one. It contains approved ASTM standards, provisional standards, and related material. These terms are defined as follows in the Regulations Governing ASTM Technical Committees.

Categories:

standard, n—as used in ASTM, a document that has been developed and established within the consensus principles of the Society and that meets the approval requirements of ASTM procedures and regulations.

standard, adj—as used in ASTM, a descriptive used in titles of test methods, specifications, and other documents to indicate consensus approval in accordance with ASTM procedures and regulations.

Types:

The various types of ASTM documents are to provide a flexibility of form, communication, and usage for both the technical committees and the myriad users of ASTM documents. The type of ASTM document that is developed and titled is based on the technical content and intended use, not on the degree of consensus achieved. ASTM standards can be of the following forms and types:

classification—a systematic arrangement or division of materials, products, systems, or services into groups based on

Subjects

224 . | ASTM

similar characteristics such as origin, composition, properties, or use.

guide—a compendium of information or series of options that does not recommend a specific course of action.
Discussion—A guide increases the awareness of information and approaches in a given subject area.

practice—a definitive set of instructions for performing one or more specific operations or functions that does not produce a test result. Discussion—Examples of practices include, but are not limited to: application, assessment, cleaning, collection, decontamination, inspection, installation, preparation, sampling, screening, and training.

specification—an explicit set of requirements to be satisfied by a material, product, system, or service.
Discussion—Examples of specifications include, but are not limited to, requirements for: physical, mechanical, or chemical properties, and safety, quality, or performance criteria. A specification identifies the test methods for determining whether each of the requirements is satisfied.

terminology—a document comprising definitions of terms; explanations of symbols, abbreviations, or acronyms.
test method—a definitive procedure that produces a test result. Discussion—Examples of test methods include, but are not limited to: identification, measurement, and evaluation of one or more qualities, characteristics, or properties. A precision and bias statement shall be reported at the end of a test method. (See and Style for ASTM Standards, Section A21, Precision and Bias.)

A new edition of the Book of Standards is published annually because of additions of new standards and significant revisions to existing standards. Approximately 30 % of each volume is new or revised. Each volume contains all actions approved by the Society at least six months before the publication date. New and revised standards approved by the Society between the annual editions of any given volume are made available as separate copies. Users are cautioned to follow the most current issue of a standard except when a specific edition of a standard is cited, for example, as in a contract.

Development and Use of ASTM Standards

ASTM International believes that technically competent standards result when a full consensus of all concerned parties is achieved and rigorous due process procedures are followed. This philosophy and standards development system ensure technically competent standards having the highest credibility when critically examined and used as the basis for commercial, legal, or regulatory actions.

ASTM standards are developed voluntarily and used voluntarily. Standards become legally binding only when a government body references them in regulations, or when they are cited in a contract. Any item that is produced and marked as conforming to an ASTM standard must meet all applicable requirements of that standard.

ASTM standards are used by thousands of individuals, companies, and agencies. Purchasers and sellers incorporate standards into contracts; scientists and engineers use them in laboratories; architects and designers use them in plans; government agencies reference them in codes, regulations, and laws; and many others refer to standards for guidance.

Consideration of Comments on ASTM Standards

An ASTM standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of any standard or for the development of new standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, P0 Box C700, West Conshohocken, PA 19428-2959.

Using the Annual Book of ASTM Standards

The standards are assembled in each volume in alphanumeric sequence of their ASTM designation numbers. Volumes 03.06, 04.09, 05.05, 05.06, and 06.03 are assembled first by committee, then in alphanumeric sequence. Each volume has a table of contents, listing the standards in alphanumeric sequence by ASTM designation; and a list by subjects, categorizing the standards according to subject. A subject index of the standards in each volume appears at the back of each volume.

Availability of Individual Standards

Each ASTM standard is available as a separate copy from ASTM International. Standards can be ordered from the ASTM website at www.astm.org. Standards can also be ordered from Customer Services at 610-832-9585, Monday through Friday, 8:30 AM to 4:30 PM Eastern Standard Time.

Caveat Statements and Policies in Standards

ASTM caveat statements on Safety Hazards and Fire Hazards are required to appear in standards where appropriate. They are located in the scope section of applicable standards. The caveats on General Statement of ASTM Policy and

Patents are contained in all standards and located at the end of each standard. For more information on the caveats see Section F2 of the Form and Style for ASTM Standards.

Title	Location	Edition / Series / Misc.
17 Antifouling Marine Coatings Author: Williams, Alec Publish.: Noyes Data Corporation - place: Park Ridge, NJ - date: ©1973 Subject: Ships -- Corrosion Desc: ix, 271 p., illus., 25 cm.	Dynix: 34101 Call No.: 667.9 Wi ISBN: 0815504640 Shelf Adult Non-Fiction	Edition: Series: Coatings Technology Review: No. 1 Year: 1973 Price: \$25.00

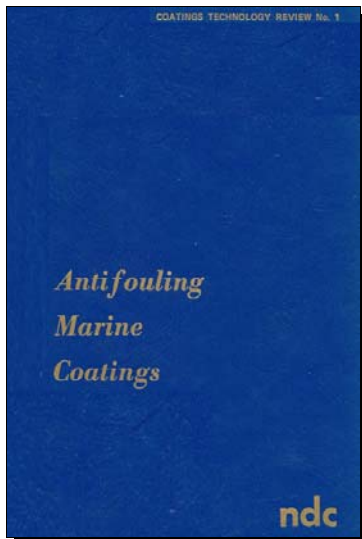


Table of Contents

INTRODUCTION

COPPER COMPOUNDS
 - Copper Oxide-Based Coatings
 Rosin and Blown Fish Oil
 Rosin and Wax
 Phenol-Formaldehyde Hot Melts
 Thermosetting Resin
 Gel Coat
 Elastomeric Coating for Sonar Domes
 Dichlorodiphenyldichloroethane
 - Other Copper Compounds
 Salts of Lower Alkyl Mercaptans
 Oil-Soluble Organocopper Compounds
 Copper Naphthenate
 Cupric Hydroxide
 Metallic Copper and Zinc Oxide
 Electrolytic Copper and Chlorinated Coal Tar
 - Copper-Containing Pigments
 Silica Particles Coated with Copper Oxide or Borate
 Stable Cupreous Pigment
 Borate Glass

Subjects

328 .	Ships -- Corrosion
413 .	Ships -- Fouling

MERCURY AND ARSENIC COMPOUNDS
 - Mercury
 Phenyl Mercury Maleates
 Phenyl Mercury Borate
 Aryl Polymercury Naphthenates
 Aromatic Mercury Compounds
 Propyl Mercuric Chloride
 Salts of Perthiocyanic Acid
 Water-Soluble Emulsifier
 Mobile Distributing Units
 - Arsenic
 Cyano- and Thio-Substituted Phenarsazines
 Triphenarsazine Chloride
 5-Hydro-10- Fluorophenarsazine

TIN AND ANTIMONY COMPOUNDS
 - Tin
 Bis(Tri-n-Butyltin) Sulfide
 Tributyltin Esters
 Bis(Tributyltin) Adipate
 Triphenyltin Chloride
 Salts of 2,5-Dimercapto-1,3,4-Thiadiazole
 Trihydrocarbyltin Salts
 Alkyd-Bis(Organotin) Oxide Reaction Products
 Multiple Elastomer Coatings
 2-Amino-3-Chloro-1,4-Naphthoquinone with Tin and Copper
 Chlorinated Methanobenzene
 Wetting Agents for Liquid Toxin Formulations

Emission Jets Along Ship's Hull
- Antimony
Triphenyl Antimony
Barium Carbonate and Antimony Oxide

OTHER ORGANOMETALLIC COMPOUNDS

- Bismuth
- Heavy Metal Salts of Terephthalic Acid
- Salts of Glutamic and Aspartic Acid
- 2-Thiazolyl Benzimidazole Complexes
- Triphenylborane-Amine Complexes

NONMETALLIC COMPOSITIONS

- Sulfur and Nitrogen Compounds
Acid Salts of Isoperthiocyanic Acid
Diiodomethyl Sulfones
2-(N,N-Dimethylthiocarbamoylthio)-5-Nitrothiazol
Dithiooxamide
Pentacyclic Amides
Thiotetrahydrophthalimide Compositions
Chlorophenyl Methylcarbamates
Biacetyl Dihydrazone
1-Bromo-3-Nitrobenzene
1,2,3-Trichloro-4,6-Dinitrobenzene
Mytilotoxin
- Organic Coatings
Polytetrafluoroethylene Sheeting
Coal Tar-Epoxy Resin Coating
Cut-Back Coal Digestion and Tar Pitch
Phenolics, Coal Tar Bases and Unsaturated Aldehydes
Phenolic-Aldehyde Condensation Products
Hydrophilic Acrylic Resins
- Other Formulations
Fluoroacetates
Fungicidal Water-Repellent Concentrate

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWARD

The detailed, descriptive information in this book is based on U.S. patents describing the chemical and technological development of antifouling marine coatings.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, commercially oriented review of antifouling marine coatings, together with the underlying chemical and biochemical principles.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure."

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open

up profitable areas of re search and development. One should have to go no further than this condensed information to establish a sound background before launching into research in this field.

Advanced composition and production techniques developed by Noyes Data Corporation are employed to bring these durably bound books to you in a minimum of time. The shortest possible production time is necessary to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, printing, binding and shipping methods can render a technical or scientific book quite obsolete before the potential user gets to see it.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to information contained in this book.

INTRODUCTION

One of the earliest needs for performance—oriented coatings was in the marine environment. Very early formulations were de signed around known toxins such as copper and mercury com pounds and the patent literature of the 19th century is replete with hundreds of formulations using these materials in creosote and natural drying oil formulations.

The two areas on a ship requiring specialty coatings are, of course, the bottom and the boot-topping area. The boot-topping area intermittently exposed to both air and water, represents a particularly difficult surface to protect from the elements.

For ship bottoms, anti fouling compounds based on copper, mercury and tin are commonly incorporated into somewhat water- sensitive binders to afford gradual breakdown of the film to al low for a sustained release of the poison.

This required self—erosion property necessitates frequent re painting of the ship bottom, depending on location and severity of exposure conditions. In general, boot—topping paints are designed to provide a high level of resistance to both salt water and weather. Typically phenolic resin—tung oil and vinyl resin combinations are used.

This book contains many patented processes which provide high performance antifouling coatings based on copper, mercury, tin and arsenic compounds, as well as a number of organic coating compositions. In all, several hundred different formulations are provided, along with references to the early process literature which contains many of the thoughts, concepts and basic information which led to today's commercial coatings.

Title	Location	Edition / Series / Misc.
781 Application of Paints and Coatings		<i>Edition:</i>
<i>Author:</i> Levinson, Sidney B.	<i>Dynix:</i> 55947-09	<i>Series:</i> Federation Series on Coatings
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Fe	<i>Technology:</i> No. FS9
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0934010099	
<i>- date:</i> ©1988	<i>Shelf</i> Reference	<i>Year:</i> 1988
<i>Subject:</i> Coatings -- Periodicals		<i>Price:</i> \$50.00
<i>Desc:</i> 49 p., illus., 28 cm.		

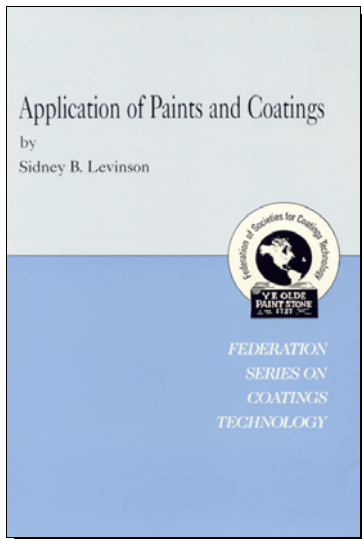


Table of Contents

- I. INTRODUCTION
 - A. Importance, Advantages, and Limitations of Proper Application
 - B. Paint Preparation
- II. APPLICATION METHODS
 - A. Brush Application
 - B. Pad Application
 - C. Roller Application
 - D. Paint Mitts
- III. SPRAY APPLICATION
 - A. Air (Conventional) Spray
 - B. Airless Spray
 - C. Electrostatic Spray
 - D. Proportioning Spray Equipment
 - E. Heated Spray
 - F. Miscellaneous Spray Equipment
- IV. ROBOTICS
- V. DIP COATING
 - A. Conventional Dip Coating
 - B. Flow Coating
 - C. Barrel Coating
- VI. ELECTRODEPOSITION
 - A. Autodeposition
- VII. ROLL COATING
 - A. Direct Roll Coating
 - B. Reverse Roll (Coil) Coating
- VIII. CURTAIN COATING
- IX. POWDER COATING
 - A. Fluid Bed Coating
 - B. Electrostatic Fluid Bed (Cloud Chamber)
 - C. Electrostatic Spray
- X. ECOLOGY AND SAFETY
 - A. Types of Hazards
 - B. Sources of Hazards
 - C. Improving the Environment
 - D. Safety Measures
 - E. General Precautions
- XI. REFERENCES
 - A. Supplier Literature
 - B. Articles, Talks, Manuals

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

A paint or coating, as supplied, is not a finished product. It serves its function only when applied to the substrate. Therefore, proper application is a critical part of the paint system.

The proper use of the application tool, or equipment used to apply the paint or coating, can have a definite effect on the time required, the appearance of the finished job, the performance of the applied product, and the total cost of the job. For example, in on-site painting, the estimate for the total cost may include 30%-60% for application vs. only 15%-20% for the cost of the paint used.

Furthermore, application can have a marked effect on the performance of the applied coating, especially when it is subsequently exposed to adverse conditions. High performance, heavy duty paint systems are particularly sensitive to misapplication and may fail drastically. Therefore, it is imperative that painting instructions be followed explicitly, especially when applying more expensive and sensitive high performance coatings.

The proper choice of the painting tool or equipment and its proper use can have the following beneficial effects:

1. Rapid coverage of the object to be painted.
2. Optimum coverage per coat, thus eliminating the necessity of applying more coats than specified in order to obtain the desired opacity.
3. Optimum wetting of the substrate by the applied coating, thus assuring optimum adhesion.
4. Optimum uniformity of the applied paint film, thus resulting in optimum leveling, gloss (if desired), and performance.

Proper paint application can be adversely affected by conditions — some of which can be controlled or avoided by knowledgeable applicators. The surroundings may limit the method of application. For example, spray application may have to be avoided because of potential damage to nearby objects, e.g., cars in a parking lot or traffic on bridges. Weather conditions may have a considerable effect on proper application. Temperatures of the paint, substrate, and environment — either below about 45°F or above 95°F — may cause problems. Rainy or windy weather can also create serious problems when painting outdoors.

The paint being applied may also have an effect on application. This is especially true of two component coatings, with a "short" pot life, which require special equipment. The skill of the painter varies in importance. Not much skill is required to apply paints by roller, but spray application definitely requires a skilled operator.

Title	Location	Edition / Series / Misc.
799 Applications of Synthetic Resin Latices [Vol. 1: Fundamental Chemistry of Latices and Applications in		Edition:
Author: Warson, Henry and C.A. Finch	Dynix: 99428-1	Series: Applications of Synthetic Resin Latices
Publish.: John Wiley & Sons	Call No.: 668.374 Wa v.01	
- place: Chichester, [West Sussex], UK	ISBN: 0471952680	
- date: ©2001	Shelf Adult Non-Fiction	Year: 2001
Subject: Gums and resins, synthetic		Price: \$158.50
Desc: xxix, 700 p., illus., 24 cm.		

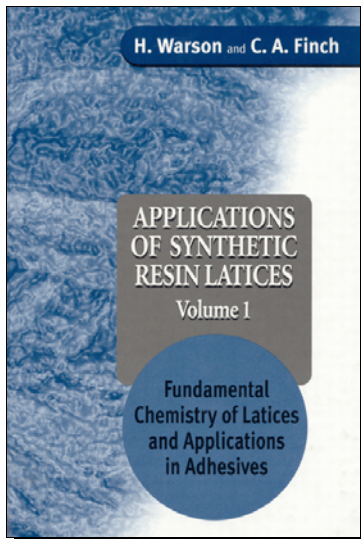


Table of Contents

Preface
Applications — A Note on References
Patent Validity
Introduction

Fundamentals of Polymer Chemistry
1 The Concept of a Polymer
1.1 Historical introduction
1.2 Definitions
2 Addition Polymerisation
2.1 Free radical polymerisation
2.1.1 Retardation and inhibition
2.1.2 Free radical initiation
2.1.3 Redox polymerisation
2.2 Copolymerisation
2.2.1 The Q, e scheme
3 Chain Branching; Block and Graft Copolymers
3.1 Chain branching
3.2 Graft copolymers
4 Polymer Structure and Properties
4.1 Polymer structure
4.2 Molecular weight effects
4.3 Transition points
5 Technology of Polymerisation
5.1 Bulk polymerisation
5.2 Solution polymerisation
5.3 Suspension polymerisation
6 The Principal Monomers and Their Polymer
6.1 Hydrocarbons
6.2 Vinyl esters
6.3 Chlorinated monomers
6.4 Acrylics
6.4.1 Acrylic and methacrylic acids
6.4.2 Individual acrylic and methacrylic esters
6.4.3 Acrylics based on the amide group
6.4.4 Cationic acrylic monomers
6.4.5 Acrylonitrile
6.5 Polymerisable acids and anhydrides
6.6 Self-emulsifying monomers
6.7 Esters for copolymerisation
6.8 Monomers with several double bonds
6.9 Allyl derivatives
6.10 Vinyl ethers
6.11 Miscellaneous monomers containing nitrogen
6.12 Toxicity and handling
7 Physical Properties of Monomers
8 Appendix
References

Emulsions and Colloids
1 Introduction to Colloid Chemistry

Subjects

259 .	Emulsions
313 .	Polymers
376 .	Gums and resins, Synthetic

- 1.1 Historical
- 1.2 Emulsions
 - 1.2.1 Properties of surfaces
 - 1.2.2 Micelles, surfactants
 - 1.2.3 Emulsion particles, emulsifier efficiency
 - 1.2.4 Emulsion viscosity
- 2 Surfactants and Stabilisers
- 3 A Survey of Technical Surfactants
 - 3.1 Anionic types—fatty acid soaps and allied salts
 - 3.2 Sulfates and sulfonates
 - 3.2.1 Sulfated fatty alcohols
 - 3.2.2 Sulfates of ethoxylated alcohols
 - 3.2.3 Sulfated natural oils and esters
 - 3.2.4 Sulfonates—general
 - 3.2.5 Sulfonated aromatic and condensed ring compounds
 - 3.2.6 Aliphatic chain sulfonates
 - 3.2.7 The sulfosuccinates
 - 3.3 Hydrotropes
 - 3.4 Phosphates
 - 3.5 Fluorochemical emulsifiers
 - 3.6 Non-ionic types
 - 3.6.1 Biodegradable emulsifiers
 - 3.7 Cationic types
 - 3.8 Amphoteric emulsifiers
 - 3.9 Polymerisable surfactants
 - 3.10 Dispersing agents
 - 3.11 Solid dispersants
- 4 Colloids and High Molecular Weight Stabilisers
 - 4.1 Starch and dextrin
 - 4.2 Cellulose ethers
 - 4.2.1 Properties of technical cellulose derivatives
 - 4.2.2 Methyl cellulose
 - 4.2.3 Hydroxyethyl cellulose
 - 4.2.4 Hydroxypropyl cellulose
 - 4.2.5 Carboxymethyl cellulose
 - 4.2.6 Other cellulose derivatives
 - 4.3 Other semi-synthetic colloids
 - 4.4 Polyvinyl alcohol
 - 4.4.1 Properties of polyvinyl alcohol as emulsifier
 - 4.4.2 Chemically modified polyvinyl alcohols
 - 4.5 Polyelectrolytes
 - 4.6 Other synthetic water-soluble polymers
 - 4.7 Associative thickeners
- References
- Supplementary references for Section 3.9

- Emulsion Polymerisation
 - 1 General Principles
 - 1.1 Chemistry and fundamentals
 - 1.1.1 Stabilisers
 - 1.1.2 Free radical initiators
 - 1.3 Water-soluble monomers
 - 2 Technology, Laboratory and Large Scale
 - 2.1 Monomers
 - 2.1.1 Liquid monomers
 - 2.1.2 Volatile monomers
 - 2.2 Pilot plants and large-scale reactors
 - 2.2.1 On-line control of polymerisation
 - 2.3 Special techniques; continuous processes
 - 2.3.1 The cascade process
 - 2.3.2 The loop reactor
 - 2.3.3 Special techniques; procedural variations
 - 2.4 Varied polymerisation techniques
 - 2.4.1 Seed latices
 - 2.4.2 Monodisperse latices

- 2.4.3 Core—shell latices
- 2.4.4 Emulsifier-free latices
- 2.4.5 Mini-emulsions
- 2.4.6 Graft copolymerisation
- 3 Vinyl Acetate and Copolymer Latices
- 3.1 Historical development of latices
- 3.2 Polyvinyl acetate and related copolymers
- 3.2.1 Vinyl acetate, polyvinyl alcohol stabilised, delayed addition of monomer [174]
- 3.2.2 Vinyl acetate, redox method with heel
- 3.2.3 Vinyl acetate and copolymers, mixed surfactant and colloid stabilisers; delayed addition of monomer
- 3.2.4 Vinyl acetate polymers and copolymers, modified starch emulsifiers
- 3.2.5 Vinyl acetate; ethylene oxide—propylene oxide block copolymer emulsifier
- 3.2.6 Vinyl acetate, positively charged polymers
- 3.3 Copolymers of vinyl acetate
- 3.3.1 Vinyl acetate—ethyl acrylate copolymer, pre-emulsion feed, sulfosuccinate emulsifier
- 3.3.2 Copolymers of vinyl acetate and ethylene
- 3.3.3 Veova copolymer
- 3.4 Alkali-soluble polymers
- 3.5 Equivalence of 'external' and 'internal' plasticisation
- 4 Acrylic Latices
- 4.1 Typical acrylic formulations
- 4.1.1 Acrylic copolymer; delayed addition procedure
- 4.1.2 Acrylic ester latex; two-stage redox process
- 4.1.3 Acrylic ester—styrene copolymer
- 4.1.4 Alkali-soluble polymer; acrylic polymer and seed latex
- 4.1.5 Core—shell polymerisation
- 4.2 Developments in polymerisation of acrylics
- 5 Styrene Latices
- 5.1 Processes—general
- 5.1.1 Soap-type surfactants
- 5.1.2 Vinyl acetate—maleic acid stabiliser
- 5.1.3 Cationic emulsifiers
- 6 Diene Polymers and Copolymers
- 6.1 Introduction
- 6.2 Dienes: non-rubber applications
- 6.3 Carboxylated latex formulations
- 7 Vinyl Halides
- 7.1 Vinyl chloride polymers and copolymers
- 7.1.1 Early processes
- 7.1.2 Graft copolymer
- 7.2 Vinylidene chloride polymers and copolymers
- 7.3 Monomers containing bromine
- 7.4 Vinyl compounds containing fluorine
- 8 Emulsion Polymerisation—Theoretical Considerations
- 8.1 Types of mechanism
- 8.2 Theories of Harkins and Smith and Ewart
- 8.2.1 Modifications by Gardon
- 8.3 Theory of Medvedev
- 8.4 Theoretical developments — Fitch and Ugelstadt
- 8.5 Copolymerisation—theoretical
- 8.6 Specificity of surfactants and stabilisers
- 8.7 Latex particle stabilization
- 8.8 Further quantitative investigations
- 8.8.1 Styrene
- 8.9 Emulsion polymerisation, acrylic and methacrylic esters
- 8.9.1 Emulsion polymerisation of methyl methacrylate
- 8.9.2 Emulsion polymerisation of butyl acrylate
- 8.9.3 Copolymers of butyl acrylate
- 8.10 Emulsion polymerisation of vinyl acetate
- 8.10.1 Copolymerisation—mainly of vinyl acetate
- 8.10.2 Vinyl acetate and acrylic copolymers
- 8.11 Styrene copolymers (except with dienes)
- 8.12 Butadiene copolymers
- 8.13 Copolymerisation including a water-soluble monomer

- 9 Emulsion Polymerisation in Supercritical Carbon Dioxide
- 10 Inverse Emulsions
- 11 Interpenetrating Networks (IPN)
- 12 Conclusions
- References
- Latex Properties Relative to Applications
- 1 Introduction
- 2 Various Properties and Descriptions
 - 2.1 Emulsion particles and resultant properties
 - 2.1.1 Particle size distribution
 - 2.2 Particle characterization
 - 2.3 Core—shell copolymers—surface and buried groups
 - 2.4 Adsorption of surfactants on latex particles
 - 2.5 Emulsion viscosity
 - 2.5.1 Definitions and theory
 - 2.5.2 The measurement of viscosity
 - 2.5.3 Viscosity, dilatancy and rheopty phenomena
 - 2.5.4 Viscosity phenomena with latices
- 3 Freeze—Thaw and Tropical Stability
 - 3.1 Freeze—thaw stability—general principles
 - 3.2 Freeze—thaw stability—technical methods of control
 - 3.3 Freeze—thaw stability—tests
 - 3.4 Tropical stability
- 4 Emulsion Films
 - 4.1 Film formation
 - 4.1.1 Methods of study—film formation
 - 4.2 Theoretical developments
 - 4.3 Minimum film-forming temperature
 - 4.4 Specific studies—film formation
 - 4.4.1 Vinyl acetate and copolymer latices
 - 4.4.2 Acrylic latices
 - 4.4.3 Styrene—butadiene latices
- 4.5 Summary
- 5 Addition of Plasticisers and Coalescing Solvents
 - 5.1 Introduction
 - 5.2 The mechanism of plasticisation in emulsion
 - 5.3 Plasticisation of principal polymers
 - 5.3.1 Plasticisation of polystyrene
 - 5.3.2 Plasticisation of polyvinyl acetate
 - 5.3.3 Plasticisation of polyvinyl chloride
 - 5.4 Transient plasticisers (coalescing solvents)
- 6 Pigmentation
 - 6.1 Introduction
 - 6.1.1 The dried composition
 - 6.2 Pigmentary power
 - 6.3 Some common pigments and extenders
 - 6.3.1 Titanium dioxide
 - 6.3.2 Other white pigments
 - 6.3.3 Extenders
 - 6.4 Pigmentation of latices
 - 6.4.1 Treatment of china clay
 - 6.5 General properties of pigmented systems
 - 6.5.1 Critical pigment volume concentration
 - 6.6 Pigment encapsulation
- 7 Organic Extenders
- References

- Crosslinking and Curing
 - 1 Introduction
 - 1.1 Problems of crosslinking in latices
 - 1.2 A survey of crosslinking
 - 2 Estimation of Crosslinking
 - 2.1 Cure studies
 - 2.1.1 Measurement of the degree of swelling

- 2.1.2 Viscosity characteristics
- 2.1.3 Gel permeation chromatography
- 2.2 Cure tests
- 3 Multiple Double Bonds
- 3.1 Polymers including divinylbenzene and allied monomers
- 3.2 Polymers derived from acrylic and allied esters—multiple double bonds
- 3.3 Allyl polymers—multiple double bonds
- 3.4 Diene polymers
- 3.5 Other vinyl-type polymers with residual unsaturation
- 4 The Carboxyl Function in Polymers
- 4.1 Introduction
- 4.2 Combinations with hydroxyl and epoxide groups
- 4.3 Metal oxides
- 5 The Hydroxyl Function
- 5.1 Reactions with aldehydes
- 5.1.1 Dioxalane derivatives
- 6 The Epoxide Function
- 6.1 Internal epoxide groups in unsaturated monomer
- 6.1.1 Two-pack latex system in single vessel
- 6.1.2 Allyl glycidyl ethers
- 6.1.3 Miscellaneous formulations including glycidyl esters
- 6.2 External epoxide compounds
- 7 Di-Isocyanates and Polyurethanes In Vinyl-Type Cures
- 8 Polymers Containing (Meth)Acrylamide
- 8.1 Chemistry of the reactions
- 8.2 Simple derivatives of acrylamide
- 8.2.1 Formulations mainly based on acrylic esters and/or styrene
- 8.2.2 Formulations with vinyl acetate as the principal monomer
- 8.2.3 Formulations including vinyl chloride
- 8.2.4 Formulations including isopropyl-, butyl and isobutyl, isobutoxy acrylamide
- 8.3 Diacetoneacrylamide (DAAM)
- 8.4 Methylene bis acrylamide (MBAM)
- 8.5 The aminimides
- 8.6 Acrylamidoglycolates
- 8.7 Other amide derivatives with unsaturation
- 8.8 Cure with aminoplasts
- 9 Polymers Containing Halogens
- 10 Radiation Curing
- 10.1 Ultraviolet curing
- 10.1.1 Photoinitiators
- 10.1.2 Photoinitiators for radical cure
- 10.1.3 Monomers and polymers in UV cured systems
- 10.1.4 Practical examples of UV cure
- 10.2 Cure by electron beam (EB)
- 11 Incorporation of Siloxanes
- 12 Cure of Unsaturated and Saturated Polymers
- 13 Other Crosslinking Systems
- 13.1 Acid and alkali induced crosslinking
- 13.2 Crosslinking via α -ketonic acid esters
- 13.3 Crosslinking with reactive nitrogen compounds
- 13.3.1 Carbodi-imides
- 13.4 Intra- and inter-molecular reactions
- 13.5 Unspecified
- References

- Technical Polymer Latices
- 1 Introduction
- 2 Polyvinyl Acetate and Related Polymers
- 2.1 Polyvinyl acetate
- 2.2 Copolymers of vinyl acetate
- 2.2.1 Types of copolymer
- 2.2.2 Equivalence of 'internal' and 'external' plasticisation
- 2.2.3 Alkali-soluble copolymers
- 2.3 Typical commercial products

- 3 Acrylic Polymers and Copolymers
 - 3.1 Properties of acrylic polymers
 - 3.2 Properties of acrylic resin films
- 4 Vinyl Halide Polymers
 - 4.1 Polyvinyl chloride
 - 4.1.1 Compounding of polyvinyl chloride and copolymer latices
 - 4.2 Polymers and copolymers of vinylidene chloride
 - 4.3 Fluorocarbon latices
- 5 Styrene Polymers and Copolymers
 - 5.1 Polystyrene
 - 5.2 Styrene—butadiene copolymers
- 6 Polymers Based on Aliphatic Hydrocarbons
- 7 Vinylpyrrolidone Copolymers
- 8 The Testing of Latices
 - 8.1 Total solids content
 - 8.2 Monomer content
 - 8.2.1 Chemical methods—vinyl acetate
 - 8.2.2 Other monomers
 - 8.3 Specific gravity
 - 8.4 pH stability
 - 8.5 Freeze—thaw stability
 - 8.6 Emulsion viscosity
 - 8.7 Particle size
 - 8.8 Soap titration; surface tension measurements
 - 8.9 Settling and sedimentation
 - 8.10 Mechanical stability
 - 8.11 Minimum film temperature (MFT)
 - 8.12 Relative molecular weight (viscosity)
 - 8.12.1 Viscosity measurements
 - 8.13 General film measurements
 - 8.14 Determination of charge
- References

- Unsaturated Polyester and Non-vinyl Emulsions
 - 1 Introduction
 - 2 Alkyds and Polyesters
 - 2.1 Polyesters
 - 2.1.1 Polyester emulsions with vinyl monomers
 - 2.1.2 Water-in-oil emulsions
 - 2.2 Alkyds and allied products
 - 2.2.1 Theoretical and miscellaneous preparations
 - 2.2.2 Pigmented alkyd emulsions
 - 2.2.3 Alkyd emulsion blends
 - 2.2.4 Styrenated alkyd emulsions
 - 2.2.5 Ecological and environmental studies
 - 3 Aminoplasts
 - 4 Polyamide Emulsions
 - 5 Epoxide Resins and Blends
 - 5.1 Initial condensation in emulsion
 - 5.2 Amine salt emulsification
 - 5.3 Non-ionic emulsifiers
 - 5.4 Miscellaneous emulsifiers
 - 5.5 Cycloaliphatic epoxides
 - 5.6 Water-in-oil emulsions
 - 5.7 Epoxides containing halogens
 - 5.8 Epoxide—polyamide emulsions
 - 5.8.1 Epoxide—polyamide blends in coatings
 - 5.9 Epoxide emulsions—miscellaneous blends and reactions
 - 5.9.1 Reaction with vinyl-type monomers
 - 5.9.2 Miscellaneous
 - 5.10 Applications
 - 6 Phenoplasts
 - 7 Silicones
 - 7.1 Elementary chemistry

- 7.2 Some methods of emulsification
 - 7.2.1 General principles
 - 7.2.2 Cationic emulsifiers
 - 7.2.3 Anionic emulsifiers—mainly sulfates and sulfonates
 - 7.2.4 Non-ionic surfactants and phosphate surfactants
 - 7.2.5 Hydrophilic silicones as emulsifiers
 - 7.2.6 Problems of hydrogen release
 - 7.2.7 Theoretical developments
- 7.3 Textile and paper applications of silicone (organopolysiloxane) latices
 - 7.3.1 General properties required
 - 7.3.2 Glass fibre treatment
 - 7.3.3 Paper treatment
- 7.4 Silicone latices in surface coating and building
- 7.5 Miscellaneous applications
- 8 Polyurethanes
 - 8.1 Chemistry of isocyanate adducts
 - 8.2 Polyurethane latex
 - 8.2.1 Emulsions via blocked copolymers
 - 8.2.2 Emulsification by salt formation—cationic
 - 8.2.3 Emulsification by salt formation—anionic
 - 8.2.4 Direct (chain extension) emulsification
 - 8.2.5 Vinyl—urethane block copolymers
 - 8.2.6 Vinyl polymerisation in a polyurethane latex
 - 8.3 Applications of polyurethane latices
 - 8.3.1 General properties, including adhesives
 - 8.3.2 Textiles and allied applications
 - 8.3.3 Paper applications
 - 8.3.4 Coatings
 - 8.3.5 Leather treatment
 - 8.3.6 Sizes for glass fibres and miscellaneous
- References

Polymer Latices in the Formulation of Adhesives

- 1 Introduction
 - 1.1 Terminology of adhesives
- 2 Survey of Theories of Adhesion
 - 2.1 Basic theory
 - 2.2 The function of adhesives: latex adhesives
- 3 Latex-Based Adhesives: Some Practical Aspects
 - 3.1 Introduction
 - 3.2 Functions of adhesives
 - 3.3 Practical requirements of adhesives
- 4 Specific Adhesive Types
 - 4.1 Polyvinyl acetate homopolymer-based adhesives
 - 4.1.1 Adhesive latices for compounding
 - 4.1.2 Plasticisers
 - 4.1.3 Tackifiers, adhesion promoters and other additives
 - 4.1.4 Fillers
 - 4.1.5 Some typical formulations
 - 4.2 Polyvinyl acetate copolymer-based adhesives
 - 4.2.1 Polyvinyl acetate copolymer latices with other ester
 - 4.2.2 Ethylene—vinyl acetate copolymer latex-based adhesives
 - 4.2.3 Crosslinking latex-based adhesives
 - 4.3 Polyvinyl propionate latices in adhesives
 - 4.4 Acrylic copolymer latices
 - 4.4.1 Some typical formulations
 - 4.4.2 Crosslinking systems
 - 4.5 Vinylidene chloride and other halogenated polymer latices in adhesives
 - 4.5.1 Some typical formulations
 - 4.6 Butadiene copolymer latices
 - 4.6.1 Some typical formulations
 - 4.7 Other latex types
- 5 Latex-Based Adhesives with Specific Functions
 - 5.1 Pressure-sensitive adhesives

- 5.1.1 Pressure-sensitive adhesion and terminology
- 5.1.2 Types of latices formulated into pressure-sensitive adhesives
- 5.2 Removable pressure-sensitive adhesives
 - 5.2.1 Acrylic and other copolymer latices
- 5.3 Contact adhesives
 - 5.3.1 Some commercial formulations
- 5.4 Heat-seal adhesives
 - 5.4.1 General
 - 5.4.2 Ethylene—vinyl acetate latex copolymers
 - 5.4.3 Acrylate latex copolymers
- 5.5 Delayed tack adhesives
 - 5.5.1 Some commercial formulations
- 5.6 Remoistenable adhesives
 - 5.6.1 General
 - 5.6.2 Some commercial formulations
- 5.7 Quick-tack and contact-grab adhesives
 - 5.7.1 Some commercial formulations
- 5.8 Redispersible components for pressure-sensitive adhesives
- 6 Adhesives for Specific Applications
 - 6.1 Wood adhesives
 - 6.1.1 Polymer latices for wood adhesives
 - 6.1.2 Aminoplasts and phenoplasts in wood adhesives
 - 6.1.3 Glycidyl and epoxy additives
 - 6.1.4 Addition of metal complexes
 - 6.1.5 Addition of aziridines, oxiranes and related compounds
 - 6.1.6 Addition of isocyanates
 - 6.1.7 Diene copolymers with crosslinking
 - 6.1.8 Some commercial formulations
 - 6.2 Latex-based adhesives for paper bonding
 - 6.2.1 General
 - 6.2.2 Some commercial formulations
 - 6.3 Adhesives for packaging
 - 6.4 Miscellaneous latex-based adhesives
 - 6.4.1 Adhesives for organic substrates
 - 6.4.2 Adhesives for inorganic substrates
 - 6.4.3 Other applications
- 7 Rubber-to-Fabric Adhesives
 - 7.1 Introduction
 - 7.2 Vinylpyridine copolymer adhesives
 - 7.3 Dip additives and composition
 - 7.4 Other rubber adhesive systems
 - 7.4.1 Blocked isocyanates
 - 7.4.2 Epoxides and glycidyl groups
 - 7.4.3 Dip additives
 - 7.5 Modifications of resorcinol—formaldehyde resins
 - 7.6 Latex modifications
 - 7.6.1 Latex dip additions
- 8 Test Methods for Adhesives
- 9 Glossary of Terms Relating to Adhesives
- 10 Appendix: Some Technical Products for Water-Based Adhesives

References

Index

Reviews - Synopsis - Dust Jacket

The first volume of this series on synthetic resin latices surveys the fundamentals of polymer chemistry, the principles and practice of emulsion polymerization and of the resulting latices and their properties, including alkali-soluble latices, in relation to the requirements of specific applications, including pigmented systems and technical latices. It also presents a comprehensive account of the formulation of latex-based adhesives for bonding of many different materials.

Target Audience: Chemists and other scientists involved in industrial or academic polymer research; technical service providers who examine latices for potential applications; and technologists in the application industries (notably adhesives for this volume, although the extended overview of underlying principles will be of interest to all end-users) who are interested in these water-based systems.

Note: Applications of Synthetic Resin Latices, Volume 2: Latices in Surface Coatings — Latex Paints and Applications of Synthetic Resin Latices, Volume 3: Latices in Diverse Applications are companion volumes to this title.

Editorial Reviews

Book Description

This volume discusses the fundamental chemistry of latices and provides a comprehensive account of the formulation of latex-based adhesives for the bonding of many different substances.

From the Back Cover

The production of polymer latices has developed over the past half-century from pioneer status to a major industry with an annual production of over 6 million tonnes of polymers. Over this period, increased understanding of their many technical applications has extended the usefulness of water-based latices both technically and commercially. With present trends in ensuring environmental safety, water-based latices play an ever-increasing role, overcoming the limitations of water-soluble and solvent-based polymers in a diverse range of applications. This title is one of a three volume set entitled *The Applications of Synthetic Resin Latices*, which discusses the preparation and application of specific groups of latices or polymer emulsions. Volume 1, *Fundamental Chemistry of Latices and Applications in Adhesives*, surveys the fundamentals of polymer chemistry, the principles and practice of emulsion polymerisation and of the resulting latices and their properties, including alkali-soluble latices, in relation to the requirements of specific applications, including pigmented systems and technical latices. This volume also includes a comprehensive account of the formulation of latex-based adhesives for the bonding of many different substances.

FROM THE DUST JACKET:

The production of polymer lattices has developed over the past half century from pioneer status to a major industry with an annual production of 6 million tones of polymers. Over this period, understanding of their many technical applications has extended the usefulness of water-based lattices both technically and commercially. With present trends in ensuring environmental safety, water-based lattices play an ever-increasing role, overcoming the limitations of water-soluble and solvent-based polymers in a diverse range of applications

This title is one of a three volume set entitled *Applications of Synthetic Resin Latices*, which discusses the preparation and application of specific groups of latices or polymer emulsions.

Volume 1: *Fundamental Chemistry of Latices and Applications in Adhesives* surveys the fundamentals of polymer chemistry, the principles and practice of emulsion polymerization and of the resulting latices and their properties, including alkali-soluble latices, in relation to the requirements of specific applications, including pigmented systems and technical latices. This volume also includes a comprehensive account of the formulation of latex-based adhesives for the bonding of many different substances.

PREFACE:

A word, allow us, sweet ladies and gentlemen

We pray you hear, while we alone appear,

We are the Prologue

In 1972 a volume by one of the current authors appeared under the title *Applications of Synthetic Resin Emulsions*. This has long been out of print. The many advances that have been made, both in the development of polymer emulsions (described more correctly as latices, by analogy with natural rubber latices) and their application in various industries, merit a new trilogy under the title *Applications of Synthetic Resin Latices*. In the words of the slightly modified quotation from an English version of the Prologue to Pagliacci, which was quoted in the Prologue to the earlier book, the current volumes are still the only comprehensive ones on the subject.

With the present trends in ensuring environmental safety, water-based latices are having an ever-increasing role in a diverse range of applications. Many of these overcome the limitations of water-based polymers since in film forming a minimum temperature is necessary. In the case of some polymers, there are limitations due to insufficient film hardness, with a tendency of films to 'creep' on a vertical surface.

Developments in the formation of latices have included increasing molecular weights of polymers and the use of 'core—shell' copolymers, which often have the effect of reducing the minimum film-forming temperature, therefore enabling harder films to be formed and, above all, the use of crosslinking reactions, often described as 'curing'. As this has now become a major part of the technology of the preparation and application of these latices, it is the subject of a separate chapter. The minimum use of water-soluble emulsion stabilisers, or in some cases the use of stabilisers that can become water insoluble, is another feature of developments in latex technology.

The general structure of these volumes is similar to that of the earlier book. Each chapter is complete in itself, but a limited amount of repetition occurs between the earlier chapters, which describe the chemical basis of the processes and also additives required in applications, e.g. pigments as well as some typical commercial products, and the specific chapters on the various application industries.

Like the previous text, these volumes are intended for three classes of readers: chemists and other scientists who are performing the necessary research and development, technical service personnel who examine latices for potential applications and also, not least, the technologists in the application industries who may wish to use these water-based systems.

The standardization of units and their presentation has caused some problems, particularly with the adoption of the various SI units. The hybrid units sometimes found in patent applications have been avoided as far as possible, e.g. pressures in pounds per square centimetre and area dimensions given in square inches but with the thickness in millimetres. Temperatures are normally quoted in degrees Celsius (°C) but exceptionally in degrees Fahrenheit (°F), especially when results were originally quoted in rounded figures such as 250 °F and 300 °F. In most cases, however, units quoted in papers and patents are quoted as in the originals.

Sufficient information on technology is included for the processes involved to be understood, but no pretence is made that the chapters concerned provide comprehensive expertise on a wide range of industries. It is to be hoped that the texts will also point the way to future improvements and that these volumes, produced at the start of the new century, will be useful for many years to come.

INTRODUCTION:

With the growth of the synthetic resin (polymer) industry in the past five decades, a considerable amount of technology has been compiled. Whilst there are many general and specialised volumes dealing both with the chemistry of polymers and their technological applications, we believe that the only single volume which endeavoured to co-ordinate the literature on applications of polymers in emulsion form was that published by one of the current authors in 1972. After nearly 30 years, with the vast increase in available information, it has been found necessary to publish a new compilation in three volumes.

Whilst the terms resin and polymer do not have exactly the same meaning, they are often used as synonyms where no confusion is likely to occur. Most of the materials with which these volumes are concerned are more properly described as polymers—a general term applied to compounds of high molecular weight featuring substantially repeating units without loss of simple units such as water or ammonia by condensation. This definition applies to vinyl polymers generally, and often, also, to polyepoxides and to polyurethanes. The term resin implies a condensation product of comparatively low molecular weight. As an example of this, apart from uncured aminoplasts and phenoplasts, the term resin is also used to describe products such as the condensates of rosin (of natural origin, usually from trees) with maleic anhydride. A further term, inacomolecule, is more generally applied to both resins and polymers, but its use tends to be restricted to academic and 'pure' scientific publications. In this text, the terms polymer emulsion and polymer latex have been used interchangeably throughout, usually depending on the source of the information discussed. The term latex is often restricted to rubbers, either natural or synthetic. In the United States, the term latex is almost universal, and, indeed, may be considered as more correct. Many products developed in Germany are referred to as dispersions ('dispersionen'), so this term is retained in some cases. A dispersion may also imply a stabilised solid of a fine particle size (often a pigment) in a liquid. However, the term dispersion polymerization is applied both to suspension polymerization in aqueous media, and dispersion polymer to stabilized macromolecular emulsions in non-aqueous media.

There is no rigid distinction between the properties of a rubber and a resin or polymer. Nevertheless, since rubber latices form a technology of their own, they are not considered here, unless they are proposed as functional alternatives to polymers with more 'plastic' properties. For this reason, the applications of only a limited number of polymers of butadiene, styrene and isoprene are discussed.

It must be admitted that this nomenclature is rather confusing, but, since it will be encountered elsewhere, distinction is made between the various terms only where it occurs in technical practice. Otherwise, as long as no ambiguity is likely to be caused, the terms resin and polymer are used virtually as synonyms.

In nearly every case, the feature of a polymer emulsion is that it is applied as an auxiliary factor rather than as a primary material e.g. it is a medium for a paint, or a major (functional) component of an adhesive. As such, latices have tended, in some ways, to be the 'Cinderella' of the world of polymer science, especially as progress in their applications has been evolutionary, rather than taking place in 'quantum style' leaps.

Information on the preparation, and properties of latices is found in numerous patents, theoretical papers and the literature of the principal manufacturers of monomers and other raw materials. Information on applications of latices is

often found in patents and the technical literature of polymer manufacturers. The preparation of a group of latices and their application is often described in the same patent specification. Selected information from these sources is presented in each of these volumes. Some technical journals contain useful data, and much information of considerable technical value is scatter throughout the trade literature, but is seldom abstracted adequately and is often issued undated.

This first volume surveys the fundamentals of polymer chemistry, the principles and practice of polymer latices, including pigmented systems and some current technical latices. The properties of alkali-soluble latices are considered. Volumes 2 and 3 describe in some detail the numerous applications of latices.

Crosslinking and curing of polymers has become important in the last few decades, and is the subject of Chapter 5. Some non-vinyl latices, such as those from alkyds and polyurethanes are also the subject of a separate Chapter, since these have assumed some industrial importance.

Title	Location	Edition / Series / Misc.
802 Applications of Synthetic Resin Latices [Vol. 2: Latices in Surface Coatings: Emulsion Paints] Author: Warson, Henry and C.A. Finch Publish.: John Wiley & Sons - place: Chichester, [West Sussex], UK - date: ©2001 Subject: Gums and resins, synthetic Desc: xxiv, 447 p., illus., 24 cm.	Dynix: 99428-2 Call No.: 668.374 Wa v.02 ISBN: 0471954616 Shelf: Adult Non-Fiction	Edition: Series: Applications of Synthetic Resin Latices Year: 2001 Price: \$135.00

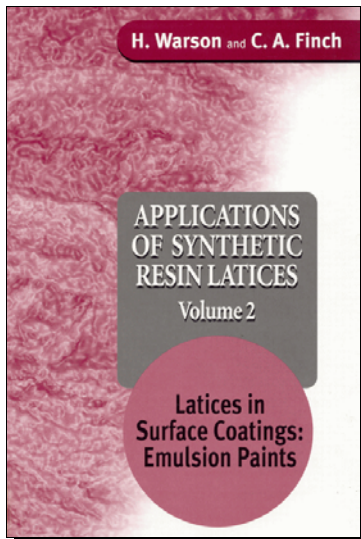


Table of Contents

Preface
 A Note on References
 Patent Validity
 Introduction

Surface Coatings, Decorative, Fundamentals and Raw Materials
 1 Historical Introduction
 2 Fundamental Formulation and Requirements
 2.1 The principal constituents
 2.2 General emulsion requirements
 2.2.1 Adsorption of the surfactants; effect on films
 2.2.2 General comments on molecular size
 2.2.3 Viscosity
 2.2.4 Miscellaneous
 2.3 Plasticisation, including transient plasticisers
 2.4 Corrosion resistance [
 3 Vinyl Acetate Polymers and Copolymers
 3.1 Homopolymers; formulation
 3.2 Paint formulation—general
 3.3 Plasticiser variations
 3.4 Vinyl acetate copolymer latices
 3.4.1 Comparative tests of comonomers
 3.4.2 Vinyl acetate—butyl acrylate copolymer variations
 3.5 Formulation of copolymer latices and paints
 3.5.1 Copolymers including 2-ethylhexyl acrylate, maleate and fumarate esters
 3.6 Chemically resistant copolymer latices
 3.6.1 The ease of hydrolysis of vinyl copolymers
 3.7 Vinyl acetate—olefin copolymers
 3.7.1 Vinyl acetate—ethylene copolymers
 3.7.2 Vinyl acetate-a-olefin copolymers
 3.8 Miscellaneous and crosslinking additives
 3.8 Terpolymers including vinyl pivalate or vinyl chloride
 3.8.2 Siloxane terpolymers
 3.8.3 Crosslinking additives
 3.9 Prepigmented latices
 4 Acrylic Latices as Paint Media
 4.1 General properties
 4.1.1 Cationic latices
 4.2 Formulation modifications
 4.3 Acrylics with reactive groups
 4.4 Technical latices
 4.5 Manufacturing techniques for acrylic latex paints
 4.6 Comparisons of vinyl ester/acrylic latices for latex paints
 5 Hydrocarbon Polymer Emulsion Paints
 5.1 Styrene latices
 5.2 Styrene—butadiene copolymers
 5.2.1 Carboxylated S—B latices and S—B with other monomers
 6 Vinyl Halide Polymers
 6.1 Vinyl chloride—vinyl ester copolymers
 6.2 Vinyl chloride—ethylene copolymers
 6.3 Polymers including fluorine

Subjects

259 .	Emulsions
313 .	Polymers
376 .	Gums and resins, Synthetic

7 Miscellaneous and Crosslinked Polymers
7.1 'Core-shell' type copolymers in emulsion paints
8 Emulsion Comparisons
8.1 Photochemical degradation
9 Pigments
9.1 Titanium dioxide
9.1.1 Dispersion and adsorption
9.2 Zinc oxide
9.3 Lithopone and antimony oxide
9.4 Metallic aluminium pigments
10 The Principal Extenders
10.1 Formulation with extenders
10.1.1 Some specific claims
10.1.2 Single extender tests
11 Coloured Pigments
12 Universal Tinters
12.1 Dispersible pigment powders
13 Organic Extenders
References

Emulsion Paints—Formulation

1 Aspects of Emulsion Paint Rheology
1.1 Effects of surfactants
1.2 Dispersion and dispersing agents
1.3 General colloid effects
1.3.1 Effect of different cellulosic thickeners
1.4 Viscosity
1.4.1 Associative thickeners
1.5 Thixotropy and related phenomena
1.5.1 Practical and theoretical considerations
1.5.2 Levelling
1.5.3 Test method—gel strength
1.5.4 Practical examples—silica and silicates
1.5.5 Metal chelate compounds
1.5.6 Addition of polyacrylamide, polyvinylpyrrolidone and miscellaneous organics
1.6 Surfactant transfer
1.7 Foam control agents
1.7.1 Specific anti-foams
1.8 Adhesion
2 Temperature Stability
2.1 Freeze—thaw stability
2.2 High-temperature (tropical) stability
3 Film Formation
3.1 Film drying and pH effects
3.2 Water resistance of paint films
3.3 Efflorescence: lime staining
3.4 Specific claims to film formation
4 Microbiological Problems, Other Organic Growths and Remedies
4.1 Introduction
4.2 Microbiocides—general
4.2.1 Problems in tropical climates
4.3 Microbiocides—metal compounds
4.3.1 Organomercurials
4.3.2 Organotin compounds
4.3.3 Zinc, copper and other metal compounds
4.4 Studies on fungicides and fungistats
4.4.1 Mouldicides
4.4.2 Anti—mildew compounds
4.5 Bactericides and bacteriostats
4.6 Some miscellaneous microbiocidal agents
4.6.1 Synergistic mixtures
4.7 Algae
4.8 Polymers with microbiocidal properties
4.9 Miscellaneous tests

- 4.10 General papers
- 5 Undercoats, Primer-Sealers and Recoating Old Oil/Alkyd Paints
- 5.1 Vinyl acetate polymers
- 5.2 Acrylic copolymers
- 5.3 Paints including drying oil fatty acid derivatives
- 6 Gloss Emulsion Paints
- 6.1 Introduction and definitions
- 6.2 Rheology—flow and levelling
- 6.3 Pigments—flow and levelling
- 6.3.1 Pigment volume concentration (PVC)
- 6.3.2 Stability
- 6.4 Film properties
- 6.4.1 Adhesion
- 6.4.2 Chemical resistance
- 6.4.3 Open time/wet edge
- 6.5 Paint media—vinyl acetate polymer and copolymer latices
- 6.5.1 Post-imitation
- 6.5.2 Polyvinyl alcohol
- 6.5.3 Summary
- 6.6 Acrylic copolymer latices
- 6.6.1 Mixed particle size latices
- 6.6.2 Speciality monomer additives
- 6.6.3 Acrylic latices including reactive groups
- 6.6.4 Hydrosols
- 6.6.5 Acrylic copolymers with alkali-soluble components
- 6.7 Vinylidene chloride copolymer latices
- 6.8 Core—shell and graft copolymers
- 6.9 Pigments—specific
- 6.9.1 Prime pigment
- 6.9.2 The inclusion of extenders
- 6.9.3 Addition of organic extenders
- 6.9.4 Deep shades
- 6.10 Emulsion stabilisers and pigment dispersants
- 6.11 Additives for flow improvement
- 6.11.1 Coalescing solvents ('transient plasticisers')
- 6.11.2 Further additives
- 6.12 Multicoats
- 6.13 Thixotropy
- 6.14 Semi-gloss paints
- 6.15 Ambient crosslinking
- 6.16 Prepigmented latices
- 6.17 Polyurethane and silicone latices
- 6.18 General papers of interest
- 7 Emulsion Paints for Exterior Use
- 7.1 General requirements
- 7.1.1 Vinyl acetate polymers and copolymers
- 7.1.2 Acrylic latices, including copolymers with styrene
- 7.1.3 Styrene—butadiene latices
- 7.1.4 Vinyl chloride, vinylidene chloride and fluorinated copolymers
- 7.2 Pigments and extenders
- 7.2.1 Coloured pigments
- 7.2.2 Extenders
- 7.2.3 Single extender tests
- 7.2.4 Inclusion of associative thickeners
- 7.3 Exterior surfaces (except wood)
- 7.3.1 Specific requirements and avoiding defects
- 7.3.2 Applications to specific surfaces
- 7.3.3 Exterior exposure tests
- 8 Wood Coatings
- 8.1 General
- 8.2 Specific problems and cures
- 8.3 Tests on wood coatings
- 8.4 Vinyl and acrylic formulations
- 8.4.1 Specific claims for wood paints

- 8.4.2 Wood paints with a crosslinking facility
- 8.5 Adhesion improvement
- 9 Emulsion Paints for Interior Use
- 10 Fire-Retardant Paints
- 10.1 Introduction—problems and general methods for fire retardancy
- 10.2 Studies and tests for fire retardance
- 10.3 Intumescent coatings
- 11 Emulsion Paints as Metal Coatings
- 11.1 The nature of the problem
- 11.2 Anticorrosive pigments
- 11.2.1 Chromates
- 11.2.2 Iron oxides and modified oxides
- 11.3 Miscellaneous metals and metal salts
- 11.4 Minerals and extenders
- 11.5 Prevention of migration of soluble iron salts—borates
- 11.6 Basic nitrogen compounds and amides
- 11.7 Miscellaneous additives
- 11.8 Specific emulsion types
- 11.8.1 Styrene polymers and styrene—butadiene and nitrile copolymers
- 11.8.2 Carboxylated latices
- 11.9 Acrylic ester and acrylic ester—styrene latices
- 11.9.1 Introduction
- 11.9.2 Acrylic latices without active groups
- 11.9.3 Acrylic latices including styrene
- 11.9.4 External plasticiser
- 11.9.5 Latices including reactive nitrogen compound
- 11.9.6 External additive for crosslinking
- 11.9.7 Cationic electrolyte
- 11.10 Coatings for automobiles
- 11.11 Unclassified
- 11.12 Vinyl acetate copolymers
- 11.13 Copolymers including ethylene
- 11.14 Paints containing a vinyl halide
- 11.15 Paints containing a silicone derivative
- 11.16 Strippable corrosion-resistant paint
- 11.17 An application trial
- 11.18 Incorporation of rust in films
- 11.19 Latices including cement
- 11.20 Coatings on aluminium, zinc and copper
- 12 Coatings on Cement and Building Boards
- 12.1 Cement and concrete coatings
- 12.2 Coatings for slate
- 12.3 Miscellaneous
- 13 Special Procedures
- 13.1 Coatings with gas and moisture barrier properties
- 13.2 Reconstitutable emulsions
- 13.3 Prepigmented latices
- 13.4 Removable coatings
- 13.4.1 Easily removable overspray
- 13.5 Gelled water-based coatings
- 13.6 Paints derived from alkyds and miscellaneous macromolecules
- 14 Special Additions
- 14.1 Zirconyl and zinc compounds
- 14.2 Treatments for metal powders
- 14.3 Addition of barium compounds; effervescent pigments
- 15 Special Effects
- 15.1 Various patterned effects
- 15.2 Multicolour paints
- 15.3 Conductive paints
- 16 Artists' Paints
- 17 Conclusion
- 18 Appendix: The Testing of Emulsion Paints
- 18.1 Viscosity
- 18.2 Film application: fineness of grind

18.3 Scrub and wash resistance of paint films
18.4 Gloss; opacity
18.5 Differential thermal analysis (DTA)
18.6 Adhesion tests
18.7 Some ASTM standard test methods
References

Industrial Finishing

1 Introduction: Definitions
1.1 Water-based industrial finishes
1.2 Pre-treatment: acid etching of metal surfaces by wash primers
2 Combinations of Carboxyl and Aminoplast
2.1 Typical examples
2.1.1 Additional additives
2.1.2 Aminoplast with alkyd or polyester
2.2 Combinations of carboxyl, hydroxyl and aminoplast
3 Combinations of Carboxyl with Other Reactive Groups
3.1 Wire enamels
3.1.1 Iminated acrylic latex for wire enamel
4 The Hydroxyl and Epoxide Groups
4.1 The hydroxyl group
4.2 Epoxide reactions
4.2.1 Epoxide group in vinyl monomer
4.2.2 Addition of external epoxide compounds
4.2.3 Epoxides with aminoplasts
4.3 Hydroxyl reactions with di-isocyanates
5 Finishes Containing Acrylamide and its Derivatives
5.1 Introduction
5.2 Finishes containing acrylamide and N-methylolacrylamide
5.3 Butoxy- and isobutoxymethacrylamide
5.4 Inclusion of epoxide groups
5.5 Other derivatives of acrylamide
5.6 Styrene—butadiene latices including acrylamide and derivatives
5.7 Finishes including vinyl chloride
5.8 finishes including acrylamide derivatives and aminoplasts/phenoplasts
5.9 Theoretical investigations
5.10 Reviews
6 Finishes Including Dienes
6.1 Pre-application grain-boundary etch
6.2 Metal compound cure
6.3 Addition of acids
6.3.1 Addition of phosphoric acid
6.3.2 Addition of chromic acid (optionally with phosphoric acid)
6.3.3 Addition of Hydrofluoric acid
6.4 Grafted copolymers
6.5 Blends with phenoplasts or aminoplasts
6.6 Miscellaneous additions
7 Self-Curing Coatings
7.1 Self-cure including silicates
7.2 Acrylic esters with unsaturated emulsifiers
8 Electroless (Auto) Deposition
9 Miscellaneous
10 Electrodeposition
10.1 Electrochemical principles and definitions
10.1.1 Fundamental definitions
10.2 Fundamental studies and reviews
10.3 The electrocoating bath
10.4 The deposits
10.5 Technological improvements
10.5.1 Early and miscellaneous processes: mainly non-vinyl
10.6 Patented processes
10.6.1 Acrylic and allied latices
10.6.2 Vinyl halide latices
10.6.3 Styrene-butadiene and ethylene latices

10.7 Cathodic deposition
References

Index

Reviews - Synopsis - Dust Jacket

The second volume of this series on synthetic resin latices describes the principles of the formulation, manufacture, and application properties of water-based emulsion paints (a topic covered so comprehensively it could fill an entire volume by itself) and other surface coatings based on synthetic latex-based systems, including a variety used in various industrial finishing operations.

Target Audience: Chemists and other scientists involved in industrial or academic polymer research; technical service providers who examine latices for potential applications; and technologists in the application industries (notably paints and coatings for this volume) who are interested in these water-based systems.

Note: Applications of Synthetic Resin Latices, Volume 1: Fundamental Chemistry of Latices and Applications in Adhesives and Applications of Synthetic Resin Latices, Volume 3: Latices in Diverse Applications are companion volumes to this title.

Editorial Reviews

Book Description

This volume describes the principles of the formulation, manufacture and application properties of water-based emulsion paints and related surface coatings.

FROM THE DUST JACKET:

The production of polymer latices has developed over the past half century from pioneer status to a major industry with an annual production of 6 million tones of polymers. Over this period, understanding of their many technical applications has extended the usefulness of water-based latices both technically and commercially. With present trends in ensuring environmental safety, water-based latices play an ever-increasing role, overcoming the limitations of water-soluble and solvent-based polymers in a diverse range of applications.

This title is one of a three volume set entitled Applications of Synthetic Resin Latices, which discusses the preparation and application of specific groups of latices or polymer emulsions.

Volume 1: Latices in Surface Coatings: Emulsion Paints, describes the principles of the formulation, manufacture and application properties of water-based 'emulsion' paints and related surface coatings. Emulsion (architectural) paints, including industrial finishes have, with adhesives, been a major field in the application of synthetic latices, therefore this volume has been devoted to this important topic. Developments including theoretical studies, film formation and in practical application ambient cure, improved microbiocides, coatings for metal, and fire resistant coatings, are all covered in this volume. Topics such as electrodeposition and electroless deposition are included with industrial finishes.

PREFACE:

A word, allow us, sweet ladies and gentlemen
We pray you hear, while we alone appear,
We are the Prologue

In 1972 a volume by one of the current authors appeared under the title Applications of Synthetic Resin Emulsions. This has long been out of print. The many advances that have been made, both in the development of polymer emulsions (described more correctly as latices, by analogy with natural rubber latices) and their application in various industries, merit a new trilogy under the title Applications of Synthetic Resin Latices. In the words of the slightly modified quotation from an English version of the Prologue to Pagliacci, which was quoted in the Prologue to the earlier book, the current volumes are still the only comprehensive ones on the subject.

With the present trends in ensuring environmental safety, water-based latices are having an ever-increasing role in a diverse range of applications. Many of these overcome the limitations of water-based polymers since in film forming a minimum temperature is necessary. In the case of some polymers, there are limitations due to insufficient film hardness, with a tendency of films to 'creep' on a vertical surface.

Developments in the formation of latices have included increasing molecular weights of polymers and the use of 'core-shell' copolymers, which often have the effect of reducing the minimum film-forming temperature, therefore enabling harder films to be formed and, above all, the use of crosslinking reactions, often described as 'curing'. As this has now become a major part of the technology of the preparation and application of these latices, it is the subject of a

separate chapter. The minimum use of water-soluble emulsion stabilisers, or in some cases the use of stabilisers that can become water insoluble, is another feature of developments in latex technology.

The general structure of these volumes is similar to that of the earlier book. Each chapter is complete in itself, but a limited amount of repetition occurs between the earlier chapters, which describe the chemical basis of the processes and also additives required in applications, e.g. pigments as well as some typical commercial products, and the specific chapters on the various application industries. Like the previous text, these volumes are intended for three classes of readers: chemists and other scientists who are performing the necessary research and development, technical service personnel who examine latices for potential applications and also, not least, the technologists in the application industries who may wish to use these water-based systems.

The standardization of units and their presentation has caused some problems, particularly with the adoption of the various SI units. The hybrid units sometimes found in patent applications have been avoided as far as possible, e.g. pressures in pounds per square centimetre and area dimensions given in square inches but with the thickness in millimetres. Temperatures are normally quoted in degrees Celsius (°C) but exceptionally in degrees Fahrenheit (°F), especially when results were originally quoted in rounded figures such as 250 °F and 300 °F. In most cases, however, units quoted in papers and patents are quoted as in the originals.

Sufficient information on technology is included for the processes involved to be understood, but no pretence is made that the chapters concerned provide comprehensive expertise on a wide range of industries. It is to be hoped that the texts will also point the way to future improvements and that these volumes, produced at the start of the new century, will be useful for many years to come.

INTRODUCTION:

With the growth of the synthetic resin (polymer) industry in the past five decades, a considerable volume of technology has been compiled. Whilst there are many general and specialised volumes dealing both with the chemistry of polymers and their technological applications, the only single volume that has appeared to date that has endeavoured to coordinate the ever-increasing literature on applications of polymers in emulsion form has been the volume by one of the current authors, published in 1972. After more than twenty-five years, with the vast increase in information, it has been necessary to publish a new up-to-date edition in three volumes.

Whilst the words 'resin' and 'polymer' do not have the same connotation, they are often used as synonyms where no confusion is caused. Most of the high molecular weight materials with which these books are concerned are more properly described as 'polymers', a general term applying to compounds of high molecular weight featuring substantially repeating units without loss of simple units such as water or ammonia by condensation. This definition applies to vinyl polymers generally, and often to polyepoxides and to polyurethanes. The term 'resin' implies a condensation product of comparatively low molecular weight. Apart from uncured aminoplasts and phenoplasts, it is also used for products such as the condensation of rosin with maleic anhydride. This latter compound is completely soluble in aqueous alkalis and may be included in emulsion polishes, as will be shown in Volume 3. A further term, 'macromolecule' ('macromolecular' adj.), is a more general one applying to resins and polymers, but tends to be restricted to academic and 'pure' scientific applications.

At this stage it may be mentioned that in this text we have used the terms 'polymer emulsion' and 'latex' as interchangeable throughout. 'Latex' is some times restricted to rubbers, whether natural or synthetic. In the United States the word 'latex' is almost universal, and indeed is more correct, as will be shown later. Many German products are referred to as 'dispersions' (dispersionen), and therefore this term has been retained in some cases. A dispersion normally implies a stabilised solid in a liquid, as a pigment. However, 'dispersion polymerisation' has been applied to aqueous suspension polymerisation and also to stabilised macromolecular emulsions in non-aqueous media.

As will be shown later, there is no rigid distinction between the properties of a rubber and a resin or polymer. Nevertheless, since rubber latices form a technology of their own, they will not be considered here. An exception will be made where they are used as alternatives to polymers with more 'plastic' properties. Thus only the applications of a limited number of polymers of butadiene, styrene and isoprene will be discussed.

It must be admitted that this nomenclature is highly confusing, but since the reader will encounter it elsewhere, distinction will be made between the various terms only where it occurs in technical practice. Otherwise, as long as no ambiguity is caused the terms 'resin' and 'polymer' will be used virtually as synonyms.

In nearly every case the feature of a polymer emulsion is that it is applied as an auxiliary, rather than as a primary material; e.g. it is a medium for a paint or a major component of an adhesive. As such, these latices have in some ways tended to become the 'Cinderella' of the polymer world, especially as progress in their application has been evolutionary, rather than by quantum-style leaps.

Information on the preparation of latices is found in numerous patents, theoretical papers and literature issued by the manufacturers of monomers. Information regarding applications is found in similar sources. The preparation of latices and their application is often in the same specification. Some technological journals contain useful data, whilst much information of considerable value is scattered through the trade literature, but is seldom abstracted and is often issued undated.

This volume gives a survey of latices in surface coatings, with special reference to emulsion (latex) paints. The volume is divided into chapters covering: fundamentals and raw materials (augmenting Chapter 4 in volume I); a very extensive chapter on formulation, including over 1000 references; and a chapter covering industrial finishing in which there have been many major developments in recent years.

Crosslinking and curing of polymers has become an important feature since 1970, and is therefore the subject of a separate chapter. Some non-vinyl latices, such as those from alkyds and polyurethanes, are also the subject of a separate chapter. The latter have assumed some industrial importance.

Title	Location	Edition / Series / Misc.
18 Applied Polymer Science		<i>Edition:</i>
<i>Author:</i> Craver, J. Kenneth and Roy W. Tess (editors)	<i>Dynix:</i> 43963	<i>Series:</i>
<i>Publish.:</i> Organic Coatings and Plastics Chemistry Division of the American Chemical Society, Washington, DC	<i>Call No.:</i> 547.84 Ap	
<i>- place:</i> Washington, DC	<i>ISBN:</i>	
<i>- date:</i> ©1975	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1975
<i>Subject:</i> Plastics -- Congresses		<i>Price:</i> \$25.00
<i>Desc:</i> xiii, 921 p., illus., 25 cm.		

APPLIED POLYMER SCIENCE

EDITED BY
J. KENNETH CRAVER
MONSANTO COMPANY
ST. LOUIS, MISSOURI
AND
ROY W. TESS
SHELL CHEMICAL COMPANY
HOUSTON, TEXAS



ORGANIC COATINGS AND PLASTICS CHEMISTRY
DIVISION OF THE AMERICAN CHEMICAL SOCIETY
WASHINGTON, D. C.

Table of Contents

1. HISTORY OF THE DIVISION OF ORGANIC COATINGS AND PLASTICS CHEMISTRY
2. A HALF-CENTURY OF CREATIVE COATINGS SCIENCE
3. SEVENTY-FIVE YEARS OF POLYMER SCIENCE AND TECHNOLOGY
4. CHEMISTRY AND TECHNOLOGY OF MULTI COMPONENT POLYMER SYSTEMS
5. STRUCTURE-PROPERTY RELATIONS IN POLYMERS
6. CRITICAL TRANSPORT PHENOMENA IN POLYMER COMPOSITE PROCESSING
7. POLYMER CHARACTERIZATION AND STRUCTURE ANALYSIS
8. SPECTROSCOPIC METHODS IN COATINGS AND PLASTICS RESEARCH AND ANALYSIS
9. MICROSCOPY IN COATINGS AND PLASTICS RESEARCH
10. PHYSICAL TESTING OF ELASTOMERS AND PLASTICS 1
11. TESTING OF COATINGS
12. THE POLYMERIZATION OF VINYL MONOMERS THROUGH FREE RADICAL MECHANISMS
13. MECHANISM OF EMULSION POLYMERIZATION
14. ANIONIC POLYMERIZATION
15. COORDINATED ANIONIC POLYMERIZATION AND POLYMERIZATION MECHANISMS
16. CATIONIC POLYMERIZATIONS: PAST, PRESENT AND FUTURE
17. CONDENSATION POLYMERIZATION AND POLYMERIZATION MECHANISMS
18. COLOR SCIENCE
19. THE SCIENCE AND TECHNOLOGY OF OPAQUE WHITE PIGMENTS IN COATINGS
20. CHEMISTRY AND TECHNOLOGY OF COLOR PIGMENTS
21. METHODS OF APPLICATION OF COATINGS
22. THE PHYSICAL CHEMISTRY OF FILM FORMATION
23. ELECTRODEPOSITION OF PAINT
24. CURING METHODS FOR COATINGS
25. CHEMISTRY AND TECHNOLOGY OF POLYSTYRENE AND STYRENE COPOLYMERS
26. CHEMISTRY AND TECHNOLOGY OF POLYOLEFINS
27. CHEMISTRY AND TECHNOLOGY OF POLYVINYL CHLORIDE
28. CHEMISTRY AND TECHNOLOGY OF RUBBER
29. CHEMISTRY AND TECHNOLOGY OF BLOCK POLYMERS
30. CHEMISTRY AND TECHNOLOGY OF ENGINEERING PLASTICS
31. ECONOMIC GROWTH OF THE COATINGS INDUSTRY
32. ECONOMIC GROWTH OF THE PLASTICS INDUSTRY
33. THE ECONOMIC GROWTH OF THE ADHESIVES INDUSTRY
34. CHEMISTRY AND TECHNOLOGY OF ADHESIVES
35. CHEMISTRY AND TECHNOLOGY OF PRINTING INKS
36. CHEMISTRY AND TECHNOLOGY OF DRYING OILS
37. CHEMISTRY AND TECHNOLOGY OF ALKYD RESINS
38. CHEMISTRY AND TECHNOLOGY OF HOUSE PAINTS
39. CHEMISTRY AND TECHNOLOGY OF HEAT-RESISTANT POLYMERS
40. CHEMISTRY AND TECHNOLOGY OF FIBERS
41. THE CHEMISTRY AND TECHNOLOGY OF LATEX POLYMERS IN COATINGS
42. CHEMISTRY AND TECHNOLOGY OF PLASTICIZERS
43. THEORIES OF SOLVENCY AND SOLUTION
44. CHEMISTRY AND TECHNOLOGY OF SOLVENTS
45. CHEMISTRY AND TECHNOLOGY OF BITUMINOUS COATINGS
46. CHEMISTRY AND TECHNOLOGY OF AMINO RESINS
47. CHEMISTRY AND TECHNOLOGY OF POLYIMIDE RESINS IN COATINGS
48. CHEMISTRY AND TECHNOLOGY OF PHENOLIC RESINS AND COATINGS
49. CHEMISTRY AND TECHNOLOGY OF UNSATURATED POLYESTER RESINS
50. THE CHEMISTRY AND TECHNOLOGY OF SILICON RESINS
51. CHEMISTRY AND TECHNOLOGY OF TALL OIL AND NAVAL STORES

Subjects

306 . Plastics -- Congresses

409 . Polymers and
polymerization --
Congresses.

52. EPOXY RESIN CHEMISTRY AND TECHNOLOGY
53. CHEMISTRY AND TECHNOLOGY OF VINYL RESINS USED IN COATINGS
54. URETHANE COATINGS
55. CHEMISTRY AND TECHNOLOGY OF ACRYLIC RESINS FOR COATINGS
56. CHEMISTRY AND TECHNOLOGY OF CELLULOSE ACETATE AND RELATED ESTERS
57. THE CHEMISTRY AND TECHNOLOGY OF NITROCELLULOSE, ETHYL CELLULOSE, AND WATER-SOLUBLE CELLULOSE ETHERS

Reviews - Synopsis - Dust Jacket

PREFACE

The science and technology of surface coatings encompasses a broad mixture of fundamental and practical disciplines including physical chemistry and physics; chemical, mechanical and other types of engineering; mathematics; and analytical, colloid, organic, polymer and resin chemistry. Polymer chemistry, as represented by the activities of the Division of Polymer Chemistry of the American Chemical Society, is largely concerned with the theoretical and fundamental aspects of the subject. On the other hand many applications of polymer chemistry have been the concern of the Division of Organic Coatings and Plastics Chemistry. Everything considered, there are many areas of common interest and fruitful opportunities for diffusion of ideas among workers in surface coatings, polymers, plastics and elastomers. Indeed, the current Division of Polymer Chemistry is an offshoot of the Coatings Division as discussed by Allen Alexander in the first chapter of this book. Because of the historical and current close relationships among these fields, the Fiftieth Anniversary Symposium was planned to include most major aspects of surface coatings, plastics, and polymer chemistry, with some attention to integral and closely related topics such as elastomers, fibers, inks, and adhesives.

Although all contributions to the symposium cannot be categorized neatly into homogeneous topical areas, the subject matter roughly follows a sequence as follows:

Introductory papers: Chapters 1-5.
Physical Phenomena, Characterization and Testing: Chapters 6-11.
Polymerization and Polymerization Mechanisms: Chapters 12-17.
Color and Pigment Science: Chapters 18-20.
Film Application, Formation and Cure: Chapters 21-24.
Chemistry and Technology of Plastics and Rubbers: Chapters 25-30.
Marketing and Economics: Chapters 31-33.
Chemistry and Technology of Various Products: Chapters 34-57.

The subject matter of this book represents a major segment of chemical industry. Research in the fundamental and applied aspects of polymer science is concentrated mainly in industrial laboratories rather than in academic institutions, but many of the polymer scientists in the universities have a high degree of appreciation for the commercial applications and economic significance of their work. Much of the academic interest and expertise was concentrated originally in the pioneer schools such as the Polytechnic Institute of New York (formerly Polytechnic Institute of Brooklyn), the Institute for Rubber Research at the University of Akron, and in the case of coatings at North Dakota State University. Although noteworthy departments and courses in polymer and coatings science have spread to many other universities, the comment has been made by many leading educators and scientists that training in polymer science in the universities deserves far more emphasis. Perhaps this volume will help to catalyze greater attention on fundamental and applied polymer science in education and provide a source of information for students as well as for established scientists and technologists.

Because of the great diversity of topics in this book as well as the diversity of attitudes and viewpoints of the various authors, the treatment of each subject varies to a fair extent. To the degree possible, each author was encouraged to present a picture of the state of the science or art in the period of about fifty years ago when the Division was organized, a recognition of major milestones since then, a discussion of the present state of knowledge, and a look into the future. Quite obviously, the

papers in general had to be fairly brief but the absolute length depended considerably upon the scope of the subject matter and the wishes of individual authors. Constraints of time, cost and the method of reproduction (no type-setters) dictated that some variations in format had to be accepted.

The editors are deeply grateful to the capable and conscientious contributing authors who are among the foremost authorities in their fields. The generosity of several publishers in permitting reproduction of text and figures is gratefully acknowledged and mentioned specifically at various places in the text.

Roy W. Tess and J. Kenneth Craver

Title	Location	Edition / Series / Misc.
909 Art of Chemistry: Myths, Medicines, and Materials		Edition:
Author: Greenberg, Arthur	Dynix: 104503	Series: Wiley-Interscience Series
Publish.: John Wiley & Sons	Call No.: 540.9 Gr	
- place: Hoboken, NJ	ISBN: 0471071803	
- date: ©2003	Shelf Adult Non-Fiction	Year: 2003
Subject: Chemistry -- History		Price: \$59.95
Desc: xix, 357 p., [16] p. of plates: illus. (some color), 29 cm.		

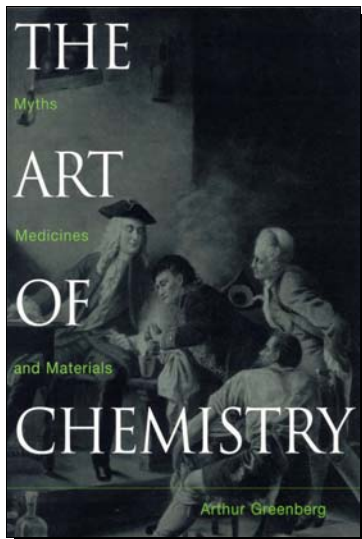


Table of Contents

Preface

Acknowledgments

Color Plate Captions

SECTION I. SPIRITUAL AND MYTHOLOGICAL ROOTS

Eastern and Western Esoterica

The Four Ancient Elements

Mystical and Majestic Numbers

Natural Magick: Metamorphoses of Werewolves and Metals

Albert the Great and "Albert the Pretty Good"

A Canterbury Tale of Alchemy

The Ship of Fools

The First Modern Encyclopedia

An Alchemical Bestiary

Who Is Athanasius Kircher, and Why Are They Saying Those Terrible Things about Him?

Unnatural Magick -- Witches and Stirring Rods of Bone

SECTION II. STILLS, CUPELS, AND WEAPONS

The Magic of Distillation

Practical Metallurgical Chymistry

A Promising President

These Are a Few of Our Nastiest Things

SECTION III. MEDICINES, PURGES, AND OINTMENTS

The Joy of Sextodecimo

The Compleat Apothecary

"Rare Effects of Magical and Celestial Fire"

Secrets of a Lady Alchemist

"Pray and Work"

A Good Old-Fashioned Purge

SECTION IV. AN EMERGING SCIENCE

The Ancient War of the Knights

Skeptical about "Vulgar Chymical Opinions"

Enhancing Frail Human Senses

A Fleeting Whiff of Oxygen?

Lucifer's Element and Kunckel's Pills

The Emperor's Mercantile Alchemist

The Humble Gift of Charcoal

The Surprising Chemical Taxonomies of Minerals and Mollusks

There Is Truth in Chalk

SECTION V. TWO REVOLUTIONS IN FRANCE

In the Early Morning Hours of the Chemical Revolution

An Early but Distant Relative of the Periodic Table

Apothecary's Assistant and Member of the Royal Academy of Sciences

Laughing Gas or Simply "Semiphlogisticated Nitrous Air" (?)

Eulogy for Eudiometry

Water Will Not "Float" Phlogiston

Subjects

561 .	Alchemy
562 .	Chemistry -- History
563 .	Medicine -- History

Ben Franklin -- Diplome Extraordinaire
Okay, I Now Know What "Oxidation" Means, but What Is "Reduction"?
The Man in the Rubber Suit
"Poor Old Marat"? I Think Not!
Poor Old Lamarck
Mon Cher Phlogiston, "You're Speaking Like an Ass!"
Requiem for a Lightweight

SECTION VI. A YOUNG COUNTRY AND A YOUNG THEORY

"It Is a Pity So Few Chemists Are Dyers, and So Few Dyers Chemists"
Two Early Visions: Oxidation without Oxygen and Women as Strong Scientists
EXCLUSIVE! First Printed Pictures of Dalton's Molecules
Atmospheric Water Molecules and the Morning Dew
'Tis a Bonnie Chymistrie We Brning Ye
"For It's Hot as Hell...in Phila-del'-phi-a"
Twelve Cents for a Chemistry Lecture

SECTION VII. SPECIALIZATION AND SYSTEMIZATION,

Geodes
Colorful "Notions of Chemistry"
What Are Organic Chemists Good for?
Never Smile at a Cacodyl
Mendeleev's "Cosmic Staircase" to a "Pythagorean Heaven"
The Electric Oxygen
"Chemistry Compressed"
Laevo-Man Would Enjoy the "Buzz" but Not the Taste of His Beer
What Else Could a Woman Write about?
Searching for Signs of Neon
A "Grouch" or a "Crank"?
Why Is Prout's Hypothesis Still in Modem Textbooks?

SECTION VIII. SOME FUN

Clairvoyant Pictures of Atoms-A Strange Chymical Narrative
The Periodic Helix of the Elements
White Lightning in an Atom, a Kiss, or a Star
"Trade Ya Babe Ruth for Antoine Lavoisier!"
The Secret Life of Wanda Witty
Pauling's Cartoon Carnival
Here's to Long Life (L'Chaim)!
So You Weren't Joking, Mr. Feynman!

Epilogue
A Natural Scientist
Descended from Fallopian Test Tubes?
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

A fascinating collection of the pictures, figures and diagrams that chemists create to explain their craft. In "A Chemical History Tour", Arthur Greenberg took readers on a wild romp through the history of chemistry, introducing the unique characters, sometimes bizarre theories and novel experiments that ultimately produced the modern science. Now Greenberg returns with more tales of chemistry glory, lovingly chronicling the extraordinary artwork that alchemists and chemists have produced in their pursuit of understanding the nature of matter in "The Art of Chemistry: Myths, Medicines and Materials".

"The Art of Chemistry" employs 187 figures (including 16 full-color plates) to illuminate 72 essays on the mythical origins, wondrous experiments and adventurous explorers in the annals of chemistry. Greenberg divides his delightful study into eight sections:

- Spiritual and Mythological Roots
- Stills, Cupels and Weapons
- Medicines, Purges and Ointments
- An Emerging Science
- Two Revolutions in France

- A Young Country and a Young Theory
- Specialization and Systemization
- Some Fun

Each section tracks chemistry's incremental progress from myth to modern science, featuring the figures and diagrams that early chemists used to explain their craft. Along the way, readers will meet the deadly basilisk and the fabulous phoenix that populated the lore of pre-modern chemistry, learn the contributions to chemistry of the American natural philosopher Benjamin Franklin and encounter Antoine Lavoisier, the father of modern chemistry and perhaps France's greatest economist.

Greenberg also examines our fundamental connections with science through two personal essays, one on an adolescent friend who improbably (but perhaps inevitably) became a world-renowned entomology professor and the other on his quest to discover his own chemical heritage. "The Art of Chemistry" is sure to inform and entertain anyone interested in our eternal quest to know the natural world.

PREFACE

The physician and writer Oliver Sacks has written that "Chemistry has perhaps the most intricate, most fascinating, and certainly most romantic history of all of the sciences." How does one convey the surprise, pleasure, and excitement of discovery in early chemistry to the college or high school student or, for that matter, the teacher? There is also a receptive public who do indeed wish to learn more about science. So why burden them with some outdated theories alongside those most current? The answer is that it is vital to help nonscientists understand how science works. First and foremost, the practice of science is an intensely human endeavor. Although alchemy is treated today by most (non-"New Age") people as an exercise in naivete if not downright fraud, it was in fact a fundamentally human attempt to understand Nature's unity and to try and express it metaphorically. The transformation of these myths, superstitions, and applications to the arts and medicine into our modern science provides the forward motion of this book. But a recurring theme is our very human need to visualize and try to understand the fundamental nature of matter. Another goal is to understand early experimental chemistry at a time when the "guts" of the apparatus were fully visible in contrast to the "black boxes" that today are so ubiquitous. (It is indeed arguable that those who perform DNA sequencing in an automated "black box" that spews out alphabetical sequences of nucleotides may have forgotten that they are actually doing chemistry.)

The Art of Chemistry is very similar in style to my earlier book, *A Chemical History Tour*, published in 2000. The book's foundation is the wonderful artwork employed over the centuries to illustrate chemical apparatus as well as our various metaphors for the nature and structure of matter. It attempts to entertain as well as inform. In the present book, 188 figures are employed to illuminate 72 essays. I have attempted to make these essays accessible to a broad audience, including chemists and chemistry teachers, other scientists and teachers, engineers and physicians, as well as nonscientists who find science interesting and enjoy artwork. This book is not an orderly history of chemistry but rather another idiosyncratic tour including many historical "sites" unvisited in our first tour as well as a few revisits uncovering new insights. The essays are organized in eight sections in roughly chronological order. The first section focuses on the imagery of the spiritual and mythological roots of chemistry-gods and goddesses, winged dragons, witches, the phoenix, of course (was the Japanese film icon Rodan a phoenix?), passionate birds of prey, the feared basilisk (spitting cobra or Godzilla?), and the ouroboros -- a metaphor for the conservation of matter and perhaps Kekule's true inspiration for the structure of benzene. The second and third sections of the book treat the technological aspects of early chemistry. In addition to beautiful plates of sixteenth- and seventeenth-century stills and other apparatus there is a rather too graphic image of antimony's power as a purgative -- both emetic and laxative. The fourth section focuses on the period between the mid-1600s and mid-1700s when chemistry began to emerge as a science. In addition to Boyle, Hooke, and Mayow, who almost solve the riddle of combustion and respiration, we have the business machinations surrounding the discovery of phosphorus -- first come the market, then decide what the new element is good for. We think of Becher as the ur-father of the first true theory of chemistry: phlogiston. However, he was perhaps the foremost mercantilist of his era as well as the economic advisor to Leopold I, Emperor of the Holy Roman Empire. The longest section of *The Art of Chemistry* is devoted to the chemical revolution that occurred during the last half of the eighteenth century. It is not commonly appreciated that while Lavoisier was surely the father of modern chemistry, he was also one of the most influential economists of the eighteenth century. Benjamin Franklin's early contributions to chemistry are visited briefly in this section. In Section VI, Dalton's atomic theory is introduced as the culmination of the chemical revolution. Five essays in this section are devoted to chemistry in America at the beginning of the nineteenth century. One of my favorite figures in this book is an early American (ca. 1790) laboratory apparatus for synthesizing sulfuric acid that combines elements of the farm (clay crocks) and the blacksmith shop (bellows). The major themes in Section VII are the development of specializations in chemistry, exemplified by organic chemistry, and the consolidation introduced by the Periodic Law. Like *A Chemical History Tour*, coverage lightens during the late nineteenth century and is very sparse during the twentieth and twenty-first centuries. The explosive exponential growth of the chemical literature would make balanced and appropriately weighted coverage impossible. Furthermore, we are immersed in a sea of textbooks and monographs treating this modern material. Thus, the final section (VIII) treats some modern topics in very light manner, although it endeavors to give readers a peek at the future- nanotechnology and self-organization, which are both triumphs of our ability to understand the chemical structure of matter at its most fundamental level.

I have concluded The Art of Chemistry with an Epilogue consisting of two brief, more personal essays. One of these is about a friend from adolescent year Robert Silberglied, a quirky and ingenious butterfly collector and mischief-maker, who became a world-renowned entomology Professor at Harvard before he died at an early age in an airplane crash. The second is a brief essay whimsical visiting my own chemistry genealogy. Although these may appear to be exercises in self-indulgence and self-aggrandizement, they are not meant to be. The purpose is to give the reader a taste for our scientific culture-the early signs of "natural scientist" and the interest in our personal scientific roots and desire to connect with the past.

But beyond artwork I have attempted to include excerpts from plays and novels and even take a trip into occult realms. Thus, we have some fun with one of Chaucer's Canterbury Tales. Dmitri Mendeleev and the great composer Alexander Borodin, both chemists in their mid-twenties, took a leisurely trip to the groundbreaking chemistry conference at Karlsruhe in 1860, stopping frequently to indulge their tastes for music. What an interesting premise for a film. While many readers are familiar with Primo Levi's autobiographical book The Periodic Table, how many are familiar with Lewis' White Lightning (1923), a 354-page novel consisting of 92 chapters for the chemical elements in order of atomic number? The broader cultural perspective of chemistry has been well served by the play Oxygen, written by the distinguished chemists Carl Djerassi and Roald Hoffmann. In addition to including a very brief excerpt from this play, I have also included a brief excerpt of Peter Weiss's 1966 play Marat/Sade. There is even a faux-Thurber short story inspired by the doodling of a high school student on the title page of her late-nineteenth-century textbook. While I have retained some of the Rabelaisian earthiness of the Renaissance and injected a bit of satire, the ultimate purpose of this book is a serious one, to provide education and enjoyment.

Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing

LASCT Holdings -
maximum detail by Title

A

Title	Location	Edition / Series / Misc.
19 Asphalts and Allied Substances: Their Occurrence, Modes of Production, Uses in the Arts and Metho		<i>Edition:</i> 6th edition
<i>Author:</i> Abraham, Herbert, 1883-	<i>Dynix:</i> 44813	<i>Series:</i>
<i>Publish.:</i> D. Van Nostrand Company, Inc.	<i>Call No.:</i> 553.27 Ab	
<i>- place:</i> Princeton, NJ	<i>ISBN:</i>	
<i>- date:</i> [1960-63], ©1918	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1960
<i>Subject:</i> Asphalt		<i>Price:</i> \$25.00
<i>Desc:</i> 5 v., illus., maps, diagrams, 24 cm.		

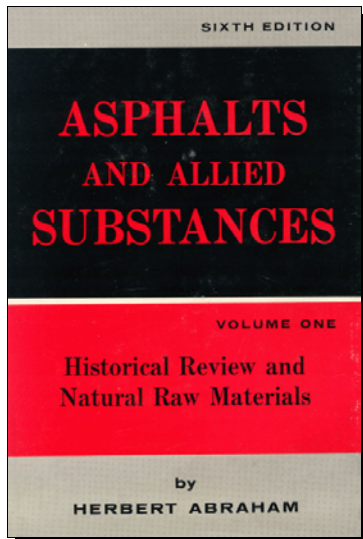


Table of Contents

VOLUME ONE:

1. Historical Review
2. Terminology and Classification of Bituminous Substances
3. Chemistry of Bituminous Substances
4. Geology and Origin of Bitumens and Pyrobitumens
5. Annual Production of Bituminous Substances and Their Manufactured Products
6. Methods of Mining, Transporting and Refining
7. Mineral Waxes
8. Native Asphalts Occurring in a Fairly Pure State
9. Native Asphalts Associated With Mineral Matter
10. Asphaltites
11. Asphaltic Pyrobitumens
12. Pyrobituminous Shales

VOLUME TWO:

1. General Methods of Producing Tars
2. Wood-Tar, Wood-Tar Pitch and Rosin Pitch
3. Peat and Lignite Tars and Pitches
4. Shale Tar and Shale-Tar Pitch
5. Coal Tar and Coal-Tar Pitch
6. Water-Gas and Oil-Gas Tars and Pitches
7. Fatty-Acid Pitch, Bone Tar and Bone-Tar Pitch
8. Petroleum Asphalts
9. Paraffin Wax, Wax Tailings and Resins
10. Wurtzilite Asphalt

VOLUME THREE:

1. Compounding of Bituminous Substances
2. Bituminous Substances Admixed with Discrete Aggregates
3. Bituminous Substances Dispersed in Water
4. Bituminous Substances Dissolved in Solvents
5. Solid, Semi-Solid and Semi-Liquid Bituminous Compositions
6. Bituminous Paving Materials
7. Bituminized Fabrics for Roofing, Flooring, Waterproofing, Building and Insulating Purposes
8. Bituminous Lacquers, Caulking Compounds, Cements, Varnishes, Enamels and Japans

VOLUME FOUR:

1. Sampling Methods
2. Examination of Crude, Refined and Blended Bituminous Substances
 - Physical Characteristics
 - Mechanical Tests
 - Thermal Tests
 - Solubility Tests
 - Chemical Tests

VOLUME FIVE:

1. Examination of Manufactured Bituminous Products Combined with Discrete Aggregates
 - Physical Tests
 - Separation of Bituminized Aggregate Into Its Components
 - Recovered Bituminous Binder
 - Recovered Mineral Constituents

Subjects

223 .	Asphalt
346 .	Bitumen
427 .	Asphalt -- Bibliography

Volumes

Historical Review and Natural Raw Materials - vol. 1
Industrial Raw Materials - vol. 2
Manufactured Products - vol. 3
Methods of Testing: Fabricated Bituminous Products - vol. 5
Methods of Testing: Industrial Raw Bituminous Materials - vol. 4

2. Examination of Bituminized Fabrics
 - Physical Tests of Finished Product
 - Separation of Bituminized Felts, Papers and Textiles Into Their Components
 - Recovered Bituminous Coatings and Saturant
 - Recovered Mineral Surfacing and Admixed Mineral Filler
 - Recovered Fabric
3. Examination of Bituminous-Solvent Compositions
 - Physical Tests of Finished Product
 - Separation of Bituminous-Solvent Composition Into Its Components
4. Examination of Bituminous Dispersions
 - Physical Tests of Finished Product
 - Separation of Bituminous Dispersion Into Its Components
5. Weathering
 - Effects of Weathering

Temperature Conversion Table
Bibliography
References
Index of Subjects
Index of Specifications
Index of Names (Authors and Patentees)
Index of Patents

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Few standard reference guides for an industry have withstood the test of time as this one by Herbert Abraham now in its sixth edition, over forty years since first publication. Repeatedly enlarged and revised to reflect the needs of a growing bituminous products' industry, this new up-to-date edition for the first time will be divided into five volumes for greater convenience. It still covers the same broad range of subjects for those interested in the fabrication, merchandising and application of bituminous products, from the needs of the chemist, data for refinery personnel, to practical applications for engineers, contractors, and architects. This revision includes both foreign and domestic technological developments that have occurred since the previous edition was published. Voluminous references and bibliographic data help make this five volume edition a unique tool for all chemists, engineers, geologists, salesmen, and students in the industry.

In volume ONE will be found a brief historical review along with terminology, classification and the chemistry of bituminous substances, and extensive coverage of the natural raw materials. The geographic locations of known asphalt deposits throughout the world are listed and methods of mining, transporting, refining, and storing them are outlined.

In the SECOND volume tars, pitches, pyrogenous asphalts and waxes are thoroughly covered. The composition of these substances are discussed as well as the various methods of distillation used in their recovery and refinement. The author includes information on specific economic uses of products derived from the distilling of asphalts and related materials.

In the THIRD volume the compounding of various substances to produce mixtures best adopted for their special purposes is presented. Many new processes are described for softening a substance and lowering its fusing point, hardening a substance and raising its fusing point, rendering the mixture less susceptible to temperature changes, effecting a more perfect union of the constituents, improving its weather-proofing and waterproofing qualities, increasing its tensile strength, making the mixture wax-like, and lessening its tendency to stickiness. It also covers the modern processes used in manufacturing various types of bituminous products, such as paving materials, roofings, floorings, waterproofing compositions, cements, emulsing, paints, lacquers, etc.

The FOURTH volume describes methods suitable for sampling, and the most important tests for examining crude, refined and blended bituminous substances. The methods given are also applicable to bituminous paving materials; granular mineral surfaces for roofings; bituminized paper and fabrics; and bituminous emulsions. Sixty-five tests, grouped under four headings-physical characteristics; mechanical tests; solubility tests; and chemical tests -- are included.

In the FIFTH volume, testing methods are given for the examination of manufactured products, including paving mixtures-bituminous macadam, grouts, mastics, pipe sealers and pipe enamels -- and premolded compositions, such as asphalt tiles, battery boxes and electrical insulation compositions. Also covered are tests for bituminized fabrics, solvent compositions, and dispersions, including tests of the finished product and effects of weathering. Both physical tests (specific gravity; voids; water, acid and impact resistance, etc.) and analysis procedures for determining the percentage and nature of the constituents and for examining physical and chemical characteristics are also covered.

Title	Location	Edition / Series / Misc.
912 ASTM Standards on Color and Appearance Measurement Author: American Society for Testing and Materials, Committee E-12 on Appearance Publish.: ASTM International - place: West Conshohocken, PA - date: ©2000 Subject: Materials -- Appearance -- Standards Desc: xxiii, 710 p., illus., 28 cm. + 1 computer laser optical disc (4¾")	Dynix: 105687 Call No.: 630.1 As ISBN: 0803127359 Shelf Reference	Edition: 6th edition Series: Year: 2000 Price: \$175.00



Table of Contents

This contents lists, in alphanumeric sequence, ASTM published standards applicable to the appearances of materials.

In the serial designations prefixed to the following titles, the number following the dash indicates the year of adoption as standard or, in the case of revision, the year of last revision. Thus, standards adopted or revised during the year 2000 have as their final number, 00. A letter following this number indicates more than one revision during that year, that is 00a indicates the second revision in 2000, 00b, the third revision, etc. Standards that have been reapproved without change are indicated by the year of last reapproval in parentheses as part of the designation number, for example, (2000).

- D 156-94 Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
- D 332-87 (1997) Test Method for Relative Tinting Strength of White Pigments by Visual Observation
- D 344-97 Test Method for Relative Hiding Power of Paints by the Visual Evaluation of Brushouts
- D 387-86 (1994) Test Method for Color and Strength of Color Pigments with a Mechanical Muller
- D 523-89 (1999) Test Method for Specular Gloss
- D 589-97 Test Method for Opacity of Paper (15°/Diffuse Illuminate A, 89% Reflectance Backing and Paper Backing)
- D 985-97 Test Method for Brightness of Pulp, Paper, and Paperboard (Directional Reflectance at 457 nm)
- D 1003-97 Test Method for Haze and Luminous Transmittance of Transparent Plastics
- D 1209-97 Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)
- D 1223-93 (1998) Test Method for Specular Gloss of Paper and Paperboard at 75° D 1494-97 Test Method for Diffuse Light Transmission Factor of Reinforced Plastic Panels
- D 1500-98 Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
- D 1535-97 Test Method for Specifying Color by the Munsell System
- D 1544-98 Test Method for Color of Transparent Liquids (Gardner Color Scale)
- D 1729-96 Practice for Visual Appraisal of Colors and Color Difference of Diffusely Illuminated Opaque Materials
- D 1746-97 Test Method for Transparency of Plastic Sheeting
- D 1834-90 (1995) Test Method for 20° Specular Gloss of Waxed Paper
- D 1889-99 Test Method for Turbidity of Water
- D 2066-97 Test Methods for Relative Tinting Strength of Paste Type Printing Ink Dispersions
- D 2244-93 Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates
- D 2616-96 Test Method for Evaluation of Visual Color Difference with a Gray Scale
- D 2745-93 Test Method for Relative Tinting Strength of White Pigments by Reflectance Measurements
- D 2805-96a Test Method for Hiding Power of Paints by Reflectometry
- D 2851-98 Specification for Liquid Optical Adhesives
- D 3022-84 (1996) Test Method for Color and Strength of Color Pigments by Use of a Miniature Sandmill
- D 3134-97 Practice for Establishing Color and Gloss Tolerances
- D 3208-94 Specification for Manifold Papers for Permanent Records
- D 3928-93 (1998) Test Method for Evaluation of Gloss or Sheen Uniformity
- D 3964-98 Practice for Selection of Coating Specimens for Appearance Measurements
- D 4039-93 (1999) Test Method for Reflection Haze of High-Gloss Surfaces
- D 4061-94 Test Method for Retroreflectance of Horizontal Coatings

Subjects

555 .	Colorimetry -- Standards
556 .	Materials -- Appearance -- Standards

- D 4086-92a (1997) Practice for Visual Evaluation of Metamerism
- D 4265-98 Guide for Evaluating Stain Removal Performance in Home Laundering
- D 4280-96 Specification for Extended Life-Type, Nonplowable, Prismatic, Raised, Retroreflective Pavement Markers
- D 4303-99 Test Methods for Lightfastness of Pigments Used in Artists' Paints
- D 4383-96 Specification for Plowable, Raised, Retroreflective Pavement Markers
- D 4449-90 (1999) Test Method for Visual Evaluation of Gloss Differences Between Surfaces of Similar Appearance
- D 4505-96 Specification for Preformed Plastic Pavement Marking Tape for Extended Service Life
- D 4592-96 Specification for Preformed Plastic Pavement Marking Tape for Limited Service Life
- D 4838-88 (1998) Test Method for Determining the Relative Tinting Strength of Chromatic Paints
- D 4956-99 Specification for Retroreflective Sheeting for Traffic Control
- D 4960-89 (1998) Test Method for Evaluation of Color for Thermoplastic Traffic Marking Materials
- D 5326-94a Test Method for Color Development in Tinted Latex Paints
- D 5386-93b Test Method for Color of Liquids Using Tristimulus Colorimetry
- D 5531-94 (1999) Guide for the Preparation, Maintenance and Distribution of Physical Product Standards for Color and Geometric Appearance of Coatings
- D 5767-95 (1999) Test Methods for Instrumental Measurement of D-O-I Gloss of Coating Surfaces
- D 6045-96 Test Method for Color of Petroleum Products by the Automatic Tristimulus Method
- D 6131-97 Test Method for Evaluating the Relative Tint Undertone of Titanium Dioxide Pigments
- D 6166-97 Test Method for Color of Naval Stores and Related Products (Instrumental Determination of Gardner Color)
- D 6290-98 Test Method for Color Determination of Plastic Pellets
- D 6359-99 Specification for Minimum Retroreflectance of Newly Applied Pavement Marking Using Portable Hand-Operated Instruments
- E 167-96 Practice for Goniophotometry of Objects and Materials
- E 171-94 (1998) Specification for Standard Atmospheres for Conditioning and Testing Flexible Barrier Materials
- E 179-96 Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials
- E 253-99 Terminology Relating to Sensory Evaluation of Materials and Products
- E 259-98 Practice for Preparation of Pressed Powder White Reflectance Factor Transfer Standards for Hemispherical and Bi-Directional Geometries
- E 275-93 Practice for Describing and Measuring Performance of Ultraviolet, Visible, and Near Infrared Spectrophotometers
- E 284-99a Terminology of Appearance
- E 308-99 Practice for Computing the Colors of Objects by Using the CIE System
- E 312-96 Practice for Description and Selection of Conditions for Photographing Specimens
- E 313-98 Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates
- E 387-84 (1995) Test Method for Estimating Stray Radiant Power Ratio of Spectrophotometers by the Opaque Filter Method
- E 424-71 (1993) Test Methods for Solar Energy Transmittance and Reflectance (Terrestrial) of Sheet Materials
- E 430-97 Test Method for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry
- E 691-99 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
- E 805-94 Practice for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials
- E 808-99a Practice for Describing Retroreflection
- E 809-94a Practice for Measuring Photometric Characteristics of Retroreflectors E 810-94 Test Method for Coefficient of Retroreflection of Retroreflective Sheeting
- E 811-95 Practice for Measuring Colorimetric Characteristics of Retroreflectors under Nighttime Conditions
- E 903-96 Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
- E 932-89 (1997) Practice for Describing and Measuring Performance of Dispersive Infrared Spectrometers

- E 991-98 Practice for Color Measurement of Fluorescent Specimens
- E 1164-94 Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation
- E 1247-92 Test Method for Identifying Fluorescence in Object-Color Specimens by Spectrophotometry
- E 1331-96 Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry
- E 1336-96 Test Method for Obtaining Colorimetric Data from a Visual Display Unit by Spectroradiometry
- E 1341-96 Practice for Obtaining Spectroradiometric Data from Radiant Sources for Colorimetry
- E 1345-98 Practice for Reducing the Effect of Variability of Color Measurement by Use of Multiple Measurements
- E 1347-97 Test Method for Color and Color Difference Measurement by Tristimulus (Filter) Colorimetry
- E 1348-90 (1996) Test Method for Transmittance and Color by Spectrophotometry Using Hemispherical Geometry
- E 1349-90 (1998) Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional Geometry
- E 1360-90 (1995) Practice for Specifying Color by Using the Optical Society of America Uniform Color Scales System
- E 1392-96 Test Method for Angle Resolved Optical Scatter Measurements on Specular and Diffuse Surfaces
- E 1455-97 Practice for Obtaining Colorimetric Data from a Visual Display Unit Using Tristimulus Colorimeters
- E 1477-98a Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating Sphere Reflectometers
- E 1478-97 Practice for Visual Color Evaluation of Transparent Sheet Materials
- E 1499-97 Guide for the Selection, Evaluation, and Training of Observers
- E 1501-99 Specification for Nighttime Photometric Performance of Retroreflective Pedestrian Markings for Visibility Enhancement
- E 1541-98 Practice for Specifying and Matching Color Using the Colorcurve System
- E 1651-94 (1999) Test Method for Total Luminous Reflectance Factor by Use of 30/ Integrating Sphere Geometry
- E 1682-96 Guide for Modeling the Colorimetric Properties of a Visual Display Unit
- E 1696-95b Test Method for Field Measurement of Raised Retroreflective Pavement Markers Using a Portable Retroreflectometer
- E 1708-95 Practice for Electronic Interchange of Color and Appearance Data
- E 1709-95a Test Method for Measurement of Retroreflective Signs Using a Portable Retroreflectometer
- E 1710-97 Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
- E 1743-96 Practice for Selection and Use of Portable Retroreflectometers for the Measurement of Pavement Marking Materials
- E 1767-95 Practice for Specifying the Geometry of Observations and Measurements to Characterize the Appearance of Materials
- E 1791-96 Practice for Transfer Standards for Reflectance Factor for Near-Infrared Instruments Using Hemispherical Geometry
- E 1808-96 Guide for Designing and Conducting Visual Experiments
- E 1809-96 Test Method for Measurement of High Visibility Retroreflective Clothing Marking Material Using a Portable Retroreflectometer
- E 1896-97a Specifications for Daytime Pedestrian Visibility Enhancement
- E 2022-99 Practice for Calculation of Weighting Factors for Tristimulus Integration
- E 2030-99 Guide for Recommended Uses of Photoluminescent Safety Markings
- F 923-94a Guide to Properties of High Visibility Materials Used to Improve Individual Safety
- F 1048-87 (1999) Test Method for Measuring the Effective Surface Roughness of Optical Components by Total Integrated Scattering
- G 26-96 Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials
- G 138-96 Test Method for Calibration of a Spectroradiometer Using a Standard Source of Irradiance

Reviews - Synopsis - Dust Jacket

FOREWORD

This sixth edition of ASTM Standards on Color and Appearance Measurement continues the series as originally conceived by Richard S. Hunter, (former Chairman, Committee E-12). It includes all revisions to existing standards made since the publication of the fifth edition as well as a number of new standards. This publication was compiled by the ASTM Technical Committee E-12 on Color and Appearance. It is intended to provide guidance in the instrumental and visual appraisal of the appearance of materials, to include specific measurement instruments and techniques for their use. Appearance appraisal involves standard illuminants and observers, as well as actual light sources and human observers. Materials include those which reflect and transmit light, and which are self-luminous. 108 ASTM standards are included, most of which relate to a variety of materials. Titles only of 159 additional ASTM standards are given where applicable to only one class of materials or where appearance is only a small part of the overall standard.

The Introduction and accompanying tables continue to provide a basic overview of the science of appearance. While it is not intended to be an all encompassing reference, the important distinctions between the various optical properties of materials are covered along with the appropriate standard test methods. Several U.S. industry specific organizations also have standards for the analysis of appearance of materials. For the purpose of identification, the applicable methods of three of these industries are listed in the tables. Table 4 lists titles of 17 TAPPI (Technical Association of the Pulp and Paper Industry) standards and eight TAPPI Technical Information Sheets (TIS) that are applicable to paper products. Table 4A lists four AATCC (American Association of Textile Chemists and Colorists) methods and 9 Evaluation Procedures applicable to textile materials. Table 4B lists four SAE (Society of Automotive Engineers) methods applicable to automotive materials. Table 4C lists thirteen selected ISO standards applicable to appearance measurement for several different types of materials.

In Tables 5, 6, and 7, the standards are arranged according to optical characteristics of specimens, optical appearance attributes involved, and industries from which the standards come.

Title	Location	Edition / Series / Misc.
913 ASTM Standards Related to Testing of Radiation-Cured Coatings		<i>Edition:</i>
<i>Author:</i> American Society for Testing and Materials	<i>Dynix:</i> 105706	<i>Series:</i>
<i>Publish.:</i> ASTM International	<i>Call No.:</i> 667 As	
<i>- place:</i> West Conshohocken, PA	<i>ISBN:</i> 0803130449	<i>Year:</i> 2002
<i>- date:</i> ©2002	<i>Shelf:</i> Reference	<i>Price:</i> \$110.00
<i>Subject:</i> Radiation curing -- Standards -- United States		
<i>Desc:</i> xv, 578 p., illus., 28 cm.		

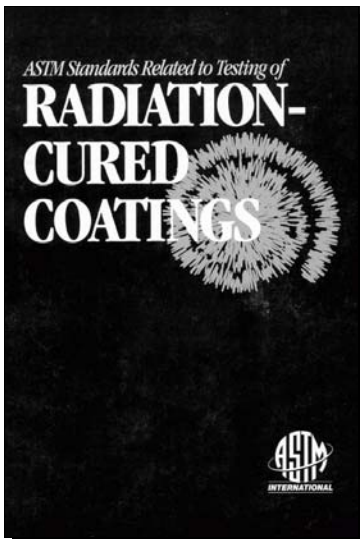


Table of Contents

- D 149-97a Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
- D 150-98 Test Methods for AC Loss Characteristic and Permittivity (Dielectric Constant) of Solid Electrical Insulation
- D 257-99 Test Methods for D-C Resistance or Conductance of Insulating Materials
- D 332-87 (1997) Test Method for Relative Tinting Strength of White Pigments by Visual Observation
- D 387-00 Test Method for Color and Strength of Chromatic Pigments with a Mechanical Muller
- D 522-93a (2001) Test Method for Mandrel Bend Test of Attached Organic Coatings
- D 523-89 (1999) Test Method for Specular Gloss
- D 542-00 Test Methods for Index of Refraction of Transparent Organic Plastics
- D 638-01 Test Method for Tensile Properties of Plastics
- D 696-98 Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer
- D 882-01 Test Method for Tensile Properties of Thin Plastic Sheeting
- D 896-97 Test Method for Resistance to Adhesive Bonds to Chemical Reagents
- D 897-01 Test Methods for Tensile Properties of Adhesive Bonds
- D 903-98 Test Method for Peel or Stripping Strength of Adhesive Bonds
- D 904-99 Practice for Exposure of Adhesive Specimens to Artificial Light
- D 905-98 Test Method for Strength Properties of Adhesive Bonds in Shear by Compressive Loading
- D 950-98 Test Method for Impact Strength of Adhesive Bonds
- D 971-99a Test Method for Interfacial Tension of Oil Against Water by the Ring Method
- D 974-01 Test Method for Acid and Base Number by Color-Indicator Titration
- D 1003-00 Test Method for Haze and Luminous Transmittance of Transparent Plastics
- D 1006-01 Practice for Conducting Exterior Exposure Tests of Paints on Wood
- D 1044-99 Test Method for Resistance of Transparent Plastics to Surface Abrasion
- D 1084-97 Test Method for Viscosity of Adhesives
- D 1144-99 Practice for Determining Strength Development of Adhesive Bonds
- D 1151-00 Practice for Effect of Moisture and Temperature on Adhesive Bonds
- D 1200-94 (1999) Test Method for Viscosity by Ford Viscosity Cup
- D 1209-00 Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)
- D 1210-96 Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
- D 1218-99 Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids
- D 1259-85 (2001) Test Methods for Nonvolatile Content of Resin Solutions
- D 1304-99 Test Methods for Adhesives Relative to Their Use as Electrical Insulation
- D 1308-87 (1998) Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- D 1316-93 (2001) Test Method for Fineness of Grind of Printing Inks by the NPIRI Grindometer
- D 1331-89 (2001) Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents
- D 1474-98 Test Methods for Indentation Hardness of Organic Coatings
- D 1475-98 Test Method for Density of Liquid Coatings, Inks and Related Products
- D 1541-97 Test Method for Total Iodine Value of Drying Oils and Their Derivatives
- D 1544-98 Test Method for Color of Transparent Liquids (Gardner Color Scale)
- D 1652-97 Test Methods for Epoxy Content of Epoxy Resins
- D 1653-93 (1999) Test Methods for Water Vapor Transmission of Organic Coating Films
- D 1747-99 Test Method for Refractive Index of Viscous Materials
- D 1875-95 Test Method for Density of Adhesives in Fluid Form
- D 2008-91 (2001) Test Method for Ultraviolet Absorbance and Absorptivity of Petroleum Products
- D 2067-97 Test Method for Coarse Particles in Printing Ink Dispersions
- D 2094-00 Practice for Preparation of Bar and Rod Specimens for Adhesion Tests
- D 2095-96 Test Method for Tensile Strength of Adhesives by Means of Bar and Rod Specimens
- D 2134-93 (2001) Test Method for Determining the Hardness of Organic Coatings with a Sward-Type Hardness Rocker

Subjects

- 591 .** Plastic coatings -- Testing -- Standards -- United States
- 593 .** Radiation curing -- Standards -- United States

- D 2196-99 Test Methods for Rheological Properties of Non-Newtonian Materials By Rotational (Brookfield Type) Viscometer
- D 2197-98 Test Methods for Adhesion of Organic Coatings by Scrape Adhesion
- D 2240-02 Test Method for Rubber Property-Durometer Hardness
- D 2556-93a (1997) Test Method for Apparent Viscosity of Adhesives Having Shear-Rate-Dependent Flow Properties
- D 2739-97 Test Method for Volume Resistivity of Conductive Adhesives
- D 2979-01 Test Method for Pressure-Sensitive Tack of Adhesives Using an Inverted Probe Machine
- D 3111-99 Test Method for Flexibility of Hot-Melt Adhesives by Mandrel Bend Test Method
- D 3121-94 (1999) Test Method for Tack of Pressure-Sensitive Adhesives by Rolling Ball
- D 3125-97 (2001) Test Method for Monomethyl Ether of Hydroquinone in Colorless Monomeric Acrylate Esters and Acrylic Acid
- D 3359-97 Test Methods for Measuring Adhesion by Tape Test
- D 3362-93 (2000) Test Method for Purity of Acrylate Esters by Gas Chromatography
- D 3363-00 Test Method for Film Hardness by Pencil Test
- D 3658-01 Test Method for Determining the Torque Strength of Ultraviolet (UV) Light-Cured Glass/Metal Adhesive Joints
- D 3732-82 (2001) Practice for Reporting Cure Times of Ultraviolet-Cured Coatings
- D 3807-98 Test Method for Strength Properties of Adhesives in Cleavage Peel by Tension Loading (Engineering Plastics-to-Engineering Plastics)
- D 4039-93 (1999) Test Method for Reflection Haze of High-Gloss Surfaces
- D 4040-99 Test Method for Viscosity of Printing Inks and Vehicles by the Falling Rod Viscometer Test
- D 4060-01 Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
- D 4092-01 Standard Terminology: Plastics: Dynamic Mechanical Properties
- D 4142-89 (1996) Guide for Testing Epoxy Resins
- D 4144-94 (1999) Test Method for Estimating Package Stability of Coatings for Ultraviolet Curing
- D 4145-83 (1996) Test Method for Coating Flexibility of Pre-painted Sheet
- D 4212-99 Test Method for Viscosity by Dip-Type Viscosity Cups
- D 4252-89 (1995) Test Method for Chemical Analysis of Alcohol Ethoxylates and Alkylphenol Ethoxylates
- D 4274-99 Test Method for Testing Polyurethane Raw Materials: Determination of Hydroxyl Numbers of Polyols
- D 4338-97 Test Method for Flexibility Determination of Supported Adhesive Films by Mandrel Bend
- D 4339-01 Test Method for Determination of the Odor of Adhesives
- D 4361-97 Test Method for Apparent Tack of Printing Inks and Vehicles by a Three-Roller Tackmeter
- D 4501-01 Test Method for Shear Strength of Adhesive Bonds Between Rigid Substrates by the Block-Shear Method
- D 4662-98 Test Methods for Polyurethane Raw Materials: Determination of Acid and Alkalinity Numbers of Polyols
- D 4671-99 Test Method for Polyurethane Raw Materials: Determination of Un saturation of Polyols
- D 5010-01 Guide for Testing Printing Inks and Related Materials
- D 5011-92 (1997) Practices for Calibration of Ozone Monitors Using Transfer Standards
- D 5110-98 Practice for Calibration of Ozone Monitors and Certification of Ozone Transfer Standards Using Ultraviolet Photometry
- D 5181-91 (1997) Test Method for Abrasion Resistance of Printed Matter by the GA-CAT Comprehensive Abrasion Tester
- D 5264-98 Practice for Abrasion Resistance of Printed Materials by the Sutherland Rub Tester
- D 5402-93 (1999) Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs
- D 5403-93 (1998) Test Methods for Volatile Content of Radiation Curable Materials
- D 5628-96 (2001) Test Method for Impact Resistance of Flat, Rigid Plastic Specimens by Means of a Falling Dart (Tup or Falling Mass)
- D 6165-97 Guide for Comparison, Detection, and Identification of Odors of Paints, Inks, and Related Materials
- D 6342-98 Practice for Polyurethane Raw Materials: Determining Hydroxyl Number of Polyols by Near Infrared (NIR) Spectroscopy
- E 96-00 Test Methods for Water Vapor Transmission of Materials
- E 595-93 (1999) Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment
- E 831-00 Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis
- E 1356-98 Test Method for Assignment of the Glass Transition Temperatures by Differential Scanning Calorimetry or Differential Thermal Analysis
- E 1539-98 Guide for Use of Radiation -Sensitive Indicators
- E 1545-00 Test Method for Assignment of the Glass Transition Temperature by Thermomechanical Analysis
- E 1631-96 Practice for Use of Calorimetric Dosimetry Systems for Electron Beam Dose Measurements and Dosimeter Calibration
- E 1640-99 Test Method for Assignment of the Glass Transition Temperature by Dynamic Mechanical Analysis
- E 1649-00 Practice for Dosimetry in an Electron Beam Facility for Radiation Processing at Energies Between 300

- KeV and 25 MeV
E 1818-96 Practice for Dosimetry in an Electron Beam Facility for Radiation Processing at Energies Between 80 and 300 KeV
E 1824-96 Test Method for Assignment of a Glass Transition Temperature Using Thermomechanical Analysis Under Tension
F 739-99a Test Method for Resistance of Protective Clothing Materials to Penetration by Liquids or Gases Under Conditions of Continuous Contact
F 1842-97 Test Method for Detennining Ink or Coating Adhesion on Plastic Substrates for Membrane Switch Applications
G 14-88 (1996) Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)
G 130-95 Test Method for Calibration of Narrow and Broad-Band Ultraviolet Radiometers Using a Spectroradiometer
G 154-00a Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
G 155-00a Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

Reviews - Synopsis - Dust Jacket

FOREWORD:

This compilation of ASTM Standards is meant to be an aid to personnel working in the field of radiation curing of coatings and allied products. The standards are listed alphanumerically in the Alphanumeric Contents and under five major topics and various subtopics in the Topical Contents. The major topics are:

- . Coatings, with separate categories for "Liquid Coatings" and "Cured-Film Properties",
- . Equipment,
- . Raw Materials,
- . Adhesives, and
- . Inks.

"Coatings" contains the largest listing of standards; however, many of the standards found under this topic will be useful in the adhesives and inks areas as well. In a few instances, the same standard will be found under more than one major topic; but, this is not a general rule. In addition to the Alphanumeric and Topical Contents, an Index is provided.

While an attempt has been made to include standards that should be of interest to people working in the radiation-curing field, the compilation is not a complete listing; rather, it is meant to be a readily available desktop resource and to provide ready access to a number of commonly used ASTM Test Methods, Procedures, and Guides. Some standards are specialized and may be of interest to a limited audience. Most of the standards included in this compilation should be of general interest.

It is worth noting that there are very few standards that have been specifically designed for the radiation-curing field, for two reasons. First, radiation curing of coatings, adhesives, and inks is a relatively new technology and insufficient time has elapsed for a larger complement of standards to be developed. Second, many existing tests that currently well serve the general coating and allied technologies industries are equally applicable to the radiation-curing field. Examples of such standards are ASTM D 522, ASTM D 3359, and ASTM D 3363, which deal with adhesion, flexibility, and hardness, respectively. Other standards have been modified to a degree by innovators in order to meet current or specialized needs in the industry. An example of this is ASTM F 739, which deals with protective clothing. It has been modified by one group to test gloves that will provide protection when handling radiation-curable materials.

There still may be a need for new standards for the fast-growing field of radiation curing. For example, at present, there are no standards that appear applicable to investigating photo initiators- neither cationic nor free radical photoinitiators. Similarly, there are no standards for direct comparison of various technologies or ingredients in regard to cure speed, effect of radiation wavelength, dual-cure systems, and related topics. Radiation-cured powder coatings is a new technology and there are no standardization tools for this promising area. For this reason, a compilation such as this one should be kept current. To achieve this end, there is a need for input from investigators as to which standards currently in the compilation are useful or not useful. Is there a need to add other standards? Are there new standards that should be developed, as perhaps for the glove test mentioned previously?

Title	Location	Edition / Series / Misc.
782 Automotive Coatings		<i>Edition:</i>
<i>Author:</i> McBane, Bruce N.	<i>Dynix:</i> 55947-07	<i>Series:</i> Federation Series on Coatings
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Fe	<i>Technology:</i> No. FS7
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0934010110	
<i>- date:</i> ©1987	<i>Shelf</i> Reference	<i>Year:</i> 1987
<i>Subject:</i> Coatings -- Periodicals		<i>Price:</i> \$50.00
<i>Desc:</i> 61 p., illus., 28 cm.		

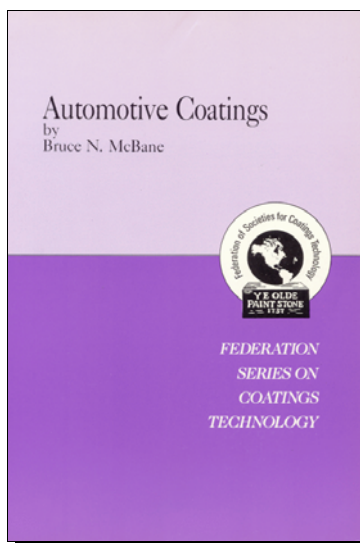


Table of Contents

- I. INTRODUCTION: THINKING AUTOMOTIVE
 - A. Systems
 - B. Stress in the Total System
 - 1. Surface Multiplicity
 - 2. Sources of Stress at Surfaces
 - 3. Mechanical Properties of Bulk Films as Sources of Stress
 - 4. Chemical Instability of Coating Films as a Source of Stress
 - C. Technical Planning for New Automotive Coatings
- II. GLOSSARY OF TERMS
- III. ORIGINAL FINISH UNDERCOATS
 - A. Surface Preparation and Pretreatments
 - B. Primers and Primer "Surfacers"
 - 1. Primer Adhesion
 - 2. Corrosion Control
 - 3. Primer Adhesion, Flexibility, and Hydrolytic Stability
 - 4. Primer and Primer Surfer Formulations
- IV. ELEMENTS OF ORIGINAL FINISH TOPCOATS
 - A. Thermosetting Topcoats (Enamels)
 - 1. Enamels with Conventional Solids, Solution Polymers, and Organic Solvents
 - 2. Nonaqueous Dispersion Enamels (NAD)
 - 3. High Solids Enamels
 - 4. Water Reducible Enamel
 - B. Thermoplastic Topcoats (Solution Polymer Lacquers)
 - 1. Thermoplastic Dispersion Coatings (NAD Lacquers)
 - C. Color-Plus-Clear Topcoating
 - 1. Ultraviolet Screening Agents
 - D. Factory Repair Procedures
- V. SOLVENTS AND DILUENTS—ACTIVITY AND CLASSIFICATION
 - A. Classifying Solvency
 - B. Volatile Release from Films
 - C. Air Pollution Controls
 - D. Industrial Hygiene and Volatiles
 - E. Viscosity and Flow Control of Films
- VI. SPECIALTY COATINGS
 - A. Automotive Interior Coatings
 - B. Elastomeric Specialty Coatings
- VII. APPLICATION TECHNIQUES
 - A. The Challenge of Material Transfer
 - B. Air Atomized Spraying
 - C. Manual Electrostatic Spray
 - D. Airless Atomization
 - E. Automatic Spray Application
 - F. Film Defects as a Function of Application
 - 1. Cratering of Films
 - 2. Solvent Popping

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

3. Sag Prevention
4. Pattern Control

VIII. PIGMENTATION

- A. Pigment Selection
 1. Colorants
 2. Hiding Power
- B. Specific Pigment Qualities and Performance
 1. Organic Colored Pigments
 2. Inorganic Colored Pigments
- C. Pigment Dispersions and Their Stabilization

IX. AUTOMOTIVE REFINISH

- A. Surface Preparation
- B. Refinish Primer Surfacer
- C. Refinish Acrylic Lacquer Topcoat
- D. Refinish Enamel Topcoats
- E. Two-Pack Refinish Urethane Enamels
- F. Reducing Solvents for Refinish Products

X. COATING EVALUATION AND QUALITY CONTROL

- A. Specific Test Procedures
 1. Some Aspects of Package Stability
 2. Aspects of Film Appearance Relative to Film Thickness
 3. Mechanical Performance of Films
 4. Weatherability
 5. Economic Evaluation

XI. REFERENCES

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

If commercially applied industrial coatings are classified, the adjective "automotive" tends to imply a level of excellence of overall quality that is unique because of the breadth of its physical and chemical performance. The implication extends to include the elements of attractive appearance, longevity of performance, and, even when the coatings are relatively costly, the faith that they represent good money value.

It is fortunate that the product development chemist in the automotive coatings laboratory is not required to deliver in a single product the variety of types of performance expected from his efforts. Attempts to do so involve so many compromises in priorities of performance levels that the end result is chiefly mediocrity. Rather, the designer of the finished product should be required to make a comprehensive effort to define the adverse elements of as many of the various service environments as can be anticipated for the finished automobile. Using that definition to dramatize the specific coating properties needed, the automotive coatings technologist who is continuously updating his resources is able to devise a "system" of successive layers of specialty coatings. The system is a multi-coat total finish which allows each component layer in proper sequence the opportunity to maximize its individual performance. The combination of films of specialty coatings into a system that produces precision performance offers versatility that is otherwise not possible. The technology reviewed in this monograph will depend heavily on the "total system" concept. System performance must be matched to finishing specifications of the automobile manufacturers; these are discussed in Section VI on specialty coatings. The enterprising use of the power of modern chemistry and physics will not stop with meeting current specifications, but will create capabilities for problem-solving that the industry has not yet thought to request.

The total system of concern in this discussion includes not only the coating composite, but the surfaces on which the coating is spread and even, in many cases, the ever-changing environments within which the automobile is expected to function.

Perception is required in compiling a list of the desirable functions and properties which need to be displayed by the total system interacting, but even deeper perception is needed to anticipate and forestall the ways in which the functioning system may fail. Most of those failures will be due to, or at least involve, film stress and become evident at points of stress relief. It is valuable, therefore, to consider experimental design that recognizes sources of stress and suggests techniques for stress control.

In the application of a liquid coating and its conversion into a solid film, dimensional changes occur as volatiles are released, as new compounds are formed in chemical reactions, or as heat is applied and released during film formation.

Dimensional change introduces stress which, in a fairly soft or nearly liquid film, can be distributed through the system by heat annealing, and thereby rendered tolerable. If the base of a film undergoing dimensional change is anchored to the substrate, its relief may take the form of local fractures at the surface, thereby disrupting film continuity. If stresses are created without opportunity for immediate relief, the film may go into service in the stressed state only to have physical or chemical changes initiated by the service environment weaken the film, allowing disastrous stress relief to cause field failures of the system.

Disruptive stress relief is often, although not always, associated with surfaces and surface interfaces. A considerable degree of ingenuity has been used in designing the components of the modern systems, such that surfaces can be integrated securely into the whole, thus minimizing the frequency and severity of stress relief at surface interfaces. Details of test procedures for monitoring stress and stress relief are presented in Section X.

With the origin of likely stress points identified, particular attention can be paid to determining whether stress at those points, either at surfaces or within the bulk of the layers, originates with physical or chemical action. Project planning can then include measures to minimize, accommodate, or dissipate stress in a way that maintains system integrity.

Title	Location	Edition / Series / Misc.
803 Billmeyer and Saltzman's Principles of Color Technology Author: Berns, Roy S. Publish.: John Wiley & Sons - place: New York, NY - date: ©2000 Subject: Color Desc: ix, 247 p., illus. (some color), 29 cm.	Dynix: 99409 Call No.: 667 Be ISBN: 047119459X Shelf Adult Non-Fiction	Edition: 3rd edition Series: Year: 2000 Price: \$78.50

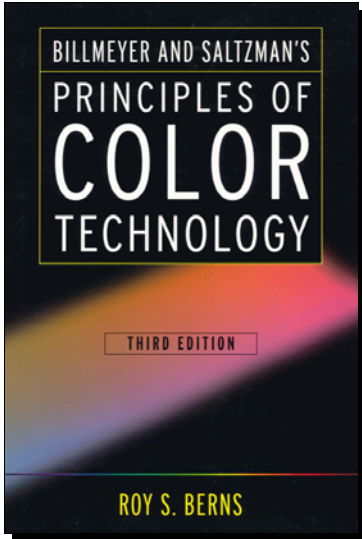


Table of Contents

Preface

CH 1: Defining Color
 CH 2: Describing Color
 CH 3: Measuring Color
 CH 4: Measuring Color Quality
 CH 5: Colorants
 CH 6: Producing Colors
 CH 7: Back to Principles

Appendix: Mathematics of Color Technology

Bibliography

Index

Reviews - Synopsis - Dust Jacket

This fully updated and revised edition of the classic treatise on color technology combines the clarity and ease of earlier editions with two decades of advancement in theory and technology. Defining color as a certain kind of light, its effect on the human eye, or, most important of all, the result of this effect in the mind of the viewer, it offers detailed information on color, colorants, the coloring of materials, and reproducing the color of materials through imaging.

Subjects

244 .	Color
250 .	Dyes and dyeing

The fully updated Third Edition of Billmeyer and Saltzman's Principles of Color Technology retains important material on paints, plastics, textiles, and other materials, augmenting this information with in-depth coverage of computer-generated color, digital image capture, desktop color printing, and color management — achieving color fidelity across a range of devices including scanners, digital cameras, monitors, output devices, etc. There is expanded coverage of color quality measurement, the mathematics of color technology, and color modeling.

Target Audience: Color technologists, color specialists, chemical and industrial engineers, computer scientists, research scientists, and mathematicians interested in color.

PREFACE:

Billmeyer and Saltzman's Principles of Color Technology has strongly influenced and, without doubt, will continue to influence my career as an educator and color scientist. I was introduced to the first edition while searching for a graduate program in color science. Fred Billmeyer was a Professor at Rensselaer Polytechnic Institute. I learned about his Rensselaer Color Measurement Laboratory, and soon afterward I entered the doctoral program in the chemistry department. The second edition was printed just in time for my first course in color science.

Every summer, Billmeyer and Adjunct Professor Max Saltzman taught a series of short courses using Principles of Color Technology as the foundation. All of Billmeyer's graduate students participated as laboratory assistants helping with demonstrations, laboratories, and evening problem-solving sessions. By observing and working for Billmeyer and Saltzman, I came to realize their many differences. Billmeyer delighted in the details, the latest theories, and the newest technologies. Saltzman viewed these "delights" as distractions, causing color technologists to forget the basic principles. Saltzman was ever the practitioner, urging a large dose of common sense. When they worked and taught together, the result was considerably greater than the sum of the parts. The first and second editions of Principles of Color Technology reflect their combined power!

My first experiences with Billmeyer and Saltzman and with Principles of Color Technology were nearly 20 years ago. All three have profoundly affected my professional life. Thus, I was very honored when asked to write the third edition. This

is my opportunity to give something back to Billmeyer and Saltzman.

In writing the third edition, I have tried to retain the spirit of the first and second editions, aided, of course, by many conversations and manuscript reviews by Billmeyer and Saltzman. Each has been foremost in my mind through-out. I have followed two guiding principles: Keep it simple and emphasize the principles.

Those readers familiar with the second edition will notice an increase in the number of color technologies described.

Today, colorimetry is an integral component of nearly every industry manufacturing colored products. The color imaging community (i.e., printing, desktop publishing, electronic imaging, and digital photography) has been added to the color-matching community (i.e., textiles, paints, and plastics). I have replaced the chapter entitled Problems and Future Directions in Color Technology with one entitled Back to Principles. Billmeyer, Saltzman, and I want to reiterate to our readers that doing the basics well is often the best path toward future success. Finally, I have added an appendix, Mathematics of Color Technology, for our readers who find mathematical descriptions equal in simplicity to narration.

Title	Location	Edition / Series / Misc.
614 Biodegradability of Surfactants		<i>Edition:</i> 1st edition
<i>Author:</i> Karsa, David R. and M. R. Porter (editors)	<i>Dynix:</i> 50467	<i>Series:</i>
<i>Publish.:</i> Blackie Academic & Professional; Chapman and Hall	<i>Call No.:</i> 668.1 Bi	
<i>- place:</i> London, UK / New York, NY	<i>ISBN:</i> 0751402060	
<i>- date:</i> ©1995	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1995
<i>Subject:</i> Surface active agents -- Biodegradation		<i>Price:</i> \$119.95
<i>Desc:</i> xiii, 257 p., illus., 24 cm.		

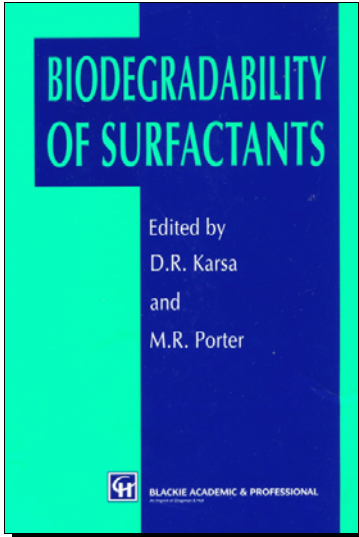


Table of Contents

- 1. Introduction to surfactant biodegradation - D. BROWN
 - 1.1 Introduction
 - 1.2 Biodegradability and the replacement of soap in detergent products
 - 1.3 Biodegradation, biodegradability testing and interpretation of results
 - 1.3.1 Biodegradation
 - 1.3.2 Assessment of biodegradability
 - 1.4 Sewage treatment processes and their significance for surfactants
 - 1.5 Biodegradability test methods for surfactants
 - 1.5.1 Biodegradability test methodology
 - 1.6 The replacement of tetrapropylene benzene sulphonate (TPBS)
 - 1.7 Surfactant biodegradability and legislation
 - 1.7.1 Anionic surfactants
 - 1.7.2 Non-ionic surfactants
 - 1.7.3 Cationic and ampholytic surfactants
 - 1.8 Surfactant analysis
 - 1.8.1 Anionic surfactant analysis
 - 1.8.2 Non-ionic surfactant analysis
 - 1.8.3 Cationic surfactant biodegradability and analysis
 - 1.8.4 Ampholytic surfactants
 - 1.9 Conclusions and thoughts for the future
- References

Subjects

503 .	Surfactants
507 .	Surface active agents -- Biodegradation

- 2 What is biodegradation? - G. F. WHITE and N. J. RUSSELL
 - 2.1 Setting the scene: Microbial nutrition and the carbon cycle
 - 2.2 Surfactants as potential microbial nutrients
 - 2.2.1 Accessing the hydrophobic chain
 - 2.2.2 Hydrophile degradation in non-ionics
 - 2.2.3 Primary versus ultimate biodegradation
 - 2.2.4 Anaerobic versus aerobic metabolism
 - 2.3 Surfactant biodegradation in the environment
 - 2.3.1 Pure versus mixed cultures
 - 2.3.2 Consortia
 - 2.3.3 Adaptation to surfactants
 - 2.3.4 Substrate concentration
 - 2.3.5 Mixed substrates
 - 2.3.6 Cometabolism
 - 2.3.7 Retardation by nutrient limitation and predation
 - 2.3.8 Surfaces and biofilms
 - 2.4 Laboratory models of surfactant biodegradation
- References
- 3. Biodegradability testing - H. A. PAINTER
 - 3.1 Introduction
 - 3.1.1 Glossary of terms
 - 3.1.2 Early tests
 - 3.1.3 Development of the tests
 - 3.2 Nature of biodegradation and influencing factors
 - 3.2.1 Composition of medium
 - 3.2.2 Inocula
 - 3.2.3 Physico-chemical factors
 - 3.2.4 Test substances

- 3.2.5 Control vessels
- 3.2.6 Duration of test
- 3.2.7 Reference compounds
- 3.3 OECD and EEC tests for primary biodegradability of surfactants
 - 3.3.1 OECD Static test procedure or screening test
 - 3.3.2 OECD Confirmatory test: continuous simulation of activated sludge process
- 3.4 List and synopses of existing methods for ultimate biodegradability
 - 3.4.1 Ready biodegradability
 - 3.4.2 Inherent biodegradability
 - 3.4.3 Simulation methods
 - 3.4.4 Comparison of methods: accuracy and precision
- 3.5 Analytical methods
 - 3.5.1 General
 - 3.5.2 Anionic surfactants
 - 3.5.3 Non-ionic surfactants
 - 3.5.4 Cationic surfactants
- References

- 4 Testing strategy and legal requirements - H. A. PAINTER
 - 4.1 Selection of tests: strategy of testing
 - 4.1.1 Primary biodegradability
 - 4.1.2 Ultimate biodegradability
 - 4.1.3 Other tests
 - 4.2 Validation and interpretation of results
 - 4.2.1 Validity of results
 - 4.2.2 Pass levels
 - 4.2.3 Interpretation
 - 4.3 Legal requirements
 - 4.3.1 EEC
 - 4.3.2 Other countries
 - 4.3.3 USA
 - 4.3.4 EEC Dangerous Chemicals Directives 67/548, 79/83 1, 90/C 33/03
 - 4.3.5 The future
- References

- 5. Biodegradability of anionic surfactants - J. STEBER and H. BERGER
 - 5.1 General characteristics of anionic surfactants
 - 5.2 Application of anionic surfactants and their environmental relevance
 - 5.2.1 Synthetic anionic surfactants and the detergent problem
 - 5.2.2 Legal requirements of biodegradability of anionic surfactants
 - 5.2.3 Anionic surfactants in the surface waters
 - 5.3 Particular structure and application features of anionic surfactants
 - 5.3.1 Soaps
 - 5.3.2 Alkylbenzene sulfonates
 - 5.3.3 Alkane sulfonates
 - 5.3.4 a-Olefine sulfonates (AOS)
 - 5.3.5 a-Sulfo fatty acid esters (methyl ester sulfonates, FES)
 - 5.3.6 Fatty alcohol sulfates (AS)
 - 5.3.7 Alcohol ether sulfates (AES)
 - 5.3.8 Sulfosuccinates
 - 5.3.9 Alkylphosphates and alkyl ether phosphates
 - 5.4 Biodegradation of anionic surfactants
 - 5.4.1 Soaps
 - 5.4.2 Alkyl benzene sulfonates
 - 5.4.3 Secondary alkane sulfonates (SAS)
 - 5.4.4 Alpha olefine sulfonates (AOS)
 - 5.4.5 a-Sulfo fatty acid esters/methyl estersulfonates (FES)
 - 5.4.6 Fatty alcohol sulfates (AS)
 - 5.4.7 Alcohol ether sulfates (AES)
 - 5.4.8 Sulfosuccinates
 - 5.4.9 Phosphate ester surfactants
- References

- 6. Biodegradability of cationic surfactants - C. G. VAN GINKEL

- 6.1 Introduction
- 6.2 Biodegradability of cationic surfactants in OECD Screening tests
 - 6.2.1 OECD screening test results
 - 6.2.2 Influence of toxicity on the biodegradation
 - 6.2.3 Generalizations on biodegradability of quaternary ammonium salts
- 6.3 Behaviour of quaternary ammonium salts in waste water treatment plants
 - 6.3.1 Activated sludge plants
 - 6.3.2 Absorption of cationic surfactants onto particles
 - 6.3.3 Removal of cationic surfactants in activated sludge reactors (bioreactors)
 - 6.3.4 Anaerobic biodegradation
 - 6.3.5 Influence of cationic surfactants on biological processes
- 6.4 Biodegradation routes of quaternary ammonium salts
 - 6.4.1 Tetramethylammonium chloride
 - 6.4.2 Ethyltrimethylammonium chloride
 - 6.4.3 Alkyltrimethylammonium salts
 - 6.4.4 Possible formation of recalcitrant intermediates
- References

- 7. Biodegradability of non-ionic surfactants - T. BALSON and M. S. B. FELIX
 - 7.1 Introduction
 - 7.2 Structure of polyglycol surfactants
 - 7.2.1 Preparation and properties of alkylene oxides and their polymers
 - 7.2.2 Initiators used for polyglycol surfactants
 - 7.2.3 General properties of polyglycol surfactants
 - 7.2.4 Applications of polyglycol surfactants
 - 7.3 General biodegradability
 - 7.3.1 Primary biodegradation
 - 7.3.2 Ultimate biodegradation
 - 7.3.3 Inherent biodegradation
 - 7.3.4 Ready biodegradation
 - 7.3.5 Analytical methods for ready and inherent biodegradation tests
 - 7.5.6 The microorganisms
 - 7.4 Mechanisms of biodegradation
 - 7.4.1 w-Oxidation
 - 7.4.2 b-Oxidation
 - 7.4.3 a-Oxidation
 - 7.4.4 Alkoxyate chains
 - 7.5 Biodegradation of polyglycols
 - 7.5.1 Nonyl phenol ethoxylates (NPE)
 - 7.5.2 Fatty alcohol ethoxylates (FAE)
 - 7.5.3 Fatty alcohol alkoxyates (FAA)
 - 7.5.4 Alternative low-foam non-ionics to fatty alcohol EO/PO copolymers
 - 7.5.5 Linear block copolymers
 - 7.5.6 Fatty amine ethoxylates Acknowledgements
- References

- 8. Biodegradability of amphoteric surfactants - A. DOMSCH
 - 8.1 Introduction
 - 8.2 Structural elements and biodegradation in general
 - 8.3 Alkyl betaines
 - 8.3.1 Chemical structure
 - 8.3.2 Properties, application
 - 8.3.3 Primary degradation
 - 8.3.4 Ultimate degradation
 - 8.4 Alkylamido betaines
 - 8.4.1 Chemical structure
 - 8.4.2 Properties, application
 - 8.4.3 Primary degradation
 - 8.4.4 Ultimate degradation
 - 8.5 Sulphobetaines and hydroxysulphobetaines
 - 8.5.1 Chemical structure
 - 8.5.2 Properties, application
 - 8.5.3 Primary degradation
 - 8.5.4 Ultimate degradation

- 8.6 Alkylamphoacetates
 - 8.6.1 Chemical structure
 - 8.6.2 Properties, application
 - 8.6.3 Ultimate degradation
- 8.7 Polycarboxyglycinates
 - 8.7.1 Chemical structure
 - 8.7.2 Properties, application
 - 8.7.3 Primary degradation
 - 8.7.4 Ultimate degradation
- 8.8 Alkylamphopropionates
 - 8.8.1 Chemical structure
 - 8.8.2 Properties, application
 - 8.8.3 Ultimate degradation
- 8.9 Imidazolinium betaines
 - 8.9.1 Chemical structure
 - 8.9.2 Degradation Acknowledgements
- References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Chemical companies manufacture a wide variety of formulations of surfactants for industrial and domestic use. Detergents, paints, inks, adhesives, cosmetics, dyes, weedkillers, insecticides and ice-cream are familiar examples. In addition, there are many formulations of surfactants used by manufacturing industry as essential processing aids; for examples, the paper industry uses defoamers, dispersing aids and release agents; the engineering industry uses anticorrosive treatments and metal-working lubricants.

The widespread use of surfactants and their release into the environment has resulted in an upsurge of interest in the biodegradability of these compounds. This volume, written by a team of industrial and academic authors, provides an overview of the science and technology of the subject. It is directed at surfactant chemists, analytical chemists and environmental chemists in the industrial and academic sectors.

PREFACE:

The awareness and development of 'biodegradable' surfactants pre-dates current pressures by the environmental movement by nearly three decades, wherein a responsible industry mutually agreed to replace 'hard', non-biodegradable components of household detergents by 'soft', biodegradable alternatives, without course to legislation.

The only requirement at that time was for surfactants used in detergents to exhibit a 'primary biodegradability' in excess of 80%; this referring to the disappearance or removal from solution of the intact surface active material as detected by specified analytical techniques. This proved useful, as observed environmental impacts of surfactants, e.g. visible foam on rivers, are associated with the intact molecule. Test methods for 'primary biodegradability' were eventually enshrined in EU legislation for nonionic surfactants (Directive 82/242/EEC, amended 73/404/EEC) and for anionic surfactants (Directive 82/243/EEC, amended 73/405/EEC). No approved test methods and resultant legislation have been developed for cationic and amphoteric surfactants to date.

The environmental classification of chemical substances, which of course includes surfactants, and associated risk assessment utilises a second criterion — 'ready biodegradability'. This may be assessed by a number of methods which monitor oxygen uptake (BOD), carbon dioxide production or removal of dissolved organic carbon (DOC). Some surfactants which comply with the above Detergents Directive are borderline when it comes to 'ready biodegradability'.

The publication of this book coincides with biodegradability legislation standing at a cross-roads, with some uncertainty as to the way in which it may develop. The European Commission has indicated a desire to develop and introduce ultimate biodegradability legislation or mineralisation into the Detergents Directive, underlining the already existing assessment of ultimate biodegradability by major surfactant end-users regardless of standardised test methods or any legislation being in place. Likewise, attention has also been focused more recently on industrial cleaning applications and some areas of industry where surfactants are used as process aids to assess their biodegradability and potential impact on the environment.

Whereas there is general agreement that surfactants should be subject to some environmental acceptance criteria, there is a growing lobby that suggests that surfactants should no longer require an exceptional role as compared with other chemical compounds released into the environment. Eventually, there may be a valid case to deregulate as far as surfactant biodegradability is concerned and to subject the acceptance of surfactants particularly for use in washing,

rinsing and cleaning to an environmental risk assessment which is required as a matter of principle for all new and existing substances (EU directives 93/67/EEC and 793/93/EEC, respectively). Only time will tell as to which approach will be accepted.

Set against such a background, this volume provides a state-of-the-art review of surfactant biodegradability mechanisms, test methods, legislative requirements and individual consideration of the four ionic classifications of surfactant, namely anionics, nonionics, cationics and amphoteric. Each chapter is written by acknowledged experts in their particular field, which should ensure that this book will provide a valuable addition to our knowledge of surfactant biodegradability and become a significant reference work on this subject.

Title	Location	Edition / Series / Misc.
20 Biodegradation Techniques for Industrial Organic Wastes		<i>Edition:</i>
<i>Author:</i> DeRenzo, D. J. (editor)	<i>Dynix:</i> 15188	<i>Series:</i> Chemical Technology Review: No. 158 / Pollution Technology Review: No. 65
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 628.54 Bi	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 081550800X	
<i>- date:</i> ©1980	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1980
<i>Subject:</i> Factory and trade waste -- Purification		<i>Price:</i> \$25.00
<i>Desc:</i> x, 358 p., illus., 25 cm.		

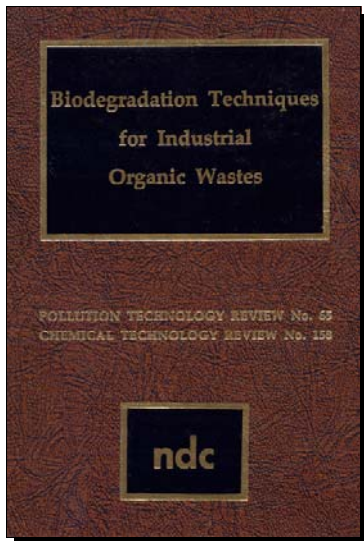


Table of Contents

- Section I: Introduction
- Section II: Conclusions and Recommendations
- Section III: Literature Review
 - The Waste Stream
 - Petroleum Refining
 - Organic Chemicals and Synthetics
 - Pulp and Paper Milling
 - Steel Making and Coal Gasification
 - Textile Processing
 - General Waste Qualities
 - Classes of Organic Wastes Not Amenable to Biodegradation
 - Required Degree of Treatment
 - Organic Chemicals Industry
 - Pulp and Paper Milling
 - Steel Making and Coal Gasification
 - Textile Processing
 - Practical Applications of Biodegradation of Organic Industrial Wastes
 - Conventional Applications
 - Innovative Applications
 - Innovative Bioreactor Design
 - Innovative Accessories
 - Innovative Operational Methods
 - Microbial Assimilation of Organic Wastes
- Section IV: Site Studies
 - Introduction
 - Gulf Coast Waste Disposal Authority (GCWDA)-40-Acre Industrial Waste Treatment Facility, Texas City, Texas
 - Gulf Coast Waste Disposal Authority (GCWDA)-Washburn Tunnel Industrial Waste Treatment Facility, Pasadena, Texas
 - ICI Deep Shaft Aeration Process-Paris, Ontario, Canada
 - An Eastern Chemical Production Plant UNOX Facility
- Section V: Sampling Activities
 - Introduction
 - Specific Sampling Activities and Results
 - 40-Acre Facility
 - Washburn Tunnel Facility
 - ECO Deep Shaft Facility
- Section VI: Engineering and Economic Comparisons of Identified Biodegradation Techniques
 - Introduction
 - Methods for Comparing Treatment Technologies
 - Comparisons of Case Study Technologies
 - Recommended Improvements for Biodegradation of Organic Materials
 - Primary Aerobic Stabilization-Equalization
 - Primary Anaerobic Digestion-Equalization
 - Spill Basins
 - Neutralization
 - Nutrient Addition
 - Bacterial Seeding
 - Extensive Aeration
 - Activated Carbon
 - Temperature Control
 - Other Pretreatment Techniques

Subjects

262 .	Factory and trade waste -- Purification
388 .	Organic water pollutants -- Biodegradation
440 .	Hazardous wastes -- Biodegradation

Section VII: References

Appendix A: Bibliography of Pertinent Literature Pertaining to Microbial Degradation of Organics

Appendix B: Sampling and Analysis-Parameter and Station Selection

Reviews - Synopsis - Dust Jacket

INTRODUCTION

Organic constituents in aqueous process effluents from numerous types of industries often include toxic or hazardous compounds not readily removed by conventional biological treatment processes. The same characteristics which make these materials undesirable in plant discharges to receiving waters may also adversely affect the in-plant biota, resulting in reduced plant efficiencies. Nevertheless, biological treatment is an important means by which such compounds can be economically converted to less innocuous materials. For this reason, research was conducted to identify and characterize types of treatment processes or innovative treatment accessories and operational methods which are successfully handling problematic organic industrial wastes.

Section 212 of the Resource Recovery Act of 1970 (PL 91-512) required the U.S. Environmental Protection Agency (EPA) to set the groundwork for a comprehensive system of national disposal sites for elimination of hazardous wastes. In 1974, work describing the magnitude of the disposal problem and technology descriptions was completed. From the resulting reports, it became evident that treatment/disposal technology was inadequate. The Office of Solid Waste Management Programs (OSWMP) asked that the Solid and Hazardous Waste Research Laboratory (SHWRL) of the National Environmental Research Center, Cincinnati, Ohio, conduct further in-depth assessments of various disposal options. This report is the result of the study commissioned to ascertain existing and promising biological detoxification and disposal technologies.

The terms "hazardous waste" and "toxic waste" are used in this study according to the scope of investigation and the professional judgment of SCS Engineers. The definitions developed for use in this report do not necessarily reflect EPA definitions, and they may or may not be in agreement with uses in federal legislation or private industry. This study is purposely focused upon waste materials potentially biocidal, carcinogenic, mutagenic, or bioaccumulative. Materials may, therefore, be excluded which present explosion or corrosion hazards in bulk, but are not considered biologically active as described by the Federal Registry of Toxic Effects of Chemical Substances.

During the execution of this study, emphasis was placed upon biological treatment technologies which are:

Treating a wide range of classes of synthetic or toxic organic compounds

Processing toxic compounds without resulting synergistic reactions and biological metabolites which would present an equal or enhanced potential for adverse environmental impact

Being utilized on a large-pilot or full-scale basis. Technologies which were demonstrated on a bench scale only are not reported, except where the process showed exceptional promise for future development.

Minimizing operating and environmental costs. The system must be cost-effective and free of secondary problems such as air pollution or excessive sludge handling/disposal requirements.

The work reported herein proceeded in consecutive steps. Initially, a data base and literature search was conducted to describe the present treatment problem and prepare an inventory of types and locations of innovative biological treatment technologies presently developed and in use. The results of this effort comprise Section III of this report. After information was assembled on candidate study sites, four (4) locations were selected for in-depth analysis. These sites included a large-scale activated sludge plant, lagoon system, a Deep Shaft pilot facility, and a UNOX pure oxygen plant. Three of the plants are treating industrial effluents exclusively; the Deep Shaft facility processes a 70:30 industrial/municipal raw influent. The plants were selected to represent the following specific process units or operational methodologies which enhance biodegradation processes:

INTENSIVE AERATION: Use of aeration technology to promote a high level of dissolved oxygen in the waste flow, resulting in higher rates of chemical and biological oxidation.

NUTRIENT ADDITION: Industrial wastes are often "unbalanced" in the nutritional requirements of microorganisms. Addition of nitrogen and/or phosphorus, or example, has been effective in increasing biodegradation rates.

BIOLOGICAL SEEDING: The application of known species to provide a seed for microbial populations has been made easier through the development of especially manufactured dried bacterial cultures. Species of bacteria can be selectively produced which demonstrate high rates of degradation for the particular waste involved.

SUBSTRATE ALTERATION: Chemical pretreatment of wastes prior to introduction into biological waste treatment

systems can be a valuable means of promoting rapid biodegradation. This technique would be particularly important in the neutralization of toxins.

GROWTH PHASE MANIPULATION: Innovative sludge recycling and clarification techniques may be used to optimize the food-to-microorganism ratio and maximize the metabolism rates.

TEMPERATURE CONTROL: Biochemical reactions are temperature-dependent. Higher rates of metabolism have been associated with higher temperatures. Techniques which use temperature control for enhancing metabolism were studied.

DEEP-SHAFT AERATION: Oxygen transfer system comprised of a 90- to 245-m (300- to 600-ft) shaft vertically partitioned into downflow and upflow sections. Increased pressure with depth coupled with air injection allows increased oxygen transfer efficiencies to the point where biodegradability of the substrate is considered the limiting factor.

During the execution of the site studies, the field team was charged with gathering information and making observations concerning the following major topics:

The types of wastes that are and are not physically or chemically amenable to treatment through biodegradation.

Process design and influence of waste characteristics on the biological assimilative capacity at each site studied.

The impact of any process effluents upon the indigenous biota when data is available.

Efficiencies and costs incurred by site owners utilizing biodegradation techniques and future economics of the technology.

Potential for site design changes at existing site facilities which will utilize and encourage accelerated biodegradation of industrial and hazardous organic wastes.

The results of these field investigations are reported in Section IV.

During the execution of the initial field studies, it became apparent to the contractor that insufficient data existed in treatment plant files and elsewhere to properly describe the presence and fate of specific organic constituents of interest. As expected, different quantities and types of information were available at each of the four plants. Gross measurements of organic materials such as the Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), and Total Organic Carbon (TOC) tests are of little value in situations where an evaluation of specific problematic compounds is required. For these reasons, chemical and biological sampling was instituted at three sites. A detailed sampling plan was prepared to characterize the inputs and outputs of specific organic toxins using gas/liquid chromatography and mass spectrometry. Biological samplings were also obtained to determine the characteristics of in-plant biota. The results of this work are presented in Section V.

Section VI of this report utilizes the information assembled in the previous sections to establish an engineering and economic comparison of biological treatment technologies for organic industrial process effluents. The goal of this exercise is to guide the EPA and U.S. industries in selecting treatment processes and comparing biological systems with chemical or physical/chemical treatment approaches. Comparative criteria include overall efficiency, operational and maintenance costs, capital and construction costs, ability to treat a wide spectrum of classes of organic compounds, susceptibility to shock loading or climatological fluctuations, and minimization of adverse environmental impact.

Title	Location	Edition / Series / Misc.
783 Cationic Radiation Curing		Edition:
Author: Koleske, Joseph V.	Dynix: 55947-16	Series: Federation Series on Coatings Technology: No. FS16
Publish.: Federation of Societies for Coatings Technology	Call No.: 667.9 Fe	
- place: Philadelphia, PA	ISBN: 0934010137	
- date: ©1991	Shelf Reference	Year: 1991
Subject: Coatings -- Periodicals		Price: \$50.00
Desc: 27 p., illus., 28 cm.		

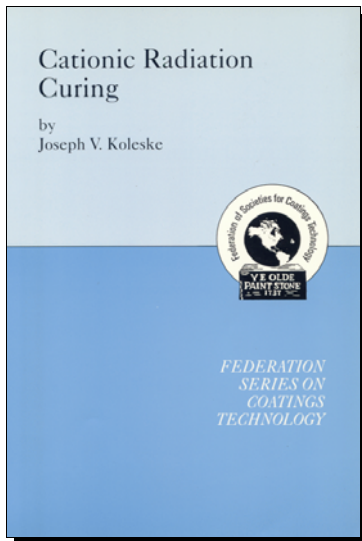


Table of Contents

- I. INTRODUCTION
 - A. Description of Cationic Technology
 - B. Historical Developments and Overview
 - 1. Definition of Onium Salts
 - 2. Diazonium Salts/Lewis Acids
 - 3. Bronsted Acids/Iodonium and Sulfonium Salts
 - C. Comparison of Cationic with Free Radical Technology
 - D. Present Day International Status
- II. CHEMISTRY
 - A. Photoinitiators and Photoinitiation
 - 1. Photoinitiator Types
 - 2. Mechanism of Photolysis
 - 3. Mechanism of Polymerization
 - a. Photosensitizers
 - b. Dual-Cure Systems
 - c. Dark Cure
- III. FORMULATION
 - A. Cycloaliphatic Epoxides
 - B. Other Epoxides
 - C. Vinyl Ethers
 - D. Active Hydrogen Compounds—Alcohols, Glycols, and Polyols
 - E. Other Ingredients
 - 1. Surfactants
 - 2. Lubricants or Slip Agents
 - 3. Thickening Agents
 - 4. Colorants
 - F. Photoinitiator Level and Type
 - G. Shelf Life and Effect of Storage at Elevated Temperatures
 - H. Effect of Heat and Humidity
- IV. FORMULATIONS
- V. APPLICATION METHODS
- VI. END USES
- VII. SUMMARY
- VIII. REFERENCES

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Coating of substrates is an art that has been known since ancient times. Man has been coating substrates to protect them from hostile environments of various types, to decorate them and make them aesthetically pleasing, or to partially coat them as a means of pictorial communication through the printed/written word, such as this publication, or depictions. In relatively recent times, such coatings have been applied with a plurality of thinner or solvent—in fact with as much or more than nine pounds of solvent per pound of material that remains on the substrate to carry out the desired function of protecting, decorating, or communicating.

Until the early 1970s, little attention was given to the quantity of solvent that was needed to dilute the high viscosity polymers used in coatings to an application viscosity. The solvents used in these conventional or low solids coatings were low in cost and functioned very well in carrying out their mission of reducing viscosity and allowing very thin films to be applied. However, in the 1970s a revolution took place within the coating industry with a variety of new technologies coming into being and replacing a large percentage of conventional coating systems. The new words coming into vogue were "high solids," "waterborne," "colloidal dispersion," "powder," and "radiation" coatings. Each of these words promised a new technology that would be acceptable through one or more factors such as energy efficiency, government acceptability, environmental soundness, etc. Limitations and challenges were associated with each technology, and these factors were either greater or lesser depending on who was expounding on the technology's assets, liabilities, or degree of difficulty to achieve.

High solids coating systems were complicated by inherent relationships between viscosity and molecular weight as well as suitable crosslinking mechanisms. Waterborne systems with their apparently desirable features of environmental compatibility and cost were not the bonanza hoped for by many. It was expensive and energy intensive to evaporate water, water caused corrosion of metal — one of the main functions a coating was supposed to protect against. Water was also a poor solvent for polymers and required significant amounts of organic cosolvent to achieve an acceptable level of performance. Powder coating required preparation of a polymer/oligomer with sufficient molecular weight that it would not evaporate at flow/leveling cure temperatures, a cure mechanism that would not activate until flow and leveling had occurred, and a material that would not block at storage temperatures but would liquefy and flow at sufficiently low temperatures that energy costs would be minimized. These were difficult goals to achieve, but progress was made in the field.

Radiation curable coatings, which were allocated a very small amount of the total coatings market in the early years of change — a factor which has changed in the ensuing years — involved monomeric species that would cure at ambient conditions when activated with low energy-requiring radiation sources such as ultraviolet light. Early electron beam and ultraviolet light radiation-cure systems involved acrylates and had handling difficulties due to monomer sensitization, toxicity, and irritation factors. These factors still exist but have been markedly alleviated by awareness coupled with monomer selection and new products. Such radiation-curable coatings are widely used today and hold strong promise for the future.

This publication will principally deal with a new technology — cationic cure — within the radiation-cure arena. This cationic-cure technology, that is primarily conducted through ultraviolet light initiation, holds hope for even greater improvements by utilizing a wide variety of readily available compounds with low viscosity and volatility that are curable under ambient conditions while decreasing the handling difficulties usually associated with radiation curing.

Ultraviolet light curing offers manufacturers a variety of attractive features. These features include the following:

- Systems that usually contain no or little inert solvent and that are considered "high solids" or are 100% solids in nature.
- Low capital investment for curing equipment (unless electron beam curing is used).
- Increased productivity because conversion from monomer to polymer occurs in a rapid manner and high line speeds can be achieved.
- Energy savings because light exposure time is short and little heating of the substrate occurs.
- Cost savings since inert solvents are eliminated.
- Small space requirements for curing equipment and for liquid coating storage.
- The ability to cure heat sensitive substrates — i.e., plastics, electronic/electrical components, etc. — because heat generation during cure is minor and can be controlled.

Title	Location	Edition / Series / Misc.
21 Chemical and Process Technology Encyclopedia Author: Considine, Douglas Maxwell (editor-in-chief) Publish.: McGraw-Hill Book Company - place: New York, NY - date: [1974] Subject: Chemistry, Technical -- Encyclopedias Desc: xxix, 1261 p., illus., 24 cm.	Dynix: 12954 Call No.: 660 Co ISBN: 007012423X Shelf Adult Non-Fiction	Edition: Series: Year: 1974 Price: \$25.00

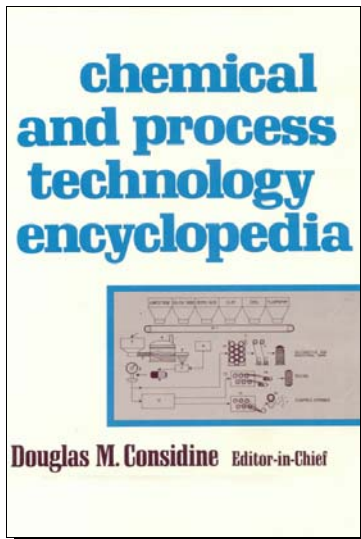


Table of Contents

- Contributors
- Preface
- Acknowledgments
- Graphic representation of contents
- Chemical and Process Technology Encyclopedia
- Classified index
- Subject index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This one-volume encyclopedia covers the many facets of chemical and process technology -- inorganic, organic, and physical chemistry as well as chemical, metallurgical, and process engineering. A fundamental reference, it provides scientists, engineers, and technical managers with concise definitions of terms, clarification of nomenclature, and indoctrinations to process techniques. Alphabetically arranged, the topics include:

- Equipment -- descriptions, applications, operating principles, and parameters
- Materials -- characteristics, specifications, and uses
- Processes -- from alkylation to isomerization, from nitration to waste and water treatment
- Products -- industrial and consumer goods that derive from the application of chemical and process technology
- Theory -- a concise presentation of scientific concepts and theoretical aspects

Subjects

232 . Chemistry, Technical -- Encyclopedias

The many engineering operations described include absorption, adsorption, centrifuging, crystallizing, diffusion, distillation, drying, evaporation, filtration, homogenizing, mixing, sedimentation, size reduction, solvent extraction, and thickening.

Broad categories of materials discussed take into consideration ores, chemical elements, air, water, natural gas, petroleum, and coal. With specific groupings ranging from acids to enzymes, from esters to terpenes and yeasts, the materials fall into three categories:

SYNTHETICS -- such as acrylics, alkyds, allylics, elastomers, fibers, laminates, nonwovens, phenolics, phenoxies, plastics, polyesters, polyethylene, polystyrenes, rayon, resins, rubbers, silicones, urethanes, and vinyls

FUNCTIONALS -- including accelerators, aerosols, antioxidants, chelating agents, detergents, dyestuffs, emulsifiers, fuels, herbicides, insecticides, lubricants, paper, soaps, solvents, surfactants, vegetable oils, waxes, and wetting agents

INORGANICS -- abrasives, alloys, batteries, catalysts, cement, explosives, fertilizers, glass, insulation, paint, pigments, silicates, semiconductors, and steel.

This encyclopedia will serve the needs of those individuals whose personal reference collection does not extend to a multi-volume reference, and it will be invaluable in "filling out" what are often the highly specialized libraries of scientists who work in somewhat isolated spheres -- medicinal chemists, biochemists, polymer chemists, etc. The hundreds of flowsheets in this first-of-its-kind reference will also be an important adjunct to standard works which have less detailed coverage of process procedures. Process information, to the extent covered in the encyclopedia, has been available in the past only from scattered sources. And a number of processes for any given material usually have not been presented all together as in this volume.

The book provides a convenient guide to chemical processes, equipment, materials, specifications, and uses -- and to new materials for new applications -- for chemical, metallurgical, mechanical, and electronics engineers; physicists and other scientists; and such professionals as materials, product, plant, and design engineers. For the nonscientist who

needs to become acquainted with matters associated with chemical and process procedures in an area such as ecology, to name but one, this incomparable guide spells out and defines every aspect of the technology.

On the management side, consultants and firms that merchandise equipment, services, and materials to the process industries will look to the book for orientation with the customer's viewpoint, and understanding of the technology with which he is concerned. And, with its wide topical scope, combined with one-source convenience, educational institutions and libraries will regard it as a "must" for study and reference.

No effort has been spared to make this work as up-to-date and all-inclusive as possible, offering the reader terse initial indoctrinations and building an educated bridge to further information on special subjects.

PREFACE

This Encyclopedia brings together in a formal reference work the many facets of inorganic, organic, and physical chemistry -- and of chemical, metallurgical, and process engineering -- which, when viewed as an integrated body of scientific knowledge, comprise chemical and process technology. In a marked departure from the traditional editorial format, this book combines the detailed coverage of a handbook with the convenience and scope of an alphabetized encyclopedia.

It not only embraces the traditional spheres of interest in industrial chemistry and chemical technology as reflected by the petroleum, petrochemical, chemical, paper, textile, and other long-established process industries, but also more recent applications of an advancing and broadening chemical technology, including, as examples, the materials and processes now required by the electronics, optics, and aerospace industries. The materials sciences are given much attention.

The Encyclopedia is designed to serve as a focal information center for the traffic of knowledge from the specialist to the generalist and, in fact, from specialist to specialist. The content and style are directed to scientific, engineering, and technical business people and industrialists at the professional and management levels; regular and frequent use by educators and librarians is also a major objective.

Because of the wide range of chemical and process technology, there are few if any professionals who have a working familiarity with all the branches. When the professional seeks information on a subject with which he may not have been in touch for a long period, if at all, he seeks rapid, concise, extremely clear summaries that will provide initial orientation and lead him to further, more detailed information. Thus the reader will find strong editorial emphasis in this book on definitions of terms, clarification of nomenclature, and classification of subject matter, leading him directly and quickly to more detailed shelf literature and other information sources.

This Encyclopedia aims to provide within one volume not only the attendant convenience and economy of a single source as contrasted with multi-volume works which rarely provide conclusive detail, but also a very large portion of highly select information which an interested reader may seek in his initial concern with a given topic. In many instances, because of the manner in which the information content was selected, the reader will find all the answers he is seeking within this one volume. Where further information is required, extensive reference lists, carefully culled for value, are included. Exhaustive bibliographies containing references of marginal value are not included. In most instances, references have been selected which, in themselves, contain long lists of references, so that the reader can assemble his own information bank rapidly, using this book as a starting base.

This Encyclopedia is not a compilation of generalities, but rather is packed with detail information, carefully selected on a priority basis by each author-specialist. Following a terse overview of a topic in most cases, the author presents details which, in his expert opinion, are the most important and timely. In outlining the content of each editorial entry, the staff and authors attempted to visualize the information needs of representative readers and, accordingly, to adjust both tone and depth of the entry. This customized editorial approach adjusts the technical approach and content of each topic to reflect inherent complexity and relative importance and frequency of occurrence in the information spectrum.

Classified Index:

The structure of the Classified Index is shown in the table on page 1188. Each entry of this Encyclopedia is listed once and only once in the Classified Index. Cross references are used extensively throughout the book, and these references, coupled with the detailed Subject Index at the end of the volume, provide a webbing to hold all topics together even though all topics are entered into the book alphabetically. Admittedly, some of the decisions involved in placing topics under the major categories of the table were arbitrary. This situation could have been avoided only by listing some entries under several categories. Such multiple listings would have resulted in a much longer and less convenient topical classification.

Some of the major cross-reference entries in the volume are included in the Classified Index, but again, they never are duplicated. These cross-reference headings are shown in italic.

Seldom can a classified index render full justice to the content of a volume, and therefore extensive use of the Subject Index is encouraged.

**Chemical Formulary: Collection of Commercial Formulas
for Making Thousands of Products in Many Fields**

LASCT Holdings -
maximum detail by Title

C

Title	Location	Edition / Series / Misc.
164 Chemical Formulary: Collection of Commercial Formulas for Making Thousands of Products in Many		<i>Edition:</i>
<i>Author:</i> Bennett, H. (Harry), 1895-1990 (editor-in-chief)	<i>Dynix:</i> 09724	<i>Series:</i> Chemical Formulary Series
<i>Publish.:</i> Chemical Publishing Company, Inc.	<i>Call No.:</i> 660.83 Ch	
<i>- place:</i> Brooklyn, NY	<i>ISBN:</i> 0820603635	
<i>- date:</i> 1933-	<i>Shelf</i> Reference	<i>Year:</i> 1933
<i>Subject:</i> Chemistry, Technical -- Formulae, receipts, prescriptions		<i>Price:</i> \$50.00
<i>Desc:</i> v. 23 cm.		

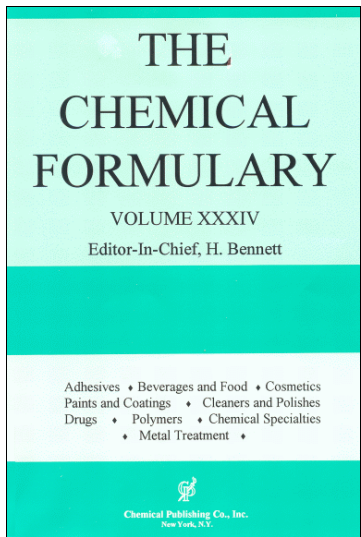


Table of Contents

Introduction
Adhesives
Beverages, Foods
Cosmetics
Coatings
Detergents
Drugs
Elastomers, Plastics & Resins
Miscellaneous
Appendix
Trademark Chemicals
Trademark Chemical Suppliers
Index

Reviews - Synopsis - Dust Jacket

From Booknews

This compilation contains commercial formulas for chemical compounding and treatment in the fields of adhesives, beverages and food, cosmetics, paints and coatings, cleaners and polishes, general drugs, polymers, chemical specialties, and metal treatment. The formulas are not highly complicated, listing the ingredients by either percentages or parts. Annotation c. Book News, Inc., Portland, OR

Subjects

233 .	Chemistry, Technical -- Formulae, receipts, prescriptions -- Periodicals
351 .	Chemistry -- laboratory manuals
438 .	Formularies
470 .	Chemistry, Technical -- Formulae, receipts, prescriptions.

FROM THE DUST JACKET:

Volumes I through XXXIV include more than 135,000 useful and tested formulas from every important industry.

The thirty-four volumes of the Chemical Formulary will -save you time and trouble. You will have a complete modern reference library of commercial formulations in your own office. It is not necessary to spend needless hours checking several sources in order to find the right formula when you need it. Each book is a complete storehouse of knowledge containing hundreds of formulas with no duplications in any of the volumes.

The Cumulative Index to the Chemical Formulary Series is a comprehensive index covering all the formulas included in the first twenty-five volumes of the series. The Cumulative Index indicates at a glance the volume and page number for each item you are searching for. Numerous cross- references lead the user to all possible subjects relating to formulas or processes of interest.

There is hardly any technical library in this country in which the volumes of the Chemical Formulary Series would not occupy a prominent place. Chemists — whether they are experienced or beginners — continually refer to them. Many successful small manufacturers based their entire business on some formula in the early volumes of this unique formulary of chemical products and methods.

Volume XXXIV — as its predecessors — counts numerous well-known experts among its contributors. It does not duplicate any of the formulas included in the previous volumes, but lists a wide array of modern and salable products from every branch of the chemical industries. Lucid and to-the-point instructions make their contributions to the success of formulation.

It is a treasury of information for the practicing chemist, beginner and student, as well as for businessmen who are searching for marketable products to start or expand their business.

If you have a formulation problem do what the experts do — consult the Chemical Formulary Series.

PREFACE:

Chemistry, as taught in our schools and colleges, concerns chiefly synthesis, analysis and engineering — and properly so. It is part of the right foundation for the education of the chemist.

Many a chemist entering an industry soon finds that most of the products manufactured by his concern are not synthetic or definite chemical compounds, but are mixtures, blends, or highly complex compounds of which he knows little or nothing. The literature in this field, if any, may be meager, scattered, or obsolete.

Even chemists with years of experience in one or more industries spend considerable time and effort in acquainting themselves with any new field which they may enter. Consulting chemists similarly have to solve problems brought to them from industries foreign to them. There was a definite need for an up-to-date compilation of formulas for chemical compounding and treatment. Since the fields to be covered are many and varied, an editorial board of chemists and engineers engaged in many industries was formed.

Many publications, laboratories, manufacturing firms, and individuals have been consulted to obtain the latest and best information. It is felt that the formulas given in this volume will save chemists and allied workers much time and effort.

Manufacturers and sellers of chemicals will find, in these formulas, new uses for their products. Non-chemical executives, professional men, and interested laymen will make through this volume a "speaking acquaintance" with products which they may be using, trying, or selling.

It often happens that two individuals using the same ingredients in the same formula get different results. This may be due to slight deviations in the raw materials or unfamiliarity with the intricacies of a new technique. Accordingly, repeated experiments may be necessary to get the best results. Although many of the formulas given are being used commercially, many have been taken from the literature and may be subject to various errors and omissions. This should be taken into consideration. Wherever possible, it is advisable to consult with other chemists or technical workers regarding commercial production. This will save time and money and help avoid trouble.

A formula will seldom give exactly the results which one requires. Formulas are useful as starting points from which to work out one's ideas. Also, formulas very often give us ideas which may help us in our specific problems. In a compilation of this kind, errors of omission, commission, and printing may occur. I shall be glad to receive any constructive criticism.

PREFACE TO VOLUME XXXIV:

In 1990 we lost our oldest and most prestigious author and friend, Harry Bennett at age 95. He is sorely missed.

It was his wish that the "Formulary" continue with or without him. Our editorial staff has put together this volume XXXIV, and shall continue to do so without making any changes in style or presentation.

This new volume of the Chemical Formulary series is a collection of new, up-to-date formulas. All the formulas in Volumes I through XXXIV (except in the Introduction) are different. Thus, if you do not find what you want in this volume, you may find it in one of the others. The only repetitious material is the introduction (Chapter 1) which is used in every volume for the benefit of those who may have bought only one volume and who have no educational background or experience in chemical compounding. The simple basic formulas and compounding methods given in the introduction will serve as a guide for beginners and students. It is suggested that they read the introduction carefully and even make a few preparations described there before compounding the more intricate formulas included in the later chapters.

The list of chemicals and their suppliers has been enlarged with new trademark chemicals. All tradename chemicals appear in the formulas in boldface and these tradenames are listed alphabetically in the appendix followed by a list of corresponding manufacturers. The Trademark Chemical Suppliers Index includes address, telephone and fax numbers. Thus buying the required ingredients will present no problem.

NOTE: This book is the result of cooperation of many chemists and engineers who have given freely of their time and knowledge. It is their business to act as consultants and to give advice on technical matters for a fee. As publishers, we do not maintain a laboratory or consulting service to compete with them. Therefore, please do not ask for advice or opinions, but consult a chemist.

The publisher makes no representation, express or implied, with regard to the accuracy of the information contained in this book and cannot accept any legal responsibility or liability for any errors or omissions that may be made.

INTRODUCTION:

The following introductory matter has been included at the suggestion of teachers of Chemistry and Home Economics.

This section will enable anyone, with or without technical education or experience, to start making simple products without any complicated or expensive machinery. For commercial production, however, suitable equipment is necessary.

Chemical specialties are composed of pigments, gums, resins, solvents, oils, greases, fats, waxes, emulsifying agents, dyestuffs, perfumes, water, and chemicals of great diversity. To compound certain of these with some of the others requires definite and well studied procedures, any departure from which will inevitably result in failure. The steps for successful compounding are given with the formulas. Follow them rigorously. If the directions require that (a) is added to (b), carry this out literally, and do not reverse the order. The preparation of an emulsion is often quite as tricky as the making of mayonnaise. In making mayonnaise, you add the oil to the egg, slowly, with constant and even stirring. If you do it correctly, you get mayonnaise. If you depart from any of these details: if you add the egg to the oil, or pour the oil in too quickly, or fail to stir regularly, the result is a complete disappointment. The same disappointment may be expected if the prescribed procedure of any other formulation is violated.

The point next in importance is the scrupulous use of the proper ingredients. Substitutions are sure to result in inferior quality, if not in complete failure. Use what the formula calls for. If a cheaper product is desired, do not prepare it by substituting a cheaper ingredient for the one prescribed; use a different formula. Not infrequently, a formula will call for an ingredient which is difficult to obtain. In such cases, either reject the formula or substitute a similar substance only after a preliminary experiment demonstrates its usability. There is a limit to which this rule may reasonably be extended. In some cases, substitution of an equivalent ingredient may be made legitimately. For example, when the formula calls for white wax (beeswax), yellow wax can be used, if the color of the finished product is a matter of secondary importance. Yellow beeswax can often replace white beeswax making due allowance for color, but paraffin wax will not replace beeswax, even though its light color seems to place it above yellow beeswax.

This leads to the third point: the use of good-quality ingredients, and ingredients of the correct quality. Ordinary lanolin is not the same thing as anhydrous lanolin. The replacement of one with the other, weight for weight, will give discouragingly different results. Use exactly what the formula calls for: if you are not acquainted with the substance and you are in doubt as to just what is meant, discard the formula and use one you understand. Buy your chemicals from reliable sources. Many ingredients are obtainable in a number of different grades: if the formula does not designate the grade, it is understood that the best grade is to be used. Remember that a formula and the directions can tell you only part of the story. Some skill is often required to attain success. Practice with a small batch in such cases until you are sure of your technique. Many examples can be cited. If the formula calls for steeping quince seed for 30 minutes in cold water, steeping for 1 hour may yield a mucilage of too thin a consistency. The originator of the formula may have used a fresher grade of seed, or her/his conception of what "cold" water means may be different from yours. You should have a feeling for the right degree of mucilaginousness, and if steeping the seed for 30 minutes fails to produce it, steep them longer until you get the right kind of mucilage. If you do not know what the right kind is, you will have to experiment until you find out. This is the reason for the recommendation to make small experimental batches until successful results are obtained. Another case is the use of dyestuffs for coloring lotions and the like. Dyes vary in strength; they are all very powerful in tinting value; it is not always easy to state in quantitative terms how much to use. You must establish the quantity by carefully adding minute quantities until you have the desired tint. Gum tragacanth is one of those products which can give much trouble. It varies widely in solubility and bodying power; the quantity listed in the formula may be entirely unsuitable for your grade of tragacanth. Therefore, correction is necessary, which can be made only after experiments with the available gum.

In short, if you are completely inexperienced, you can profit greatly by experimenting. Such products as mouthwashes, hair tonics, and astringent lotions need little or no experience, because they are, as a rule, merely mixtures of simple liquid and solid ingredients, which dissolve without difficulty and the end product is a clear solution that is ready for use when mixed. However, face creams, toothpastes, lubricating greases, wax polishes, etc., whose formulation requires relatively elaborate procedures and which must have a definite final viscosity, need some skill and not infrequently some experience.

FIGURING

Some prefer proportions expressed by weight or volume, others use percentages. In different industries and foreign countries different systems of weights and measures are used. For this reason, no one set of units could be satisfactory for everyone. Thus diverse formulas appear with different units, in accordance with their sources of origin. In some cases, parts are given in stead of percentage or weight or volume. On the pages preceding the index, conversion tables of weights and measures are listed. These are used for changing from one system to another. The following examples illustrate typical units.

Example No. 1: Ink for Marking Glass

Glycerin	40	Ammonium Sulfate	10
Barium Sulfate	15	Oxalic Acid	8
Ammonium Bifluoride	15	Water	12

Here no units are mentioned. In this case, it is standard practice to use parts by weight throughout. Thus here we may

use ounces, grams, pounds, or kilograms as desired. But if ounces are used for one item, the ounce must be the unit for all the other items in the formula.

Example No. 2: Flexible Glue

Powdered Glue	30.90%	Glycerin	5.15%
Sorbitol (85%)	15.45%	Water	48.50%

Where no units of weight or volume, but percentages are given, forget the percentages and use the same method as given in Example No. 1.

Title	Location	Edition / Series / Misc.
22 Chemical Hazard Communication Guidebook: OSHA, EPA and DOT Requirements		Edition: 2nd edition
Author: Waldo, Andrew B. and Richard deC. Hinds	Dynix: 56535	Series:
Publish.: Executive Enterprises, Inc.	Call No.: 363.17 Wa	
- place: New York, NY	ISBN: 1558407588	
- date: ©1991	Shelf Reference	Year: 1991
Subject: United States. Occupational Safety and Health Administration		Price: \$49.95
Desc: 583 p., illus., 28 cm.		

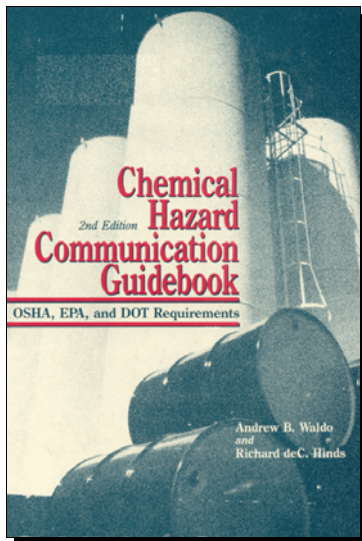


Table of Contents

CHAPTER ONE: INTRODUCTION
 ORGANIZATION
 THE OSHA HAZARD COMMUNICATION STANDARD
 SARA TITLE III EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW REQUIREMENTS
 HAZARDOUS MATERIALS TRANSPORTATION
 COMPLIANCE PLANNING

CHAPTER TWO: THE OSHA HAZARD COMMUNICATION STANDARD
 INTRODUCTION
 WHO MUST COMPLY WITH THE HCS
 CHEMICALS COVERED
 OBLIGATIONS OF THE EMPLOYER
 Hazard Determination
 Hazard Determination Procedure
 MATERIAL SAFETY DATA SHEETS
 LABELS
 EMPLOYEE INFORMATION AND TRAINING
 THE WRITTEN HAZARD COMMUNICATION PROGRAM
 TRADE SECRETS
 ENFORCEMENT
 RELATIONSHIP TO STATE AND LOCAL "RIGHT-TO-KNOW" LAWS
 HAZARD COMMUNICATION STANDARD COMPLIANCE CHECKLIST FOR CHEMICAL USERS

CHAPTER THREE: SARA TITLE III EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW REQUIREMENTS
 INTRODUCTION
 Preemption
 EMERGENCY PLANNING REQUIREMENTS
 EMERGENCY RELEASE REPORTING REQUIREMENTS
 COVERED FACILITIES, RELEASES, AND SUBSTANCES
 Covered Facilities
 Covered Releases
 Covered Substances
 EXEMPTED RELEASES
 Federally Permitted Releases
 Other Exempted Releases
 THE NOTIFICATION PROCESS
 Immediate Notification Requirements
 CONTENTS OF IMMEDIATE REPORT
 FOLLOW-UP WRITTEN RELEASE REPORTS
 COMPLIANCE PLANNING
 HAZARDOUS CHEMICAL "RIGHT-TO-KNOW" REPORTING REQUIREMENTS
 Basic Requirements
 Submission of MSDSs or Lists
 The List Option
 Mixtures
 Emergency and Hazardous Chemical Inventory
 Content of Forms
 Request for Tier 2 Information
 Confidentiality
 TOXIC CHEMICAL RELEASE REPORTING

Subjects

338 .	United States. Occupational Safety and Health Administration
422 .	United States. Environmental Protection Agency
467 .	United States. Dept. of Transportation
482 .	Hazardous substances -- United States -- Safety measures -- Handbooks, manuals, etc.
495 .	Hazardous substances -- Law and legislation -- United States -- Handbooks, manuals, etc.

- Introduction
- Toxic Chemicals Covered
- Facilities Covered
- Thresholds for Reporting
- Toxic Chemical Release Reporting
- Supplier Notification
- PROTECTING TRADE SECRETS
 - Introduction
 - Procedure for Making Trade Secret Claims Under SARA
- SUBSTANTIATION REQUIREMENTS
 - Petition for Disclosure or Review of Claim
 - Disclosure to Health Professionals
- ENFORCEMENT
 - Emergency Planning Notification Requirements
 - Emergency Release Notification Requirements
 - Reporting Requirements
 - Trade Secrets
 - Enforcement of Section 323 by Health Professionals
 - Enforcement by Citizen Suits and State or Local Suits
 - State Enforcement
- COMPLIANCE PLANNING
- COMPLIANCE CHECKLIST

- CHAPTER FOUR: HAZARDOUS MATERIALS TRANSPORTATION
 - THE HAZARDOUS MATERIALS TRANSPORTATION ACT AND GENERAL STRUCTURE OF THE REGULATIONS
 - HAZARDOUS MATERIALS COVERED
 - GENERAL OVERVIEW OF THE SHIPPER'S RESPONSIBILITIES
 - SHIPMENT OF EPA HAZARDOUS SUBSTANCES
 - Definition of Hazardous Substances
 - DOT REGULATION OF HAZARDOUS SUBSTANCES
 - INCIDENT REPORTING FOR SPILLS IN TRANSPORTATION
 - PROPOSED CHANGES TO THE DOT SYSTEM OF REGULATION
 - COMPLIANCE PLANNING

- APPENDIX A: MODEL COMPANY PROGRAMS: HAZARD COMMUNICATION AND EMPLOYEE TRAINING
 - INTRODUCTION
 - ABC COMPANY HAZARD COMMUNICATION PROGRAM
 - 1. Policy Statement
 - 2. Program Responsibilities
 - 3. Employee Notification and Training
 - 4. Location and Availability of Written Hazard Communication Program
 - 5. Sample Bulletin Board Notification
 - 6. Hazardous Material List
 - 7. Chemical Name Index
 - 8. Hazard Determinations
 - 9. Material Safety Data Sheets (MSDSs)
 - 10. Sample MSDS Request Letter
 - 11. Guide for Reviewing MSDS Completeness
 - 12. Labeling
 - 13. Employee Information/Training
 - 14. Outside Contractors
 - 15. Letter of Notification to Contractor Employers
 - HAZARDOUS CHEMICAL EMPLOYEE TRAINING
 - Introduction
 - Outline of a Model Hazardous Chemical Employee Training Program
 - General Information
 - Site Specific Information

- APPENDIX B: REFERENCE GUIDE TO THE REGULATIONS
 - OSHA HAZARD COMMUNICATION STANDARD
 - A. Scope of the Hazard Communication Standard
 - B. Performing a Hazard Determination
 - C. Preparing Material Safety Data Sheets

- D. Maintaining Material Safety Data Sheets
- E. Preparing and Maintaining Labels and Other Warnings
- F. Training Employees about Chemical Hazards
- G. Preparing and Providing a Written Hazard Communication Program
- H. Requirements for Those Handling Hazardous Chemicals in Sealed Containers
- I. Special Requirements for Laboratories
- J. Requirements for Disclosing and Withholding Trade Secret Information
- OSHA's Hazard Communication Standard
- OSHA Material Safety Data Sheet Form
- EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW
 - A. Emergency Planning Notice
 - B. Emergency Release Reporting
 - C. MSDS/List Submission
 - D. Hazardous Chemical Inventory Reporting
 - E. Submission of Toxic Chemical Release Reports
 - F. Disclosure of Information
 - EPA's Emergency Planning Rule
 - EPA's Release Reporting Regulations Under CERCLA
 - EPA's Regulation Establishing Emergency and Hazardous Chemical Inventory Forms and Community Right-to-Know Reporting Requirements
 - EPA's Regulation Establishing Toxic Chemical Release Reporting
 - EPA's Toxic Chemical Release Inventory Reporting Form R and Instructions
 - EPA's Trade Secrecy Claims for Emergency Planning and Community Right-to-Know Information: and Trade Secret Disclosures to Health Professionals
- DOT REQUIREMENTS APPLICABLE TO SHIPPERS OF HAZARDOUS MATERIALS
 - A. Determining the Proper Shipping Name and Classification
 - B. Complying with General Restrictions on Transporting Hazardous Materials
 - C. Determining the Proper Packaging
 - D. Selecting the Proper Label(s)
 - E. Marking the Packaging in the Manner Required
 - F. Determining the Proper Placard(s)
 - G. Preparing Shipping Papers
 - DOT Hazardous Materials Table
 - Appendix to § 172.101 ? List of Hazardous Substances and Reportable Quantities
- APPENDIX C: DEFINITIONS OF HAZARDS
 - OSHA HAZARD COMMUNICATION STANDARD
 - SARA RIGHT-TO-KNOW REPORTING
 - HAZARDOUS MATERIALS TRANSPORTATION
- APPENDIX D: LIST OF EXTREMELY HAZARDOUS SUBSTANCES (ALPHABETICAL ORDER)
- APPENDIX E: LIST OF EXTREMELY HAZARDOUS SUBSTANCES (CAS ORDER)
- APPENDIX F: LIST OF HAZARDOUS SUBSTANCES (ALPHABETICAL ORDER)
- APPENDIX C: LIST OF HAZARDOUS SUBSTANCES (CAS ORDER)

Reviews - Synopsis - Dust Jacket

SYNOPSIS

This book provides all the information necessary to understand and comply with hazard communication requirements in the workplace. The reader will learn reporting requirements imposed by federal emergency planning and community right-to-know, as well as how to deal with changing restrictions on the transportation of hazardous materials. The book reviews these requirements, provides approaches to compliance planning, suggests model company programmes, includes relevant extracts of the source requirements, and provides tables of regulated chemicals. This guidebook offers details on OSHA, EPA, and DOT regulations; a glossary of hazard-related terms; and a list of chemicals subject to emergency planning, emergency release reporting and toxic chemical release reporting in alphabetical and CAS order. It is a practical resource for the regulatory professional or the beginner seeking a better understanding of these regulations.

INTRODUCTION

Organization

This book is written to assist the reader in complying with hazard communication requirements applicable to hazardous chemicals in the workplace, in meeting reporting responsibilities imposed by emergency planning and community right-to-

know requirements, and in understanding restrictions on the transportation of hazardous materials. Chapter Two contains a detailed summary of the U.S. Occupational Safety and Health Administration's (OSHA) Hazard Communication Standard (HCS) which requires all employers to provide information to their employees on the hazards of the chemicals with which they work. Chapter Three details the obligations of employers established by the Environmental Protection Agency (EPA) under Title III of the Superfund Amendment and Reauthorization Act (SARA) to provide the community with information on the identity and amount of hazardous chemicals present at a facility and information on releases of hazardous chemicals to the environment. Finally, Chapter Four summarizes the major requirements for shipments of hazardous materials under the U.S. Department of Transportation's (DOT) regulations.

The book is designed to provide the reader with tools to determine what the regulations require and to develop a plan to meet these requirements. The chapters provide a summary of the requirements that apply in each area and provide practical suggestions for a cost-effective compliance program.

Appendix A includes a model hazard communication program that the reader may use as the basis for developing a company program to comply with OSHA's requirements. In addition, Appendix A provides an outline of an employee training course which can be used to prepare a training program that meets the HCS.

Appendix B is a reference guide to the OSHA, EPA, and DOT regulations covered. It contains an outline of the principal requirements in each area followed by the actual text of the regulations that apply. The outlines in the reference guide summarize the requirements, briefly describe its application, and provide a reference to the pertinent regulation. Although the regulations reprinted here include the principal ones of concern, space limitations precluded the inclusion of the entire text of DOT's regulations, which occupy several volumes.

Appendix C contains the definitions of hazard-related terms used in the regulations. Each of the regulations promulgated by OSHA, EPA, and DOT defines the types of hazards covered. In some cases, the same term may be defined differently. In other cases, the definition in one regulation may refer to the definition in another regulation. To clarify how these terms relate to one another, the appendix provides each definition and compares the terms used in the three program areas.

The appendices that follow provide the lists of chemicals subject to emergency planning, emergency release reporting, and toxic chemical release reporting in alphabetic and CAS order. The DOT Hazardous Materials Table is included as part of Appendix B. With the passage of SARA and its reference to various lists of chemicals, each defined differently, an important element in compliance is the need to compare the chemicals present at a facility with the lists adopted as part of the regulations. Although the OSHA Hazard Communication Standard established floor lists of chemicals which, at a minimum, are to be considered hazardous, the HCS is broad in scope and employs performance criteria in defining hazardous chemicals subject to regulation. The HCS applies to many chemicals not specifically included on any list. Similarly, the spill reporting requirements imposed by EPA incorporate by reference both listed and unlisted hazardous wastes. In developing a compliance program, close attention should be given to any performance criteria that may apply, as well as to any specific lists of chemicals to which the regulation may refer.

The OSHA Hazard Communication Standard

The purpose of the OSHA Hazard Communication Standard is to ensure that the hazards of all chemicals produced in or imported into the United States are identified and that this information, together with information on protective measures, is provided to employees who are exposed or potentially exposed to hazardous chemicals in the work place. Although the original HCS applied only to employers in the manufacturing sectors included in Standard Industrial Classification (SIC) codes 20-39, OSHA published a final rule on August 24, 1987, extending the scope of the OSHA HCS to cover all employers. The revised HCS first required manufacturers, importers, and distributors to provide a material safety data sheet (MSDS) to commercial customers in the non-manufacturing sector with the first shipment of a hazardous chemical after September 23, 1987. By May 23, 1988, all firms that ship, store, sell, or use chemicals were to have prepared and implemented a comprehensive hazard communication program for their employees. The HCS was recodified as 29 CFR 1910.1200 for general industry, 29 CFR 1915.99 for shipyard employment, 29 CFR 1917.28 for marine terminals, 29 CFR 1918.20 for longshoring, 29 CFR 1926.59 for construction, and 29 CFR 1928.21 for agriculture.

Due to court challenges and administrative actions, OSHA was prevented from enforcing the HCS in all industries, including MSDS provisions on multi-employer worksites, coverage of consumer products, and the coverage of drugs in the non-manufacturing sector. As a result of the February 21, 1990 Supreme Court decision in *Dole, Secretary of Labor et al. v. United Steelworkers of America et al.*, 110 S. Ct. 929 (1990), all provisions of the rule are in effect for all industrial segments, including the three areas for which a stay had been granted.

The original HCS required manufacturers and importers to prepare MSDSs and appropriate labels for each container of chemicals shipped after November 25, 1985. After that date, manufacturers, importers, and distributors of chemicals had to provide MSDSs to their manufacturing customers. Employers in the manufacturing sector were also required to provide appropriate training to employees and to develop a written hazard communication program by May 25, 1986.

Title	Location	Edition / Series / Misc.
<p>23 Chemical Process Industries <i>Author:</i> Shreve, Randolph Norris, 1885-1975 and Joseph A. Brink <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> ©1977 <i>Subject:</i> Chemistry, Technical <i>Desc:</i> xiii, 814 p., illus., 25 cm.</p>	<p><i>Dynix:</i> 12955 <i>Call No.:</i> 660.2 Sh <i>ISBN:</i> 0070571457 <i>Shelf:</i> Adult Non-Fiction</p>	<p><i>Edition:</i> 4th edition <i>Series:</i> <i>Year:</i> 1977 <i>Price:</i> \$25.00</p>

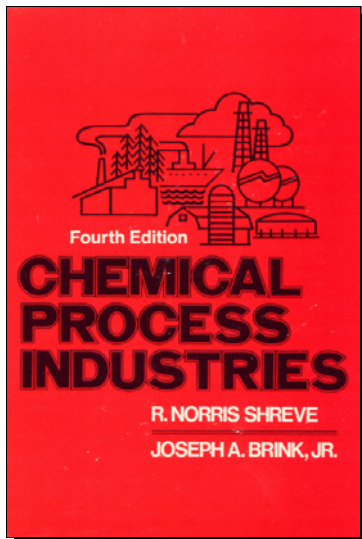


Table of Contents

1. CHEMICAL PROCESSING
Unit Operations (Physical Principles); Chemical Conversions; Flowcharts; Chemical Processing; Information Sources.
2. CHEMICAL PROCESSING AND THE WORK OF THE CHEMICAL ENGINEER
Basic Chemical Data; Batch versus Continuous Processing; Flowcharts; Chemical Process Selection, Design, and Operation; Chemical Process Control and Instrumentation; Chemical Process Economics; Market Evaluation; Plant Locations; Safety; Construction of Plant; Management for Productivity and Creativity; Research and Development; Patents; Chemical Systems.
3. WATER CONDITIONING AND ENVIRONMENTAL PROTECTION
Reuse; Water Conditioning; Methods; Demineralization; Precipitation Processes; Desalting; Environmental Protection; Industrial and Sewage Wastewater Treatment; Air Pollution.
4. ENERGY, FUELS, AIR CONDITIONING, AND REFRIGERATION
Energy; Projected Energy Demands; Fossil Fuels; Power Generation; Other Sources of Energy; Air Conditioning; Refrigeration.
5. COAL CHEMICALS
Destructive Distillation of Coal; Coking of Coal; Distillation of Coal Tar; Coal to Chemicals.
6. FUEL GASES
Natural Gas; Coke-Oven Gas; Water Gas (Blue Gas); Producer Gas; Liquefied Petroleum Gases; Synthetic Natural Gas.
7. INDUSTRIAL GASES
Carbon Dioxide; Hydrogen; Synthesis Gas; Hydrogen Purification; Oxygen and Nitrogen; Rare Gases of the Atmosphere; Helium; Acetylene; Sulfur Dioxide; Carbon Monoxide; Nitrous Oxide.
8. INDUSTRIAL CARBON
Lampblack; Carbon Black; Activated Carbon; Natural Graphite; Manufactured Graphite and Carbon; Industrial Diamonds.
9. CERAMIC INDUSTRIES
Basic Raw Materials; Chemical Conversions, Including Basic Ceramic Chemistry; Whitewares; Structural Clay Products; Refractories; Specialized Ceramic Products; Enamels and Enameled Metal; Kilns.
10. PORTLAND CEMENTS, CALCIUM, AND MAGNESIUM COMPOUNDS
Portland Cements; Cement Manufacture; Lime; Lime Manufacture; Gypsum; Miscellaneous Calcium Compounds; Magnesium Oxychloride Cement; Magnesium Compounds.
11. GLASS INDUSTRIES
Manufacture; Methods of Manufacture; Manufacture of Special Glasses.
12. SALT AND MISCELLANEOUS SODIUM COMPOUNDS
Sodium Chloride, or Common Salt; Sodium Sulfate; Sodium Bisulfate, or Niter Cake; Sodium Bisulfite; Sodium Sulfite; Sodium Hydrosulfite; Sodium Sulfide; Sodium Hydrosulfide; Sodium Thiosulfate; Sodium Nitrite; Sodium Silicates; Sodium Peroxide; Sodium Perborate; Sodium Amide; Sodium Cyanide and Ferrocyanide.
13. CHLOR-ALKALI INDUSTRIES
Manufacture of Soda Ash; Manufacture of Sodium Bicarbonate; Miscellaneous Alkalies; Manufacture of Chlorine and Caustic Soda; Bleaching Powder; Sodium Hypochlorite; Sodium Chlorite.

Subjects

230 . | Chemistry, Technical

14. ELECTROLYTIC INDUSTRIES

Aluminum; Magnesium; Sodium; Chlorates and Perchlorates; Primary and Secondary Cells.

15. ELECTROTHERMAL INDUSTRIES

Artificial Abrasives; Calcium Carbide; Miscellaneous Electrothermal Products.

16. PHOSPHORUS INDUSTRIES

Phosphate Rock and Superphosphates; Superphosphates; Wet-Process Phosphoric Acid; Phosphorus and Pure Phosphorus Derivatives; Phosphoric Acid from Phosphorus; Sodium Phosphates; Baking Powders; Phosphorous Fire-Retardant Chemicals.

17. POTASSIUM INDUSTRIES

Potassium Chloride; Various Potassium Salts.

18. NITROGEN INDUSTRIES

Cyanamide; Synthetic Ammonia; Urea; Nitric Acid; Sodium Nitrate and Potassium Nitrate.

19. SULFUR AND SULFURIC ACID

Mining and Manufacture of Sulfur; Sulfuric Acid; Manufacture by the Contact Process; Contact Process Equipment; Recovery of Waste Sulfuric Acid; Sulfur Pollution; Concentration.

20. HYDROCHLORIC ACID AND MISCELLANEOUS INORGANIC CHEMICALS

Hydrochloric or Muriatic Acid; Bromine; Iodine; Fluorine and Fluorochemicals; Alumina; Aluminum Sulfate and Alums; Aluminum Chloride; Copper Salts; Molybdenum Compounds; Barium Salts; Strontium Salts; Lithium Salts; Boron Compounds; Rare-Earth Compounds; Sodium Dichromate; Hydrogen Peroxide.

21. NUCLEAR INDUSTRIES

Nuclear Reactions; Plutonium; Feed-Materials Production; Uranium; Nuclear Reactors; Reprocessing of Nuclear Materials; , Protection from Radioactivity; Waste Disposal.

22. EXPLOSIVES, TOXIC CHEMICAL AGENTS, AND PROPELLANTS

Industrial and Military Explosives; Military Explosives; Industrial Explosives; Toxic Chemical Weapons; Pyrotechnics; Matches; Propellants of Rockets and Guided Missiles.

23. PHOTOGRAPHIC PRODUCTS INDUSTRIES

Color Photography --Theories. Materials, and Processes; Special Applications of Photography.

24. SURFACE COATING INDUSTRIES

Paints; Pigments; White Pigments; Black Pigments; Blue Pigments; Red Pigments; Yellow Pigments; Green Pigments; Brown Pigments; Toners and Lakes; Miscellaneous Pigments; Pigment Extenders; Oils; Varnishes; Lacquers; Industrial Coatings; Coated Metals; Printing Inks and Industrial Polishes.

25. FOOD AND FOOD BY PRODUCT PROCESSING INDUSTRIES

Food Processing; Milk Processing; Meat, Poultry, Food By Products; Leather, Animal Skins, Manufacture; Gelatin; Adhesives.

26. AGRICHEMICAL INDUSTRIES

Insecticides; Fungicides, Herbicides; Fertilizers; Plant Nutrients and Regulators; Feedstuff Additives and Supplements.

27. FRAGRANCES. FLAVORS. AND FOOD ADDITIVES

Constituents; Vehicle; Fixative; Odorous Substances; Condensation Processes; Esterification Processes; Grignard Processes; Hydrogenation; Nitration Processes; Oxidation Processes; Miscellaneous Processes; Perfume Formulation; Fragrance Quality; Flavoring Industry; Natural Fruit Concentrates; Flavor-Essence Formulation; Food Additives.

28. OILS. FATS. AND WAXES

Vegetable Oils, Cottonseed Oil and Soybean Oil by Solvent Extraction; Animal Fats and Oil.; Processing of Animal Fats and Oils-Hydrogenation, Interesterification; Waxes.

29. SOAP AND DETERGENTS

Detergents; Detergent Raw Material.; Manufacture of Detergents; Biodegradability of Surfactants; Straight-Chain Alkylbenzene; Fatty Acids and Fatty Alcohols; Soap; Glycerin.

30. SUGAR AND STARCH INDUSTRIES

Sugar; Manufacture of Sugar; Starches and Related Products; Miscellaneous Starches.

31. FERMENTATION INDUSTRIES

Industrial Alcohol; Manufacture of Industrial Alcohol; Absolute, or Anhydrous, Alcohol; Beers, Wines, and Liquors; Butyl Alcohol and Acetone; Vinegar and Acetic Acid; Citric Acid; Lactic Acid; Enzymes.

32. WOOD CHEMICALS

Distillation of Hardwood; Naval Stores Industry; Manufacture for Naval Stores; Hydrolysis of Wood; Chart of Cellulose Derivatives; Fire Retardants.

33. PULP AND PAPER INDUSTRIES

Sulfite, Sulfate, Soda, Groundwood Pulp for Paper; Manufacture of Paper; Specialty Papers; Paper Stock; Structural Boards.

34. PLASTIC INDUSTRIES

Resin-Manufacturing Processes; Condensation-Polymerization Products; Addition Polymerization Products; Natural Products and Their Derivatives; Manufacture of Laminates and Other Types; Chemical Intermediates for Resins-Phenol, Formaldehyde, Hexamethylenetetramine, Vinyl Esters, Phthalic Anhydride.

35. SYNTHETIC FIBER AND FILM INDUSTRIES

Polyfibers and Films; Polyamide, or Nylon, Fibers; Nylon Intermediates; Polyesters; Acrylics and Modacrylics; Vinyl. and Vinylidines; Spandex; Polyolefins; Fluorocarbons; Glass Fibers; Cellulosic Fibers and Films; Rayon and Acetate; Viscose Manufacturing Process; Cellulose Acetate Manufacturing Process; Finishing and Dyeing of Textiles.

36. RUBBER INDUSTRIES

Statistics and Economics; Natural Rubber; Synthetic Rubbers; Monomer Production; Synthetic-Rubber Polymerization; Butadiene-Styrene Copolymers; Butadiene-Acrylonitrile Rubbers; Neoprene; Thiokol; Silicone Rubbers; Butyl Rubber; Urethane Rubber; Hypalon; Stereospecific Rubbers; Ethylene-Propylene Polymers and Terpolymers; Rubber-Processing Chemicals; Rubber Compounding; Rubber Fabrication; Latex Compounds; Reclaimed Rubber; Rubber Derivatives.

37. PETROLEUM REFINING

Constituents of Petroleum, Including Petroleum Gases; Products of Refining; G880line, Lub Oils, and Precursor for Petrochemicals, Manufacture, or Refining.

38. PETROCHEMICALS

Physical Separations, or Unit Operations; Chemical Conversions for Petrochemicals, Alkylation, Amination, Halogenation and Hydrohalogenation.

39. INTERMEDIATES, DYES, AND THEIR APPLICATION

Intermediates; Nitration; Amination by Reduction; Amination by Ammonolysis; Halogenation; Sulfonation; Hydrolysis; Oxidation; Alkylation; Condensation and Addition Reactions (Friedel-Crafts); Dyes by Application Classification; Dyes by Chemical Classification for Manufacture.

40. PHARMACEUTICAL INDUSTRY

Classification; Manufacture of Pharmaceutical Products; Alkylations; Carboxylation; Condensation and Cyclization; Dehydration; Esterification (Alcoholysis); Halogenation; Oxidation; Sulfonation; Complex Chemical Conversions; Fermentation and Life Processing for Antibiotics, Biologicals, Hormones, and Vitamins; Antibiotics; Biologicals; Steroid Hormones; Vitamins; Isolates from Plants or Animals.

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This updated version of the classic work on the chemical process industries will be an invaluable reference tool to anyone with an interest in the field. Covering the entire range of conversions of raw materials through the use of chemical reactions, it gives you instant, detailed information on any of the process industries, from the history of each to the economics and the manufacturing processes that are used.

In this new edition, special emphasis has been placed on environmental problems and the energy crisis. The impact of the radical changes and developments in the chemical process industries, such as new federal laws on air and water pollution and product safety, are discussed in depth.

Additional material has been added on chemical processing and the work of the chemical engineer, water conditioning and environmental protection, energy, fuels, air conditioning and refrigeration, and the food and food by-product

processing industries.

Each of the chemical process industries is analyzed and described by use of convenient flow charts, presenting chemical processing from the engineering approach. Salient production and sales statistics are given for many products so that the reader can appreciate the magnitude of various industries and trends in the consumption of various products.

If you are a chemical engineer, this book will help you run the chemical process industries in all their phases. For other scientists and engineers, it provides a valuable overview of each chemical process industry, as well as in-depth analyses of such important factors as chemical and physical changes and reactions, and economic and production statistics and costs. Technical sales and service people can learn more about their customers' processes and products, as well as alternate processes and products that might be used to meet competition.

This latest edition carries more than 200 new tables, charts, graphs, and flow-sheets. About 90% of the material is new or has been substantially revised from the previous edition. In addition, more than 3,000 footnotes and selected references to current journals, books and patents eliminate the need for time-consuming searching through the literature for further information.

PREFACE

The illness and subsequent death of Dr. R. Norris Shreve make it necessary for the fourth edition of CPI to appear without his full collaboration. The book was originally the product of his initiative, and the first three editions were molded by him. This fourth edition follows the format of previous editions.

Each chapter covers a given chemical process industry -- such as glass, paper, rubber, or sulfuric acid -- in somewhat the following order. After a brief introduction, aimed at epitomizing the industry, some attention is given to the historical background of the particular process. This is followed by a consideration of uses and economics, including statistical tabulations by which the industry's importance can be judged. Production trends, whether on the increase or decrease, are of more importance than mere statements that so many pounds or so many dollar's worth of a given substance are being manufactured. Trends are shown by parallel columns for different years and by statistical curves. Under manufacture -- as this is a book on chemical engineering -- energy change, unit operations, and chemical conversions are brought to the reader's attention. For some important processes, principal unit operations and unit chemical conversions are tabulated. Dividing the industries into these units helps greatly in the transference of information from one industry to another. Indeed, the many flowcharts do this in a visual manner. This breakdown clearly shows the reader that filtration and evaporation and hydrogenation and nitration are employed in many industries. Raw materials, their sources and their economic and chemical relationship to the manufacturing procedures, are also discussed.

This book has several potential uses. It is a college text designed to give the young chemical engineer some comprehension of the various fields into which he will enter, or with which he will be associated. It is a reference book for practicing chemical engineers, chemists, other engineers, and scientists in industry. Indeed, many professionals who are not chemical engineers have found that it helps them understand the chemical engineering aspects of company operations. The chemical process industries employ mechanical, electrical, and civil engineers and scientists -- as well as chemical engineers -- and these professionals can profit greatly from material in Chemical Process Industries that applies to their work and to their companies.

Since the third edition of CPI appeared in 1967, legislation and events have greatly affected the various industries. Environmental health and control restrictions have resulted in modification processes and products. The energy crises of the 1970s have altered the economics of processes and the design of plants. These changes have necessitated many revisions in the fourth edition of CPI.

Title	Location	Edition / Series / Misc.
24 Chemistry and Technology of UV & EB Formulations for Coatings, Inks and Paints [Vol. 1: UV & EB C		<i>Edition:</i>
<i>Author:</i> Mehnert, R., A. Pincus, I. Janorsky, R. Stowe and A. Berejka	<i>Dynix:</i> 89747	<i>Series:</i> Wiley/SITA Series in Surface Coatings Technology
<i>Publish.:</i> John Wiley & Sons	<i>Call No.:</i> 660 Ch	
<i>- place:</i> Chichester, [West Sussex], UK	<i>ISBN:</i> 0471978906	
<i>- date:</i> ©1998	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1998
<i>Subject:</i> Radiation curing		<i>Price:</i> \$148.50
<i>Desc:</i> x, 291 p., illus., 24 cm.		

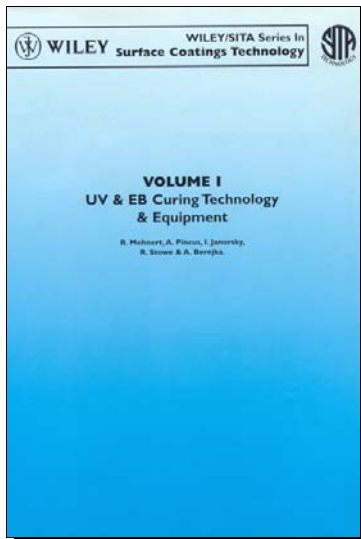


Table of Contents

- Ch.1 Radiation Curing: Definition and Basic Characteristics
 - Chemical Systems used for Radiation Curing
 - Initiation of Curing: Action of Photons and Electrons
 - UV (EB) Curing in Comparison to Thermal Curing and Conventional Drying
 - Economic and Ecological Factors for the Growth of Radiation Curing
- Ch.2 Industrial Applications of Radiation Curing
 - Radiation Curable Coatings
 - Radiation Curable Inks
 - Radiation Curable Adhesives
 - Radiation Curing for Manufacturing Plastic Parts
- Ch.3 UV Curing Equipment - Polychromatic UV Lamps
 - Polychromatic UV Radiation for Curing
 - Light Emission from a Dense Mercury Vapour Plasma
 - Polychromatic Light Sources for UV Curing
- Ch.4 UV Curing Equipment - Monochromatic UV Lamps
 - Monochromatic UV Radiation for Curing
 - Excimer Lamps in Comparison to Medium Pressure Mercury Lamps
- Ch.5 Dosimetry for EB and UV Curing
 - Low-Energy Electron Beam Dosimetry
 - Ultraviolet Radiation Dosimetry
- Ch.6 Electron Beam (EB) Curing Equipment
 - Generation of Accelerated Electrons
 - Types of Industrial Low-Energy Electron Processors
- Ch.7 UV Curing Technology - UV Curing Units and Application Techniques
 - UV Curing Units - General Design Principles
 - UV Curing of Coatings and Inks on Two-Dimensional Substrates
 - UV Curing of Inks and Coatings on Cylindrically Shaped Parts
 - UV Curing of Three-Dimensional Parts
 - UV Matting of Coatings
- Ch.8 Radiation Curing Technology - UV Curing
 - Degree of Cure and Cure Speed
 - Degree of Cure: Physical and Chemical Characterisation
- Ch.9 UV&EB Equipment Health and Safety
 - UV Equipment Health and Safety
 - EB Equipment Health and Safety

References

Reviews - Synopsis - Dust Jacket

Synopsis:

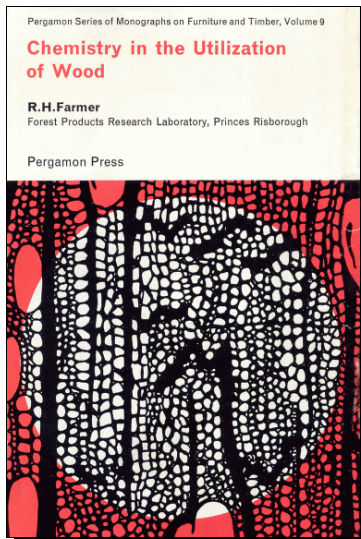
This series seeks to publish practical, applications orientated books designed for professional chemists employed in the paints and coatings industry, and reflecting technological developments, environmental concerns and increasing

Subjects

325 .	Radiation curing
404 .	Polymers -- Curing
448 .	Photochemistry -- Industrial applications

demand for higher volume production in emerging markets. The books in the series should provide insights into industrial methods which have traditionally been trade secrets. The volumes in this series provide information covering markets, substrates, processes, curing equipment, materials and world suppliers. This is combined with an in-depth treatment of the chemistry that is essential to the development of an understanding of the technology.

Title	Location	Edition / Series / Misc.
25 Chemistry in the Utilization of Wood Author: Farmer, Robert Harvey Publish.: Pergamon Press, Ltd. - place: Oxford, UK - date: [1967] Subject: Wood -- Chemistry Desc: viii, 193 p., illus., 20 cm.	Dynix: 14913 Call No.: 674.134 Fa ISBN: 0080121373 Shelf: Adult Non-Fiction	Edition: [1st edition] Series: Pergamon Series of Monographs on Furniture and Timber: Vol. 9 Year: 1967 Price: \$25.00

**Table of Contents**

FOREWORD
 PREFACE
 1. CHEMICAL COMPOSITION OF WOOD
 2. CHEMISTRY OF WOOD COMPONENTS
 3. WOOD ANALYSIS
 4. INFLUENCE OF EXTRACTIVES ON THE PROPERTIES AND UTILIZATION OF WOOD
 5. USE OF TIMBER IN CONJUNCTION WITH CHEMICALS
 6. CONVERSION OF WOOD INTO CHEMICAL PRODUCTS
 7. CORROSION OF METALS IN ASSOCIATION WITH WOOD
 8. WOOD-WATER RELATIONSHIPS
 9. CHEMICAL ASPECTS OF ATTACK BY FUNGI AND INSECTS
 10. PULP AND PAPER MANUFACTURE
 11. BOARD MATERIALS
 12. DESTRUCTIVE DISTILLATION OF WOOD

BOTANICAL NAMES OF TIMBERS
 INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Modern developments in wood technology and in the wood-based industries of pulp and paper, fibreboard and particle board, etc., require an increased understanding among technical men in these industries of the chemical nature of the material. The book provides a concise account of the chemistry of wood and its components and of the various ways in which chemical considerations deter mine or influence the utilization of wood. It is written, not for fully qualified chemists and specialists in wood science, but for technical staff in the industries concerned, scientists of other disciplines concerned with wood and, in particular, students at technical colleges undergoing training in subjects such as building, architecture, furniture manufacture, pulp and paper manufacture, etc.

Some knowledge of chemistry is assumed, corresponding roughly to GCE "Advanced" level. The first three chapters deal very briefly with the chemical composition and analysis of wood, and the remainder of the book is devoted to the practical applications of a knowledge of the chemistry of wood in its utilization and conversion into other products., Emphasis is laid mainly on practical and technical applications of the subject; the discussion of the basic chemistry of wood and its components is limited to that which is necessary for understanding its practical aspects. Few, if any, other books cover the ground from this angle in so concise a manner.

PREFACE:

The spread of scientific education and the introduction of new science-based techniques into the wood-using industries make it both possible and necessary for the wood technologist of the future to have a better understanding of the fundamental properties of his material. It might be thought that there are already sufficient books on the chemistry of wood to fill this need. Indeed, the excellent textbooks of Wise and Jahn, Hägglund, Stamm and Harris, Sandermann, Hillis, Browning and Stamm provide full and detailed accounts of this complex subject which are indispensable to the specialist and the research worker. Nevertheless, it is felt that there is a need for a shorter and simpler treatment that will be better suited to the requirements of students of wood technology and of technical men in the wood-using industries, who have some basic know ledge of chemistry and wish to apply this knowledge to the practical problems arising in the utilization of wood.

The emphasis in the present book is on the practical applications of the chemistry of wood. The discussion of the chemical composition of wood has intentionally been kept short and concise, and it is assumed that the reader has sufficient know ledge of chemistry to grasp the essential principles without lengthy explanations. The principal aim of the book is to show how the chemical nature of wood influences its proper ties and utilization, both as a constructional

Subjects

342 . Wood -- Chemistry

material and as the raw material for the manufacture of secondary products, such as pulp and paper, cellulose derivatives, board materials, etc.

Full literature references have not been provided, but at the end of each chapter will be found a short list of books and articles which is intended to assist the reader who wishes to study the various subjects in greater detail.

In the preparation of this book the author has drawn freely on existing publications on wood chemistry, and particularly on the works mentioned above. He also gratefully acknowledges the help and advice of his colleagues at the Forest Products Research Laboratory.

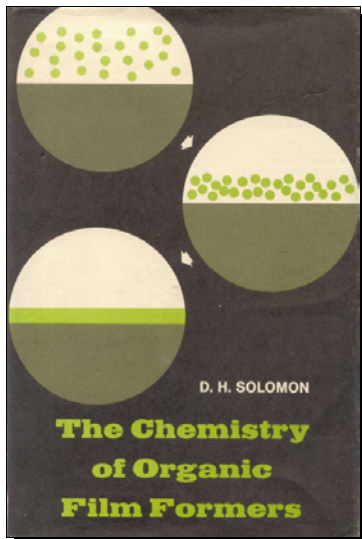
FOREWARD:

Wood is a ubiquitous raw material employed for many widely varying purposes. It is mainly used as a constructional material and for fuel but it also serves as the basic raw material for chemical processing, the most important being for the manufacture of paper.

These highly specialized processes have their own literature but the chemical aspects of wood affect all its uses from ease of sawing to changes in colour.

This book is a much shorter and less detailed treatment of the chemistry of wood than the existing textbooks and is largely concerned with its technical and practical application over a wide field. It is primarily intended for technical men in the wood-using industries who have an interest in wood and some knowledge of chemistry. It will also serve as a valuable textbook for students entering any field of wood technology.

Title	Location	Edition / Series / Misc.
26 Chemistry of Organic Film Formers		Edition:
Author: Solomon, D. H. (David Henry)	Dynix: 43971	Series:
Publish.: John Wiley & Sons (Krieger Publishing Company)	Call No.: 547.84 So	
- place: New York, NY	ISBN: 0882751654	
- date: [1967]	Shelf Adult Non-Fiction	Year: 1967
Subject: Polymers and polymerization		Price: \$25.00
Desc: xi, 369 p., illus., 24 cm.		



Subjects

313 .	Polymers
316 .	Polymers and polymerization

Table of Contents

1. THE FORMATION, CHARACTERIZATION, AND PROPERTIES OF POLYMERS
 - Polymer Preparation
 - Copolymers
 - Random Copolymers
 - Block and Graft Copolymers
 - Polymer Characterization
 - The Glass-Transition Temperature Range
 - The Concept of Solubility Parameters
2. GLYCERIDE OILS
 - Occurrence, Isolation, and Structure of Glyceride Oils
 - Autoxidation
 - Nonconjugated Fatty Acids and Esters
 - Conjugated Fatty Acids and Esters
 - Film Formation and Degradation
 - Nonconjugated Systems
 - Conjugated Systems
 - Autoxidation Catalysts--Driers
 - Coordination Complexes as Driers
 - Yellowing and Discoloration of Oil Films
 - Modified Oils
 - Isomerized Oils
 - cis-trans Isomerism
 - Nonconjugated to Conjugated Isomerization
 - Dehydration
 - Polymerized and Maleinized Oils
 - Reaction of Oils with Maleic Anhydride and Other Dienophiles
3. VARNISHES AND ALKYD RESINS
 - Varnishes
 - Alkyd Resins
 - Theory of Polyesterification
 - Methods of Preparing and Processing Alkyds
 - The Effects of Chemical Composition on the Preparation and Film-Forming Reactions of Alkyd Resins
 - Molecular Weight Distribution
4. VINYL AND ACRYLIC MODIFIED OILS AND ALKYDS
 - Blending of the Two Polymer Entities
 - Modifications Involving the Unsaturation of the Fatty Acid
 - Methods of Chemically Combining the Polymer Entities (Esterification and Etherification)
5. UNSATURATED POLYESTERS AND HIGH SOLIDS COATING SYSTEMS
 - Unsaturated Polyesters
 - The Unsaturated Polyester Backbone Polymer
 - The Polymerizable Solvent
 - The Initiating System
 - Stabilization of Polyester Solutions
 - Air Inhibition
 - High Solids Systems

6. THERMOPLASTIC CELLULOSE, ACRYLIC AND VINYL COATINGS
 - Cellulose Derivatives
 - Cellulose Nitrate
 - Organic Esters of Cellulose
 - Organic Ethers of Cellulose
 - Acrylic Polymers and Copolymers
 - Acrylic Organosols
 - Vinyl Polymers and Copolymers
 - Poly(ethylene)
 - Poly(styrene)
 - Fluorine-Containing Polymers
 - Poly(vinyl acetate)
 - Vinyl Chloride Polymers
 7. EPOXY RESINS
 - Synthesis of Epoxy Resins
 - Film Formation from Epoxy Resins
 - Self-Condensation of Epoxy Resins
 - Reaction of Epoxy Resins with Amines
 - Esterification of Epoxy Resins
 - Reactions of Epoxy Resins with Thiol, Methylol, Hydroxyl, and Phenolic Groups
 8. POLYURETHANES AND RELATED POLYMERS DERIVED FROM ISOCYANATES
 - Reactions of the Isocyanate Group
 - Utilization of Isocyanates in Surface-Coating Polymers
 - One-Component (Pack) Coatings
 - Two-Component (Pack) Systems
 9. AMINE- AND PHENOL-FORMALDEHYDE RESINS
 - Amine- and Amide-Formaldehyde Resins
 - Amide-Formaldehyde Resins
 - Amine-Formaldehyde Resins
 - Phenol-Formaldehyde Resins
 - Resoles
 - Novolacs
 - Oil Soluble Phenolic Resins
 10. THERMOSETTING VINYL AND ACRYLIC COPOLYMERS
 - The Preparation and Composition of the Acrylic Copolymers
 - The Cross-Linking Reactions of Acrylic Polymers
 - Epoxide-Amine Reaction
 - Ester-Forming Reactions
 - Reactions Involving N-Methylol or N-Methylol Ether Groups
 - Reactions in Resin Mixtures
 - Miscellaneous Cross-linking Reactions
 11. WATER-DILUTABLE POLYMER SYSTEMS
 - Aqueous Dispersions of Polymers
 - Vinyl and Acrylic Emulsions
 - Water-Soluble Polymer Systems
 - Water-Soluble Vinyl and Acrylic Polymers
 - Water-Soluble Vegetable Oils, Polyesters, and Alkyd Resins
 12. RUBBER AND SILICONE RESINS
 - Natural and Synthetic Rubbers and Derivatives
 - Silicone Oils and Resins
- APPENDIX
- Author and Patent Index
 - Subject Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The preparation of polymers for use as surface coatings -- a process that is rapidly becoming a science -- is covered thoroughly in THE CHEMISTRY OF ORGANIC FILM FORMERS. Particular emphasis is placed on the chemistry necessary for a scientific approach to the subject, and full consideration is given to the influence of catalysts, temperature, etc. on polymer forming reactions and on the crosslinking reactions of film forming processes. The book is written at the advanced level of the organic polymer scientist and technological aspects are kept to a minimum.

PREFACE

Until recently, the formulation of surface coatings was basically an art, but it is now rapidly changing to a science. This book is designed to provide the basic chemistry necessary to approach coating technology from a scientific point of view.

During my 20 years association with the surface-coating industry, I have noticed numerous instances where a single textbook covering the chemistry of surface coatings would have been invaluable for a number of reasons. First, the research findings in this field appear in a wide range of scientific publications, and the collation of this information in a single reference book would save much time and effort. Second, those involved in the more technological aspects of coating technology often require, and would benefit considerably from, an understanding of the chemistry of the systems involved. Third, while lecturing on this subject at the Royal Melbourne Institute of Technology, I became aware of the need for a single textbook concerned predominantly with the chemistry (as opposed to the technology) of coating compositions.

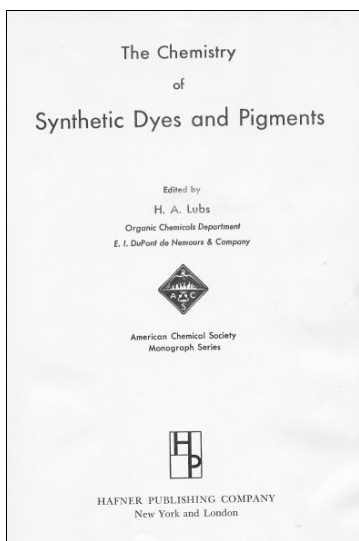
In the first chapter, I have discussed sufficient basic polymer science for the reader to be able to understand and control both stepwise and chain polymerizations. I have also brought together information that has not, to my knowledge, been presented in a single text, although this information is scattered throughout other books. For example, I have included a discussion of the methods of controlling the molecular weight of a polymer that is produced by a chain reaction. The remaining chapters deal specifically with the chemistry of the various types of vehicles used in coating composition.

Throughout the book, the more technological aspects of coating compositions have been deliberately kept to a minimum, because these are well covered in other textbooks and in the literature available from the suppliers of chemicals and polymers.

I have attempted to cover the literature up to the end of 1965 and to include existing and projected coating compositions. I hope this book will be of value to the technologists and scientists working in the industry, and to students concerned with organic polymers suitable for use as coating compositions, plastics, or rubbers.

The Appendix contains the formulae and manufacturing instructions for typical polymer compositions used in surface coatings. These have been included to relate the chemistry discussed in the text with the polymer systems used in practice.

Title	Location	Edition / Series / Misc.
28 Chemistry of Synthetic Dyes and Pigments		<i>Edition:</i>
<i>Author:</i> Lubs, H. A. (Herbert August), 1891- (editor)	<i>Dynix:</i> 18530	<i>Series:</i> American Chemical Society Monograph Series
<i>Publish.:</i> Hafner Publishing Company	<i>Call No.:</i> 667.2 Lu	
<i>- place:</i> New York, NY	<i>ISBN:</i>	
<i>- date:</i> [1965, ©1955]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1955
<i>Subject:</i> Dyes and dyeing -- Chemistry		<i>Price:</i> \$25.00
<i>Desc:</i> xiv, 734 p., illus., 24 cm.		

**Table of Contents**

Preface

1. Benzene Intermediates
2. Naphthalene Intermediates
3. Azo Dyes
4. Azoic Dyes
5. Miscellaneous Dyes
6. Sulfur Dyes
7. Anthraquinone Dyes and Intermediates
8. Indigoid Dyes
9. Phthalocyanine Pigments
10. Phthalocyanine Dyes
11. Organic Pigment
12. Color and Chemical Constitution of Dyes
13. Common Names of Dye Intermediates
14. Critical Bibliography

Dye Index
Subject Index

Reviews - Synopsis - Dust Jacket

PREFACE

When Mauve, the first man-made dye, was discovered in England by William Perkin in 1856, followed by the erection in 1857 of a factory for its production, no one dreamed of the far-reaching influence of these events on world history during the next century. The dye industry catalyzed the development of the general synthetic organic chemical industry in England, France, and Germany, and more recently in the United States. Had Germany not lost its leadership in the field and had not England and America grown strong since 1914, the course of world history would have been entirely different.

This book was born as a result of two world wars. World War I brought about the cessation of dye imports from Germany, and thus there came a near-paralysis of the textile and other important industries. As a result, there was established an American dye industry with the consequent development of a large number of chemists and engineers thoroughly versed in the chemistry and technology of this difficult and complicated field. From this situation came the Jackson Laboratory of the Du Pont Company -- today one of the world's largest laboratories of industrial chemical research.

All nineteen of the contributors to this Monograph have been on the staff of this laboratory. Each contributor has spent the major portion of his scientific life in the field of dyes or intermediates, and each has had from twelve to forty years' experience in his chosen field. It is this broad background that makes possible the selectivity we have striven for. These authoritative specialists have illustrated their discussions of dye and pigment chemistry with examples chosen for historical or chemical interest, or because of their usefulness in the American economy. In many cases, a single dye is cited to typify a class or group of related products, since the accent is on chemistry rather than complete tabulation. No attempt whatsoever is made to treat the subject in an encyclopedic manner. For those who wish more detailed or comprehensive information, the abundant and carefully selected literature references will be of great value.

Prior to World War II, the processes and practices of the dye and organic chemical manufacturers were, for the most part, closely guarded secrets. After the Allied occupation of Germany, various governmental missions collected and published for general information virtually all of the important processes developed by the German chemical industry. The availability of this information was an important factor in facilitating the preparation of this Monograph. We have drawn heavily on the FIAT and BIOS reports. The disclosures in these reports are spread through many documents and are often difficult to find and interpret without the proper background and experience. The editor believes the various contributors have rendered an invaluable service to other investigators by a judicious selection from these reports and by

Subjects

251 .	Dyes and dyeing -- Chemistry
293 .	Pigments
461 .	Synthetic products

the inclusion of abundant references on important processes and products.

The discovery and development of the phthalocyanine pigments is perhaps the greatest advance in the dye field during the past generation. The outstandingly bright and fast blue and green phthalocyanine pigments have already found extensive use in industry, particularly in paints, paper, textiles, and plastics, and their use is constantly growing. For these reasons we have tried to discuss all the important chemistry and include all pertinent literature references bearing on this relatively new and highly important development.

Just as we saw in 1914 the development of the very important alkyd resin field from an old dye intermediate, phthalic anhydride, we some years later witnessed the production of two remarkable new products -- Dacron polyester fiber and Mylar polyester film -- from terephthalic acid. Today we are just beginning to develop wide uses for isocyanates based on well-known and old aromatic diamines previously used only for dye syntheses. The possibilities for the production of new plastics, elastomers, finishes, textile treating agents, and pharmaceuticals from the isocyanates almost stagger the imagination.

These few examples are cited to illustrate how important it is to maintain a strong dye industry so that there will continue to be a full reservoir of organic chemical products as a basis for future important developments. It should be abundantly clear both to the layman and the scientist that this is indispensable to the nation's further growth, prosperity, health, and security. The impact of the chemical industry on our academic life is strikingly shown by the fact that in 1914 there were only 71 Ph.D.'s in chemistry granted in the United States, whereas in 1953 there were 1,164, and the demand is ever increasing.

Those of us who participated in the preparation of this Monograph were largely motivated by a desire to contribute something to lighten the task of training the scientists and technical men of tomorrow, and to repay in part our debt to those who in years gone by, at home and abroad, developed the fundamental scientific information on which the modern chemical industry is based. Perhaps this book will serve to stimulate greater activity in the field and encourage the maintenance of a strong and dynamic organic chemical industry, which is so essential to the welfare of America.

Title	Location	Edition / Series / Misc.
165 Chemistry of Wood		<i>Edition:</i>
<i>Author:</i> Browning, B. L. (Bertie Lee), 1902- (editor)	<i>Dynix:</i> 14912	<i>Series:</i>
<i>Publish.:</i> Interscience Publishers, Inc.	<i>Call No.:</i> 674.134 Br	
<i>- place:</i> New York, NY	<i>ISBN:</i>	
<i>- date:</i> ©1963	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1963
<i>Subject:</i> Wood -- Chemistry		<i>Price:</i> \$25.00
<i>Desc:</i> x, 689 p., illus., 24 cm.		

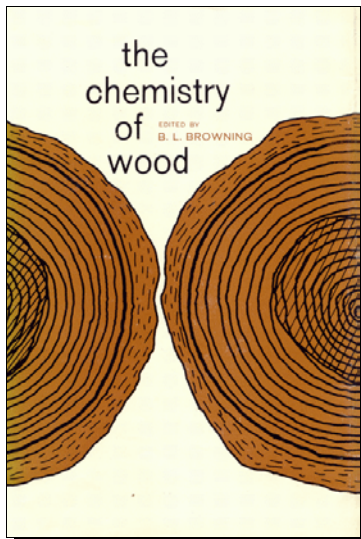


Table of Contents

1. The Supply and Uses of Wood - B. L. Browning
 2. The Structure of Wood - I. H. Isenberg
 3. The Composition and Chemical Reactions of Wood - B. L. Browning
 4. Cellulose - E. H. Immergut
 5. The Hemicelluloses - Conrad Schuerch
Addendum - N. S. Thompson
 6. Wood Lignins - Kyosti V. Sarkanen
 7. Extraneous Components of Wood - M. A. Buchanan
 8. The Chemistry of Developing Wood - R. E. Kremers
 9. The Wood-Water Relationship - B. L. Browning
 10. Manufacture of Wood Pulp - N. Sanyer and G. H. Chidester
 11. Wood as a Chemical Raw Material - J. F. Harris, J. F. Saerman, and E. G. Locke
 12. The Chemistry of Bark - Waldemar Jensen, K. E. Fremner, P. Sierila, and V. Wartiovaara
- Subject Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This timely book offers a compact and concomitantly detailed treatment of the chemistry of wood and its components. The rapidity with which developments present themselves necessitates a fresh look at both the basic concept and the current state knowledge in this important field.

Two topics included in *The Chemistry of Wood* have had little or no attention given them in previous books on the subject. The first—the chemistry of developing wood—plays an essential role in the “wood story,” since the chemistry of mature wood can properly be understood only in the light of the biochemical processes through which the wood tissue is formed and laid down. The second topic appearing by way of innovation is set forth in “The Chemistry of Bark,” a chapter devoted to the origin, the formation, and the considered potential uses of bark. The editor states in his Preface: “If bark has proved by and large to be less useful [than wood] for commercial purposes, its ubiquitous presence and great quantity inspire study of possible utilization in ways not yet dreamed of.”

The coverage of the above and other topics, such as recent developments in the areas of hemicellulose, cellulose, lignin, and wood extractives, render this book highly serviceable as a reference work and text. *The Chemistry of Wood* reflects the accumulated knowledge of some of the world's leading wood chemists.

PREFACE:

The field of wood chemistry is far from static, and developments of even less than a decade justify a fresh look at our concepts and state of knowledge in this important area. A new book on the subject must be anticipated with some trepidation, as it will inevitably be judged against a series of illustrious predecessors. The texts of Schorger (1926), Hawley and Wise (1926), Wise (1944), Wise and Jahn (1952), Hägglund (1928, 1939, 1951), and others have set enviably high standards which must serve as targets for later efforts. Monographs on cellulose by Heuser (1924, 1944) and by Ott and his associates (1943, 1955), on lignin by Brauns (1952, 1960), and many others on specialized topics have treated these subjects in such ample detail that attempts at compression may sometimes seem frustrating and futile.

Nevertheless, the prospective preparation of a new book has proved challenging, and the opportunity of participating in such an under taking is not to be dismissed lightly. It has been our purpose to present the outstanding features of the chemistry of wood and its components in a text not too gargantuan for ready use and, at the same time, sufficiently detailed to serve as a reference text for those interested in the subject. If a publication must have a hypothetical audience, we would define ours to include the student, the young scientist in wood-using industries, and the scientist and technologist who may wish to have available critical if not exhaustive surveys of the topics included among the contents.

Subjects

342 . Wood -- Chemistry

Two chapters in the present book represent something of an innovation in books devoted to wood chemistry and deserve special mention. One is the discussion of the development of woody tissue that takes place in the cambial zone. It is here that both wood and bark originate, and the end products can scarcely be discussed adequately or completely without some understanding of the biochemical processes that occur in the narrow zone where new material is formed. It is here, too, that our lack of understanding becomes embarrassingly evident, and so much needs to be learned. A chapter on bark may logically seem out of place in a book on the chemistry of wood, yet it is a truism that the tree cannot grow wood without bark. Both originate from the same cambial layer, and both must be dealt with when the trees are harvested in the forest. If bark has proved by and large to be less useful for commercial purposes, its ubiquitous presence and great quantity inspire study of possible utilization in ways not yet dreamed of.

Classic Paints and Faux Finishes: How to Use Natural Materials and Authentic Techniques in Today's Decorating

LASCT Holdings - maximum detail by Title

C

Title	Location	Edition / Series / Misc.
29 Classic Paints and Faux Finishes: How to Use Natural Materials and Authentic Techniques in Today' <i>Author:</i> Sloan, Annie, 1949- and Kate Gwynn <i>Publish.:</i> Reader's Digest Association <i>- place:</i> Pleasantville, NY <i>- date:</i> ©1993 <i>Subject:</i> Painting -- Technique <i>Desc:</i> 160 p., illus. (some color), 28 cm.	<i>Dynix:</i> 23718 <i>Call No.:</i> 745.7 SI <i>ISBN:</i> 0895775239 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1993 <i>Price:</i> \$25.00

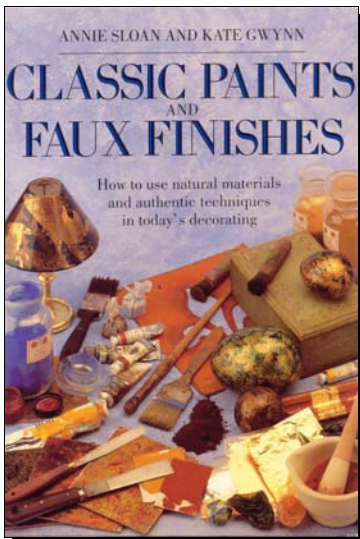


Table of Contents

- The Paint and Equipment Directory
 - Mediums and Thinners
 - Oil-based Paints
 - Water-based Paints
 - Artist's Paints
 - Waxes and Woodstains
 - Varnishes, Gums, and Resins
 - Brushes
 - Preparation
 - Mixing Paint
- The Color Directory
 - Earth Pigments
 - Mineral Pigments
 - Plant Pigments
 - International Palettes
 - Color Mixing
- The House Painter's Techniques
 - Plaster
 - Glue and Size
 - Simple Coatings
 - Simple Oil Paint
 - Limewash
 - Size Paints
 - Glazes
 - Casein Paints
- The Furniture Painter's Techniques
 - Gesso
 - Oil-gilding
 - Bronze Powders
 - Lining
 - Découpage
 - Lacquer
 - Woodstains
 - Varnishes
 - Liming
- The Artist's Techniques
 - Fresco
 - Glue Painting
 - Patinating Walls
- The Restorer's Techniques
 - Antiquing and Distressing
 - Crackle Varnish
 - Peeling Paint
 - Verdigris

Subjects

276 .	Paint
286 .	Painting -- Technique
366 .	Decoration and ornament

SUPPLIERS

INDEX
CREDITS AND ACKNOWLEDGMENTS

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

One of today's fastest-growing home decorating trends is the rediscovery of traditional paints; the softer, subtler colors enable today's homes to reclaim the look of earlier times. As these paints become increasingly available, more people seek instruction in their use.

"Classic Paints and Faux Finishes" meets all the needs of the do-it-yourself decorative painter. This complete guide for the novice and the experienced offers new versions of the old techniques used by house painters, furniture painters, artists, and restorers. It provides step-by-step instruction in the traditional skills of wall coating, *découpage*, limewashing, and glue painting, as well as more complex techniques for fresco, decorating with bronze powders, gilding, and lacquering.

In addition, it provides information on the paints that are available today and how to obtain them. Starting with how paints are made and which paint is suitable for each task, the book demonstrates the wide variety of colors and textures that are offered and gives detailed instructions for making paints from natural pigments and other basic ingredients.

"Classic Paints and Faux Finishes" includes a complete paint and equipment directory, and supplier listings.

A combination of instructional handbook, practical sourcebook and visual inspiration, this single volume is an important reference for everyone interested in the art of home decorating.

Step-by-step information on classic decorative techniques, including:

A Color Directory
A Paint and Equipment Directory
A Directory of Suppliers

The House Painter's Techniques

Plaster • Glue and Size • Simple Coatings • Simple Oil Paint • Limewash • Size Paints • Glazes • Casein Paints

The Furniture Painter's Techniques

Gesso • Oil-gilding • Bronze Powders • Lining *Découpage* • Lacquer • Wood Stains • Varnishes Liming

The Artist's Techniques

Fresco • Tempera • Glue Painting • Patinating Walls

The Restorer's Techniques

Antiquing and Distressing • Crackle Varnish • Peeling Paint • Verdigris

INTRODUCTION:

We have written this book because of the growing interest in natural pigments and materials, and the newly revitalized techniques which comprise today's most popular trend in home decorating. This interest began about 15 years ago when some specialty decorative oil glazes and paint finishes were reintroduced to the marketplace and there was a revival of interest in traditional techniques such as sponging, ragging, and faux finishes, first used in Europe as early as the 17th century.

Time, too, has proved that paints and other finishes made from ingredients and pigments found in nature create softer, subtler colors and give more pleasing effects than ordinary, mass-produced, plastic paints. Today, the vogue for classic paints has spread into more specialized fields — those of the artist, furniture maker, gilder, and restorer — all of whom have seen these authentic glaze and other finishes as a way of expanding their own decorative ideas. These artists and craftspeople have gone on to explore and reintroduce other classic skills and materials. The arts of *découpage*, lacquer, and even fresco have taken on a new lease of life, and the use of glue size, old varnishes, and waxes has been renewed. Ancient decorating manuals have been consulted, conversations with those who practice traditional crafts have been written down, and surviving examples of classic techniques have been preserved and now serve as reference.

This delving into the past is not simply the result of a wave of nostalgia. It is a reaction to the blandness and uniformity of modern paints. Although easy to use, modern paints tend to have similar textures as they are plastic paints, that is, based on polymers, vinyl acetates, and acrylics. They are available in a bewildering array of colors, yet the pigments used to color them are so standardized and ground so finely that these colors tend to be uniform and lack individuality.

Classic paints and finishes, on the other hand, offer a refreshing variation in texture — from the flat/mat, slightly uneven quality of limewash, size paints, and fresco, to the gloss of shellacs and resin varnishes. The pigments used to color these paints are often crudely ground and unevenly dispersed in the paint mixture, so that when the paint is applied, the color comes through more strongly in some areas than in others, creating a splendidly unique and hand—crafted surface.

Traditional paints have the added attraction of being environmentally friendly. Unlike modern plastic paints, they do not rely on the petrochemical industry for their manufacture. Most of their ingredients come from plants, or other natural products such as earth pigments, and they tend to work in harmony with the environment. -Authentic paints such as limewash, for example, are absorbed into the surface on which they are applied and allow walls to “breathe” as, unlike with modern, plastic paints, moisture is not trapped by a film of plastic.

Our first chapter, The Paint and Equipment Directory, introduces the raw materials used to make paints, the different types of paints and other finishes that there are, and the equipment needed for their application. There is today, a tremendous range of paints available, some of which can be found in your standard paint or hardware store, others from specialty art stores and supply companies which specialize in authentic' paints, and a few which have to be made up from their basic ingredients. The way in which paint is applied to the surface is of course integral to the finished look and, depending on the task at hand, there are specific materials and tools for preparing the surface and for applying the paint or finish. For the first time, our book tells you what paints are available and how to obtain and use them.

Most people's first reaction to paint is based on its color anti The Color Directory includes historical and practical information on the different pigments available. It looks at the glorious array of colors and types of paint traditionally found in different parts of the world, and gives advice on how different colors should be mixed to produce the desired result.

The techniques for both making and using classic paints and other finishes have then been divided into four broad categories covered in the remaining sections of the book: The Rouse Painter's Techniques, The Furniture Painter's Techniques, The Artist's Techniques, and The Restorer's Techniques. For each of these, the manufacture and application of paint and other finishes has, in the past, existed at two different levels. At a basic level, the peasant or farmer would himself use whatever materials were locally available to protect and decorate his home. At a more sophisticated level, the rich commissioned highly-skilled artists and decorators, using a far greater range of materials, to do the task for them. The book covers these techniques, both primitive and sophisticated, each creating a unique paint effect.

In the case of house painting, peasants and farmers traditionally coated their walls with limewash, or other simple paints based on milk or glue size. The result varied from a delicate and even finish to a vibrant, uneven coat, depending on the application. These paints age well, are esthetically pleasing and suit conservationists and environmentalists.

At a more advanced level, professional artists and decorators would grind chunks of dried pigment in a pestle and mortar or mechanical grinding mill and then, like a medieval alchemist, concoct their paints using a wide range of different materials. The latter included resins (from trees), animal glue, chalk, egg, flour, milk, and a whole variety of oils, like walnut, poppy, and linseed oil. Each of these unique paint effects is considered in turn, from simple coatings, glazes and lime to casein and size paints.

Next we look at The Furniture Painters Techniques. The high point of furniture decoration was in the 18th century, when professional crafts men used a whole range of techniques, such as gilding, lacquer, and decoupage, to embellish furniture for the grand houses of the time. Many of the techniques originated in tile East and arrived in the west via Italy and Flanders. They often involve using exotic materials like bronze powders, metal leaf, shellac, and many different resins for varnishes, which you will learn about in our book.

At a simpler level, there was and still is a vast amount of rustic furniture painting, which tends to use stylized motifs. The work often imitates the designs seen in grand houses, but uses simpler products and skills, such as those needed for stenciling, woodstaining, and liming. All of these authentic techniques can be replicated in your home.

The Artist's Techniques are in some ways the most difficult to categorize as the artist can be found working with the house painter, furniture painter, and restorer. In the past, the artists were primarily good draftsmen and colorists, who were employed to paint scenes on plaster, wall panels, and pieces of furniture. Some would have been full-time commercial painters, while others would have used the work to supplement the income they gained from their private paintings. This section includes such classic finishes as fresco, glue painting, and patinating walls. Although these do require the skills of an artist if an intricate design is selected, they can also be practiced at a simpler level by almost anyone.

The Restorerts Techniques, which are aimed at simulating the character of antique furniture, is our final section. The restorer is concerned more with creating a traditional or aged look, than with actually using a classic technique. Particularly in recent years, there has been a general move away from making surfaces look new and fresh and toward

giving them a distressed and timeworn character. Whereas cracked or peeled paint was previously seen as undesirable, it is now often thought of as a virtue. Techniques have been developed which can create these effects, such as antiquing and distressing, crackle varnish, and verdigris, giving surfaces a texture with a sense of applied history.

The ease with which the materials featured in this book can be obtained depends greatly on what they are. The essential ingredient for all paintmaking is pigment, the coloring matter, and these are sold in some paint stores, or otherwise can be found at any good artist's supply store. Some paints can be made with materials found at home — simple milk paint and egg tempera for example. Other materials, such as whiting and lime putty, may be more difficult to find. Happily, an increasing number of small companies have been set up in response to the growing demand. As well as stocking the raw materials, they are now manufacturing their own specialty paints and other materials such as varnishes. There are now even reproduction historical paints, which, although using modern manufacturing techniques, use natural pigments and look and feel like the 18th- and 19th-century paints on which they are based.

The recent growth in the number of specialty manufacturers is a reflection of the paint revolution which has taken place over the past few years. We hope our book will go some way towards a greater understanding of the materials and techniques associated with this revolution. We hope, too, that the book will inspire and, above all, that you will enjoy trying out these techniques. As you become accustomed to using unfamiliar materials to create different effects and finishes, you will become aware of the exciting and endless possibilities for re-creating classical effects, or even using the materials add techniques to invent innovative, contemporary looks.

Title	Location	Edition / Series / Misc.
648 Coating and Drying Defects: Troubleshooting Operating Problems		<i>Edition:</i>
<i>Author:</i> Guttoff, Edgar B. and Edward D. Cohen	<i>Dynix:</i> 50465	<i>Series:</i> SPE (Society of Plastics Engineers) Monographs
<i>Publish.:</i> John Wiley & Sons	<i>Call No.:</i> 667 Gu	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0471598100	
<i>- date:</i> ©1995	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1995
<i>Subject:</i> Coatings -- Defects		<i>Price:</i> \$69.95
<i>Desc:</i> xvi, 287 p., illus., 27 cm.		

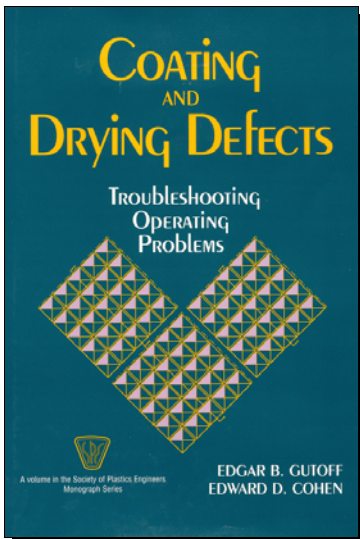


Table of Contents

- Troubleshooting or Problem-Solving Procedure.
- Coater Diagnostic Tools.
- Problems Associated with Feed Preparation.
- Problems Associated with Roll Coating and Related Processes.
- Problems in Slot, Extrusion, Slide, and Curtain Coating.
- Coating Problems Associated with Coating Die Design.
- Surface-Tension-Driven Defects.
- Problems Associated with Static Electricity.
- Problems Associated with Drying.
- Problems Associated with Web Handling
- Coating Defects Catalog.
- Index.

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The past decade has been one of exciting growth in coating technology. Over the last few years alone, researchers have developed new product formulations that are more uniform, have a considerably lower defect level, and produce substantially higher yields at significantly lower costs than were previously considered possible. Nevertheless, coating personnel continue to spend a great deal of their time correcting defects and attempting to make the process as error-free as possible. And while they may receive adequate training in the basic sciences, those personnel rarely receive any formal training in troubleshooting and problem solving techniques.

Subjects

501 .	Coatings -- Defects
502 .	Drying

Now Coating and Drying Defects rectifies that situation by providing manufacturing and quality control personnel, equipment operators and supervisors, and plant engineers and scientists with the full complement of proven tools and techniques for detecting, defining, and eliminating coating defects and operating problems, and for ensuring that they do not recur. Practical and comprehensive, it describes all major processes for coating and drying of continuous film on sheets or webs, including roll, slot, extrusion, slide, curtain, and other common processes.

Just as importantly, rather than simply describing a disparate set of troubleshooting techniques, this unique guide arms readers with a systematic, nonmathematical methodology encompassing the entire coating operation. Providing a rational framework within which to assess and analyze virtually any defect which may arise, this rigorously systematic approach incorporates step-by-step guidelines on conducting every phase of the troubleshooting process -- from the detection and naming of a defect, to data analysis and determination of its cause, from eliminating the problem to documenting results. And since the ideal coating process is one that is defect-free, the authors also offer guidelines for defect prevention.

A book that arms readers with the full range of proven troubleshooting tools and techniques, Coating and Drying Defects is an indispensable resource for manufacturing and quality control personnel as well as plant engineers, polymer scientists, surface scientists, organic chemists, and coating scientists.

From Book News, Inc.

Not about how to paint over mistakes and hope the boss doesn't notice, but a guide to correcting defects that occur during the coating and drying stages of a manufacturing process. Describes tools and techniques for defining, analyzing, and eliminating individual defects and the underlying operational problems that cause them during the coating of continuous film on sheets or webs. A non-mathematical treatment for coating personnel, quality control managers, plant engineers, and scientists. Annotation copyright Book News, Inc. Portland, Or.

Book Info

Comprehensive troubleshooter - covers all major processes, including roll, slot, extrusion, slide, curtain, and other

coating techniques. Includes detailed guidelines for defect prevention. DLC: Coatings - Defects.

The publisher, John Wiley & Sons

Using a non-mathematical approach, it offers all the tools needed to troubleshoot defects as well as the means to eliminate them. Contains brief descriptions of key coating processes. Presents a methodology to guide readers from the start of the troubleshooting procedure, when the defect is first discovered, to the finish where the mechanism for the formation of the flaw is defined and then eliminated.

Publisher's Notes

Coating and Drying Defects provides manufacturing and quality control personnel, equipment operators and supervisors, and plant engineers and scientists with the full complement of proven tools and techniques for detecting, defining, and eliminating coating defects and operating problems, and for ensuring that they do not recur. Practical and comprehensive, it describes all major processes for coating and drying of continuous film on sheets or webs, including roll, slot, extrusion, slide, curtain, and other common processes. Just as importantly, rather than simply describing a disparate set of troubleshooting techniques, this unique guide arms readers with a systematic, nonmathematical methodology encompassing the entire coating operation. Providing a rational framework within which to assess and analyze virtually any defect which may arise, this rigorously systematic approach incorporates step-by-step guidelines on conducting every phase of the troubleshooting process - from the detection and naming of a defect, to data analysis and determination of its cause, from eliminating the problem to documenting results. And since the ideal coating process is one that is defect-free, the authors also offer guidelines for defect prevention. A book that arms readers with the full range of proven troubleshooting tools and techniques, Coating and Drying Defects is an indispensable resource for manufacturing and quality control personnel as well as plant engineers, polymer scientists, surface scientists, organic chemists, and coating scientists.

Title	Location	Edition / Series / Misc.
784 Coating Film Defects <i>Author:</i> Pierce, Percy E. and Clifford K. Schoff <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1994 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 25 p., illus., 28 cm.	<i>Dynix:</i> 55947-08 <i>Call No.:</i> 667.9 Fe <i>ISBN:</i> 0934010145 <i>Shelf</i> Reference	<i>Edition:</i> Revised edition <i>Series:</i> Federation Series on Coatings Technology: No. FS8R94 <i>Year:</i> 1994 <i>Price:</i> \$50.00

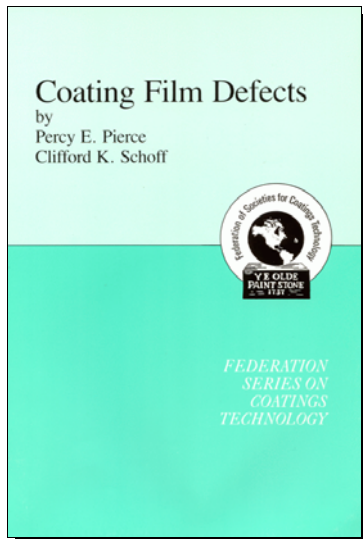


Table of Contents

- I. INTRODUCTION
- II. THEORETICAL BACKGROUND
 - A. Surface Tension of Pure Liquids and Solutions
 - B. Surface Tension of Solids
- III. FACTORS THAT INFLUENCE THE FLOW OF PAINT FILMS
 - A. Shear and Gravity Forces
 - B. Surface Tension Forces
- IV. COMMON COATINGS DEFECTS: CAUSES AND CURES
 - A. Air Entrapment
 - B. Bénard Cells
 - C. Bloom
 - D. Blushing
 - E. Bumps and Sinks
 - F. Cratering
 - G. Crawling and Dewetting
 - H. Fat Edges and Picture Framing
 - I. Fish Eyes
 - J. Floating
 - K. Flooding
 - L. Haze
 - M. Orange Peel
 - N. Rub Up
 - O. Sagging, Running, Curtaining
 - P. Seeds
 - Q. Silking
 - R. Solvent Popping
 - S. Telegraphing
 - T. Water Spotting
- V. TECHNIQUES FOR CHARACTERIZATION OF DEFECTS AND MEASUREMENT OF SURFACE PROPERTIES
 - A. Microscopy and Macrophotography
 - B. Flocculation Tests
 - C. Liquid Surface Tension
 - D. Contact Angles
 - E. Dewetting Tests
 - F. Observation of Defect Formation
- VI. GENERAL GUIDELINES FOR THE PREVENTION/SOLUTION OF DEFECTS
 - A. Formulation Practices
 - B. Raw Materials
 - C. Good Housekeeping and Production Practices
 - D. Solvents
 - E. Additives
 - F. Substrates
- VII. SUMMARY AND CONCLUSIONS
- VIII. REFERENCES

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

IX. BIBLIOGRAPHY

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

A major problem faced by most coatings chemists is the task of correcting surface defect problems, such as cratering, fish eyes, blushing, and sagging. The elimination of defects is essential if the decorative and protective functions of the coating are to be achieved. The elimination of film defects can be a trying task even for experienced workers. Often, changes which eliminate one type of defect introduce other problems.

To effectively solve film defect problems, the type of defect must be identified, causes established, and a plan of action for elimination made and implemented. Some defects can be prevented by filtration or better housekeeping. Others may require a solvent or resin change. Most defects are remedied by adjusting the additive portion of the paint formula. Pigment dispersants and stabilizers, flow control agents, and thickeners are especially important in controlling and preventing film defects.

Surface tension variations across the surface of the wet paint film are the main driving force for many coating defects. These surface tension gradients are caused by differences in temperature and concentration across the coating surface which arise as the coating film cures or dries. The surface tension gradient-induced flow causes the movement of the coating from regions of low surface tension to regions of higher surface tension.

The main force which opposes the surface tension gradient-induced flow is the viscous force which arises from the viscosity of the coating. Viscous forces can retard or completely suppress surface flows, but they can also prevent the flowout of brushmarks or roller striations, thereby causing other appearance problems.

The main task of the coating chemist is to manage the balance of surface tension and viscous forces to attain the quality of surface appearance required for the given product and method of coating application. This is generally accomplished by clever formulation utilizing all the ingredients of the coating formulation, but with special emphasis on solvents, flow agents, thixotropes, and other additives.

Some surface appearance problems cannot be completely solved by paint formulation. Dust and dirt in the paint application area will mar the surface appearance of the most carefully prepared and designed coating. Resin gels or pigment agglomerates arising from substandard materials will also ruin a good formula. Poor quality or inadequate surface preparation of the part to be coated will produce surface defects, loss of adhesion, and poor durability.

This monograph attempts to provide a background to deal with these aforementioned issues. The types of common surface defects and their typical causes are discussed. Common remedies are described, along with the fundamental rationale behind their operation. Hints on how to identify the various defects and diagnose their causes are provided.

The authors have not found an easy road or solution to coating defect problems. They have found that the methods and approaches discussed in this monograph are effective means to deal with defects. These methods have been invaluable in solving customer and product development problems. We hope that the reader will find them equally useful and successful.

Title	Location	Edition / Series / Misc.
30 Coatings Encyclopedic Dictionary		<i>Edition:</i>
<i>Author:</i> LeSota, Stanley (editor)	<i>Dynix:</i> 65280	<i>Series:</i>
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Co	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0934010048	
<i>- date:</i> ©1995	<i>Shelf</i> Reference	<i>Year:</i> 1995
<i>Subject:</i> Coatings -- Dictionaries		<i>Price:</i> \$105.00
<i>Desc:</i> 1 v., xvi, 391 p., 24 cm.		

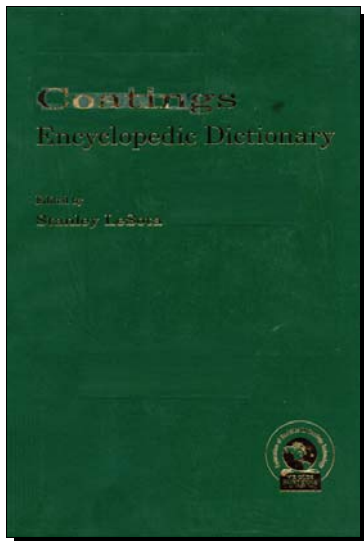


Table of Contents

Preface

Definitions

Categorical Listing of Terms:
 Numerical Index of Categories
 Alphabetical Index of Categories
 Category Listings

Appendix
 Coatings-Related Organizations and Associations
 Abbreviations
 Measures: SI Units
 Measures: Metric and U.S. Equivalents
 Temperature Conversion Chart
 Periodic Table of the Elements

Reviews - Synopsis - Dust Jacket

This excellent resource, considered the standard for the industry, contains over 6,000 terms related to the paint, coatings, ink, art, visual, and related industries. A comprehensive reference, the Coatings Encyclopedic Dictionary is intended for professionals at all levels of the industry, including sales and marketing, R&D, as well as chemists, government and regulatory workers, management, and technicians. Terms are cross-referenced for synonyms and related categories, and are classified into one or more of 75 categories (color, pigments, additives, methods of application, and more). A categorical listing of terms is ideal for keyword searching. (FSCT) 392 pages, soft cover. (1995)

Subjects

241 .	Coatings -- Dictionaries
359 .	Coatings processes -- Dictionaries

PREFACE:
 First published by the FSCT in 1978, the FSCT Paint/Coatings Dictionary has become a standard among reference sources for the coatings industry. The Coatings Encyclopedic Dictionary is the expanded and encyclopedic version of the Paint/Coatings Dictionary, and it reflects the many changes experienced by the paint and coatings industry over the past 17 years.

Over 6,000 definitions, including state-of-the-art technologies and regulatory terminology are featured in the Coatings Encyclopedic Dictionary. The broad scope of terms included reveals the usefulness of this volume to a wide audience, ranging from the layman, artists and artisans, legal and governmental agencies, to technicians in all coatings-related fields.

One of the most beneficial enhancements to this publication is the "encyclopedic" additions which are presented in italic type after many definitions. These succinct paragraphs relay significant information that the reader should know about the term defined. In many cases, ASTM Test Method references are provided, further enhancing the usefulness of the Dictionary.

Another unique feature is the classification of all terms into one or more of 80 categories (color, pigments, additives, methods of application, etc.). At the end of the definitions, numerical superscripts indicate the categories which are listed in the second section of this volume. This categorical listing of terms serves as a check list for key words which assist in the preparation of research papers, literature searches, etc.

To signal readers that a technical or non-commonplace word which is part of the definition of a term is also defined in another part of the Coatings Encyclopedic Dictionary, a different type style, called "CAP-SMALL CAP," is used. In some cases this type is used for emphasis.

To further benefit readers, there is a considerable amount of cross-referencing that refers the reader to other similar significant terms that may help in the understanding of definitions. There are also cf. (compare) references that indicate contrasting terms or antonyms. Synonyms (Syn:) follow the definition in many cases.

For many of the chemical definitions in this book, the chemical formula follows the chemical defined. Also, SI (System International d'Unites) units and spellings are used throughout.

Pigment terms have been classified by their Colour Index numbers (which immediately follow the pigment being defined) and pigment synonyms are extensively cross-referenced to a commonly accepted name.

After many definitions, there is a parenthetical reference such as ASTM, IUPAC, EPA, etc., to acknowledge their source. Descriptions of organizations, associations, and societies related to the coatings industry are featured in the Coatings Encyclopedic Dictionary, and addresses and phone numbers of many are included in the Appendix.

Title	Location	Edition / Series / Misc.
31 Coatings of High-Temperature Materials		Edition:
Author: Hausner, Henry Herman, 1901- (editor)	Dynix: 13008	Series:
Publish.: Plenum Press	Call No.: 667.9 Ha	
- place: New York, NY	ISBN: 0306302101	
- date: ©1966	Shelf Adult Non-Fiction	Year: 1966
Subject: Diffusion coatings		Price: \$25.00
Desc: ix, 296 p., illus., 26 cm.		

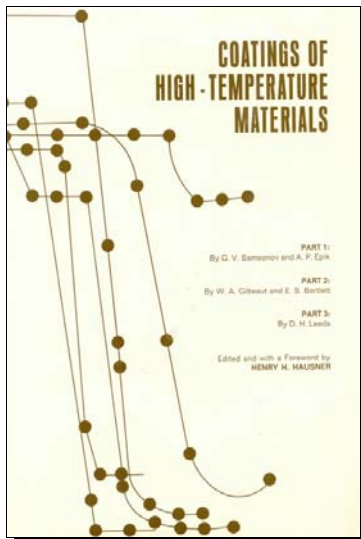


Table of Contents

PART 1: Coatings of High-Temperature Material - By G. V. SAMSONOV AND A. P. EPIK

- a) Boride Coatings
- b) Carbide Coatings
- c) Nitride Coatings
- d) Suicide Coatings
- e) Coatings on Graphite
- f) Some Properties of High-Temperature Compounds
- g) References

PART 2: Properties of Coated Refractory Metals - By W. A. GIBEAUT AND E. S. BARTLETT

- a) Introduction
- b) Coatings for Columbium and Columbium-Base Alloys
- c) Coatings for Molybdenum and Molybdenum-Base Alloys
- d) Coatings for Tantalum and Tantalum-Base Alloys
- e) Coatings for Tungsten
- f) Discussion
- g) References

PART 3: Coatings on Refractory Metals - By D. H. LEEDS

- a) Some Material Problems in Space Technology
- b) Fabrication and Structure of Coated Refractory Metals.
- c) Testing and Properties of Coated Refractory Metals.
- d) Failure Mechanisms
- e) References

Subjects

249 .	Diffusion coatings
324 .	Protective coatings
411 .	Refractory transition metal compounds

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Deals with the problems of coating high-temperature materials and the progress made in the United States and the USSR. The book is divided into three parts in which coating problems are discussed from different aspects.

The first and largest part of the book, which has been translated from the Russian, represents a rather comprehensive text on the subject by G. V. Samsonov and A. P. Epik of the Ukrainian Academy of Sciences. They discuss and analyze the coating problems for high-temperature materials, and have organized their work according to the various types of coatings, such as borides, carbides, nitrides, silicides, etc. More than 75% of the 133 references are from the Russian literature, many to Prof. Samsonov's own work.

The second part, by W. A. Gibeaut and E. S. Bartlett of the Battelle Memorial Institute, is arranged according to materials to be protected by coatings, and is based on 49 US references. The authors discuss coatings of columbium, molybdenum, tantalum, tungsten, and their alloys.

Part three, by D. H. Leeds, is mainly concerned with applications of coated materials in space technology — fabrication and structure of coated materials, possible failure, and testing. This part is based exclusively on US sources.

The problems of coating, the properties of coated materials, and the characteristics of the coating are of importance not only to metallurgists and ceramists, but also to mechanical engineers and space technologists. Chemical engineers will also find this book stimulating.

PREFACE TO THE ENGLISH EDITION

The constant development of research into methods of applying coatings of oxygen-free high-temperature compounds to various materials and into the properties of these coatings has called for the introduction of some additions and amendments despite the fact that the Russian edition of the book appeared in 1964.

As in the Russian edition, the authors have not considered publications on the plasma, flame-spraying, and detonation methods of applying coatings. The additions relate only to coatings produced by thermodiffusion saturation or by deposition from the gas or vapor phase. The chapters dealing with carbide coatings and coatings on graphite have been amplified. The chapter on suicide coatings in particular has been considerably enlarged. The list of literature references has been amplified to include publications appearing in 1963-1964, and also some publications previously omitted.

The authors hope that the book will prove useful to American readers interested in coatings of metal-like, high-temperature materials, and that it will encourage the further development of work in this promising field of the science of materials.

PREFACE

Technical progress is closely bound up with the development and application of new materials which improve the working conditions of technical process (temperature, velocity, stress, service life) and promote their fuller mechanization and automation. Among promising materials of this kind may be included high temperature metal-like compounds, principally carbides, nitrides, borides, and silicides of the transition metals and alloys based on them.

A new branch of the application of high-temperature materials has recently been developed in the form of coatings on metallic and nonmetallic materials. In a number of cases, the production of such coatings is most effective, and sometimes it is the only method of imparting special physicochemical properties to the surfaces of components. Components coated with high-temperature materials possess great hardness, resistance to wear, and resistance to corrosion and high-temperature oxidation, and also possess special electrophysical and semiconductor properties.

A sufficiently thorough development of the technology of the various coatings, as well as a comprehensive study of their properties, will result in a considerable expansion of their fields of application. Information on the technology of the production of the various coatings, their properties, and use is currently very scattered, which makes it almost impossible for large numbers of scientists and engineers to become acquainted with these developments, and impedes the conduct of corresponding work of research, engineering, and design.

This small monograph represents an attempt to review information available in Soviet and other literature on methods of producing coatings based on high temperature materials, together with some of their properties and fields of application. Attention is focused mainly on coatings consisting primarily of carbides, nitrides, borides, and silicides of refractory transition metals, and produced by the thermal diffusion method.

This first attempt to collect information on coatings of high-temperature materials is naturally not without its shortcomings, and the authors will be grateful for critical comments which could be taken into consideration in their future work.

FOREWORD

The properties of materials depend on the characteristics of the bulk and on those of the surface. Any change in surface characteristics affects a wide variety of material properties.

During the last few years the role of surface phenomena in metallurgy has been the subject of many studies. Surface energy, surface tension, the activity of surfaces, and related problems are under discussion in the western world as well as in the eastern world. The relation between volume and surface properties in metals and alloys has been investigated and is still under investigation.

Materials are frequently exposed to environments which change their physical and chemical characteristics on account of a reaction going on between the material surface and the environment. The science and technology of surface preparation to improve material properties have gained importance during the last decade in many parts of the world. Main efforts have been concentrated especially on the coating of material surfaces in connection with the exposure of these materials to space environment.

The problems of coating metals are complex. The coating should act as an air barrier; it should be ductile; and the process of coating should guarantee a perfect continuity of the coated layer. Physical and chemical stability of the coated layer is a prime factor in coating technique. The problems of bond formation between the material to be coated and the coated layer offer an entire new series of problems. These are only a few of the aspects which have been under

investigation during the last few years. Work in this field is going on especially in the United States and USSR in their competitive exploration of space and the development of space technology. The results of the coating investigation for space technology purposes, however, have found many other applications in other fields of technology where materials are exposed to high temperature.

This book deals with the problems of coating high-temperature materials and the progress made in the solution of these problems in the United States and USSR. The book is divided into three parts, in which coating problems are discussed from different angles.

In the first, and largest, part of the book, which represents a rather comprehensive text on the subject, G. V. Samsonov and A. P. Epik of the Ukrainian Academy of Science in Kiev, have discussed and analyzed the coating problems for high-temperature materials and have organized their material according to the various types of coatings, such as borides, carbides, nitrides, suicides, etc. The information given by the two Soviet authors is taken from 149 references of which more than 75% are from the Russian literature, and many of them refer to Professor Samsonov's own work in the field.

The second part of the book, by W. A. Gibeau and E. S. Bartlett of Battelle Memorial Institute, Columbus, Ohio, is based on 49 American references. The authors have arranged their information according to the materials to be protected by coating, and have discussed the coating of columbium, molybdenum, tantalum, tungsten, and the alloys based on these materials. In this way a duplication of presentation is practically avoided between Parts I and II of the book.

The third part is directed mainly to the application of coated materials in space technology, and is by D. H. Leeds of the Materials Sciences Laboratory, Aero space Corporation, El Segundo, Calif. He discusses first material problems in space technology, the fabrication and structure of coated refractory metals, possible failures, and the testing of these coated materials. The information given in this part of the book is also based exclusively on American references. It was not possible to avoid some duplication of information in Parts II and III; however, it is believed that it would not benefit the reader if this duplication had been eliminated.

The information in this book is substantiated in a total of 106 figures and 83 tables. The reader will find much useful information in the following pages. The main purpose of the book, however, is to stimulate new ideas for more extensive studies for those readers who are involved in material problems in connection with high-temperature applications.

The problems of coating, the properties of coated materials, and the characteristics of the coating are of importance, not only to metallurgists and ceramists, but also to mechanical engineers and space technologists. The chemical engineer will also find stimulating thoughts in this book.

For the reader who wants more information on high-temperature materials, attention is called to the "Plenum Press Handbooks of High-Temperature Materials," especially to No. 1., "Materials Index," by P.T.B. Shaffer, and No. 2., "Properties Index," by Professor Samsonov. These two books were published approximately a year ago, and have become known as standard works since then.

The field of coating, and especially of coating high-temperature materials, is in a state of steady development. It is hoped that the large amount of practical work in this field will result in a better understanding of the fundamentals of the complex problems of coating.

Title	Location	Edition / Series / Misc.
1460 Coatings of Polymers and Plastics		<i>Edition:</i>
<i>Author:</i> Ryntz, Rose Ann and Philip V. Yaneff (editors)	<i>Dynix:</i> 111669	<i>Series:</i> Materials Engineering: No. 21
<i>Publish.:</i> Marcel Dekker, Inc.	<i>Call No.:</i> 668.4 Co	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0824708946	
<i>- date:</i> ©2003	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2003
<i>Subject:</i> Plastic coatings		<i>Price:</i> \$155.00
<i>Desc:</i> x, 359 p., illus., 24 cm.		

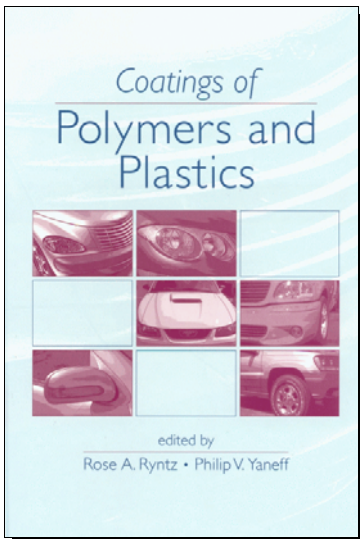


Table of Contents

Preface

Contributors

1 Overview of the Automotive Plastics Market -- Susan J. Babinec and Martin C. Cornell

2 Plastics Processing -- Steven D. Stretch

3 Formulating Plastics for Paint Adhesion -- Dominic A. Berta

4 Polymers for Coatings for Plastics -- J. David Nordstrom

5 Performance and Durability Testing -- Philip V. Yaneff

6 Painting Problems -- Clifford K. Schoff

7 Recycling of Automotive Plastics -- Rose A. Ryntz

8 Alternatives to Coatings for Automotive Plastics -- Norm Kakarala and Thomas Pickett

9 Trends in Coatings for Automotive Plastics and Rubber in North America and Europe -- Robert Eller

10 Automotive Plastic Coatings in Europe -- Hans Christian Gruner and Klaus-Werner Reinhart

Index

Subjects

297 .	Plastic coatings
313 .	Polymers

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Surveying recent developments in coating polymers and plastics, this book examines proper materials selection, basic processing mechanics, process selection based on cost and coating mechanics, molding, and performance and durability assessments — highlighting techniques for salvaging plastics from used vehicles, and a comparison of North American and European techniques for coating plastics in the automotive industry.

Evaluates the cost-performance compromise in coating selection for polymers and plastics.

Facilitating further study with the inclusion of more than 450 references, this volume discusses various plastics processes used to produce component parts. . .the conversion of raw materials to plastics through pushing, squeezing, pulling-pushing, forming, blowing, and rotating. . .the theory, chemistry, formulation, preparation, and testing of plastics for paint adhesion. . .the appraisal of painted parts prior to commercialization to optimize appearance, physical properties, durability, and performance. . .testing for adequate adhesion, gasoline resistance, gouging, chipping, flexibility, impact, scratch and mar, etch and chemical resistance, after-aging, and weathering. . .alternatives to coatings for automotive plastics. . .dynamics and driving forces in trends in coatings for automotive plastics and rubber in European and North American markets. . .and procedural and ecological considerations in coatings for automotive plastics in Europe.

PREFACE:

As a group, plastics are seeing increased widespread usage on a global scale. They continue to proliferate and dominate many industrial applications at ever-increasing rates. The shift from metal to plastic offers many advantages such as light weight, ease of formability, and low cost. While new types and grades of plastics emerge, many new and

exciting challenges are introduced for the coating formulator and, ultimately, the part decorator. Adhesion and painted-part performance require attention to the smallest detail, from dispersion techniques utilized in formulating the resins to molding protocol utilized to fabricate the component, to paint type and application methods utilized to decorate the component, to service-life durability and performance, and finally to reuse or recycle technologies utilized to alleviate land filling.

This book is directed toward both scientists and technologists working in the field of coatings for plastics. Chapter 1 begins with an extensive discussion on the types of plastics in use today and references the future needs and types of characteristics required to lower costs and enhance performance. Chapter 2 is then devoted to plastics processing requirements, which discusses molding parameters and the tooling needed to produce aesthetically pleasing and performance-capable parts.

Adhesion and the formulation tools required to achieve adhesion are discussed in Chapter 3, in the context of low surface free energy plastics, e.g., olefins. The ability to enhance adhesion as well as the possibility of increasing paint transfer efficiency, e.g., conductivity of the part, are discussed in subsequent chapters. Alternatives to paint are also addressed, in Chapter 8, particularly with respect to the need to achieve lower-cost, more environmentally compliant technologies.

Once a plastic part is decorated, issues centered on dirt and paint defects are addressed from the analytical point of view, and suggestions are made in Chapter 6 on how to identify and alleviate these defects.

We address an ever-increasing priority in Chapter 7 — that of plastic part recycling and reuse once parts have reached the end-of-life cycle. The ability to remove paint is discussed in terms of process and performance. The ability to compatibilize dissimilar materials in lieu of the complexity of plastic families utilized industrially is also addressed.

Future trends in European and North American plastics markets are addressed in Chapters 9 and 10 from a product-life-cycle perspective. Specialized needs of the market or customer as well as environmental legislation, end-of-life requirements, and projected technologies required to achieve the proposed targets are introduced.

This book was born out of the perceived need for a comprehensive work to address decorated plastic components as systems rather than as independent parts. The interplay of resin chemistry, processing technology, and decoration scheme is a complex mix of interrelated events. Treating each event separately often leads to insurmountable issues, from potential decohesion of the plastic to potentially aesthetically displeasing appearance, and even to potential adhesion problems in the field. We hope that by addressing the overall manufacturing processes required to produce decorated plastic components as a system, we can begin to explore the possibilities of expanding the role of plastic in the industry. By improving overall performance of these materials there is no end to the possibilities of applications in which plastics can be utilized.

Title	Location	Edition / Series / Misc.
32 Coatings Technology		Edition: 3rd edition
Author: Fibiger, W. and A. C. Boyce (editors)	Dynix: 84296	Series:
Publish.: ITE Consultants	Call No.: 667.9 Co	
- place: Willowdale, Ontario, Canada	ISBN:	
- date: 1998	Shelf Adult Non-Fiction	Year: 1998
Subject: Coating processes		Price: \$100.00
Desc: various pagings, illus., diagrams, 28 cm.		

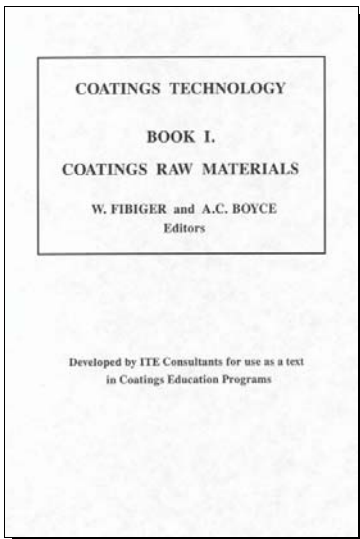


Table of Contents

- BOOK I -- Coatings Raw Materials
 - I. Introduction to Coatings
 - II. Chemistry and Chemical Terminology
 - III. Oils, Varnishes and Alkyd Resins
 - IV. Polyester, Vinyl and Amino Resins
 - V. Epoxy, Phenolic and Silicone Resins
 - VI. Cellulosic, Acrylic and Urethane Resins
 - VII. Waterborne Resins and Emulsions
 - VIII. Solvents
 - IX. Coating Additives
 - X. Organic Pigments
 - XI. Inorganic and Black Pigments
 - XII. White and Extender Pigments

- BOOK II -- Architectural and Trade Sales
 - I. Introduction to Trade Sales Paints
 - II. Resins for Trade Sales and Architectural Paints
 - III. Coatings Calculations
 - IV. Dispersion Process and Equipment
 - V. Pigments and Tinting Systems
 - VI. Instrumental Colour Matching
 - VII. Oil and Solvent Based Formulations
 - VIII. Formulating Latex Paints
 - IX. Special Formulating Know-How
 - X. Manufacturing Methods
 - XI. Exterior Durability
 - XII. Quality Control and Paint Testing

- BOOK III -- Industrial Coatings
 - I. Introduction to Industrial Coatings
 - II. Corrosion
 - III. Primers and Surface Preparation
 - IV. Pigments, Dispersion and Equipment
 - V. Automotive Coatings (OEM)
 - VI. Automotive Refinish
 - VII. Radiation Curing
 - VIII. Powder Coating Resins and Formulations
 - IX. Powder Coating Application and Equipment
 - X. Liquid Coatings, Application and Equipment
 - XI. Coil Coating
 - XII. Statistical Process Control and Quality

Subjects

235 .	Coating processes
283 .	Paint materials
324 .	Protective coatings

Volumes

Coatings Raw Materials - vol. 1
Industrial Coatings - vol. 3
Trade Sale and Architectural Coatings - vol. 2

Reviews - Synopsis - Dust Jacket

INTRODUCTION

The three volume set of textbooks was created with two aims in mind.

- 1) To help individuals to increase their ability to apply themselves more effectively in the coatings and related industries, and
- 2) to help persons already in the coatings and related industries to more fully understand the basic and recent advances in the coatings technology.

Each of the three books covers a segment of the coatings technology dealing first with Coatings Raw Materials in Book I, Architectural and Trade Sales Coatings in Book II, and Industrial Coatings in Book III. The reasoning behind this division of the material is that for the students to be able to formulate coatings, he/she must first be familiar with all the main raw material groups used in the process of formulating the various types of coatings which are discussed in the second and third volumes.

In addition to the coverage of the individual raw materials, their chemistry, properties and selection, one chapter (Chapter II) provides a short review of the most important chemical reactions by which many of the products are created. Chemical terminology and glossary of the most frequently encountered terms is also included in that chapter. Book and articles pertaining to the individual chapters are listed at the end of each chapter. These should be consulted for further study.

Historical Background

Paint is almost as old as man himself. Over 35,000 years ago, people living in caves decorated the walls with paints made of naturally occurring materials such as clay, chalk and animal fats. These essential components have not changed over these thousands of years.

What did change since the early times, and what has caused these improvements? The answers lie in the ingredients, in the method of manufacturing, and in the method of application. The progress continues from the early cavemen to the early civilization of Egypt, Greece and Rome (3000 - 600 B.C.), to the artists and craftsmen of the Middle Ages (400 - 1600 A.D.), the Renaissance and on to the Industrial Revolution that took place from 1600 to 1900 and then to the present day.

In the early times, and up to the beginning of the Industrial Revolution, the user of paint was also the paint maker. Paint and the concept of paint making changed very slowly until almost the 18th century. Demands for paints of all types had increased to such an extent that it became worthwhile and profitable for people to go into business to make paints and varnishes for others to use.

In the 1800's paint production has began because the industrial revolution was changing the end use for paint. Iron and steel had to be protected from rust, for which lead and zinc based paints were developed. Science was also slowly awakening with new pigments, like Prussian Blue (in 1704). In 1740 turpentine was discovered. Formaldehyde chemistry was discovered in 1850, and nitrocellulose in 1870.

In spite of the new discoveries in chemistry, the art of paint formulating still remained relatively static until the 1900's. In the early 1900's recipes were varied between natural resins and oils and the many dyes and pigments, but one method of application was common - "the brush". Paint usually took hours or days to dry.

Before the First World War (1914 - 1918) cars, for example, required twelve coats of paint, applied by brush, and each coat was dried for 24 hours. This war accelerated the exploitation of the discoveries of chemistry and the growth of the chemical industry. New coloured pigments and dyestuffs became available. Resin chemistry advanced with such products as phenol formaldehyde resins, melamine resins, alkyd resins and acrylic resins, to name a few. Drying oils live on in modern coating chemistry, but now as modifiers to alkyds, urethanes and other resins.

When we look back on some of our paint history, we see that the earliest known paints were limited in colour, they were not durable to outside exposure, and were very crudely applied. In other words, they were suitable for interior decoration and not protective in nature.

Progress in paint formulating and manufacturing have varied at different rates over the years. Sometimes the progress seemed to standstill, and at other times it seemed very fast. As the choice of pigment widened, and newer resins were discovered, then the quality and durability improved. Paint making thus became a job and skill in itself.

The methods of science have ensured that the quality of paints or coatings can be controlled and reproduced again and again. The demand for new products, new building materials are with us, and paint making has become a "Technology", growing to meet the durability and protection required.

Should one wish to read more on paint history, two books are recommended. Technology of Paints, Varnishes and Lacquers, by Martens, and Surface Coatings - Volume 1, prepared by the Oil and Colour Chemists Association of Australia.

The Coatings Industry is important to the economies of most developed countries. Industries use many types of paints (cars, machinery, marine etc.), and the home owner needs decorative and protective paints. The coatings industry products are split roughly into two major categories. 1) - architectural, or decorative paints, and 2) - industrial coatings. The architectural market is moving more and more to water based systems (latex paints), and by the end of the century

could be 90 - 95% of all the paint products. The other segment, the industrial market, are coatings formulated to meet special conditions that are required for automobiles, trucks, marine ships, aircraft and a wide variety of other consumer items.

Ever since the last World War (1939 - 1945), changes in coatings technology have been rapid and have kept pace with the many other sciences. As was mentioned earlier, we have advanced into an era of synthetics (pigments, resins, additives and solvents), and although we still rely to some extent on the natural products, the shift is definitely to the tailored made synthetics. The synthetic pigment, resin and additive chemistry has allowed the industry to meet the environmental requirements, government regulations, and even to learn how to control our waste management.

We are noticing that the "non-productive" activities connected with government compliance and regulations is having an effect on manufacturing operations, the type of raw materials we can use, and also on the methods of application. The coatings industry is positive in its approach and is responding to the new demands with the help of the many raw material suppliers. The problems are not going to get easier as time goes by, and many will become even more complex.

The coatings industry will be able to meet the emerging demands of our complex society. This will have to be an industry that will put aside our individual demands and work as a team to insure our future. By constant educational training, and the proper dissemination of new technical or scientific information, we will progress in a positive manner to meet the environmental challenge.

What Does Paint Consist Of

Much depends on the end use and although some are as simple as whitewash, most coatings are extremely complex. This coating, or paint, decorates and protects surfaces. The pigment is to decorate (add colour, or hide unsightly substrate), and also provide protection, and in some cases functional value. The resin or vehicle binds the pigment together, acts as the glue to hold coating to the substrate, and provides protective qualities. The solvent helps to make the coating application easier and the additives give certain features to the paint performance.

The most important features of paint are

- 1) the ease with which it is applied
- 2) the speed of drying
- 3) the adhesion to the surface
- 4) and the strength and durability of the dry film

Title	Location	Edition / Series / Misc.
938 Coatings Technology Author: Fibiger, W. and A. C. Boyce (editors) Publish.: ITE Consultants - place: Willowdale, Ontario, Canada - date: ©2002 Subject: Protective coatings Desc: 3 v., illus., 28 cm.	Dynix: 106361 Call No.: 667.9 Co ISBN: Shelf Adult Non-Fiction	Edition: 5th edition, Revised Series: Year: 2002 Price: \$300.00

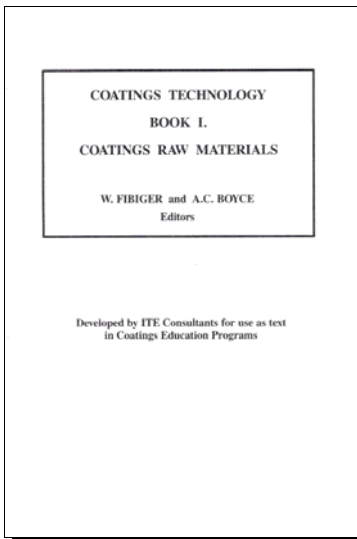


Table of Contents

BOOK 1:

- I. Organic Coatings
 - Part 1. Introduction to Coatings
 - Part 2. Glossary of Common Terms
- II. Oils, Varnishes and Alkyd Resins
 - Part 1. Oils and Varnishes
 - Part 2. Conventional Alkyds
 - Part 3. High Solids Alkyds
 - Part 4. Waterborne Alkyds
- III. Polyester, Vinyl and Amino Resins
- IV. Epoxy, Phenolic and Silicone Resins
- V. Cellulosic, Acrylic, Urethane Resins and Emulsions
- VI. Waterborne Resins and Emulsions
- VII. Solvents
- VIII. Coating Additives
 - Part 1. Driers, Anti Skinning Agents, Bodying Agents
 - Part 2. Antimicrobials
 - Part 3. Surfactants and Wetting Agents
 - Part 4. Controlling Foam
 - Part 5. Rheology Modifiers
- IX. Organic Pigments
- X. Inorganic and Black Pigments
- XI. White Pigments, Alternative Hiding Methods and Extender Pigments
- Appendix - Basic Organic Chemistry

Subjects

235 .	Coating processes
283 .	Paint materials
324 .	Protective coatings

BOOK II:

- I. Introduction to Architectural Paints
- II. Resins for Architectural Paints
- III. Part 1. Coatings Calculations
Part 2. Computers
- IV. Dispersion Process and Equipment
- V. Color in Architectural Paints
 - Part 1. Pigments and Tinting Systems
 - Part 2. Instrumental Color Matching
- VI. Oil, Solvent and Waterborne Alkyds
 - Part 1. Conventional Solvent Based Formulations
 - Part 2. High Solids and Waterborne Alkyd Paints
- VII. Formulating Latex Paints
 - Part 1. Conventional Types
 - Part 2. Zero or Low VOC Types
- VIII. Special Formulating Know-How (Latex Paints)
- IX. Drywall - Construction, Taping and Painting
- X. Architectural Paint Manufacturing
 - Part 1. Manufacturing Systems and Storage
 - Part 2. Storage and Distribution of Latex Resin
- XI. Exterior Durability of Latex Paints
- XII. Quality Control for Architectural Paints
- Appendix - Aerosol Coatings

BOOK III:

- I. Introduction to Industrial Coatings

II. Corrosion
III. Primers and Surface Preparation
IV. Pigments, Dispersion and Equipment
V. Automotive Coatings (OEM)
VI. Automotive Refinish
VII. Radiation Curing
VIII. Powder Coating Resins and Formulations
IX. Powder Coating Application and Equipment
X. Liquid Coatings, Application and Equipment
XI. Coil Coating
XII. Statistical Process Control and Quality

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

The three volume set of textbooks was created with three aims in mind.

- 1) To help individuals to increase their ability to apply themselves more effectively in the coatings and related industries,
- 2) to help persons already in the coatings and related industries to more fully understand the basic and recent advances in the coatings technology, and
- 3) to be a handy reference guide for each student

Each of the three books covers a segment of the coatings technology dealing first with Coatings Raw Materials in Book I, Architectural in Book II, and Industrial Coatings in Book III. The reasoning behind this division of the material is that for the students to be able to formulate coatings, he/she must first be familiar with all the main raw material groups used in the process of formulating the various types of coatings which are discussed in the second and third volumes.

In addition to the coverage of the individual raw materials, their chemistry, properties and selection, an appendix chapter on Basic Organic Chemistry will provide short review of the most important chemical reactions by which many of the products are created. Books and articles pertaining to the individual chapters are listed at the end of each chapter. These should be consulted for further study.

Historical Background

Paint is almost as old as man himself. Over 35,000 years ago, people living in caves decorated the walls with paints made of naturally occurring materials such as clay, chalk and animal fats. These essential components have not changed over these thousands of years.

What did change since the early times, and what has caused these improvements? The answers lie in the ingredients, in the method of manufacturing, and in the method of application. The progress continues from the early cavemen to the early civilization of Egypt, Greece and Rome (3000 - 600 B.C.), to the artists and craftsmen of the Middle Ages (400 - 1600 A.D.), the Renaissance and on to the Industrial Revolution that took place from 1600 to 1900 and then to the present day.

In the early times, and up to the beginning of the Industrial Revolution, the user of paint was also the paint maker. Paint and the concept of paint making changed very slowly until almost the 18th century. Demands for paints of all types had increased to such an extent that it became worthwhile and profitable for people to go into business to make paints and varnishes for others to use.

In the 1800's paint production began because the industrial revolution was changing the end use for paint. Iron and steel had to be protected from rust, for which lead and zinc based paints were developed. Science was also slowly awakening with new pigments, like Prussian Blue (in 1704). In 1740 turpentine was discovered. Formaldehyde chemistry was discovered in 1850 and nitrocellulose in 1870.

In spite of the new discoveries in chemistry, the art of paint formulating still remained relatively static until the 1900's. In the early 1900's recipes were varied between natural resins and oils and the many dyes and pigments, but one method of application was common - "the brush". Paint usually took hours or days to dry.

Before the First World War (1914-1918) cars, for example, required twelve coats of paint, applied by brush, and each coat was dried for 24 hours. This war accelerated the exploitation of the discoveries of chemistry and the growth of the chemical industry. New colored pigments and dyestuffs became available. Resin chemistry advanced with such products as phenol formaldehyde resins, melamine resins, alkyd resins and acrylic resins, to name a few. Drying oils live on in modern coating chemistry, but now as modifiers to alkyds, urethanes and other resins.

When we look back on some of our paint history, we see that the earliest known paints were limited in color, they were not durable to outside exposure, and were very crudely applied. In other words, they were suitable for interior decoration

and not protective in nature.

Progress in paint formulating and manufacturing have varied at different rates over the years. Sometimes the progress seemed to stand still, and at other times it seemed very fast. As the choice of pigments widened, and newer resins were discovered, the quality and durability improved. Paint making thus became a job and skill in itself.

The methods of science have ensured that the quality of paints or coatings can be controlled and reproduced again and again. The demand for new products, new building materials are with us, and paint making has become a "Technology", growing to meet the durability and protection required.

Should one wish to read more on paint history, two books are recommended. Technology of Paints, Varnishes and Lacquers, by Martens, and Surface Coatings - Volume 1, prepared by the Oil and Colour Chemists Association of Australia.

The Coatings Industry is important to the economies of most developed countries. Industries use many types of paints (cars, machinery, marine etc.), and the home owner needs decorative and protective paints. The coatings industry products are split roughly into two major categories. (1) - architectural, or decorative paints, and (2) - industrial coatings. The architectural market is moving more and more to water based systems (latex paints). The other segment, the industrial market, are coatings formulated to meet special conditions that are required for automobiles, trucks, marine ships, aircraft and a wide variety of other consumer items.

Ever since the last World War (1939 - 1945), changes in coatings technology have been rapid and have kept pace with the many other sciences. As was mentioned earlier, we have advanced into an era of synthetics (pigments, resins, additives and solvents), and although we still rely to some extent on the natural products, the shift is definitely to the tailored made synthetics. The synthetic pigment, resin and additive chemistries has allowed the industry to meet the environmental requirements, government regulations, and even to learn how to control our waste management.

We are noticing that the "non-productive" activities connected with government compliance and regulations is having an effect on manufacturing operations, the type of raw materials we can use, and also on the methods of application. The coatings industry is positive in its approach and is responding to the new demands with the help of the many raw material suppliers. The problems are not going to get easier as time goes by, and many will become even more complex.

The coatings industry will be able to meet the emerging demands of our complex society. This will have to be an industry that will put aside our individual demands and work as a team to insure our future. By constant educational training, and the proper dissemination of new technical or scientific information, we will progress in a positive manner to meet the environmental challenge.

Title	Location	Edition / Series / Misc.
33 Coatings Technology Annual: 1978 Author: Gillies, M. T. (editor) Publish.: Noyes Data Corporation - place: Park Ridge, NJ - date: ©1978 Subject: Coating processes -- Patents -- Periodicals Desc: xiv, 353 p., 24 cm.	Dynix: 35194 Call No.: 667.6 Co ISBN: 0815507054 Shelf Adult Non-Fiction	Edition: 1st edition Series: Year: 1978 Price: \$25.00

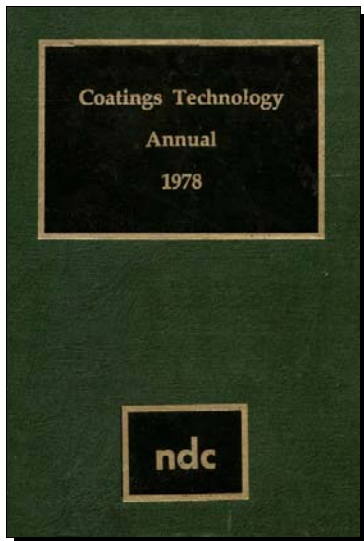


Table of Contents

- Metal Coatings
- Powder Coatings
- Electrodeposited Coatings
- Radiation Cured Coatings
- Paints, Lacquers And Varnishes
- Fire Retardant And Corrosion Resistant Coatings
- Antifungal And Antifouling Coatings
- Coatings For Plastics And Glass
- Wood And Paper Coatings
- Specialty Applications
- Company Index
- Inventor Index
- U.S. Patent Number Index

Reviews - Synopsis - Dust Jacket

FOREWORD

The purpose of this annual publication, of which this is the first, is to keep the reader advised of new processes and products in the coatings field. The information, based on 306 patents issued during 1977, makes it a practical, useful manual. It reflects the efforts and skills of many talented inventors. Its continuing purpose is to present the necessary chemistry, as well as changing technology and applications, to serve the varied interests of the makers and users of coatings.

Subjects

237 .	Coating processes -- Patents -- Periodicals
357 .	Coatings -- Patents -- Periodicals

While the information is taken from U.S. patents, the coverage is actually worldwide in scope, as evidenced by the many patents from West Germany, Japan, England, Austria, Italy, France and other nations included in this book.

It is expected that antisolvent legislation will have a major impact on the way coatings are made and formulated. Critical evaluation of the processing data given in this volume reveals that major replacements for solvent-based coatings are being sought.

This book serves a double purpose in that it supplies detailed technical information and is a guide to the U.S. patent literature in this field during 1977. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, commercially oriented review of profitably making and applying coatings by modern processes as depicted in the U.S. patents issued during 1977.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." There has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development.

Advanced composition and production methods developed by Noyes Data are employed to bring these new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide

the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index.
Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

Title	Location	Edition / Series / Misc.
804 Coatings Technology Handbook		<i>Edition:</i> 2nd edition, Revised and expanded
<i>Author:</i> Satas, Donatas and Arthur A. Tracton (editors)	<i>Dynix:</i> 99418	<i>Series:</i>
<i>Publish.:</i> Marcel Dekker, Inc.	<i>Call No.:</i> 667.9 Co	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0824704398	<i>Year:</i> 2001
<i>- date:</i> ©2001	<i>Shelf</i> Reference	<i>Price:</i> \$188.50
<i>Subject:</i> Coating processes -- Handbooks, manuals, etc.		
<i>Desc:</i> xvi, 902 p., illus., 26 cm.		

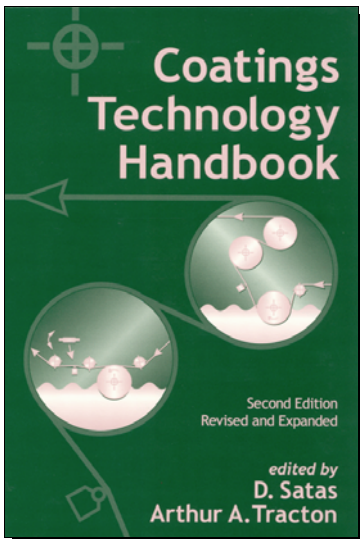


Table of Contents

Preface
Contributors

PART 1: FUNDAMENTALS AND TESTING

1. Rheology and Surface Chemistry
2. Coating Rheology
3. Leveling
4. Structure-Property Relationships in Polymers
5. The Theory of Adhesion
6. Adhesion Testing
7. Coating Calculations
8. Infrared Spectroscopy of Coatings
9. Thermal Analysis for Coatings Characterizations
10. Color Measurement for the Coatings Industry
11. The Use of X-ray Fluorescence for Coat Weight Determinations
12. Sunlight, Ultraviolet, and Accelerated Weathering
13. Cure Monitoring: Microdielectric Techniques
14. Test Panels

PART 2: COATING AND PROCESSING TECHNIQUES

15. Wire-Wound Rod Coating
16. Slot Die Coating for Low Viscosity Fluids
17. Extrusion Coating with Acid Copolymers and Ionomers
18. Porous Roll Coater
19. Rotary Screen Coating
20. Screen Printing
21. Flexography
22. Ink Jet Printing
23. Electrodeposition of Polymers
24. Electroless Plating
25. The Electrolyzing Thin, Dense, Chromium Process
26. The Armoloy Chromium Process
27. Sputtered Thin Film Coatings
28. Reactive Plasma: Deposition and Etching
29. Cathodic Arc Plasma Deposition
30. Industrial Diamond and Diamondlike Films
31. Tribological Synergistic Coatings
32. Chemical Vapor Deposition
33. Solvent Vapor Emission Control
34. Surface Treatment of Plastics
35. Flame Surface Treatment
36. Plasma Surface Treatment
37. Surface Pretreatment of Polymer Webs by Fluorine
38. Calendering of Magnetic Media
39. Embossing
40. In-Mold Finishing
41. HVLP: The Science of High-Volume Low-Pressure Finishing Steve Stalker

PART 3: MATERIALS

42. Acrylic Polymers
43. Vinyl Ether Polymers

Subjects

235 . Coating processes

44. Poly(Styrene-Butadiene)
45. Liquid Polymers for Coatings
46. Polyesters
47. Alkyd Resins
48. The Polyurea Revolution: Protective Coatings for the 21st Century
49. Phenolic Resins
50. Coal Tar and Asphalt Coatings
51. Vulcanizate Thermoplastic Elastomers
52. Olefinic Thermoplastic Elastomers
53. Ethylene Vinyl Alcohol Copolymer (EVOH) Resins
54. Elastomeric Alloy Thermoplastic Elastomers
55. Polyvinyl Chloride and Its Copolymers in Plastisol Coatings
56. Polyvinyl Acetal Resins
57. Polyimides
58. Parylene Coating
59. Nitrocellulose
60. Soybean, Blood, and Casein Glues
61. Fish Gelatin and Fish Glue
62. Waxes
63. Carboxymethylcellulose
64. Hydroxyethylcellulose
65. Antistatic and Conductive Additives
66. Silane Adhesion Promoters
67. Chromium Complexes
68. Nonmetallic Fatty Chemicals as Internal Mold Release Agents in Polymers
69. Organic Peroxides
70. Surfactants for Waterborne Coatings Applications
71. Surfactants, Dispersants, and Defoamers for the Coatings, Inks, and Adhesives Industries
72. Pigment Dispersion
73. Colored Inorganic Pigments
74. Organic Pigments
75. Amino Resins

PART 4: SURFACE COATINGS

76. Flexographic Inks
77. Multicolor Coatings
78. Paintings Conservation Varnish
79. Thermoset Powder Coatings
80. Peelable Medical Coatings
81. Conductive Coatings
82. Silicone Release Coatings
83. Silicone Hard Coatings
84. Pressure Sensitive Adhesives and Adhesive Products
85. Self-Seal Adhesives
86. Sol-Gel Coatings
87. Radiation-Cured Coatings
88. Nonwoven Fabric Binders
89. Fire-Retardant/Fire-Resistive Coatings
90. Leather Coatings
91. Metal Coatings
92. Corrosion and Its Control by Coatings
93. Marine Coatings Industry
94. Decorative Surface Protection Products
95. Coated Fabrics for Protective Clothing
96. Coated Fabrics for Apparel Use: The Problem of Comfort
97. Architectural Fabrics
98. Gummed Tape
99. Transdermal Drug Delivery Systems
100. Optical Fiber Coatings
101. Exterior Wood Finishes
102. Pharmaceutical Tablet Coating
103. Textiles for Coating
104. Nonwovens as Coating and Laminating Substrates

Index

Reviews - Synopsis - Dust Jacket

This updated edition serves as an all-in-one guide to the entire field of coatings technology. It covers a diverse range of topics — from basic concepts through coating types, materials, processes, testing, and applications — summarizing both the latest developments and standard coatings methods.

The second edition of The Coatings Technology Handbook reviews recent testing methods such as infrared spectroscopy, thermal analysis, weathering, and cure monitoring; extensively details a variety of contemporary processes such as flexography, electroless plating, flame surface treatment, embossing, and calendaring; analyzes current materials and surface coatings from resins and thermoplastic elastomers.

ABOUT THE SECOND EDITION:

Serving as an all-in-one guide to the entire field of coatings technology, this encyclopedic reference covers a diverse range of topics — including basic concepts, coating types, materials, processes, testing, and applications — summarizing both the latest developments and standard coatings methods. Take advantage of the insights and experience of over 100 recognized experts in over 100 chapters to select and apply the best coatings for your own product needs.

Emphasizing an interdisciplinary exchange of ideas and approaches, the Coatings Technology Handbook, Second Edition reviews the most recent testing methods, including infrared spectroscopy, thermal analysis, weathering, and cure monitoring...extensively details a variety of contemporary processes such as flexography, electroless plating, flame surface treatment, embossing, and calendaring...analyzes current materials and surface coatings from resins and thermoplastic elastomers to peelable medical, radiation-cured, leather, and metal coatings...and much more.

PREFACE:

Coatings are widely used for many purposes. It is difficult to think of an item that does not have a coating of one type or another. Coatings are applied to protect materials from corrosion and other detrimental effects of the ambient atmosphere. They are used to beautify by changing surface properties such as gloss, color, slipperiness, and general appearance. Adhesive coatings are used in laminating and preparing composites. Other coatings serve as barriers for gases and liquids. Coatings, inks, and adhesives use many of the same raw materials, making them more similar than different. The wide range of application techniques, coating types, and purposes makes coating technology an extremely diverse field. As general technology pushes the envelope, new coatings and applications are needed.

Coating technology is transferable from one application to another. It also draws from other technologies. This comprehensive handbook will be of interest and value to both those already involved in coatings and those who plan to work with coatings. A person practicing one aspect may not be familiar with techniques or materials used for other applications. Awareness and understanding of these techniques and materials will help solve problems and improve levels of technology.

This handbook has been expanded by adding new chapters that include discussions of more diverse techniques, processes, and materials used for coatings, increasing the realm of knowledge.

INTRODUCTION:

A basic understanding of rheology and surface chemistry, two primary sciences of liquid flow and solid-liquid interaction is necessary for understanding coating and printing processes and materials. A generally qualitative treatment of these subjects will suffice to provide the insight needed to use and apply coatings and inks and to help solve the problems associated with their use.

Rheology, in the broadest sense, is the study of the physical behavior of all materials when placed under stress. Four general categories are recognized: elasticity, plasticity, rigidity, and viscosity. Our concern here is with liquids and pastes. The scope of rheology of fluids encompasses the changes in the shape of a liquid as physical force is applied and removed. Viscosity is a key rheological property of coatings and inks. Viscosity is simply the resistance of the ink to flow — the ratio of shear stress to shear rate.

Throughout coating and printing processes, mechanical forces of various types and quantities are exerted. The amount of shear force directly affects the viscosity value for non-Newtonian fluids. Most coatings undergo some degree of "shear thinning" phenomenon when worked by mixing or running on a coater. Heavy inks are especially prone to shear thinning. As shear rate is increased, the viscosity drops, in some cases, dramatically.

This seems simple enough except for two other effects. One is called the yield point. This is the shear rate required to cause flow. Ketchup often refuses to flow until a little extra shear force is applied. Then it often flows too freely. Once the yield point has been exceeded the solidlike behavior vanishes. The loose network structure is broken up. Inks also display this yield point property, but to a lesser degree. Yield point is one of the most important ink properties.

Yield value, an important, but often ignored attribute of liquids, will also be discussed. We must examine rheology as a dynamic variable and explore how it changes throughout the coating process. The mutual interaction, in which the coating process alters viscosity and rheology affects the process, will be a key concept in our discussions of coating technology.

The second factor is time dependency. Some inks change viscosity over time even though a constant shear rate is being applied. This means that viscosity can be dependent on the amount of mechanical force applied and on the length of time. When shearing forces are removed, the ink will return to the initial viscosity. That rate of return is another important ink property. It can vary from seconds to hours.

Rheology goes far beyond the familiar snapshot view of viscosity at a single shear rate which is often reported by ink vendors. It deals with the changes in viscosity as different levels of force are applied, as temperature is varied, and as solvents and additives come into play. Brookfield viscometer readings, although valuable, do not show the full picture for non-Newtonian liquids.

Surface chemistry describes wetting (and dewetting) phenomena resulting from mutual attractions between ink molecules, as well as intramolecular attractions between ink and the substrate surface. The relative strengths of these molecular interactions determine a number of ink performance parameters. Good print definition, adhesion, and a smooth ink surface all require the right surface chemistry. Bubble formation and related film formation defects have their basis in surface chemistry also.

Surface chemistry, for our purposes, deals with the attractive forces liquid molecules exhibit for each other and for the substrate. We will focus on the wetting phenomenon and relate it to coating processes and problems. It will be seen that an understanding of wetting and dewetting will help elucidate many of the anomalies seen in coating and printing.

The two sciences of rheology and surface tension, taken together, provide the tools required for handling the increasingly complex technology of coating. It is necessary to combine rheology and surface chemistry into a unified topic to better understand inks and the screen printing process. We will cover this unification in a straightforward and semi-qualitative manner. One benefit will be the discovery that printing and coating problems often blamed on rheology have their basis in surface chemistry. We will further find that coating leveling is influenced by both rheology and surface chemistry.

Title	Location	Edition / Series / Misc.
785 Coil Coatings Author: Gaske, Joseph E. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1987 Subject: Coatings -- Periodicals Desc: 20 p., illus., 28 cm.	Dynix: 55947-04 Call No.: 667.9 Fe ISBN: 0934010153 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS4 Year: 1987 Price: \$50.00

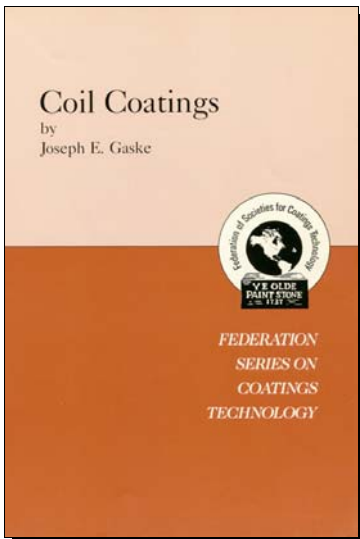


Table of Contents

- I. INTRODUCTION
- II. TERMINOLOGY
- III. COATING TYPES
 - A. Alkyds
 - B. Acrylic Resins
 - C. Polyesters
 - D. Vinyls
 - E. Epoxies
 - F. Fluorocarbons
 - G. Other Coating Types
- IV. PROBLEMS IN THE APPLICATION AND USE OF COIL COATINGS
- V. PROCESSING OF PRECOATED COILED METAL
- VI. TESTING
- VII. PROBLEMS IN THE MANUFACTURE AND MARKETING OF COIL COATINGS
- VIII. SUMMARY
- IX. REFERENCES

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

The majority of industrial coatings typically are applied on a conveyerized production line, and "painting" is considered just another step in the total production operation. As such, the degree to which the coating step can be automated is restricted by the limitations imposed by the total production line. Metal parts generally are prefabricated, hung on the conveyor to be chemically cleaned and pretreated, followed by coating by either dipping, flow coating, spraying, electrocoating, or a combination of these. The coatings are baked in large chamber ovens for 20 to 30 minutes, and the part is then conveyed to the final assembly area. Each manufacturing plant must be equipped to handle all of these operations, which, in many cases, often involve numerous departments within the plant. Such conventional production line-oriented operations require a great deal of interplant coordination, additional handling equipment, and are labor intensive.

A variation of this type of coating operation evolved in the 1930's by recognizing the coating, or "painting," process itself as an entirely separate operation. Simple equipment was designed to paint Venetian blind slats using a paint roller coater and drying racks from which the slats were removed for use on a separate assembly line. This concept was developed by J. Hunter and led to his building a coil coating line in 1935 to coat metal strip in a continuous manner. The innovation introduced by Hunter utilized mechanical brushes and water-borne chemical cleaner to thoroughly remove mill rolling oil and other soils followed by water rinsing and a chemical etching pretreatment, water rinsing, drying, painting by roller coating, baking to drive off solvents and force dry the coating, cooling, and re-rolling back to the original metal roll form in a continuous operation. The pre-coated metal strip was used on another production line where it was cut to the required length and punched to produce Venetian blind slats which were assembled into the final product.

Improved coatings were used to precoat strips used in a similar manner to post-fabricate curtain rods and other drapery hardware. By 1943, there were approximately eight of these coil coating lines in operation in the United States. Roller coating application methods using metal and rubber composition rolls were not new at that time, having been used for many years to lithograph metal sheets for cans, toys, bottle caps, and in the manufacture of plywood sheets to uniformly

spread adhesive by metering from rolls. The importance of Hunter's concept was that the coiled metal strip was precoated by a more efficient method and then used on a separate production line to be fabricated into the desired finished shape. This eliminated the inherently slow, labor intensive and space consuming painting operation from the production line.

At the end of World War II, there was an excess of sheet aluminum production capacity left over from military aircraft production. Sheet aluminum began to be used for siding and for other building products which were in great demand at that time. The aluminum strip was precoated on coil coating production lines and post-fabricated into siding and rainware. More and more products were produced by post-forming precoated metal and the demand for precoated metal increased dramatically. The rapid utilization of new engineering principles with commensurate higher line speeds imposed even greater challenges on the organic coatings industry. Coatings had to be applied at higher shear rates, cure more rapidly at higher temperatures, be harder, tougher, and impart improved corrosion resistance and weatherability. From Hunter's modest beginning grew a sophisticated industry utilizing every new development in mechanical, electrical, and chemical engineering, as well as organic coating science, and commanding even more developments as markets for its products grew.

By 1962, the industry had grown with constraints of such magnitude that a separate professional trade organization evolved. The National Coil Coaters Association (NCCA) now has approximately 75 active members with coil coating lines, in addition to a number of associate and affiliate members who supply coatings, equipment, metal, chemicals, and other materials and services. The Association provides a forum for technical and marketing information interchange, as well as compiling statistics on the amount of steel and aluminum coated. It lists members capable of coating stainless steel, brass, bronze, and titanium metals. NCCA reported shipments of 464,000 tons of coated metal in 1962, growing to 4.17 million tons in 1984 in North America alone. The industry consumed about 21 million gallons of paint containing approximately 113 million pounds of solids by 1979. It is estimated that the volume of coatings consumed reached 26 million gallons (160 million pounds of solids) during 1984. With an increase in coated steel being used by the transportation industry, 1985 was expected to at least equal this volume. The growth of the use of coil coated metal has been phenomenal. It would be remiss not to acknowledge the outstanding contributions and progress made by the European Coil Coaters Association (ECCA), which is in close communication with the NCCA.

Relatively recent events have led to more emphasis on the coil coating process. These were more stringent environmental regulations, the energy "crunch" involving natural gas, and new coil coating lines and coating developments. Coil coating lines have unique process control advantages. Oven chamber sizes are smaller, thereby more efficiently utilizing heat generated by natural gas on the flat sheet. Afterburners are used to eliminate solvent vapor emissions to the atmosphere. The exact metering of the automatic roller coater heads permits very precise and uniform film thickness with automated controls maintaining this thickness as well as monitoring gloss, color, strip surface temperature, and film defects. Cleaning and the chemical pretreatment of waste water is also more effectively done by this compact operation. Coating developments, such as highly durable siliconized and fluorocarbon based construction coatings, weldable zinc-rich coatings for automotive use, and highly malleable coatings for use in packaging, appliance, transportation, and other fields also contributed to the growth and emphasis on the process.

Title	Location	Edition / Series / Misc.
1369 Colloid and Surface Properties of Clays and Related Minerals		<i>Edition:</i>
<i>Author:</i> Giese, Rossman F. and Carel J. van Oss (editors)	<i>Dynix:</i> 111668	<i>Series:</i> Surfactant Science Series: Vol. 105
<i>Publish.:</i> Marcel Dekker, Inc.	<i>Call No.:</i> 541.3 Gi	
<i>- place:</i> New York, NY	<i>ISBN:</i> 082479527X	
<i>- date:</i> ©2002	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2002
<i>Subject:</i> Clay		<i>Price:</i> \$128.50
<i>Desc:</i> xvi, 295 p., illus., 24 cm.		

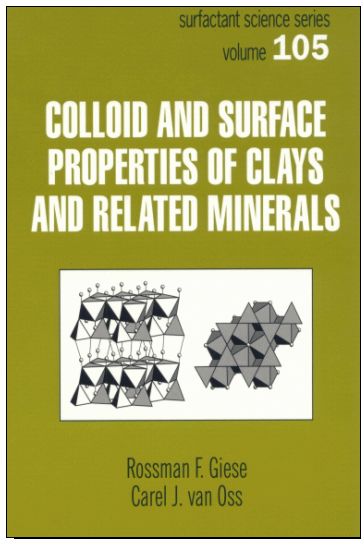


Table of Contents

Preface

1 Introduction
1.1 Importance of Clay Minerals

2 Applications of Clays and Clay Minerals
2.1 Ceramics and Related Clay Products
2.1.1 Bricks and other structural ceramic ware
2.1.2 Refractories
2.1.3 Earthenware
2.1.4 Porcelain
2.1.5 Pencil leads
2.2 Clay as Filler Material
2.3 Agricultural Applications
2.4 Clays as Adsorptive Materials
2.4.1 Physical adsorption
2.4.2 Ion exchange
2.4.3 Zeolites as molecular sieves
2.5 Washing Scouring and Felting: Fuller's Earth
2.6 Talc and Its Uses
2.7 Smectites and Their Uses
2.7.1 Uses of hydrophilic smectites
2.7.2 Bentonites

3 Clay Minerals
3.1 Silicate Mineral Structures
3.1.1 The polyhedral paradigm
3.1.2 Polymerization of polyhedra
3.2 Silicate Classification
3.3 Structure of Phyllosilicates
3.3.1 Layer types
3.3.2 Octahedral site occupancy
3.3.3 Layer charge
3.3.4 The interlayer
3.3.5 Chemical variations
3.4 Phyllosilicate Minerals
3.4.1 1:1 minerals
3.4.2 2:1 minerals
3.4.3 2:1:1 minerals
3.5 Interlayer Water
3.5.1 Structure of interlayer water
3.6 Intercalated Organic Molecules
3.6.1 Organic complexes with vermiculite
3.6.2 Organic complexes with kaolinite
3.6.3 Summary of molecular-clay interactions
3.7 Origin of Clay Minerals
3.7.1 Modes and environments of formation
3.7.2 Commercial deposits of clay minerals

4 Other Mineral Colloids
4.1 Simple Oxides

Subjects

433 .	Colloids
717 .	Clay
718 .	Clay Materials

- 4.2 Halides
 - 4.3 Hydroxides
 - 4.4 Nesosilicates
 - 4.5 Cyclosilicates
 - 4.6 Sorosilicates
 - 4.7 Pyroxenes
 - 4.8 Amphiboles
 - 4.9 Silica Minerals
 - 4.10 Feldspars
 - 4.11 Carbonates
 - 4.12 Phosphates
 - 4.13 Sulphates
 - 4.14 Asbestos
- 5 Theory of Colloids
- 5.1 The Hamaker Approximation
 - 5.2 The Lifshitz Approach
 - 5.3 Interfacial Lifshitz-van der Waals Interactions
 - 5.4 Polar Forces
 - 5.5 Lewis Acid-Base Interactions
 - 5.6 Polar Attractions and Repulsion
 - 5.7 Electrostatic Interactions
 - 5.8 Ionic Double Layer
 - 5.9 Electrokinetic Phenomena
 - 5.10 The zeta-Potential
 - 5.10.1 Thick double layer
 - 5.10.2 Thin double layer
 - 5.10.3 Relaxation
 - 5.11 Energy Balance Relationships
 - 5.12 Decay with Distance
 - 5.12.1 LW interactions
 - 5.12.2 Polar interactions
 - 5.13 Electrostatic Interactions
 - 5.14 Energy Balance Diagrams
 - 5.14.1 Types of energy balance diagram
- 6 Measurement of Surface Thermodynamic Properties
- 6.1 The Young Equation
 - 6.2 The Young-Dupré Equation as a Force Balance
 - 6.3 Concept of the Surface Tension of a Solid
 - 6.4 Contact Angle Measurements on Heterogeneous Surfaces
 - 6.4.1 The Cassie equation
 - 6.4.2 The extent to which solid surfaces become heterogeneous by condensation of molecules evaporating from the liquid drop
 - 6.5 Contact Angle Measurement on Solid, Flat Surfaces
 - 6.5.1 Advancing and retreating contact angles
 - 6.5.2 Preparation of solid surfaces
 - 6.5.3 Contact angles measured with liquid 1, immersed in liquid 2
 - 6.6 Other Approaches to the Interpretation of Contact Angle Data
 - 6.6.1 The Zisman approach
 - 6.6.2 The single polar parameter or 'gamma-P' approach
 - 6.6.3 The "equation of state"
 - 6.7 Contact Angle Determination by Wicking and Thin Layer Wicking
 - 6.7.1 Determination of the average pore radius, R
 - 6.7.2 Derivation of contact angles from wicking measurements
 - 6.7.3 Other uses of wicking
 - 6.8 Solution of the Young-Dupré Equation from Contact Angle Measurements
 - 6.8.1 Minimal solution
 - 6.8.2 The overdetermined case
 - 6.8.3 Estimation of errors in the gamma values
 - 6.9 Other Methods for Determining Surface Properties
 - 6.9.1 Stability of particle suspensions
 - 6.9.2 Advancing freezing fronts
 - 6.9.3 Force balance

- 6.9.4 Electrophoresis in monopolar organic solvents
- 6.10 Surface Tension Measurement of Liquids
 - 6.10.1 The Wilhelmy plate method
 - 6.10.2 Pendant drop shape
 - 6.10.3 Interfacial tension between immiscible liquids
 - 6.10.4 Apolar and polar surface tension component liquids
 - 6.10.5 Determination of the polar surface tension parameters of liquids
- 7 Electrokinetic Methods
 - 7.1 Electrophoresis
 - 7.1.1 Particle microelectrophoresis
 - 7.1.2 Electrophoresis in non-aqueous media
 - 7.2 Electroosmosis
 - 7.3 Streaming Potential and Sedimentation Potential
 - 7.4 Link Between the Electrokinetic Potential and Electron Donicity
 - 7.4.1 The Schulze-Hardy rule
- 8 Interactions Between Colloids
 - 8.1 Introduction
 - 8.2 Lifshitz-van der Waals Interactions
 - 8.3 Electrostatic Interactions
 - 8.4 Polar Interactions: Lewis and Brønsted Acid-Base Approaches
 - 8.4.1 Lewis acid-base properties of polar condensed-phase materials
 - 8.4.2 Polar solids
 - 8.4.3 Polar solutes
 - 8.4.4 Polar liquids
 - 8.5 The Hydrophobic Effect: Hydrophobic Attraction
 - 8.6 Hydrophilic Repulsion
 - 8.7 Definition of Hydrophobicity and Hydrophilicity
 - 8.8 DLVO Approach, Including Lewis Acid-Base Energies
 - 8.8.1 Decay of interaction energies and forces as a function of distance
 - 8.8.2 The extended DLVO (XDLVO) approach applied to aqueous media
 - 8.8.3 Stability versus flocculation of aqueous particle suspensions
 - 8.8.4 Inadequacy of "steric" stabilization theories
 - 8.8.5 The extended DLVO approach in aqueous media; comparison with experimental data
 - 8.8.6 Comparison between DLVO and XDLVO plots of hectorite suspensions, as a function of ionic strength
 - 8.9 Influence of Plivalent Cations on the Flocculation of Negatively Charged Particles: DLVO and XDLVO Analysis
 - 8.10 Solubility
 - 8.10.1 Solubility of electrolytes
 - 8.10.2 Solubility of organic compounds
 - 8.10.3 Solubility of surfactants and other amphipathic compounds
 - 8.11 Adhesion and Adsorption
 - 8.11.1 Macroscopic scale adhesion and adsorption
 - 8.11.2 Adhesion and adsorption onto the water-air interface -
flotation
 - 8.11.3 Macroscopic and microscopic-scale adsorption phenomena combined
 - 8.11.4 Adsorption and adhesion kinetics
 - 8.11.5 Adsorption and adhesion equilibrium
 - 8.12 Net Repulsive Interactions
 - 8.12.1 Reversal of adsorption and adhesion
 - 8.12.2 Temperature effects
 - 8.13 Nature of Clay-water Interactions
 - 8.14 Structure of Bound Outer Layer Water
 - 8.15 Swelling of Clays
 - 8.15.1 Nature of the swelling mechanism
 - 8.15.2 Prerequisite properties of swelling clays
 - 8.15.3 Influence of steam on swelling clays
 - 8.15.4 Hydrophobicity of talc and pyrophyllite
 - 8.16 Special Properties of Kaolinite
- 9 Surface Thermodynamic Properties of Minerals
 - 9.1 Phyllosilicate Minerals
 - 9.1.1 Samples
 - 9.1.2 Values

- 9.1.3 Generalities; clay minerals
- 9.1.4 Role of organic material adsorbed on clays
- 9.2 Other Minerals
 - 9.2.1 Generalities; other minerals
- 10 Biological Interactions with Mineral Particles
 - 10.1 Interactions with Biological Systems
 - 10.2 Polymer Adsorption
 - 10.3 Protein Adsorption
 - 10.3.1 Protein adsorption onto hydrophobic surfaces
 - 10.3.2 Protein adsorption onto hydrophilic surfaces
 - 10.3.3 In vivo consequences of protein adsorption onto clay and mineral particles
 - 10.4 Pulmonary Pathogenesis
 - 10.4.1 Small, roughly spherical particles
 - 10.5 Needle-shaped or Fibrous Particles
 - 10.5.1 The most dangerous fibrous particles
 - 10.5.2 The less dangerous fibrous (asbestos) particles
 - 10.5.3 A few proposed physical or chemical correlations with the pathogenicity of, e.g., amphiboles that turn out to be erroneous

References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book focuses on Lifshitz-van der Waals, Lewis acid—base, and electrical double-layer interactions. The first two use contact angles of drops of high-energy liquids deposited on solid surfaces, or the thin-layer wicking technique, to determine the surface properties of flat or particulate solids, respectively. The interfacial free energies that occur in water among identical as well as different condensed-phase materials are derived from these surface properties, giving rise to hydrophobic attractions and hydrophilic repulsions.

Exploring the distinction between polar and apolar interrelationships, "Colloid and Surface Properties of Clays and Related Minerals" discusses surface properties of silica minerals, feldspars, carbonates, phosphates, sulfates, and amphibole as well as serpentine asbestos species. . . analyzes the stability of aqueous suspensions of clays and other mineral particles. . . examines simple oxides, halides, hydroxides, and pyroxenes. . . surveys neso-, cyclo-, and sorosilicates. . . classifies silicate mineral and phyllosilicate structures. . . employs the Young-Dupré equation. . . covers electrophoresis and electroosmosis. . . clarifies polymer and protein adsorption. . . and more.

INTRODUCTION:

The earth is a large and complex object. It is differentiated according to the densities of the minerals which compose the planet. The density differences along with the abundances of the elements making up the earth ultimately lead to an accumulation of iron in the center (the core) of the earth, surrounded by a thick layer of silicate minerals relatively rich in iron and magnesium (the mantle), overlain by a thin layer of silicate minerals with less iron and magnesium and more silicon and aluminum (the crust). All of these materials, if placed on a laboratory table would be identified by a competent geologist as some sort of igneous or metamorphic rock, that is the product of heat along with pressure. Rocks at the surface of the crust are modified by contact with a very corrosive chemical: water in equilibrium with dissolved carbon dioxide to form carbonic acid. This weak acid coupled with an active atmosphere and moderate temperatures leads to the chemical and physical breakdown of a wide variety of rock types.

Thus, a mineral (part of a rock) that formed and was at equilibrium under conditions of elevated temperature and pressure is unstable at earth surface conditions. The acidic water, possibly aided by temperature fluctuations, attacks the mineral and a series of chemical reactions ensue producing a series of new minerals which are at equilibrium under the new conditions. If there is sufficient time, then ultimately the end of the search for thermodynamic equilibrium produces clay minerals with lesser quantities of other colloidal materials. This is the process known as weathering and is the major source of sediments and soils at the earth's surface on the continents and blanketing much of the oceans. Since the clay minerals form at low temperatures (in a geological sense), reaction rates are slow and crystals of these new phases form slowly and imperfectly resulting in very small particle sizes, far smaller than would result from mechanical abrasion of larger crystals.

We share the surface of the earth with these sediments, sedimentary rocks, and soils and our lives benefit greatly from the existence of these fine-grained materials. If weathering did not take place, the continents would be barren and

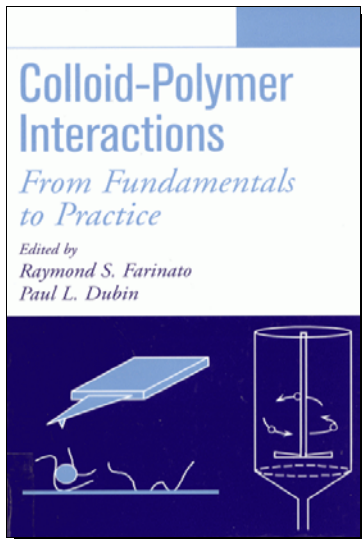
unproductive places. The clay minerals form something like one third of the sediments (clay rich muds and silts), sedimentary rocks (principally shale) and soils.

Clearly a material that is so common at the surface of the earth would be of geological importance. In addition, clay minerals are of considerable technological importance as, for example, raw materials for ceramic ware, additives to a range of products including paints, inks and rubber. At one time, clay minerals were widely used as catalysts, but much of this market has been taken over by zeolites. The fertility of soils is largely due to the presence of clay minerals which contribute an ability to retain water and to exchange a variety of cationic species. These topics are discussed in some detail in Chapters 3 and 8.

The utility of clay minerals is strongly linked to their interfacial properties, especially with water. Thus, the ability to fabricate a complexly shaped ceramic body depends on the ability of the fine-grained raw materials, clay minerals, quartz and feldspar principally, to be formed while wet into the desired shape and retain that shape while drying. Without the plasticity of the wet clay, the shaping would not be possible. In fact, a clay is a clay because it is plastic when wet with an appropriate quantity of water. The plasticity is a result of complex interactions between the water and the surfaces of the constituents of the clay, principally the clay minerals.

The ability of clay minerals to participate in ion exchange reactions is a mechanism for the release of transition elements, alkali and alkaline earth metals to plant roots. Inorganic cations are not the only exchangeable entities; a wide variety of organic cations also undergo exchange leading to the conversion of the clay surface from neutral or hydrophilic to hydrophobic. A fine-grained hydrophobic material has very attractive properties as a barrier for contaminated soils or dump sites, in that it has a large surface area coupled with an attraction for hydrophobic organic compounds such as halogenated aromatic molecules. This is an area of intense experimental and commercial interest at present. Untreated clay minerals are frequently transported by rivers and streams. The transport is easy because of the small grain size of the clays, typically of the order of a few micrometers or less so that average-sized clay particles are suspended in stagnant water. However, the usual turbulence of natural flowing water can keep these particles in almost indefinite suspension. When conditions change, as will happen if the chemistry of the water is modified by, for example, the entry of river water into the ocean (which is richer in electrolyte) can cause the clay mineral particles to flocculate upon encountering the higher salt content of seawater. Again, this is the result of competing forces between the clay particles and water molecule interacting with clay particles, and the interactions of water molecules with each other. The traditional explanation of flocculation rests on the electrostatic interactions of clay particles as modified by the electrolyte. The real situation is much more complex and more interesting and will be discussed later (Chapter 8).

Title	Location	Edition / Series / Misc.
640 Colloid-Polymer Interactions: From Fundamentals to Practice		Edition:
Author: Farinato, Raymond S. and Paul L. Dubin (editors)	Dynix: 88634	Series:
Publish.: John Wiley & Sons	Call No.: 541.33 Fa	
- place: New York, NY	ISBN: 0471243167	
- date: ©1999	Shelf Adult Non-Fiction	Year: 1999
Subject: Adsorption		Price: \$115.00
Desc: x, 417 p., illus., 25 cm.		



Subjects

313 .	Polymers
433 .	Colloids
506 .	Adsorption

Table of Contents

Preface (Paul L. Dubin and Raymond S. Farinato)

I. Applied Technologies

1. Polyelectrolyte-Assisted Dewatering (Raymond S. Farinato, Sun-Yi Huang, and Peter Hawkins)
2. Polymer-Colloid Interactions in Pulp and Paper Manufacture (Robert H. Pelton)
3. Dual-Addition Schemes (Gudrun Petzold)
4. Role of Polymers in Particle Adhesion and Thin Particle Layers (Marcel R. Bohmer, Willem Hoogsteen, and Gerald F. Belder)

II. Fundamentals of Colloid-Polymer Interaction

5. Diffusion-Controlled Phenomena in Adsorbed Polymer Dynamics (Maria M. Santore)
6. Depletion-Induced Aggregation and Colloidal Phase Separation (Andrew Milling and Brian Vincent)
7. Polyelectrolyte Adsorption: Theory and Simulation (M. Muthukumar)
8. Small-Angle Neutron Methods in Polymer Adsorption Studies (Terence Cosgrove, Stephen M. King, and Peter C. Griffiths)

III. Methods for Investigating Polymer Adsorption

9. Nuclear Magnetic Resonance of Surface Polymers (Frank D. Blum)
10. Radiochemical Methods for Polymer Adsorption (Joseph B. Schlenoff)
11. Measurement of Colloidal Interactions Using the Atomic Force Microscope (Patrick G. Hartley)
12. Surface Forces Apparatus: Studies of Polymers, Polyelectrolytes, and Polyelectrolyte-Surfactant Mixtures at Interfaces (Per M. Claesson)
13. Scanning Angle Reflectometry and Its Application to Polymer Adsorption and Coadsorption with Surfactants (Robert D. Tilton)
14. Total Internal Reflectance Fluorescence (Maria M. Santore)
15. Design and Applications of Oscillating Optical Tweezers for Direct Measurements of Colloidal Forces (H. Daniel Ou-Yang)

Index

Reviews - Synopsis - Dust Jacket

Publisher's Notes

Owing to their crucial role in many technical processes, colloid-polymer interactions have been actively researched in recent years. Yet none of the books available on polymer and colloid chemistry provide specific guidelines to the manipulation of the stability of colloidal materials central to such diverse industries as paint/coatings, film, food processing, water treatment, paper, pharmaceuticals, and agricultural chemicals. This book fills a gap in the field, imparting the basic understanding readers need to deal with applications in the real world.

Book News, Inc.

Provides a forum in which engineers and others close to the applications end of the spectrum and scientists working at the theoretical and mathematical end can better understand each other's requirements and efforts. The four contributions on applied technologies include discussions of polyelectrolyte-assisted dewatering, and dual addition schemes; among the four on fundamental interaction are depletion-induced aggregation and colloidal phase separation, and small-angle neutron methods in polymer adsorption studies. Another seven studies look at methods for investigating polymer adsorption such as the nuclear magnetic resonance of surface polymers and total internal reflectance fluorescence.

Annotation:

The study of colloid-polymer interactions involves discovering the ways polymer chains are configured at interface, and how they behave, and then relating these findings to applications in industry. Important applications centre on solid-liquid separations (for example in water treatment, paper making, and mineral processing) and modifying the properties of

suspensions (for example, in food technology, agricultural technology, pharmaceuticals, and paints and coatings).

This volume combines coverage of the basic principles, analytical techniques and major applications, with surveys and reviews of recent advances. Tutorials are included in each chapter to make them suitable for the non-expert reader. It also addresses the fundamental problem in the field: how does one arrive at a complete, accurate description of the configuration and behaviour of polymer chains at interfaces? And how does this configuration and behaviour determine the useful properties of such systems (for example, flocculation and stabilisation)? By addressing these basic issues, scientists can identify fundamental principles relevant to both their own individual problems and to real-life industrial applications.

Title	Location	Edition / Series / Misc.
<p>914 Colloidal Dispersions: Suspensions, Emulsions, and Foams</p> <p><i>Author:</i> Morrison, Ian Douglas and Sydney Ross <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Colloids <i>Desc:</i> xxvii, 616 p., illus., 25 cm.</p>	<p><i>Dynix:</i> 105707 <i>Call No.:</i> 541.3 Mo <i>ISBN:</i> 0471176257 <i>Shelf:</i> Adult Non-Fiction</p>	<p><i>Edition:</i> <i>Series:</i> Wiley-Interscience Series <i>Year:</i> 2002 <i>Price:</i> \$91.50</p>

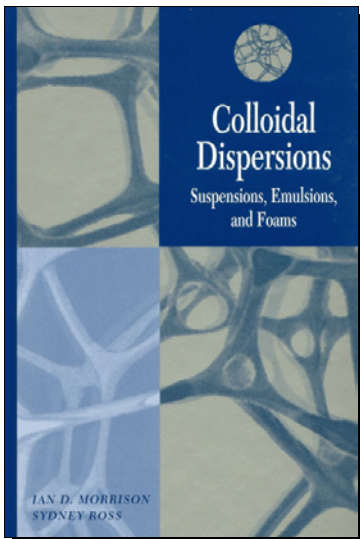


Table of Contents

- Preface
- Acknowledgments
- Introduction
- 1. Optical Properties: Light Scattering
- 2. Rheology
- 3. Kinetic and Statistical Properties
- 4. Particle Sizing
- 5. Processing Methods for Making Emulsions and Suspensions
- 6. Liquid Surfaces and Interfaces
- 7. Liquid/Solid Interfaces
- 8. Theories of Surface and Interfacial Energies
- 9. Experimental Methods of Capillary
- 10. Wetting of Irregular Surfaces
- 11. Surface-Active Solutes
- 12. Physical Properties of Insoluble Monolayers
- 13. Aqueous Solutions of Surface-Active Solutes
- 14. Surface Activity in Nonpolar Media
- 15. Thermodynamics of Adsorption from Solution
- 16. The Relation of Capillary to Phase Diagrams
- 17. Electrical Charges in Dispersions
- 18. Forces of Attraction Between Particles
- 19. Forces of Repulsion
- 20. Dispersion Stability
- 21. Polymeric Stabilization
- 22. Emulsions
- 23. Foams
- 24. Technology of Suspensions
- 25. Special Systems
- 26. Appendices

Bibliography
Index

Subjects

433 . Colloids

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

From the basics to the most recent developments --a concise review of suspensions, emulsions, and foams. Updating and expanding their highly popular Colloidal Systems and Interfaces, Ian Morrison and Sydney Ross now provide authoritative coverage of the concepts and techniques applicable to suspensions, emulsions and foams. Concisely yet thoroughly encompassing the significant developments of the past fourteen years, "Colloidal Dispersions, Emulsions and Foams" describes a wide range of topics, including particles in liquids, interactions at interfaces, surfactants, and the technology of emulsions and foams. Industrial chemists and chemical engineers will discover among the book's insights recently developed computer-based methods that offer fast, precise measurements of particle concentration, size and charge by acoustics, application of acid-base concepts to adsorption, the role of electric charges in nonpolar media and the fundamentals of nanotechnology.

This new edition includes:

- Updated material and major advances in the field, including the development of new equipment
- In-depth instruction on methods for producing emulsions and suspensions
- Extensive industrial and practical applications of general principles

- Expanded sections on particle sizing, nonpolar dispersions and polymer stabilization

PREFACE:

This book was originally intended to be the second edition of our book *Colloidal Systems and Interfaces* published in 1988. That book was closely related to a four-day short course on emulsions and dispersions that had been taught by Professor S. Ross and Professor F. M. Fowkes since 1967, joined by Dr. I. D. Morrison in 1985, and by 1988 had gathered some 2000 alumni. Since the death of Professor Fowkes, our two-day short course has been sponsored by the American Chemical Society's Department of Continuing Education under the title *Dispersion of Fine Powders in Liquids* and our three-day short course was sponsored by Rensselaer Polytechnic Institute under the title *Colloid Chemistry Applied to Industrial R&D*. The ACS course has been delivered over fifty times to groups of participants varying in number from fifteen to thirty, as well as in-house to larger groups, bringing the total to some 3000 alumni.

This book, like the first, is intended for the industrial chemist or chemical engineer who may not have had a formal university course in colloid and interface chemistry but finds that the nature of the problems that must be solved necessitates the rapid acquisition of some knowledge of that subject. The major step in solving a problem is to define it. If this step is not well considered, the enterprise is sick. We hope to display the armory of concepts and techniques that are available in this discipline, so that investigators may orient their thinking along lines already laid down by the experience of previous workers. Every topic we broach is treated at greater length in monographs and reviews. We do no more than outline its nature, define its terms, explain its elementary concepts, and direct the reader to sources of fuller information. Our book therefore is an index of related topics, by means of which the enquirer, with a specific problem in mind, may hope to find the appropriate context to help formulate it. A great body of organized knowledge is at hand, but many who could use it are only vaguely aware of its existence or are intimidated by its bulk and impenetrability. This book is a guide to those so perplexed.

An outgrowth of colloid science is surface science, which has grown remarkably since the 1960s when ultrahigh vacuum systems made clean solid substrates available for adsorption studies. Further advances in instrumentation, such as scanning-tunneling microscopy and atomic-force spectroscopy have provided additional probes for the study of solid surfaces. In the same way that polymer science developed as a separate outgrowth from colloid science, so now surface science has reached its independent status with its own techniques, journals, monographs, and textbooks. The subject is so large that its inclusion here could not be other than an inadequate treatment.

The behavioral phenomena of foams, emulsions, and suspensions are almost always very complicated. To understand all the details involved in these phenomena requires a more advanced knowledge than what is provided in just the chapters headed "Foams," "Emulsions," and "Suspensions." The explanations of the phenomena are, therefore, materially facilitated by a preliminary account of the general principles of the science.

Considerable additions of material pertaining to recent advances in the various subjects treated, and some deletions of mathematical derivations, have been made from our first book. Our experience has been that the students attending short courses are more familiar with surface properties than with particulate and collective properties. These topics have been given greater attention in this second book. The title of the book has been changed to better describe its contents.

We are on the threshold of another scientific revolution brought about by nanotechnology. Properties of matter measured on a scale of nanometers are now within our reach. Even as we write, new techniques are being developed, soon to be reported in the specialized journals of this field, to remove guesswork from our theories, and to advance our knowledge of phenomena. As the pace of development quickens, so does the rate at which current techniques and even current modes of thought become obsolescent. Today's knowledge may be only of historical interest tomorrow. Even experience may become irrelevant in a mere 20 years, long before a young scientist has reached the end of active life. There is nothing else for it but the prolongation of studenthood throughout one's whole career, by attending short courses and habitual reading. Now more than ever before may it be said that the art is long and life is brief.

Title	Location	Edition / Series / Misc.
642 Colloidal Domain: Where Physics, Chemistry, Biology and Technology Meet		Edition: 2nd edition
Author: Evans, D. Fennell and Hakan Wennerstrom	Dynix: 88636	Series: Advances in Interfacial Engineering Series
Publish.: Wiley - VCH, Verlag GmbH & Co. (John Wiley & Sons)	Call No.: 541.345 Ev	
- place: New York, NY	ISBN: 0471242470	
- date: ©1999	Shelf Adult Non-Fiction	Year: 1999
Subject: Colloids		Price: \$89.95
Desc: xl, 632 p., illus., 26 cm.		

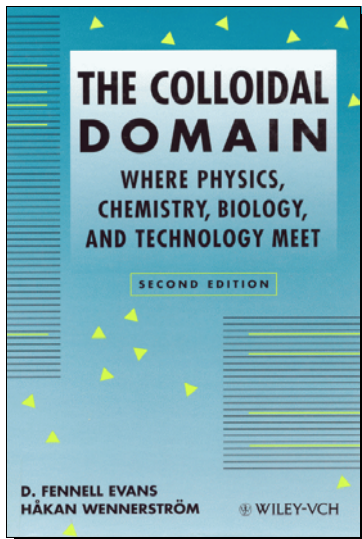


Table of Contents

- Preface to the First Edition
- Preface to the Second Edition
- Symbols
- References
- Author Biographies
- Introduction: Why Colloidal Systems Are Important
- 1. Solutes and solvents, self-assembly of amphiphiles
- 2. Surface chemistry and monolayers
- 3. Electrostatic interactions in colloidal systems
- 4. Structure and properties of micelles
- 5. Forces in colloidal systems
- 6. Bilayer systems
- 7. Polymers in colloidal systems
- 8. Colloidal stability
- 9. Colloidal sols
- 10. Phase equilibria, phase diagrams, and their applications
- 11. Micro- and macroemulsions
- 12. Epilogue
- Index

Reviews - Synopsis - Dust Jacket

Publisher Comments:

This new edition provides students and professionals with a comprehensive and up-to-date treatment of colloid science theory, methods, and applications. Emphasizing the molecular interactions that determine the properties of colloidal systems, the authors provide an authoritative account of critical developments in colloid science that have occurred over the past several decades.

Combining all of the best features of a professional reference and a student text, the Second Edition features:

- * Concept maps preceding each chapter that put subject matter into perspective.
- * Numerous worked examples - many new to this edition - illustrating key concepts.
- * More than 250 high-quality illustrations that help clarify processes described.
- * A new chapter that integrates the development of colloid science and technology in the twentieth century with challenges facing the field today.

The Colloidal Domain, Second Edition is an indispensable professional resource for chemists and chemical engineers working in an array of industries, including petrochemicals, food, agricultural, ceramic, coatings, forestry, and paper products. It is also a superb educational tool for advanced undergraduate and graduate-level students of physical chemistry and chemical engineering.

Book News Annotation:

This textbook introduces colloid science theory, methods, and applications, and emphasizes the molecular interactions that determine the properties of colloidal systems. The updated edition adds a chapter that integrates the development of colloid science and technology with challenges facing the field. Annotation c. by Book News, Inc., Portland, OR

Publisher's Notes

Colloids are small particles which are dispersed through another medium, such as milk, toothpaste, and volcanic smoke. They have a major impact on our ability to understand biological processes and to control technology. This book integrates theoretical concepts, experimental methods, and applications to specific systems to present an authoritative description of the critical developments in colloid science that have taken place over the past several decades.

Synopsis

Subjects

333 .	Surface chemistry
433 .	Colloids

From reviews of the first edition: "Very well written and brings a focus and a perspective that are not currently available in one convenient volume, especially one that is suitable for self-study or as a teaching tool." —Colloid and Interface Science "A revolutionary approach [to] writing an up-to-date text on 'The Colloidal Domain' and its origin in and impact on physics, chemistry, biology, and technology." —Advanced Materials "The authors should be congratulated for producing such a well-written text that is full of illustrations and formulas." —Chemistry and Industry This new edition of Evans and Wennerström's critically acclaimed text provides students and professionals with a comprehensive and up-to-date treatment of colloid science theory, methods, and applications. Emphasizing the molecular interactions that determine the properties of colloidal systems, the authors provide an authoritative account of critical developments in colloid science that have occurred over the past several decades. Combining all of the best features of a professional reference and a student text, *The Colloidal Domain, Second Edition* features: *Concept maps preceding each chapter that put subject matter into perspective *Numerous worked examples—many new to this edition—illustrating key concepts *More than 250 high-quality illustrations that help clarify processes described *A new chapter that integrates the development of colloid science and technology in the twentieth century with challenges facing the field today *The Colloidal Domain, Second Edition* is an indispensable professional resource for chemists and chemical engineers working in a range of areas, including the petrochemical, food, agricultural, ceramic, coatings, forestry, and paper industries. It is also a superb educational tool for advanced undergraduate and graduate-level students of physical chemistry and chemical engineering.

Title	Location	Edition / Series / Misc.
786 Color and Appearance Author: Pierce, Percy E. and Robert T. Marcus Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1994 Subject: Coatings -- Periodicals Desc: 44 p., illus., 28 cm.	Dynix: 55947-22 Call No.: 667.9 Fe ISBN: 093401017X Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS22 Year: 1994 Price: \$50.00

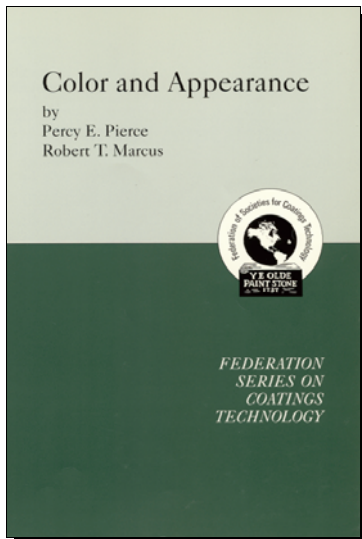


Table of Contents

- I. INTRODUCTION
- II. COLOR PERCEPTION
 - A. Source of Light
 - B. Object
 - C. Observer
- III. THEORIES OF COLOR VISION
 - A. Newton and Goethe
 - B. Young-Helmholtz Theory
 - C. The Opponent Color Theory
 - D. Other Theories
- IV. COMMUNICATING COLOR
 - A. Four Stages of Color Communication
 - B. Initial Color Specification
 - C. Color Collections
 - D. Color Order Systems
 - E. Munsell Color Order System
 - F. Natural Color System
- V. COLORIMETRY AND THE CIE SYSTEM FOR MEASURING COLOR
 - A. Standard Light Sources and Illuminants
 - B. The Object
 - C. The Standard Observer
 - D. Calculation of Tristimulus Values
 - E. Chromaticity Coordinates and Diagram
 - F. CIE L*a*b* Color Space
- VI. COLOR AND APPEARANCE MEASUREMENT INSTRUMENTS
 - A. Spectrophotometers
 - B. Colorimeters
 - C. Spectrocolorimeters
 - D. Goniospectrophotometers
 - E. Glossmeters
- VII. Color Differences and Tolerances
 - A. Color Difference Equations
 - B. Visual Tolerances
 - C. Instrumental Tolerances
- VIII. COLOR STANDARDS
 - A. Product Standards
 - B. Instrument Standards
 - C. Intermediate Standards
- IX. PIGMENTS AND COLOR MIXTURES
 - A. Pigment Selection
 - B. Inorganic Pigments
 - C. Organic Pigments
 - D. Metallic, Pearlescent, and Special Effect Pigments

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

- E. Pigment Dispersion and Stabilization
- F. Paste Colorants
- G. Intermix Systems

- X. COLOR MATCHING
 - A. Requirements of a Good Color Formula
 - B. Visual Matching
 - C. Instrumental Matching
 - D. Metamerism

- XI. BATCH CORRECTION
 - A. Visual Batch Correction
 - B. Instrumental Batch Correction

- XII. COLOR MATCHING CALCULATIONS
 - A. Saunderson Correction
 - B. Gall's Method — Initial Match Concentrations
 - C. Allen's Method — Tristimulus Refinement of the Initial Match

- XIII. CREATION OF A PIGMENT DATABASE FOR COMPUTER COLOR MATCHING
 - A. Pigment Calibration
 - B. Requirements for Accurate Calibration
 - C. Relative Calibration
 - D. Absolute Calibration

- XIV. HIDING POWER

- XV. TINTING STRENGTH
 - A. Black and Colored Pigments
 - B. White Pigments or Bases

- XVI. SUMMARY

- XVII. REFERENCES

- XVIII. BIBLIOGRAPHY

- XIX. GLOSSARY OF TERMS

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

The two major functions of a coating are protection and decoration. Color and appearance are important in the coatings industry because they describe the decorative qualities that our customers seek from our products. A knowledge of color and appearance is important to personnel in the sales, marketing, research and development, production, and quality control functions of the coatings industry.

This monograph is an introduction to color and appearance. It is intended for the individual working in the coating industry who is faced with color and appearance decisions in work either as a new employee or as the result of a new assignment. It treats the essential minimum knowledge required to deal effectively with the subject from the viewpoint of the coatings industry. It also serves as a bridge to more specialized sources of information that are required to solve color and appearance problems encountered in our daily work.

This monograph is divided into sections that deal with color perception, theories of color vision, communicating color, color measurement, geometric attributes of appearance, color and appearance measurement instruments, color differences and tolerances, color standards, pigments and color mixtures, color matching, batch correction, pigment calibration, hiding power, and tinting strength. It is recommended that these sections be read in sequence. Depending on individual needs, some of the later sections can be omitted. A glossary of color terms is provided at the end of the monograph along with a bibliography of useful sources of color and appearance information for the coatings industry.

Title	Location	Edition / Series / Misc.
34 Color and Its Reproduction		Edition: 2nd edition
Author: Field, Gary G.	Dynix: 89745	Series:
Publish.: GATF Press	Call No.: 535.6 Fi	
- place: Pittsburgh, PA	ISBN: 0883622017	
- date: ©1999	Shelf Adult Non-Fiction	Year: 1999
Subject: Color		Price: \$58.50
Desc: 475 p., illus. (some color), 27 cm.		

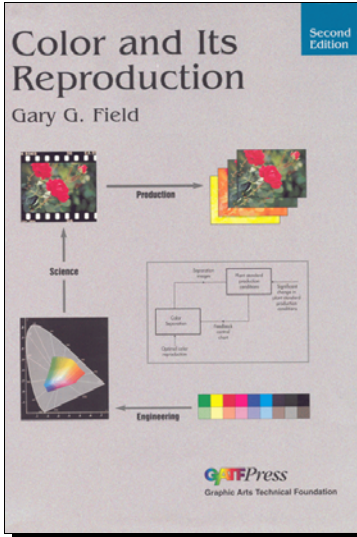


Table of Contents

- History of Color Reproduction
- Color Theory
- Color Systems
- Color Perception Fundamentals
- Complex Image Color Perception
- Color Measurement and Specification
- Paper and Ink
- Color Printing
- Printing Systems Analysis
- Color Originals
- Color Reproduction Objectives and Strategies
- Color Separation
- Color Proofing
- Color Communication
- Color Quality Strategy
- Appendix A: Symbols and Abbreviations
- Appendix B: Color-Related Standards and Specifications
- Appendix C: Color Difference Equations
- Appendix D: Equations for Color Reproduction
- Appendix E: Sources of Standards and Related Technical Information

Subjects

244 . Color

Reviews - Synopsis - Dust Jacket

Provides a fundamental, theoretical understanding of color and color reproduction. It should be read by anyone who needs to make intelligent decisions about color.

From the Inside Flap

Color and Its Reproduction is a comprehensive guide to color and its reproduction--in theory and in practice. This authoritative text is ideal for all those who must make informed judgments about color reproduction quality--graphic arts professionals, technical specialists, and print buyers. More than 40% of this revised edition is new; 15 chapters cover all aspects of the field in-depth, including: color theory, color systems, color perception fundamentals, color measurement, color printing, color reproduction objectives, color separation, color proofing, color communication, and color quality strategy.

About the Author

Gary G. Field is an Imaging Scientist and Professor of Graphic Communication at the California Polytechnic State University. He is a leading authority on color reproduction and printing quality and has lectured widely on these subjects in the United States, Britain, Australia, and Canada.

Book News, Inc. Review

A full reference to the fundamentals of color science, engineering, and reproduction as understood and practiced in the printing and related industries. First explores the historical and theoretical foundation of the color reproduction process, including perception and measurement. Then describes reproduction practices from such perspectives as on the ink-paper-press system, color originals and separation, systems analysis, objectives, requirements of individual printing markets, proofs, and communication techniques. Includes a glossary without pronunciation guides. Updated from the 1988 edition. -- Copyright © 1999 Book News, Inc., Portland, OR All rights reserved

Title	Location	Edition / Series / Misc.
805 Color for Science, Art and Technology Author: Nassau, Kurt (editor) Publish.: Elsevier - place: Amsterdam, The Netherlands - date: ©1998 Subject: Color Desc: xvii, 491 p., illus. (some color), 25 cm.	Dynix: 99410 Call No.: 535.6 Co ISBN: 0444898468 Shelf Reference	Edition: Series: Azimuth Series: Vol. 1 Year: 1998 Price: \$118.50

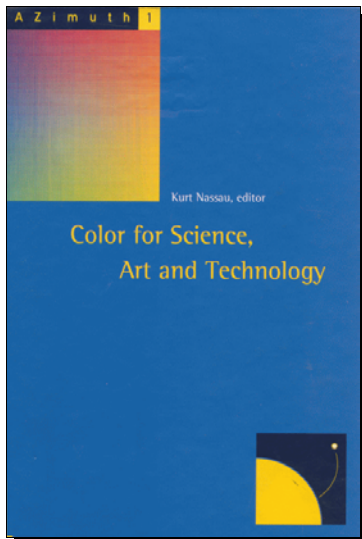


Table of Contents

Preface
 List of Contributors
 Biographical Notes

Section I. THE SCIENCE OF COLOR

1. Fundamentals of Color Science
2. The Measurement of Color
3. Color Vision
4. The Fifteen Causes of Color

Section II. COLOR IN ART, CULTURE AND LIFE

5. Color in Abstract Painting
6. Color in Anthropology and Folklore
7. The Philosophy of Color
8. Color in Plants, Animals and Man
9. The Biological and Therapeutic Effects of Light

Addendum: Double Blind Testing for Biological and Therapeutic Effects of Color

Section III. COLORANTS, THE PRESERVATION AND THE REPRODUCTION OF COLOR

10. Colorants: Organic and Inorganic Pigments
11. Colorants: Dyes
12. Color Preservation
13. Color Imaging: Printing and Photography
14. Color Encoding in the Photo CD System
15. Color Displays

Subjects

244 . Color

Color Section
 Index

Reviews - Synopsis - Dust Jacket

The aim of Color for Science, Art and Technology is to assemble a series of chapters, written by experts in their fields, covering the basics of color — and then some more. In this way, readers are supplied with almost anything they want to know about color outside their own area of expertise. The diverse chapters address color perception, biological and therapeutical aspects of color, color in abstract art, color measurement, color vision, pigments and dyes, color preservation, and more.

From the Preface: "...The aim has been to avoid excess technicalities, yet some topics would be meaningless without them. Some chapters, such as those on color measurement, color perception, and color reproduction, require some mathematical details in view of the astonishing complexities involved. Others, such as those on the causes of color, colorants, and color preservation, need to be grounded in the chemistry and physics involved...The attempt has always been made to include the necessary fundamentals for those whose background lies in other fields. Some overlap was accepted so that chapters should be able to stand on their own to a significant extent, always excepting the basic concepts covered in Chapter 1, which are prerequisite for almost all the other chapters..."

Target Audience: Color measurement experts, dye and pigment researchers, artists, graphic designers, and any other reader with a broad-based interest in color.

Editorial Reviews

From Book News, Inc.
 Dedicated to the proposition that color serves as a bridge linking science, art, and technology, 13 contributors address specific aspects of the topic in each mode: the fundamentals of color science (definition, Newton's spectrum,

measurement, theories of color and color vision); color in art, culture, and life (in abstract painting, in anthropology and folklore, in plants, animals, and man, the philosophy of color, biological and therapeutic effects of color); and colorants: the preservation and reproduction of color. Includes 39 color plates complementing points in the text. Book News, Inc.®, Portland, OR

PREFACE:

The aim of this book is to assemble a series of chapters, written by experts in their fields, covering the basics of color — and then some more. This should supply what almost any reader might want to know about color in areas outside their own expertise. Thus the color measurement expert, as well as the general reader, can find here information on the perception, causes, and uses of color. For the artist there are details on the causes, measurement, perception, and reproduction of color. And there are few indeed who would not want to know more about color in anthropology, art, medicine, nature, and about the philosophical aspects of color.

It would be easy to decide on the topics to be included in a multivolume work covering all aspects of color. However there might be a problem in how to limit the number of volumes. To make the same decision for a one-volume work of reasonable size presents a real challenge. I was greatly helped in the early stages of the selection process by Dr. Eric Melse of Voorburg, the Netherlands; he subsequently resigned as co-editor because of the pressure of other obligations.

Each chapter easily could have been many times its final length; several of the contributors have indeed published book-length treatments on their specialties. Yet the publisher's limitation on length had to be taken seriously. The fact that most of the contributors were ultimately annoyed with me for length restrictions suggests that I was uniformly unfair! Contributors encompass both academia and industry (both in several instances) and were selected to be international in range. Some are specialists in advanced research in their field, others are educators or generalists with a broad overview. Diversity was the aim.

The attempt has been made to cover not just the fundamentals, but also to include work on the frontiers. Two examples are a new approach to testing for the biological and therapeutic effects of color in the addendum to Chapter 9, and the encoding of color in a photo compact disk system of Chapter 14 with its surprising complexity.

Within each chapter, authors were requested to indicate directions of future efforts, where applicable. One might reasonably expect that all would have been learned about color in the more than three hundred years since Newton established the fundamentals of color science. The situation is far from it: the measurement of color still has unresolved complexities (Chapter 2); many of the fine details of color vision remain unknown (Chapter 3); every few decades a new movement in art discovers original ways to use color (Chapter 5); the philosophical approach to color has not yet crystallized (Chapter 7); new pigments and dyes continue to be discovered (Chapters 10 and 11); the study of the biological and therapeutic effects of color is still in its infancy; and so on. Color remains vigorously developing toward maturity.

A most difficult decision involved the application of color in fields extending from the pure arts, such as painting, to the applied, decorative, and commercial areas such as fashion, interior decorating, packaging, and advertising. Since the concepts in the latter groups change periodically as styles change, often on a monthly basis, I decided not to include these topics. The use of color in painting, however, changes only slowly with time. There have been many discussions of the use of color in the paintings of earlier periods, but the twentieth century is mostly neglected; it is therefore a pleasure to have abstract painting covered.

The aim has been to avoid excess technicalities, yet some topics would be meaningless without them. Some chapters, such as those on color measurement, color perception, and color reproduction, require some mathematical details in view of the astonishing complexities involved. Others, such as those on the causes of color, colorants, and color preservation, need to be grounded in the chemistry and physics involved. To produce absolute uniformity and consistency in any such multi-author work might be desirable, but would have required unreasonable effort and ultimately would be of little value. The reader will find that some chapters have many references, while others have only a few or even none. Detailed referencing was felt to be unnecessary where a few extended treatments cited in the "Further Reading" section are available and where these treatments provide both great depth and more than adequate referencing.

The attempt has always been made to include the necessary fundamentals for those whose background lies in other fields. Some overlap was accepted so that chapters should be able to stand on their own to a significant extent, always excepting the basic concepts covered in Chapter 1, which are prerequisite for almost all the other chapters. Some parts of Chapter 1 may seem to be trivial or self-evident, but it is always essential to build from a solid foundation.

There exist many erroneous ideas on color. As one example, we are usually taught in school that there is just one set of three specific primary colors. Since erroneous elementary ideas could lead to the misinterpretation of advanced concepts, such essential basics are covered in Chapter 1. This chapter is part of the first section the science of color,

which also contains chapters on the measurement of color, color perception, and on the fifteen physical and chemical causes of color.

The next section deals with color in art, culture, and life, covering the uses of color in abstract painting of the twentieth century; the views on color from anthropology and folklore and from philosophy*; color in plants, animals, and man; as well as the biological and therapeutic effects of light and color. This last is a subject of much controversy but of almost no well-controlled experimental studies; appended is the outline for a new approach to the necessary double-blind investigations.

The last section covers technological aspects: colorants, pigments, and their preservation; color printing and photography; the Photo CD system; and color displays as used in television and computer displays.

I have also included in Chapter 1 a very brief discussion of three universal paradigms involved in the basics of modern science. Although not strictly necessary for understanding the nature of color, they are an essential part of the nature of light. These important paradigms are fundamental models of science which are at odds with our everyday experiences; each forced a radical change in our understanding of the working of the universe. Two of these three paradigms have been generally accepted and continued exposure has dulled us to their weirdness.

The first great paradigm, the constancy of the speed of light as well as the inability of matter to travel as fast as or faster than light, derives from Einstein's relativity theory. Here, there are the equivalences of space and time, of mass and energy, as well as of acceleration and gravity.

The second great paradigm, quantum theory, explains the equivalence of the particle and wave characteristics of light (as well as of small quantities of matter such as electrons and atoms). Quantum theory had its roots in the early disagreements between the views of Newton and Hooke on the nature of light some 300 years ago. It was not resolved to general satisfaction until about the middle of this century.

The third great paradigm, involving the non-locality part of quantum theory, was first taken seriously by Einstein, who never felt comfortable with quantum theory because of it. This problem was outlined in the Einstein, Podolski, and Rosen paper of 1934 and clarified as Bell's Paradox in 1964. Only in the last few years has a series of increasingly more elegant experiments demonstrated that quantum theory is correct and that it is very, very weird indeed, as is briefly indicated in Chapter 1. There is as yet no generally accepted interpretation of the non-locality problem and most physicists have preferred to ignore its complexities and implications.

I bring up these paradigms because I believe that there is need for one more paradigm, a global one that would resolve the dichotomy between the seemingly irreconcilable approaches and attitudes in the "Sciences" and in the "Arts"; the emphasis is meant to indicate what I consider to be the arbitrariness of such designations. The origins of this dichotomy can be traced back to the differing approaches to color of Newton and Goethe outlined in Chapter 1. It is only now being seriously faced by authors such as Zajonc, as also briefly discussed there. The nature of the paradigm required to resolve this issue has yet to be defined. This volume is dedicated to the proposition, that there is much common ground between the sciences and the arts and that color is a major connecting bridge.

INTRODUCTION:

In this chapter we consider some basic concepts which are the essential underpinnings of all that follows. Some of these ideas are taught even as early as kindergarten, yet complexity is usually avoided at that level. Many may therefore continue to believe that there is just a single set of three primary colors, as one example. Again, it is often assumed that there is a unique color perception for each wavelength of the spectrum and that a given wavelength is perceived by everyone as the same color, whatever the circumstances, and that there is one unique, absolute white. So the aim here is to outline some color fundamentals and correct those misconceptions which may present difficulties in grasping more subtle advanced concepts later.

The reader should not be discouraged if some of this matter appears to be too abstruse or too naive. Merely skimming across such material should serve: this will acquaint the reader with its existence and will provide the setting for some of the items that follow. It is most desirable for such a reader to continue to the end, since the level in this, and indeed in all of the chapters of this book, varies considerably from section to section.

Defining color

Since color is a sensation unrelated to anything else, it is essentially impossible to give a meaningful definition except indirectly and circularly; for example: "Color is that aspect of perception which distinguishes red from green, etc." A useful functional definition might be: "Color is that part of perception that is carried to us from our surroundings by differences in the wavelengths of light, is perceived by the eye, and is interpreted by the brain". Again, we could say: "Our brain perceives color when a non-white distribution of light is received by the eye". Yet it is easy to find flaws in and exceptions to any such definition. The painful tribulations of the Committee on Colorimetry of the Optical Society of

America (Committee on Colorimetry 1953) to reach consensus on an adequate definition of color makes interesting but ultimately frustrating reading.

The term 'color' describes at least three subtly different aspects of reality. First, it denotes a property of an object, as in "green grass". Second, it refers to a characteristic of light rays, as in "grass efficiently reflects green light while absorbing light of other colors more or less completely". And, third, it specifies a class of sensations, as in "the brain's interpretation of the eye's detection of sunlight selectively reflected from grass results in the perception of green". By careful wording one could always indicate which of these three (and other) types of meaning is intended in any given usage. In actual practice the distinction among such usages of color is not usually made, nor is any effort made here to do so. The mere awareness that such different aspects exist enables one to identify the intended meaning and save the use of many additional words. At the same time, it will be obvious to the discerning that some philosophical discussions on color are meaningless just because of confusion among such different aspects.

Sometimes such differences are, indeed, 'black' (in the strictest sense) as used for the 'color' of a paint or the surface of an object has an exact meaning, namely zero transparency and zero reflectivity for all visually-perceived light. As the characteristic of a light ray, 'black' has no meaning at all. And in perception, the ideal 'black' is merely the total absence of visual sensation from a given region. These distinctions are also important to those who are involved with precise color communication (see Chapters 2 and 13 to 15), particularly when such communication places them in contact with others in different professions: these are circumstances where misunderstanding and confusion can so easily result.

Early views on color

The Greek philosopher, Plato, about 428-348 BC, held a pessimistic view on the possibility of a science of color:

"There will be no difficulty in seeing how and by what mixtures the colors are made ... For God only has the knowledge and also the power which are able to combine many things into one and again resolve the one into many. But no man either is or ever will be able to accomplish either the one or the other operation" (MacAdam 1970, p. 1).

The view of the Greek philosopher Aristotle, 348-322 BC, dominated in the pre experimental stage of science. Aristotle (or at least the writing attributed to him) noted that sunlight always becomes darkened or less intense in its interactions with objects and therefore viewed color as a mixture of white and black. To some of the Greeks it was the eye that sent out rays, acting like feelers, which detected the color of objects. Others believed that luminous objects emitted particles which were detected by the eye, while yet others believed that these objects emitted waves.

Newton, the spectrum, and "colored" light

The beginning of the science of color was described by Sir Isaac Newton, English mathematician and astronomer (1642-1727) in a report in the Philosophical Transactions for 1671:

"... in the beginning of the Year 1666 ... I procured me a Triangular glass-Prisme ... having darkened my chamber, and made a small hole in my window-shuts, to let in a convenient quantity of the Sun's light, I placed my Prisme at its entrance, that it might be thereby refracted to the opposite wall. It was at first a very pleasing divertisement to view the vivid and intense colours produced thereby; but after a while applying myself to consider them more circumspectly, I became surprised to see them in an oblong form; which, according to the laws of Refraction ... I expected should have been circular... Comparing the length of this coloured Spectrum with its breadth, I found it about five times greater; a disproportion so extravagant, that it excited me to a more than ordinary curiosity of examining from whence it might proceed" (Newton 1671).

Newton chose to designate the spectrum as containing seven major colors: red, orange, yellow, green, blue, indigo, and violet (a modern mnemonic is "Roy G. Biv"), possibly by analogy with the seven notes, A through G, of the musical scale. Newton himself was careful to explain that there are many more colors in the spectrum in addition to these seven. All colors that we can possibly perceive are the colors in this pure spectrum and various combinations of these colors with each other and with white (namely by diluting a colored paint with white paint or a colored light beam with white light) and 'black' (namely by darkening a colored paint by adding black paint or by reducing the intensity of a colored light beam; but see below; this is frequently and incorrectly called "mixing with black", and we may also do so in what follows). These combinations of colors also include those colors that are not present in the Newton's spectrum, such as purple, magenta, pink, olive, and brown.

Newton also organized his spectral colors in the form of a color circle or wheel (Newton 1730) with white at the center of the circle, an approach frequently used by artists and in some versions of color theory. It can be said realistically that color is in the eye of the beholder. It is based on the spectrum as perceived by the eye and interpreted by the brain. Newton knew that there is no 'colored' light: there is only the sequence of colors of the spectrum, as well as combinations of these. In Newton's own words:

"And if at any time I speak of Light and Rays as coloured or endued with Colours, I would be understood to speak not philosophically and properly, but grossly, and accordingly to such Conceptions as vulgar People in seeing all these

Experiments would be apt to frame, For the Rays to speak properly are not coloured. In them is nothing else than a certain Power and Disposition to Stir up a Sensation of this or that Colour" (Newton 1730).

The eye in perceiving the range of colors functions quite differently from the ear in perceiving the range of tones. The ear is able to separate the tones of many instruments sounding together, recognizing the presence of a piccolo in a full orchestra. The eye always perceives only a single color at any point, whether this be a spectrally pure yellow, an identically visually-perceived equivalent mixture of green and red, and so on. Terms such as 'yellow light' are nevertheless widely used (for example in what follows) and need not produce any confusion if this range of possibilities is kept in mind. The eye of course has a much superior resolution of detail and of motion than does the ear.

Title	Location	Edition / Series / Misc.
35 Color Science: Concepts and Methods, Quantitative Data and Formulae		<i>Edition:</i> 2nd edition
<i>Author:</i> Wyszecki, Gunter and W. S. (Walter Stanley) Stiles	<i>Dynix:</i> 00296	<i>Series:</i> Wiley Series in Pure and Applied Optics
<i>Publish.:</i> John Wiley & Sons	<i>Call No.:</i> 535.6 Wy	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0471021067	
<i>- date:</i> ©1982	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1982
<i>Subject:</i> Color		<i>Price:</i> \$25.00
<i>Desc:</i> xv, 950 p., illus., 27 cm.		

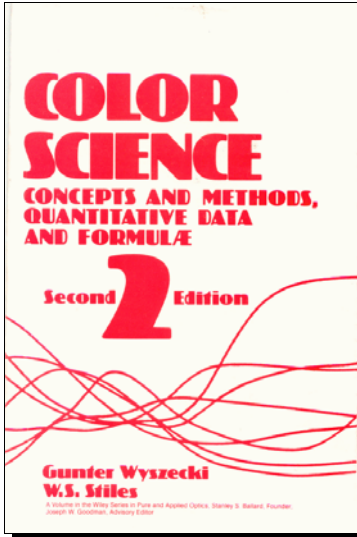


Table of Contents

- Physical Data
- The Eye
- Colorimetry
- Photometry
- Visual Equivalence and Visual Matching
- Uniform Color Scales
- Visual Thresholds
- Theories and Models of Color Vision
- Appendix
- References
- Indexes

Reviews - Synopsis - Dust Jacket

Book Description

Deals with all phases of light, color, and color vision. Provides comprehensive data, formulae, concepts, and procedures needed in basic and applied research in color vision, colorimetry, and photometry. Includes new and expanded material on the latest advances in color science, particularly in color matching, increment-threshold work, chromatic adaption, and the theoretical modelling of color discrimination and other color-vision phenomena.

Synopsis

Color in Business, Science, and Industry, 3rd Edition Deane B. Judd & Gunter Wyszecki Incorporating the most important practical and theoretical advances that have occurred in colorimetry in recent years, this volume presents the basic concepts of human color vision and the problems of measurement, specification, and control. This Third Edition gives an extended treatment of colorant formulation, perceptibility and acceptability of color differences, color rendering of light sources, and colorimetry of fluorescent materials. Essential tables and formulae for exact color measurement and production control are also included.

Subjects

244 . Color

Title	Location	Edition / Series / Misc.
36 Color: A Multidisciplinary Approach		<i>Edition:</i>
<i>Author:</i> Zollinger, Heinrich, 1919-	<i>Dynix:</i> 89746	<i>Series:</i>
<i>Publish.:</i> Verlag Helvetica Chimica Acta; Wiley-VCH,	<i>Call No.:</i> 535 Zo	
<i>- place:</i> Zurich, Switzerland / New York, NY	<i>ISBN:</i> 3906390187	
<i>- date:</i> ©1999	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1999
<i>Subject:</i> Color -- Analysis		<i>Price:</i> \$98.50
<i>Desc:</i> x, 258 p., illus. (some color), 24 cm.		

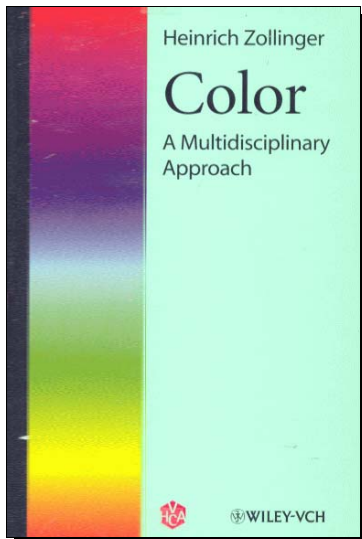


Table of Contents

- Introduction
- What Do We Mean by Color?
- Historical Survey
- Physics of Light and Color
- The Nature of Light
- Color by Refraction: Newton's Experiments
- The Rainbow
- Peacock's Colors: A Phenomenon of Interference
- How Many Causes of Color Do We Know?
- Chemistry of Color
- History of Colorants
- Inorganic Pigments
- Organic Colorants
- Correlations Between Chemical Structure and Color
- Colorimetry
- Color Measurement
- Color: Harmony or Contrasts?
- How Do We See Colors?
- Perception and Cognition of Color
- Anatomy of the Human Eye
- Photochemistry in the Retina
- What the Eye 'Tells' the Brain
- Psychophysical Investigations into Color Vision
- Color Vision in Animals
- How Do We Name Colors?
- From Color Chemistry to Color Linguistics
- The Phenomenon of 'Human Language'
- Categorization of the Color Space by Color Naming
- Color and Phonological Universals
- Influence of Culture on Color Naming
- Color in Art in Other Cultural Activities
- Color in European Art from Antiquity to Gothic
- From Renaissance to Neo-Impressionism
- Color in Twentieth-Century Art
- Color in the Art of Non-European Cultures:
- The Case of Japan
- Color in Psychology
- Goethe's Zur Farbenlehre
- Sound- Color Synesthesia
- Epilogue
- Name Index
- Subject Index

Subjects

246 .	Colors -- Analysis
361 .	Color vision
362 .	Colorimetry
474 .	Color in art
494 .	Color -- Psychological aspects

Reviews - Synopsis - Dust Jacket

This book leads us through a fascinating tour of the world of color. Geared to laymen and scientists alike, it describes color as it pertains to a variety of disciplines--from biology and mineralogy to physics and chemistry to neuroscience and psychology. Heinrich Zollinger, prolific writer of books on color chemistry, discusses the theoretical underpinnings of light and color, the causes of color, inorganic pigments and organic colorants, color measurement, perception and cognition

of color, what does the eye tell the brain, color vision in animals, and much more.

Synopsis

The intention of this text is to assist those interested in the potential interplay of various aspects of colour. It describes facts, experiments, examples and observations, and gives an interpretation to lead to an understanding or to the recognition that there are colour phenomena.

Title	Location	Edition / Series / Misc.
37 Colour Index		Edition: 2nd edition
Author: Society of Dyers and Colourists	Dynix: 08254	Series:
Publish.: Society of Dyers and Colourists; American Association of Textile Chemi	Call No.: 667.2 So	
- place: Bradford, [Yorkshire], UK / Lowell, MA	ISBN:	
- date: ©1956	Shelf Reference	Year: 1956
Subject: Dyes and dyeing		Price: \$250.00
Desc: xxviii, 809 p., 29 cm. (Includes 1963 Supplement)		

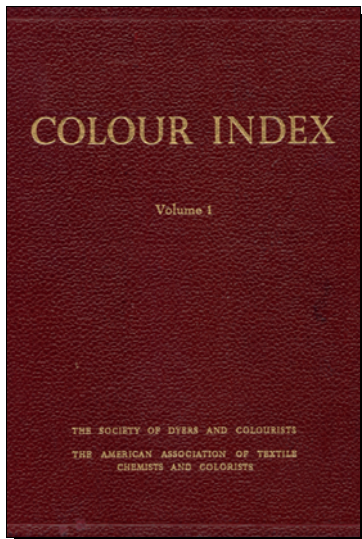


Table of Contents

Volume 1 - PART I: Dyes and Pigments classified according to their usage
 Acid Dyes
 Mordant Dyes
 Basic Dyes
 Disperse Dyes
 Natural Dyes and Pigments
 Food Dyes
 Leather Dyes

Volume 2 - PART I: Dyes and Pigments classified according to their usage
 Direct Dyes
 Sulphur Dyes
 Vat Dyes
 Ingrain Section:
 Ingrain Dyes
 Azoic Diazo Components
 Azoic Coupling Components
 Azoic Compositions
 Oxidation Bases
 Pigments
 Solvent Dyes
 Fluorescent Brightening Agents
 Developers
 Reducing Agents

Volume 3 - PART II: Dyes and Pigments classified according to their chemical constitutions
 Nitroso
 Nitro
 Azo
 Monoazo
 Disazo
 Trisazo
 Polyazo
 Azoic
 Stilbene
 Diphenylmethane
 Triarylmethane
 Xanthene
 Acridine
 Quinoline
 Methine and Polymethine
 Thiazole
 Indamine and Indophenol
 Azine
 Oxazine
 Thiazine
 SuWur
 Lactone
 Aminoketone
 1-hydroxyketone
 Anthraquinone

Subjects

245 .	Colors
250 .	Dyes and dyeing
251 .	Dyes and dyeing -- Chemistry

Volumes

Vol 1: Part I-Dyes and Pigments (Usage)
Vol 2: Part I-Dyes and Pigments (Usage)
Vol 3: Part II-Dyes and Pigments (Chemical Constitutions)
Vol 4: Part III-Abbreviations
Vol 5: 1963 Supplement

Indigoid
Phthalocyanine
Natural Organic Colouring Matters
Oxidation Bases
Inorganic Colouring Matters
Intermediates Index
Empirical Formula Index

Volume 4 - PART III: Abbreviations used in the Colour Index
Code Letters used for Dye and Pigment Manufacturers
Dye and Pigment Manufacturers' Names, Addresses and Code Letters
Abbreviations for Scientific Data and Literature References
Fastness Tests
Index to Patents relating to the Manufacture of Dyes and Pigments
Index of Patents relating to the Use of Dyes and Pigments
Commercial Names Index
Conversion Tables:
Table 1 Part I Designation (in serial order) - Part II Number — 1st Edition C.I. Number
Table 2 Part II Number — 1st Edition — Schultz 7th Edition
Table 3 AATCC 1957 Prototype Number — Part I Designation — Part II Number
Table 4 C.I. 1st Edition—2nd Edition Part II — 2nd Edition Part I
Additions and Amendments
Hue Indication Chart

CONTENTS OF SUPPLEMENT (1963):
Code Letters of Dye and Pigment Manufacturers
Dye and Pigment Manufacturers' Names, Addresses and Code Letters
Fastness Properties
Additions and Amendments to Second Edition

VOLUME 1 Acid Dyes
Mordant Dyes
Basic Dyes
Disperse Dyes
Natural Dyes
Food Dyes
Leather Dyes

VOLUME 2 Direct Dyes
Sulphur Dyes (completely rewritten)
Vat Dyes
Ingrain Dyes
Azoic Dyes
Oxidation Bases
Reactive Dyes (new section)
Pigments
Solvent Dyes
Fluorescent Brightening Agents
Developers
Reducing Agents

VOLUME 3 Dye and Pigment Constitutions
Intermediates Index
Empirical Formulae

VOLUME 4 Patent Index
Commercial Names Index (completely rewritten)

Reviews - Synopsis - Dust Jacket

FORWARD:

The first edition of the Colour Index was published in 1924. Quickly it became recognised as the standard work on the subject in the English language. Shortly before the Second World War the Society of Dyers and Colourists was planning the preparation of a new edition of the Index as many of the dyes listed in it had become obsolete and many new

dyes—indeed complete new ranges of dyes—had been introduced since the original publication. The outbreak of the war interrupted these plans and the work could not recommence until 1945.

A Colour Index Editorial Panel was set up in 1945 by the Society of Dyers and Colourists and at the same time the American Association of Textile Chemists and Colorists was invited to collaborate in the preparation of the new edition. The two organisations agreed that the work of compiling the new Index should be a joint undertaking. In view of the information received from users of the original Index, it was decided that it would be advantageous to re-cast it in an entirely new form and to include much more information than was contained in the first edition. Every dyemaker in the world was invited to supply information for the new edition. Many firms collaborated in this way and we acknowledge their help with gratitude. The task of the Editorial Panels proved to be much greater than was anticipated originally and has required of them and their helpers a very great amount of detailed and tedious work. Perhaps it is appropriate that their task should have been completed in the year which marks the centenary of Perkin's discovery of Mauve.

It is recognised that any work of reference will tend to become out of date and it is the intention of the Society and the Association to keep the Index up to date by the issue of supplementary volumes as occasion demands.

FOREWORD TO THE SUPPLEMENT (1963):

In the Foreword to the Second Edition the Presidents of the Society of Dyers and Colourists and the American Association of Textile Chemists and Colorists stated that it was intended to keep the Index up-to-date by the issue of supplementary volumes as occasion demanded. This first Supplement, which comes seven years after the publication of the Second Edition, embodies additions and amendments to the information given on dyes described therein together with information on new dyes introduced since that time.

Some of the ground has been covered by the regular issue of Additions and Amendments up to July 1962, but the information about the new dyes, i.e., dyes which differ in chemical constitution from any previously listed in the Colour Index, has been limited to C.I. Generic Names, commercial names and, in some cases, hues and constitutions. About 1250 new dyes, rather more than a quarter of the number in the Second Edition, have been reported by manufacturers and are treated in this Supplement in the same way as were the dyes in the Second Edition.

The data given in this Supplement include and supersede all the information contained in the quarterly Additions and Amendments numbered 1 to 16. In addition it contains material relating to properties and some commercial names which have not appeared in the Additions and Amendments. The arrangement of the Supplement follows closely the order used in the Second Edition, and the more important developments are given below.

It will be noticed that some new generic names are accompanied solely by the statement "This C.I. Generic Name is discontinued". The explanation is that the dye or dyes originally listed under this name have either ceased to be made or have been transferred to another entry.

It has been necessary to compile a completely new Commercial Names Index because of the large number of new commercial names and the many changes in the original index but, to save space, obsolete names recorded as such in the Second Edition, and especially those of the I.G., have not been repeated, although obsolete range names have been retained. Where dyes whose constitutions have been disclosed are no longer known to be manufactured, the generic names have been retained to preserve the connection with the chemical constitution. Users of the Commercial Names Index, when referred to Volumes 1 or 2, should refer also to the Supplement to determine whether any additions or deletions have been made.

An important feature of the Supplement is the introduction of the new usage group of C.I. Reactive Dyes which appears between the Oxidation Base and Pigment sections. It comprises 89 entries and the next issue of Additions and Amendments will contain additional dyes which, unfortunately, could not be included as the Supplement went to press. The section on Sulphur Dyes has been completely rewritten and the generic name C.I. Solubilised Sulphur Dye is now restricted to the water-soluble non-substantive sulphur dyes. A new generic name, C.I. Leuco Sulphur Dye, has been introduced for the water-soluble sulphur dyes which are directly substantive. This is elaborated in the preamble to the section.

The section on Food Dyes is largely a record of the changes made in the permitted lists published in the United Kingdom, the United States of America, and Western Germany. Because of possible health hazards the use of colouring matters in food is constantly under Government review in many countries. It is essential to obtain from an authoritative official source the latest information on the regulations in force in any country where it is proposed to offer colouring matter for foods.

Reference is made to developments in methods for fastness testing subsequent to the detailed methods which were given in the Second Edition.

The proportion of new dyes to which a constitution number could be given is much less than in the Second Edition because no information regarding the constitution of the majority of the new dyes has been supplied by the colour manufacturers.

The success of the Second Edition was due in no small measure to the valuable co-operation extended to both the Society and the Association by colour makers throughout the world who, in the preparation of this Supplement, have again evinced the same public spirit.

The task of producing the Supplement, although not so arduous as the preparation of the Second Edition because of the difference in the mass of material to be handled and the experience gained in producing the Second Edition has, nevertheless, involved members of both the Society's Editorial Board and the Association's Editorial Committee in considerable effort. As in the past, they have been encouraged and supported by the goodwill of their employers.

INTRODUCTION

Before the coal tar industry, founded by Perkin in 1856, came into existence the number of colouring matters available to users in all branches of tinctorial technology including the dyeing of textiles or leather, the printing of textiles or wallpaper, the manufacture of paints and printing inks, and so on, was very limited. All the colouring matters then available, with the exception of two or three, e.g. Picric Acid, form only a small part of the sections devoted in this Index to natural organic dyes and pigments and to inorganic colouring matters.

Perkin's discovery of Mauve, his recognition that it was a dye, and his commercial exploitation of it, encouraged other workers to attempt to produce new colouring matters with the result that the number of colouring matters available to the users rapidly increased and has continued to expand steadily ever since and its growth shows no signs of diminishing. Over the years, the rate of increase has been about fifty new chemical entities a year, i.e. fifty dyes which had not been manufactured before, in addition there have and are being constantly brought on to the market modifications of dyes already produced and of course firms start to make products already being made by others.

This increase in available colouring matters soon created the need for a reference book and this need was first met by J. W. Slater who compiled *The Manual of Colours and Dyewares* (London, 1870; second enlarged edition 1882). In this work colouring matters were listed strictly in alphabetical order and the same system was also followed by G. H. Hurst in his *Dictionary of the Coal Tar Colours* (London, 1892; second edition 1896) and by C. Rawson, W. M. Gardner and W. F. Laycock in their *Dictionary of Dyes, Mordants and Other Compounds used in Dyeing and Calico Printing* (London, 1901; other editions 1905 and 1926). During these years there was also considerable output of books on the manufacture of coal tar dyes and some of them dealt with all the products known at the time of their publication, e.g. A. Lehne's *Tabellarische Uebersicht über die künstlichen organischen Farbstoffe* (Berlin, 3 vol. 1893—1906) and L. Lefèvre's *Traité des Matières Colorantes* (2 vol. Paris, 1896). In addition the dye and pigment makers produced, and still produce, valuable literature but naturally their lists contain only the dyes and pigments made by the firm issuing them.

By 1885 the need for a more systematic method of listing dyes and pigments became apparent and one of the earliest efforts in this direction was that of W. R. Richardson who in that year published *A Classification of the Coal-Tar Colours giving their Commercial Names, Chemical Nomenclature and Chemical Formula* (JSDC 1 (1885) 251—6) his method being to classify the colouring matters according to their hues arranged in spectral order.

Richardson's work was followed three years later by the *Tabellarische Uebersicht der im Handel-befindlichen künstlichen Organischen Farbstoffe* compiled by G. Schultz and P. Julius (Berlin, 1888). Schultz and Julius classified the colouring matters solely by their chemical constitutions. Their work was a great success and remained the standard work on the subject for nearly forty years and it is still the standard work in the German language. Seven editions have appeared (second 1891, third 1897, fourth 1902, fifth 1914, sixth (reprint of the fifth) 1923 and seventh 193 1—39, the latter having L. Lehmann as the editor). The original pattern was retained throughout. An English translation of the second edition of this work was published in London in 1894 as *A Systematic Survey of the Organic Colouring Matters* by Drs. G. Schultz and J. Julius translated and edited with extensive additions by A. G. Green, a second edition of this translation was issued in 1904 and a reprint issued in 1908.

The renaissance of the British dye making industry during the 1914—18 war again emphasised the importance of the need for an up-to-date survey of the available commercial dyes and the work of compiling such a survey was undertaken by the Society of Dyers and Colourists. Co-operative work, with F. M. Rowe as the editor, resulted in the publication of the *Colour Index* in 1924 and of the *Supplement* in 1928. Rowe and his colleagues followed the example of Schultz and Julius in arranging the dyes according to their chemical constitutions. It had all along been realised that frequent supplements would be necessary to keep the *Colour Index* up-to-date but the world-wide economic depression of the early 1930's prevented any further work being done on the *Colour Index*. With the economic recovery of the late 1930's the Society began to consider bringing the *Index* up-to-date but the outbreak of war in 1939 effectually put such plans

into cold storage.

As soon as the war was over in 1945 the Society took up the work again and invited the collaboration of the American Association of Textile Chemists and Colorists who readily accepted. Careful consideration of the format of the Colour Index showed that while listing by constitution was most desirable for use by colour chemists it was by no means the best arrangement for users of colouring matters and it makes no provision for dealing with dyes whose constitution is unknown or has not been disclosed. After much consideration and discussion it was decided to divide the Colour Index into two parts; one part (Part I) to contain the dyes grouped according to their recognised usage categories (the dyes inside each group being arranged in spectral hue order) and the other part (Part II) to contain the dyes grouped according to their chemical constitutions. Each dye in Part I is given a usage number, e.g. C.I. Acid Yellow 1, and each constitution in Part II a five figure number, this system renders the necessary cross referencing very simple. It was also decided to have a third part which should consist essentially of an alphabetical list of commercial names together with the Part I and Part II numbers.

In Part I all the known commercial names under which a dye is sold are given. Names of dyes which are no longer commercially made and names which are no longer used either because they have been discarded by the dye maker, or were used by firms who have gone out of existence, are not included in Part I. It was, however, decided that the names of all homogeneous dyes made by the former I.G. should be listed in the commercial names index in Part III and that it should also contain all obsolete range names and the range names under which dyes and pigments are sold by some firms who are purely merchants and not manufacturers. In addition to the lists of names Part I also contains the methods of applying the colouring matters, their usage, the more important fastness properties and certain other basic data.

In Part II there is given the structural formula for the dye, methods of manufacture and, where known, the inventor and the literature, including patents.

Part III contains lists of the abbreviations used in the Index, a list of dye and pigment makers with their abbreviations, details of the fastness tests, patents index, commercial names index and conversion tables equating the numbers given to dyes in this edition of the Colour Index with those given them in the first edition and in the seventh edition of Schultz and with the A.A.T.C.C. prototypes.

Part I consists of two volumes, Parts II and III of one volume each. To simplify ease of reference each volume is paged with four figure numbers, the first digit in each number indicating the volume in which that page is to be found.

The compilation of this Index has been a great co-operative work extending for over a decade between the members of the Society's Editorial Panel and the Association's Editing Committee. They sought the co-operation of all the dye makers in the world and with the exception of those in a few countries obtained it. Without the help readily accorded by most dye makers this Index could not have been compiled in the form in which it is now presented. But besides the dye makers the editorial bodies have received considerable help from numerous organisations, firms and individuals. It is an impossible task to mention them all by name but in some cases this help has been outstanding and in such cases special mention is made of them under the lists of the Editorial Panel and the Editing Committee. Both the Society and the Association desire to pay tribute to the public spirit of all those who have helped the compilers of this Index and the Editorial Panel and the Editing Committee express their appreciation and thanks for all the encouragement and help that has been so freely and willingly given to them.

In compiling this work judicious assessment and balancing has had to be made of the claims made by firms manufacturing the same product. It must be explicitly stated that neither the Society, nor the Association, nor any of the dye and pigment makers can guarantee that the results obtained by any user will be strictly in accord with the data given in this Index. It is indeed a well established custom in the dye and pigment making and using industries that all such statements are "without guarantee" for while a maker may guarantee the quality of his products he cannot guarantee that some one else has used them correctly. Nevertheless the greatest care has been taken in the presentation of the data given in this Index and all the proofs have been carefully checked and reviewed by the two editorial bodies and by the staffs of the dye and pigment making firms.

Title	Location	Edition / Series / Misc.
672 Complete Guide to Painting Your Home: Doing It the Way a Professional Does, Inside and Out <i>Author:</i> Luts, Jack, 1918- and Pete Peterson <i>Publish.:</i> Betterway Publications, Inc. <i>- place:</i> White Hall, VA <i>- date:</i> ©1989 <i>Subject:</i> House painting -- Amateurs' manuals <i>Desc:</i> 160 p., illus., 28 cm.	<i>Dynix:</i> 21208 <i>Call No.:</i> 698.1 Lu <i>ISBN:</i> 1558701192 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1989 <i>Price:</i> \$25.00

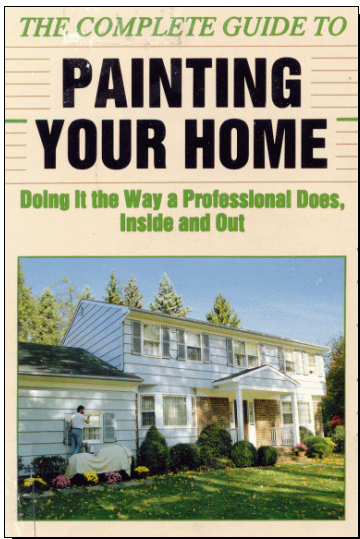


Table of Contents

- Introduction
- 1. About Paint
- 2. Preparation Exterior
- 3. Exterior Prime Coat
- 4. Exterior Finish Coat
- 5. Interior Painting
- 6. Painting a Room with Wallpaper
- 7. About Wallcoverings
- 8. How to Hang Wallcoverings
- 9. Staining
- 10. Refinishing Floors
- 11. How to Figure a Job — Inside and Out
- 12. Care of Brushes, Paint, and Ladders
- 13. Equipment
- 14. Helpful Hints
- 15. Do It Yourself — with Others
- 16. The Way We Used to Do It
- 17. Most Common Mistakes
- Glossary
- Forms
- Index

Subjects

509 .	House painting -- Amateurs' manuals
510 .	Interior decoration -- Amateurs' manuals

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

There is a world of difference between just covering a surface with paint, and painting...the way a professional does it. And there is a world of difference in cost between hiring a contractor to paint your house — inside or outside — and doing it yourself. This book shows the amateur — the average homeowner or renter — how to develop the skills of the professional painter, how to achieve a professional result at a do-it-yourself cost.

Written by a veteran painting contractor and his advertising agency brother-in-law, THE COMPLETE GUIDE TO PAINTING YOUR HOME is loaded with proven tricks of the trade; techniques GUARANTEED to save both time and money. Each chapter includes easy-to-follow instructions, supported by clear and informative photographs and illustrations. Separate chapters cover interior and exterior staining and hanging wallpaper.

Inside and outside estimating guides are included, as are detailed descriptions of every interior/ exterior paint and stain product, a complete glossary of painting and wall covering terms, as are illustrations of a range of brushes and other painting tools and accessories. This is a comprehensive guide and handbook, with scores of photographs and illustrations and many reproducible charts, forms, and checklists...all the help the amateur painter needs to plan, prepare for, and complete — even clean up after — a quality paint job.

- Packed with proven tricks of the trade guaranteed to save you time and money
- Easy to follow instructions in each chapter, supported by clear and informative photographs and illustrations
- Comprehensive chapters on interior and exterior staining and hanging wallpaper, and applying other wall coverings
- Special chapters on equipment and its care and maintenance
- A guide to estimating a job, inside and out
- Detailed descriptions of every interior/exterior paint and stain product, a complete glossary of painting and wall covering terms, a helpful guide to reading labels... much more.

INTRODUCTION:

If your idea of painting is "first you borrow a ladder," this book is for you. Even if you have already painted half a dozen house exteriors and a baker's dozen interiors, you should still read it because there's a good chance that half of what you're doing is wrong . . . and as much as half of what you should be doing has not been a part of your past performances. Don't believe it? Read on and see if I'm not right.

There is a world of difference between covering a surface with paint and painting as a professional does. By the time you finish this book you'll know exactly how a professional does it. Knowing how doesn't automatically turn you into a professional painter, but with a little practice you'll easily sharpen your skills and save yourself a lot of time, effort, and money. The quality of your work will also improve greatly.

I am not conspiring to put your neighborhood painting contractor out of business. On the contrary, if your home needs painting and you can afford to have it done, I recommend that you do have it painted by a professional. There are at least two good reasons: it will be done without short cuts, and it will be done in its entirety, within a short period of time. Many homeowners do half the job, then a sudden "crisis" somewhere else demands their time and part of the house goes unprotected for another winter.

In a very few paragraphs, I'll be getting into the actual work of painting, but first, allow me to present my credentials. J. Luts & Sons is a third generation painting firm in Madison, New Jersey, started in 1938 by my father, John Luts, Sr. Realizing that sons tend to know more than their fathers, my Dad arranged a three-year apprenticeship for me at another shop until I became a journeyman painter. Then he took me into his company as a full partner. By that time I still had a few things to learn, but I also knew that I had a pretty good teacher. Looking back, I realize that he was a fine craftsman as well as an excellent businessman. When my turn came, I made sure that my sons, Jim and Rick, learned the trade properly, and they are now running the company (assisted during the summer by my oldest son, Jack, an industrial arts teacher in the area).

We now do residential work primarily, but over the years we have done all kinds of painting and decorating including the beautiful Hartley Dodge Memorial Building (our town hall) and most of the churches in Madison at least once, both inside and out.

Madison is next door to Morristown, New Jersey, where George Washington and his Continental Army spent the winter of 1777 and endured the "terrible winter" of 1779-80. We're just a handful of miles from Fort Mifflin and from Jockey Hollow, where the Wicke House still stands. (If you're a Revolutionary War history buff, you know that a young lady named Tempe Wicke hid her horse in this house to prevent it being stolen by a small band of mutineering Pennsylvania Line soldiers...or so the story goes.)

In our part of the country, an old house is pre Revolution and it's surprising how many of these homes are still in use; most of them remarkably well preserved by the loving care of the owners...and good paint.

Madison is considered by many to be a "bedroom" community of New York City because a good percentage of our work force commutes the twenty- five miles into the city. More than a few of our customers are "board level" executives. It's been a common practice over the years for a number of our regular customers to hand us their keys when they take off for their winter vacations and expect to find their rooms redecorated on their return. Not to brag —just to make the point that J. Luts & Sons has worked for some very particular customers. We've had these families with us for three generations. Still do.

The fact that I've spent a lifetime as a practicing professional painter doesn't necessarily qualify me to write a book on the subject. But our paint store does. And that's the reason for this book. Each day that we're open, I give away a free painting lesson with just about every can of paint we sell.

It's the one-on-one conversations with our customers that have convinced me the average home owner who comes in our shop really would like to know how to do it himself or herself. And do it right! These are people from all walks of life. And except for the people who come into our shop, they probably have nowhere else to find out and no one to ask.

So the purpose of this book is to tell you just as if you were standing across the counter at Luts' Paint Center, 4 Elmer Street, and wondering what kind of paint to use or how you should handle a specific painting problem. I've tried to answer everything you've ever wanted to know. And lots more you never thought of. I'll go through it a step at a time, from start to finish. First outside, then inside, and top to bottom.

Title	Location	Edition / Series / Misc.
1 Comprehensive Guide to the Hazardous Properties of Chemical Substances		Edition: 2nd edition
Author: Patnaik, Pradyot	Dynix: 89749	Series:
Publish.: John Wiley & Sons	Call No.: 615.9 Pa	
- place: New York, NY	ISBN: 0471291757	
- date: ©1999	Shelf Adult Non-Fiction	Year: 1999
Subject: Toxicology		Price: \$155.00
Desc: xxiii, 984 p., illus., 26 cm.		

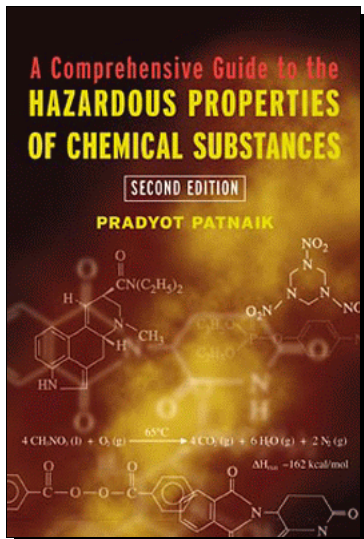


Table of Contents

PART A.
 Glossary.
 Physical Properties of Compounds and Hazardous Characteristics.
 Toxic Properties of Chemical Substances.
 Target Organs and Toxicology.
 Cancer-Causing Chemicals.
 Teratogenic Substances.
 Habit-Forming Addictive Substances.
 Flammable and Combustible Properties of Chemical Substances.
 Explosive Characteristics of Chemical Substances.
 Peroxide-Forming Substances.

PART B.
 Acids, Carboxylic.
 Acids, Mineral.
 Acids, Peroxy.
 Alcohols.
 Aldehydes.
 Alkalies.
 Alkaloids.
 Amines, Aliphatic.
 Amines, Aromatic.
 Asbestos.
 Azo Dyes.
 Chlorohydrins.
 Cyanides, Organic (Nitriles).
 Cyanides, Inorganic.
 Dioxin and Related Compounds.
 Epoxy Compounds.
 Esters.
 Ethers.
 Gases, Common Toxic and Flammable.
 Glycol Ethers.
 Haloethers.
 Halogenated Hydrocarbons.
 Halogens, Halogen Oxides, and Interhalogen Compounds.
 Heterocyclic Compounds.
 Hydrocarbons, Aliphatic and Alicyclic.
 Hydrocarbons, Aromatic.
 Industrial Solvents.
 Isocyanates, Organic.
 Ketones.
 Metal Acetylides and Fulminates.
 Metal Alkoxides.
 Metal Alkyls.
 Metal Azides.
 Metal Carbonyls.
 Metal Hydrides.
 Metals, Reactive.
 Metal, Toxic.
 Mustard Gas and Sulfur Mustards.

Subjects

227 .	Chemicals
336 .	Toxicology
350 .	Chemicals -- Tables
481 .	Hazardous Substances -- toxicity

Nerve Gases.
Nitro Explosives.
Oxidizers.
Particulates.
Peroxides, Organic.
Pesticides and Herbicides: Classification, Structure, and Analysis.
Pesticides, Carbamate.
Pesticides, Organochlorine.
Pesticides, Organophosphorus.
Herbicides, Chlorophenoxy Acid.
Herbicides, Triazine.
Herbicides, Urea.
Phenols.
Phosphorus and Its Compounds.
Polychlorinated Biphenyls.
Radon and Radioactive Substances.
Sulfate Esters.
Sulfur-Containing Organics (Miscellaneous).
Miscellaneous Substances.
Appendices.
Indexes.

Reviews - Synopsis - Dust Jacket

Review by Book News, Inc.

Presents information on many aspects of the hazardous properties of chemical substances and correlates those properties to the functional groups, reactive sites, and other structural features in the molecules in order to aid in predicting or assessing the hazards of a compound from its structure when there is a lack of experimental data. The first part examines the four primary hazardous properties of substances in general: toxicity, carcinogenicity, flammability, and explosive characteristics. The second part details individual substances and classes of substances, including organics, metals and inorganics, industrial solvents, common gases, particulates, explosives, and radioactive substances. They are arranged, with a few exceptions, in accordance with their structures and reactive functional groups, each group beginning with a general discussion before specific compounds are considered. The second edition is substantially revised, rearranged, and enlarged to incorporate information that has emerged since 1991. -- Copyright © 1999 Book News, Inc., Portland, OR All rights reserved Book News, Inc.®, Portland, OR

Book Description

More than just a compendium of hazardous materials, this book correlates the chemical structure of compounds to their hazardous properties, thereby allowing us to assess the toxicity of a substance even when no experimental data exists. Clearly illustrating the chemical structures of more than 1,500 chemicals from 46 different groups, this important update of the 1992 guide adds 1,000 new entries under specific classes of compounds along with major revisions in every other respect. Organics, metals and inorganics, industrial solvents, common gases, particulates, explosives, and radioactive substances are thoroughly examined for all facets of their primary characteristics—from toxicity and carcinogenicity to flammability and explosive reactivity to handling and disposal practices. Special features of the Second Edition include:

Fifteen new chapters covering teratogenic and addictive substances, organometallic compounds, sulfur mustards and esters, and much more

An up-to-date review of synonyms, CAS numbers, physical properties, uses, chemical analyses, and EPA and DOT status

Expanded coverage of pesticides and herbicides, and other topics

Regrouping of metals according to reactivity or toxicity

Revision of the relevant federal regulatory requirements

Extensive literature citations on current analytical methods

An indispensable reference for investigative and analytical chemists as well as professionals dealing with industrial hygiene, safety, hazardous waste, and compliance issues, this book also serves as an excellent complement to such major references as Sax's Dangerous Properties of Industrial Materials, Hazardous Chemicals Desk Reference, Hawley's Condensed Chemical Dictionary, and Environmental Contaminant Reference Databook, Volumes I, II, and III—all available from Wiley.

From the Back Cover

"A new edition of the definitive guide to the hazardous properties of chemical compounds

More than just a compendium of hazardous materials, this book correlates the chemical structure of compounds to their hazardous properties, thereby allowing us to assess the toxicity of a substance even when no experimental data exists. Clearly illustrating the chemical structures of more than 1,500 chemicals from 46 different groups, this important update

of the 1992 guide adds 1,000 new entries under specific classes of compounds along with major revisions in every other respect. Organics, metals and inorganics, industrial solvents, common gases, particulates, explosives, and radioactive substances are thoroughly examined for all facets of their primary characteristics—from toxicity and carcinogenicity to flammability and explosive reactivity to handling and disposal practices. Special features of the Second Edition include: Fifteen new chapters covering teratogenic and addictive substances, organometallic compounds, sulfur mustards and esters, and much more An up-to-date review of synonyms, CAS numbers, physical properties, uses, chemical analyses, and EPA and DOT status Expanded coverage of pesticides and herbicides, and other topics Regrouping of metals according to reactivity or toxicity Revision of the relevant federal regulatory requirements Extensive literature citations on current analytical methods

An indispensable reference for investigative and analytical chemists as well as professionals dealing with industrial hygiene, safety, hazardous waste, and compliance issues, this book also serves as an excellent complement to such major references as Sax's Dangerous Properties of Industrial Materials, Hazardous Chemicals Desk Reference, Hawley's Condensed Chemical Dictionary, and Environmental Contaminant Reference Databook, Volumes I, II, and III—all available from Wiley.

About the Author

Pradyot Patnaik, Ph.D., is the Director of the Environmental Chemistry Laboratory of the Interstate Sanitation Commission, Staten Island, NY, and a Research Investigator for the Center for Environmental Science of the City University of New York at the College of Staten Island

Title	Location	Edition / Series / Misc.
<p>915 Copyright Handbook: How to Protect and Use Written Works Author: Fishman, Stephen Publish.: Nolo Press - place: Berkeley, CA - date: ©2002 Subject: Copyright -- United States -- Popular works Desc: [various pagings], illus., 28 cm.</p>	<p>Dynix: 54747 Call No.: 346.73 Co 2002 ISBN: 0873378555 Shelf Reference</p>	<p>Edition: 6th edition Series: Nolo Press Self-Help Law Books Year: 2002 Price: \$28.50</p>

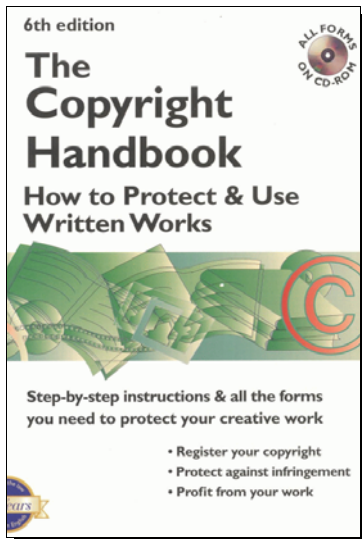


Table of Contents

1. How to Use This Book
2. Copyright Basics
3. Copyright Notice
4. Copyright Registration
5. Correcting or Changing Copyright Notice or Registration
6. What Copyright Protects
7. Adaptations and Compilations
8. Initial Copyright Ownership
9. Transferring Copyright Ownership
10. Copyright Duration
11. Using Other Authors' Words
12. Copyright Infringement: What It Is, What to Do About It, How to Avoid It
13. International Copyright Protection
14. Copyright in the Online World, Electronic Publishing and Multimedia
15. Help Beyond This Book

Sample Forms

How to Use the CD-ROM

Blank Forms

- . Form TX
- . Short Form TX
- . Form PA
- . Short Form PA
- . Form SE
- . Short Form SE
- . Form SE/Group
- . Form G/DN
- . Form VA
- . Short Form VA
- . Request for Special Handling
- . Form ____/CON (Continuation Sheet for Application Forms)
- . Form CA
- . Form GR/CP (Adjunct Application for Copyright Registration for a Group of Contributions to Periodicals)
- . Document Cover Sheet
- . Form GATT
- . Form GATT/GRP
- . Form GATT/CON
- . Work Made for Hire Agreement
- . Work for Hire Letter Agreement
- . Search Request Form
- . Collaboration Agreement
- . Copyright License
- . Copyright Permission Request
- . Copyright Assignment
- . Notice of Claimed Copyright Infringement
- . Counter-Notification in Response to Claim of Copyright Infringement
- . Form NLA
- . From NLA Con

Subjects

554 . Copyright -- United States -- Popular Works

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Don't Get Burned. Protect yourself against copyright piracy in the Real World and on the Web. Ignorance is not bliss in the information age. If you work with words, images or other creative projects, you won't be able to protect what you create unless you understand copyright law.

"The Copyright Handbook" provides all the forms you need to protect all types of creative expression under U.S. and international copyright law, with step-by-step instructions to fill them out.

Written in plain-English, it tells you everything you need to know about:

- . registering a work.
- . determining what works can be protected
- . when and how to use a copyright notice
- . rights and duration of ownership
- . how long a copyright lasts
- . copyright owners' rights
- . transferring copyright ownership
- . what constitutes infringement
- . recognizing an adapted or recast work
- . fair use -- when and how to use copyrighted work
- . electronic publishing rights
- . registration of multimedia works and rights
- . protecting creative works on the Internet

Completely updated to provide the latest in law and court rulings, the 6th edition covers new topics such as the Supreme Court's seminal ruling in *Tasini v. The New York Times*, which defines freelancers' rights when their works are reprinted online. It also covers website rights and registration, copyright licensing case law and much more.

INTRODUCTION:

Here's a book about copyright for written works. It is for the entire universe of people who deal with the written word.

Who This Book Is For:

Novelists, short story writers, poets, playwrights screenwriters, biographers, historians, authors of how-to books, writers of scientific and technical works and other works of nonfiction, published and unpublished authors, journalists, freelance writers, persons employed by others to create written works, persons who employ others to create written works, editors who work for magazines and book publishers, established self-publishers, librarians, teachers, and literary agents

A. How This Book Is Organized

This book has two parts:

Part I (Chapters 2-4) consists of a short overview of copyright law (Chapter 2, Copyright Basics), and a "how-to" guide on copyright notice and registration with the Copyright Office.

Part II (Chapters 5-15) serves as your copyright resource; it discusses the most important aspects of copyright law in detail. If you are unable to find the answers to your questions in Part II, the final chapter (Chapter 15, Help Beyond This Book) tells you how to do further research on your own and, if necessary, find a copyright attorney.

B. Which Parts of This Book You Should Read

Not everyone will want to read the whole book. Which parts you do want to read will of course depend on why you bought the book.

Most of you bought the book for one of these three reasons:

- . You want to know how to satisfy the procedural requirements to obtain maximum copyright protection for a written work.
- . You have a specific copyright question or problem.
- . You want a general education about copyright law.

Assuming you fall into one of these three categories, here is how you can make best use of this book.

1. Readers Who Want to Know How to Satisfy the Procedural Requirements for Maximum Copyright Protection

If you just want to know how to place a valid copyright notice on your work (that's the © followed by a date and name you usually see on published works) read Chapter 3, Copyright Notice. Placing a valid copyright notice on your work will make it easier to enforce your copyright.

If you want to register your work with the Copyright Office, refer to Chapter 4, Copyright Registration, for a step-by-step explanation. You'll find all the registration forms you need on the CD-ROM or in the tear-out appendix at the end of the book. You will obtain important benefits by registering your work after it is published.

2. Readers Who Have a Specific Copyright Question

If you have a specific question or problem, start with the table of contents at the front of the book. For example, suppose you want to know whether you need permission to use a quotation from Abraham Lincoln that you found in a recent Civil War history. By scanning the table of contents you would discover Chapter 11, Using Other Authors' Words -- probably the place to start. And by examining the section headings under Chapter 11, you would find that Section A is the place to start reading.

If you didn't find what you were looking for in the table of contents, you could use the index at the back of the book and search under such terms as "quotations" and "public domain."

3. People Who Want to Learn All About Copyright

If you simply want to learn more about copyright, read Chapter 2, Copyright Basics, and then read as much of Chapters 5 through 14 as you wish. You can skip Chapters 3 and 4, since these chapters are intended for people who want to take specific steps to obtain maximum copyright protection for a written work.

C. What This Book Is Not About

This book only covers copyright for written works. This means it is not about:

- . copyright protection for music, artwork, photography or audio-visual works; for a detailed discussion of legal protection for music, see *Music Law: How to Run Your Band's Business*, by Richard Stim (Nolo).
- . publishing contracts -- although we discuss the copyright aspects of publishing contracts, this is not a book about how to negotiate or draft contracts
- . protecting inventions -- see *Patent It Yourself*, by David Pressman (Nolo), if you want to know about this
- . protecting computer software -- see *Copyright Your Software and Web and Software Development: A Legal Guide*, both by Stephen Fishman (Nolo), if you want to know about this
- . protecting titles, logos or slogans -- these items may be protected under the federal and state trademark laws, which have nothing to do with copyright; see *Trademark: Legal Care for Your Business & Product Name*, by Kate McGrath and Stephen Elias (Nolo).
- . protecting ideas -- copyright only protects words, not ideas. Ideas can be protected as trade secrets, which involves committing anyone who learns of the ideas to secrecy, and maintaining security procedures to prevent the ideas from leaking out.

For a detailed discussion of idea protection, see *Nondisclosure Agreements: Protect Your Trade Secrets & More*, by Richard Stim and Stephen Fishman (Nolo).

D. What's New in the Sixth Edition

In this edition, we introduce some new topics and we address significant changes in copyright law including:

- . rules regarding registration of multiple works as a single unit (see Chapter 4)
- . registration rules for freelance writers (see Chapter 4)
- . registration of photos and artwork in conjunction with registration of written works (see Chapter 4)
- . mail procedures after the anthrax scare of 2001 (see Chapter 4)
- . Writers Guild registration rules (see Chapter 4)
- . case law distinguishing opinions and facts under copyright law (see Chapter 7)
- . protection of copyrightable works created by teachers and professors (see Chapter 8)
- . transfer of copyright by email or Internet (see Chapter 9)
- . the right to sublicense under an exclusive license (see Chapter 9)
- . preventing unpublished works from entering the public domain (see Chapter 10)
- . parody rules and the *Wind Done Gone* case (see Chapter 11)
- . linking, framing and deep linking (see Chapter 14)
- . website rights and registration (see Chapter 14)
- . the U.S. Supreme Court Ruling in *Tasini* (see Chapter 14), and
- . E-Books case law -- the *Rosetta Books* case (see Chapter 14) .

Title	Location	Edition / Series / Misc.
39 Corrosion		<i>Edition:</i> 3rd edition
<i>Author:</i> Shreir, L. L., R. A. Jarman and G. T. Burstein (editors)	<i>Dynix:</i> 49681	<i>Series:</i>
<i>Publish.:</i> Butterworth-Heinemann, Ltd.	<i>Call No.:</i> 620.1 Co	
<i>- place:</i> Oxford, UK	<i>ISBN:</i> 0750610778	<i>Year:</i> 1994
<i>- date:</i> 1994	<i>Shelf</i> Reference	<i>Price:</i> \$125.00
<i>Subject:</i> Corrosion and anti-corrosives		
<i>Desc:</i> xxv, various paging (approx. 3184 pp.), illus., 24 cm.		

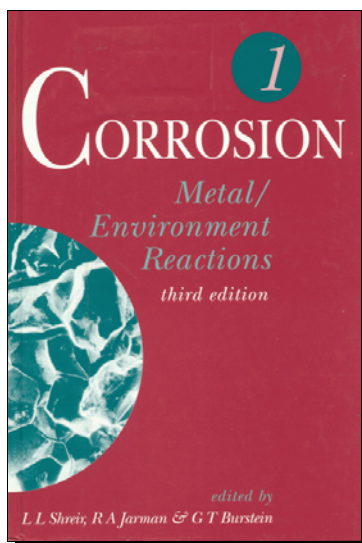


Table of Contents

Volume One: Metal/Environment Reactions
Principles of corrosion and oxidation
Environments
Ferrous metals and alloys
Non-ferrous metals and alloys
Rarer metals
The noble metals
High-temperature corrosion
Effect of mechanical factors on corrosion

Volume Two: Corrosion Control
Introduction
Design and economic aspects of corrosion
Cathodic and anodic protection
Pretreatment and design for metal finishing
Methods of applying metallic coatings
Protection by metallic coatings
Protection by paint coatings
Chemical conversion coatings
Miscellaneous coatings
Conditioning the environment
Non-metallic materials
Corrosion testing, monitoring and inspection
Electrochemistry and metallurgy relevant to corrosion
Useful information
Index

Subjects

247 . Corrosion and anti-corrosives

Volumes

Corrosion Control - vol. 2

Metal / Environment Reactions - vol. 1

Reviews - Synopsis - Dust Jacket

Synopsis

Corrosion science is probably unique in crossing the borders of almost all technologies and since 1963 Corrosion has been the leading source of information on the subject. It provides an encyclopedic coverage of corrosion science and technology and is an essential first point of reference for everyone in the field. The science has advanced significantly in the seventeen years since the publication of the second edition and this new edition has been thoroughly updated to reflect this.

From the Publisher

Corrosion is a two-volume reference work embracing a vast range of topics including high-temperature and aqueous corrosion and their control. George Newnes Ltd first published it in 1963 and over the years it has gained an international reputation. This edition extends to over 2700 pages, and contains 138 sections all written by specialists. It follows the format of previous editions; some sections have been completely rewritten, while others have been altered and extended. New sections have been added to cover areas not previously included. Lionel Shreir, who wrote the first two editions, has been joined by two editors, Ray Jarman and Tim Burstein, to produce this unique work. Although he did not live to see its publication it is hoped that this book serves as a fitting tribute to his memory.

From the Critics

A comprehensive reference on corrosion science and technology, first published in 1963, and again in 1976. The late Lionel Shreir, editor of the first two editions, was joined by Ray Jarman and Tim Burstein for the third edition, which extends to some 2,700 pages and 138 sections. Volume 1, Metal/Environment Reactions, contains sections on principles of corrosion and oxidation; environments; ferrous metals and alloys; non-ferrous metals and alloys; rarer metals; the noble metals; high-temperature corrosion; and effect of mechanical factors on corrosion. Volume 2, Corrosion Control, contains sections on design and economic aspects of corrosion; cathodic and anodic protection;

pretreatment design for metal finishing; methods of applying metallic coatings; protection by paint coatings; chemical conversion coatings; miscellaneous coatings; conditioning the environment; non-metallic materials; corrosion testing, monitoring, and inspection; electrochemistry and metallurgy relevant to corrosion; and useful information (tables, terms, calculations, etc.). Slipcased.

FROM THE DUST JACKET:

Corrosion science is probably unique in crossing the borders of almost all technologies and since 1963 'Corrosion' has been the leading source of information on the subject. It provides an encyclopedic coverage of corrosion science and technology and is an essential first point of reference for everyone in the field. The science has advanced significantly in the seventeen years since the publication of the second edition and this new edition has been thoroughly updated to reflect this.

'Corrosion' is a two-volume reference work embracing a vast range of topics including high-temperature and aqueous corrosion and their control. It was first published in 1963 by George Newnes Ltd and over the years it has gained an international reputation. This edition extends to over 2700 pages, and contains 138 sections all written by specialists. It follows the format of previous editions; some sections have been completely rewritten, whilst others have been altered and extended. New sections have been added to cover areas not previously included.

PREFACE TO THE THIRD EDITION:

The huge success of the first two editions of Corrosion has inevitably created the demand for a third edition. Corrosion science and technology, like most of the physical sciences, has progressed and advanced significantly in the seventeen years since the second edition was published. Such knowledge requires transferral from the laboratory and the journal literature to the wider audience: the student, the teacher, the engineer, the metallurgist and workers in other fields who require knowledge and understanding of the interactions of materials with their environments. The previous two editions, the fruits of Lionel Shreir's hard labours, have fulfilled this multiple role admirably and the new editors hope that this new edition will continue to do so. The fact that Lionel worked so hard on producing the third edition but did not live to see its publication, is a personal and deeply poignant sorrow for us, as it must be for the many readers of Corrosion who knew and respected him as scientist and friend.

The ever-increasing research into corrosion, and the knowledge that this produces is driven to a small part by the corrosion scientist him- or her-self in seeking a detailed understanding of the intricacies of the interfacial processes driving corrosion and passivation. Such a self-fulfilling drive cannot of itself however, be indefinitely sustainable, despite the fascination that this science engenders, since research is costly. Such advances are led primarily by the continuing need to predict, control and prevent corrosion as an engineering imperative. Corrosion science, multidisciplinary in itself, is probably unique in crossing the borders of almost all the technologies: environmental stability of all components of those technologies remains a prime requirement for their success. New technologies, new engineering practices, new materials and new processes can succeed only if the behaviour of their components with the environment is satisfactory, and predictably so. The eighties and nineties, and beyond, see a further need to underpin research and development into corrosion and protection — the growing awareness of the necessity for conservation, of materials and of energy, the so-called green issues. Most materials and components made from them require large energy resources to produce; clearly the quest for longevity and reliability of structures is a significant and worthy contribution towards conserving energy and materials, quite additional to minimising the heavy cost of corrosion failures.

As with the second edition, the new volumes have been revised according to the general format and structure of their antecedents. Some sections have been completely rewritten to bring them up to date, while others have been altered and extended. New sections have been included to cover areas not previously treated. The incorporation of new authors to carry out such revisions and additions is the inevitable consequence of the fact that thirty years have elapsed since Corrosion first appeared. The multiplicity of authors for the new edition leads (as with previous editions) to a variety of styles of writing and variation in treatment and emphasis of subject matter. One hopes this is beneficial to the work in providing a broader cross-section of corrosion science and technology as a whole: it is for the reader and casual user to judge. One hopes too, that the third edition remains a tribute to the man who initiated Corrosion.

INTRODUCTION

Corrosion Control

In Section 1.1 corrosion was defined simply as the reaction of a metal with its environment, and it was emphasised that this term embraces a number of concepts of which the rate of attack per unit area of the metal surface, the extent of attack in relation to the thickness of the metal and its form (uniform, localised, intergranular, cracking, etc.) are the most significant. The rate of corrosion is obviously the most important parameter, and will determine the life of a given metal structure. Whether or not a given rate of corrosion can be tolerated will, of course, depend upon a variety of factors such as the thickness of the metal, the function and anticipated life of the metal structure and the effect of the corrosion products on the environment, etc.

With metals used as construction materials corrosion control may be regarded as the regulation of the reaction so that the physical and mechanical properties of the metal are preserved during the anticipated life of the structure or the component. In relation to the term 'anticipated life' it should be noted that this cannot be precise, and although the designer might be told on the basis of information available at that time that the plant should last, say, 10 years, it might be scrapped much earlier or be required to give more prolonged service. It is also evident that, providing there are no restrictions on costs, it is not difficult to design a plant to last at least 10 years, but quite impossible to design one that will last exactly 10 years. Thus although under- design could be catastrophic, over-design could be unnecessarily expensive, and it is the difficult task of the corrosion engineer to avoid either of these two extremes. A further factor that has to be considered is that in the processing of foodstuffs and certain chemicals, contamination of the environment by traces of corrosion products is far more significant than the effect of corrosion on the structural properties of the metal, and under these circumstances the materials selected must be highly resistant to corrosion.

Since corrosion involves a reaction of a metal with its environment, control may be effected through either or both of the two reactants. Thus control could be based entirely on the selection of a particular metal or alloy in preference to all others or the rejection of metals in favour of a non-metallic material, e.g. by a glass-reinforced polymer (g.r.p.). At the other extreme control may be effected by using a less corrosion-resistant material and reducing the aggressiveness of the environment by (a) changing composition, (b) removing deleterious impurities, (c) lowering temperature, (d) lowering velocity, (e) adding corrosion inhibitors, etc.

Although it has been found to be convenient to present this work in the form of two volumes entitled Metal/Environment Reactions and Corrosion Control, it is evident that this separation is largely artificial, and that a knowledge of the various types of corrosion behaviour of different metals under different environmental conditions is just as important for corrosion control as the protective treatments that have been collated in this volume.

In many structures and components the choice of a metal and alloys is based largely on their engineering properties, but it is seldom that their resistance to corrosion can be ignored completely; at the other extreme corrosion resistance may be of predominant importance, but even so the engineering properties cannot be neglected. Availability is frequently of over-riding importance, and it is quite futile to specify a particular alloy and then to find that it cannot be manufactured and delivered to the fabricators for a year or more. Fabrication technology and fabrication costs will also have to be considered, and in certain cases a more expensive alloy will be preferable to a cheaper one with adequate corrosion resistance that is more difficult to fabricate, e.g. an 18% Cr-8% Ni austenitic stainless steel is frequently selected in preference to a cheaper ferritic 17% Cr stainless steel, since the latter is more difficult to weld than the former, although its corrosion resistance may be adequate.

Costs must always be considered, but it does not follow that an inexpensive metal or alloy will prove to be the cheapest in the long term; platinum and platinum alloys are used in certain applications and apart from their high corrosion resistance have been a wise investment for the purchaser. However, mild steel, which has good mechanical properties, is readily available in a variety of forms and easily fabricated, is frequently preferred to more corrosion-resistant alloys for large structures, and its poor resistance to corrosion is counteracted by means of protective coatings, cathodic protection, conditioning the environment, etc.

Title	Location	Edition / Series / Misc.
645 Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering <i>Author:</i> Uhlig, Herbert Henry, 1907- <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1985 <i>Subject:</i> Corrosion and anti-corrosives <i>Desc:</i> xiv, 441 p., illus., 24 cm.	<i>Dynix:</i> 07945 <i>Call No.:</i> 620.1 Uh <i>ISBN:</i> 0471078182 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1985 <i>Price:</i> \$25.00

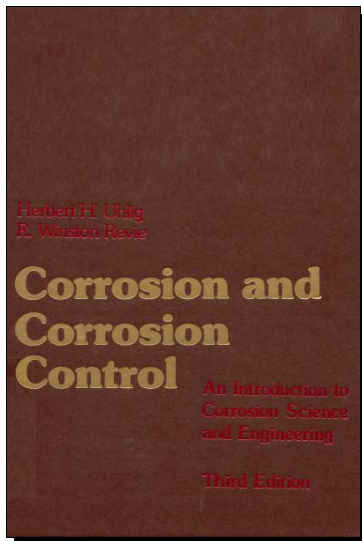


Table of Contents

1. Definition and Importance
2. Electrochemical Mechanisms
3. Corrosion Tendency and Electrode Potentials
4. Polarization and Corrosion Rates
5. Passivity
6. Iron and Steel
7. Effect of Stress
8. Atmospheric Corrosion of Iron and Other Metals
9. Corrosion of Iron and Other Metals in Soil
10. Oxidation and Tarnish
11. Stray-Current Corrosion
12. Cathodic Protection
13. Metallic Coatings
14. Inorganic Coatings
15. Organic Coatings
16. Inhibitors and Passivators
17. Treatment of Water and Steam Systems
18. Alloying for Corrosion Resistance; Stainless Steels
19. Copper and Copper Alloys
20. Aluminium and Magnesium
21. Lead
22. Nickel and Nickel Alloys
23. Cobalt and Cobalt Alloys
24. Titanium, Zirconium and Tantalum
25. Silicon-Iron and Silicon-Nickel Alloys
26. Problems
27. Appendix
- Index

Subjects

247 . Corrosion and anti-corrosives

Reviews - Synopsis - Dust Jacket

FROM THE PUBLISHER:

This standard work in corrosion science and engineering, Uses a quantitative approach (including basic equations-- explained and derived--and illustrative problems), to discuss the basic thermodynamic and electrochemical principles that cause corrosion and treats practical corrosion problems and methods of protection and prevention. A new chapter covers cobalt and its alloys, and expanded discussions focus on electrochemical polarization, cracking, fatigue and steel reinforcements in concrete.

PREFACE:

During the past decade, the literature on corrosion science and its applications has expanded considerably. In the present edition, new information is integrated with that presented in the previous editions. Every chapter has been re-examined and brought up to date. The book benefits from the collaborative efforts that have evolved from a former professor-graduate student relationship.

A major change in this edition is the introduction of SI units, in line with their increasing use in the scientific and technical literature of all countries. In general, the ASTM "Standard for Metric Practice" and "Condensed Metric Practice Guide for Corrosion" are followed. Accordingly, corrosion rates are now reported in grams per square meter per day (gmd) and in millimeters penetration per year (mm/y). These units either replace or more often are cited in parallel with the units milligrams per square decimeter per day (mdd) and inches penetration per year (ipy), which are still commonly used in the United States. Current densities are expressed as amperes per square meter (A/m²), except in some cases where mA/cm² or μA/cm² express the magnitude of experimental dimensions, and thereby provide the reader with a better visualization of the laboratory measurement. We now express electrode potentials in terms of their reduction reactions only; as before, the potential is designated by *f*. The term *E* continues to be used for electromotive force (emf)

of a cell. To avoid confusion, a differentiating symbol for the oxidation potential, equivalent to $-f$, is now discontinued.

In line with its fundamental importance, the discussion of polarization is now treated in further detail. A new section on fracture mechanics is included in the chapter on stress. Critical potentials below which stress-corrosion cracking does not initiate are treated in further detail. Because failures by hydrogen cracking and delamination continue as a major engineering problem, this subject now receives greater emphasis. The discussion on the mechanism of corrosion fatigue is brought up to date. Corrosion of steel reinforcements in concrete is discussed as a separate topic, justified in our opinion by related continuing failures of concrete structures.

A new chapter on cobalt alloys is added; these alloys have recognized practical importance as surgical implant materials and in applications requiring unusual resistance to corrosion-erosion and to fretting corrosion.

The chapter on problems and answers has been updated. The derivation of the general equation applicable to the calculation of corrosion rates from polarization data, going beyond the limitations of the Stern-Geary equation, is given in the Appendix.

Title	Location	Edition / Series / Misc.
40 Corrosion Engineering		<i>Edition:</i>
<i>Author:</i> Fontana, Mars Guy, 1910- and Norbert D. Greene	<i>Dynix:</i> 14747	<i>Series:</i>
<i>Publish.:</i> McGraw-Hill Book Company	<i>Call No.:</i> 620.1122 Fo	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0070214603	
<i>- date:</i> [1967]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1967
<i>Subject:</i> Corrosion and anti-corrosives		<i>Price:</i> \$25.00
<i>Desc:</i> 391 p., illus., 23 cm.		

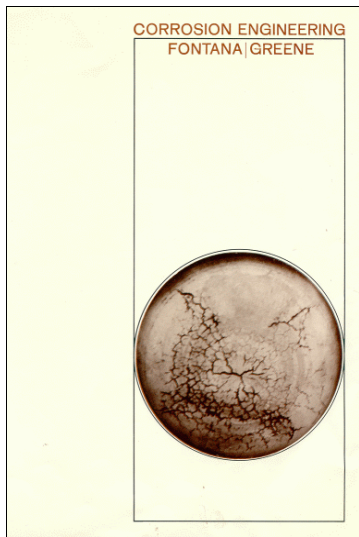


Table of Contents

1. Introduction
 2. Corrosion Principles
 3. The Eight Forms of Corrosion
 4. Corrosion Testing
 5. Materials
 6. Corrosion Prevention
 7. Sulfuric, Nitric, Hydrochloric, Hydrofluoric and Phosphoric Acids
 8. Other Environments
 9. Modern Theory -- Principles
 10. Modern Theory -- Applications
 11. Oxidation and Other High-Temperature Metal-Gas Reactions
- Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Including modern theory and recent concepts, this is the first suitable textbook for corrosion courses in engineering curricula. The only book that presents information by corrosives, it simplifies and blends theory with practical applications. "Corrosion Engineering" covers all materials including nonmetallics and all important aspects of corrosion engineering. Case histories and examples make up an important part of the book, and most material is readily understandable without extensive technical background. The book is based on many years of teaching courses on corrosion in engineering curricula and on industrial experience as well.

"Corrosion Engineering" is designed for undergraduate and graduate corrosion courses, intensive short courses for plant engineers and maintenance personnel, and self-study and reference purposes.

PREFACE:

The background for this book consists of the combined experience of 30 years of teaching beginning and advanced courses in corrosion at Ohio State and RPI and 13 years of corrosion engineering and corrosion research in industry. During our academic tenure we have been actively engaged in applied and fundamental research and in consulting for industry, primarily in the solution of corrosion problems. Many of our former students are successful corrosion engineers.

This book covers practically all the important aspects of corrosion engineering and corrosion science, including noble metals, "exotic" metals, nonmetallics, coatings, mechanical properties, and corrosion testing, and includes modern concepts as well. This coverage eliminates some of the deficiencies of previous books on corrosion. The book is designed to serve many purposes: It can be used for undergraduate courses, graduate courses, intensive short courses, inplant training, self study, and as a useful reference text for plant engineers and maintenance personnel.

Professors in metallurgical engineering, materials engineering, materials science, chemical engineering, mechanical engineering, chemistry, or other physical science or engineering disciplines could teach a beginning course using this text without extensive background or much work in preparation. The theory required for a beginning course is included in Chaps. 2, 3, and 6, and this is all the theory needed for engineers, other than those practicing corrosion engineering. The theory is simplified, blended with practical application, and requires no extensive background in electrochemistry and metallurgy for either the teacher or the student. Examples are used to illustrate the causes and cures of corrosion problems. Case histories are helpful in engineering teaching. Descriptions, including mechanical properties, of materials are presented so the reader will get the proper "feel" for materials.

Chapters 9 and 10, on modern theory, and part of Chap. 11 are suitable for an advanced course in corrosion or for a long first course. These chapters are helpful for practicing corrosion engineers.

One unique aspect of this book is the presentation of corrosion data in terms of corrosives or environments rather than in terms of materials. A given corrosion problem usually concerns a specific environment. This saves thumbing through many chapters on materials to determine candidate materials for a corrosion problem, e.g., sulfuric acid. Isocorrosion charts present a quick look at candidates for a given corrosive.

Considerable data are presented for the more important corrosive environments from the greatest damage-cost standpoint. These are acids, seawater, and the atmosphere. Much space has been devoted to the more important subjects, such as theory and forms of corrosion. However, some items, such as filiform and human-body corrosion, are

Subjects

247 . Corrosion and anti-corrosives

emphasized because they have not been widely discussed elsewhere. Space limitations preclude the presentation of complete corrosion data and a thoroughgoing discussion of all aspects of corrosion.

It is not the intent of this book to present a complete literature survey. Some pertinent literature is cited and reference books are listed so the reader can pursue topics in more depth, if he so desires.

If this book results in the better education of many more people in the field of corrosion, particularly the young people in colleges and universities, and in a greater awareness of the cost and evils of corrosion as well as of the means for alleviating it, this book will have served its major purpose.

Title	Location	Edition / Series / Misc.
41 Corrosion Inhibitors: Developments Since 1980		<i>Edition:</i>
<i>Author:</i> Collie, M. J. (editor)	<i>Dynix:</i> 00750	<i>Series:</i> Chemical Technology Review: No. 223
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 620.1 Co	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 081550957X	
<i>- date:</i> ©1983	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1983
<i>Subject:</i> Corrosion and anti-corrosives		<i>Price:</i> \$25.00
<i>Desc:</i> xii, 379 p., illus., 24 cm.		

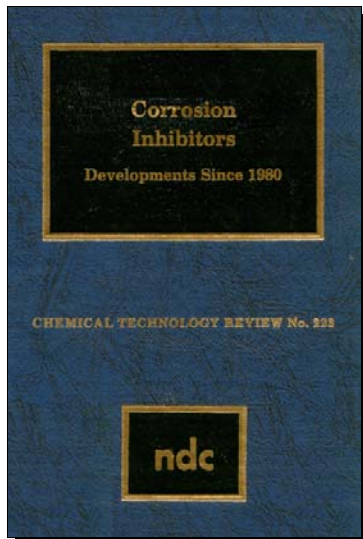


Table of Contents

Introduction
 1. Structural and Manufacturing Applications
 2. Aqueous System Applications
 3. Aqueous/Nonaqueous System Applications
 4. Coatings and Films
 5. Lubricant, Fuel and Hydraulic Fluid Additives
 6. Natural Gas and Oil Industry Applications
 7. Metal Treating Baths
 Company Index
 Inventor Index
 U.S. Patent Number Index

Reviews - Synopsis - Dust Jacket

INTRODUCTION

There are few industries that do not make use of corrosion inhibitors in some phase of their operations. The organization of this book, based on the recent patent literature, is mainly according to the uses for which the corrosion inhibitors described are intended.

The largest number of patents give information on compositions for the protection of various structural materials and equipment used in the production of chemicals, foods and cosmetics. Also described are materials intended for use as the equipment itself, for example, one for parts such as impellers in ore treatment equipment and another for parts used in hydrogen fluoride laser systems.

Another large group of patents describes inhibitors useful in various aqueous systems. Included are inhibitors for automobile radiator coolants as well as methods of dispensing such inhibitors. Compositions to prevent corrosion in industrial cooling water systems include one that also prevents scale formation. Oxygen scavengers for boiler systems are described. Many patents in this chapter supply inhibitors for more than one type of aqueous system. In addition to the systems mentioned above, systems addressed include reverse osmosis, metal pickling and shaping and hydraulic systems. Corrosion inhibitors to protect equipment used in the secondary recovery of petroleum by water flooding and in the disposal of wastewater and brine from oil and gas wells are also in the group.

Compositions intended for use in both aqueous and nonaqueous systems are next described. These include metal treating baths, aqueous and hydrocarbon systems of the oil industry, motor oils, heat transfer media, hydraulic fluids and greases. Because of the wide range of uses, classification of these inhibitors has been according to chemical composition.

Corrosion inhibiting coatings and films for ferrous and nonferrous metals are described in another large group of patents. Zinc-rich coatings, methods of preparing anticorrosive phosphate pigments, and low temperature curable coatings are provided. Also included are rust inhibiting pigments that are less toxic than lead- and chromium-containing pigments and coating compositions that require no rinsing, thus lowering the volume of water that must be treated for pollution control. Special applications include can coatings, one-step cleaner-primers, and high temperature corrosion protection for superalloys.

Corrosion inhibiting additives for lubricants, fuels and hydraulic fluids have been grouped together. Among the lubricant additives there may be mentioned those for the protection of silver plate areas of railway diesel engines, antioxidant and anticorrosive additives for diesel crankcase lubricants and for perfluorinated fluids. Some of the fuel additives have activity as antioxidants, detergents and anti icing agents as well as corrosion inhibitors. Fuels to which the compositions are to be added include gasoline, jet fuels, fuel oil and gasohol.

In the natural gas and oil industry applications there are described inhibitors for use in well drilling operations such as well packer solutions and aqueous drilling fluids. Two patents provide methods for preventing corrosion problems in deep gas wells where high pressure, high temperature bottomhole conditions prevail. There are compositions that prevent evolution of hydrogen sulfide while removing sulfide-containing scale from crude oil and natural gas refinery equipment. Other natural gas and oil applications will be found in the chapters on aqueous and aqueous/nonaqueous systems.

The last chapter pertains to corrosion inhibition in metal treating baths. These include surface scale and rust removers, metal working solutions, prevention of rust and discoloration in the burnishing of steel and prevention of

Subjects

247 . Corrosion and anti-corrosives

etching in aluminum polishing solutions. Compositions for removing phenolic resins from aluminum, alloys that keep corrosion of the metal to a minimum, and one for selective stripping of gold-nickel brazing alloys used in jet engines without damage to the substrate are provided. Again, the reader is referred to the chapters on aqueous and aqueous/nonaqueous systems for other compositions useful in metal treating baths.

Title	Location	Edition / Series / Misc.
42 Corrosion Inhibitors: Recent Developments		<i>Edition:</i>
<i>Author:</i> Robinson, J. S., 1936-	<i>Dynix:</i> 14752	<i>Series:</i> Chemical Technology Review: No. 132
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 620.112 Ro	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815507577	
<i>- date:</i> ©1979	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1979
<i>Subject:</i> Chemical inhibitors -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> xiii, 306 p., illus., 25 cm.		

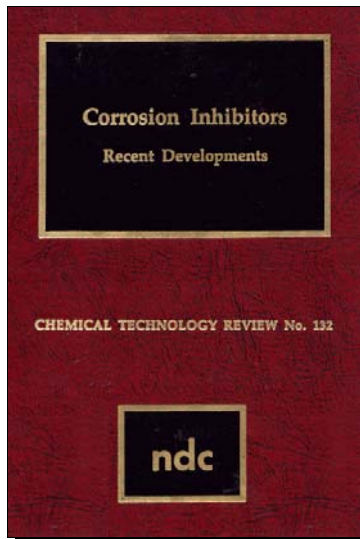


Table of Contents

Introduction
 1. Circulating Water Systems
 2. Oil Well and Refinery Operations
 3. Building and Structural Materials
 4. Fuels and Lubricants
 5. Inorganic Treatments and Coatings for Metal Surfaces
 6. Organic Treatments and Coatings for Metal Surfaces
 7. Additional Applications
 Company Index
 Inventor Index
 U.S. Patent Index

Reviews - Synopsis - Dust Jacket

FORWARD:

The detailed, descriptive information in this book is based on U.S. patents, issued since July 1976, that deal with corrosion inhibitors. This title contains new developments since our previous title Corrosion Inhibitors-Manufacture and Technology published in 1976.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of recent developments in the manufacture and application of corrosion inhibitors.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data were employed to bring this durably bound book to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have by-passed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION:

The field of corrosion inhibition is a broad one, ranging from physical barriers such as resistant coatings to chemical inhibitors such as sequestering agents and oxygen scavengers. Included are additives and coatings used in circulating water systems, oil well and refinery operations, fuels, greases, lubricants, and structural materials. There is a vast collection of multipurpose inhibitors as well as those geared to highly specific processes.

This book provides a review of the recent R&D effort directed towards corrosion control. Nearly three hundred processes relating to all phases of the alleviation of corrosion are described in detail.

Many of the additives and preventive techniques are fully satisfactory for a number of end uses. The arrangement

Subjects

225 .	Chemical inhibitors -- Patents
365 .	Corrosion and anti-corrosives -- Patents

here attempts to reflect the most significant and practical aspects of each process, but should not be construed as limiting. The reader is encouraged to consult sections and even chapters of the book which may not at first glance appear to be within his sphere of concern.

Title	Location	Edition / Series / Misc.
646 Corrosion Prevention by Protective Coatings		Edition:
Author: Munger, Charles G.	Dynix: 04800	Series:
Publish.: National Association of Corrosion Engineers	Call No.: 620.1122 Mu	
- place: Houston, TX	ISBN: 0915567040	Year: 1984
- date: ©1984	Shelf Adult Non-Fiction	Price: \$25.00
Subject: Corrosion and anti-corrosives		
Desc: 512 p. [8] pages of plates, illus., 29 cm.		

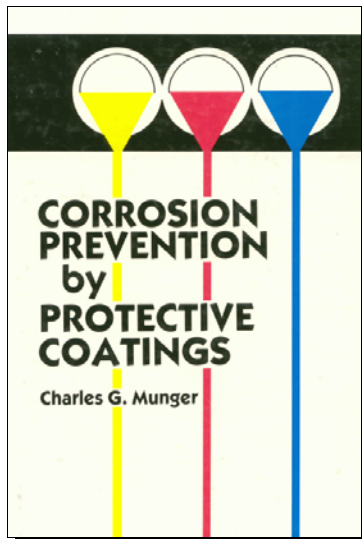


Table of Contents

Preface
1 Introduction to Corrosion
2 Corrosion as Related to Coatings
3 Essential Coating Characteristics
4 Coating Fundamentals
5 Corrosion-Resistant Organic Coatings
6 Corrosion-Resistant Zinc Coatings
7 Structural Design for Coating Use
8 The Substrate-Importance to Coating Life
9 Surface Preparation
10 Application of Coatings
11 Coatings for Concrete
12 Coating Selection
13 Coatings and Cathodic Protection
14 Coating Failures
15 Coating Repair and Maintenance
16 Safe Application of Coatings and Linings
17 Specifications
18 Inspection and Testing
19 Typical Coating Uses
Color Insert
Subject Index

Subjects

247 . Corrosion and anti-corrosives

Reviews - Synopsis - Dust Jacket

PREFACE:

An understanding of corrosion and the development of a corrosion engineering science have come about because of the need to protect materials of all types (e.g., wood, concrete, steel, cast iron, stainless alloys, aluminum, etc.) from disintegration by so-called normal breakdown processes. These processes, which include atmospheric rusting, chemical solution, oxidation, crystallization, and galvanic couple reactions, are the means by which materials return to their original state of oxides, minerals, or elemental carbon.

It is important to note that all structural materials have a strong tendency to revert to their native state. This is because of the tremendous amount of energy used to convert them from their original form to one usable by man. This energy input, whether man-induced or a result of solar radiation, remains latent in the material and is released at every opportunity as the material reverts to a state of equilibrium with nature.

Everyone in modern society is affected in some way by this energy release phenomenon, or corrosion. The corporate executive; the marine, chemical, or materials engineer; the petroleum refinery manager; the papermill superintendent; or the amusement park maintenance employee -- all are affected by corrosion, and all attempt in their own way to prevent the material under their control from reverting to its original, unusable state. Control of this reversion process is the goal of corrosion engineering.

Some of the most important tools used in corrosion engineering are high performance coatings. Such coatings, as compared with paints, have only been available for a relatively short time (since the late 1930s). The more advanced coatings, however, are presently the most widely used method of corrosion control, and effectively protect more surfaces and substrates from environmental change than any other corrosion prevention system.

In relation to the entire paint field, high performance coatings constitute only a small section. Nevertheless, it is one of the most important sections since it includes products designed for the protection of the most costly and complex structures in the world, e.g., ultra large cargo carriers, LNG ships, chemical transport equipment (ships, barges, and tank cars), offshore drilling and production structures, petroleum refineries, sewage systems, and chemical, nuclear, and paper plants. The importance and social value of such structures and equipment far exceed the material and application costs involved in protecting them. Thus, some of the most highly engineered coating systems are used to prevent their corrosion and disintegration.

High performance coatings provide a true engineering approach to the control of corrosion, and thus form the section

of the coating field to which this book is directed. The specific purpose of this book is to supply corrosion engineers and others involved in the selection or application of coatings for corrosion protection basic information that will allow them to understand and use coatings as an engineering approach to the protection of plants and equipment. It is designed primarily to supply the fundamental reasons and philosophy behind coating selection, application, and use so that maximum effectiveness may be obtained from the excellent coating materials available. It is to this most effective and economic use of coatings for corrosion control that this book is dedicated.

Title	Location	Edition / Series / Misc.
787 Corrosion Protection By Coatings <i>Author:</i> Wicks, Zeno W., Jr. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1987 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 22 p., illus., 28 cm.	<i>Dynix:</i> 55947-05 <i>Call No.:</i> 667.9 Fe <i>ISBN:</i> 0934010188 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS5 <i>Year:</i> 1987 <i>Price:</i> \$50.00

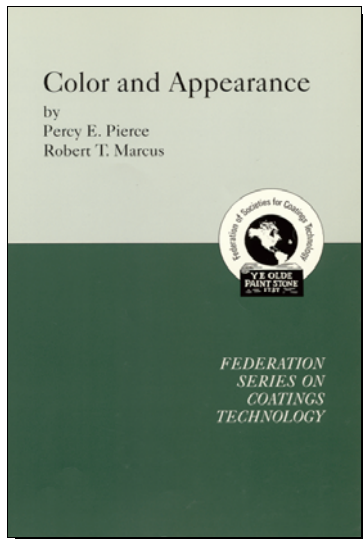


Table of Contents

- I. INTRODUCTION
- II. ELECTROCHEMICAL CORROSION
 - A. Polarization and Depolarization
 - B. Effect of Salts, pH, and Temperature
 - C. Inhibition and Passivation
 - D. Cathodic Protection
- III. CORROSION PROTECTION BY INTACT COATINGS
 - A. Introduction
 - B. Adhesion
 - C. Oxygen and Water Permeability
 - D. Saponification Resistance
 - E. Acid Permeability
 - F. Mechanical Properties
- IV. CORROSION PROTECTION WITH NON-INTACT FILMS
 - A. Passivating Pigments in Primers
 - 1. Lead Pigments
 - 2. Chromate Pigments
 - 3. Other Pigments
 - B. Cathodic Protection by Zinc-Rich Primers
- V. APPROACHES TO FORMULATING CORROSION PROTECTION COATINGS
 - A. Baking Systems
 - B. Air Dry Systems
- VI. EVALUATION AND TESTING
- VII. SUMMARY
- VIII. ACKNOWLEDGMENTS
- IX. REFERENCES

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Corrosion is defined as the process of wearing away a substance by chemical action. Most commonly, the term is applied to the destructive attack on a metal by chemical reaction with its environment. The term includes any kind of chemical attack on metals, but the most commonly encountered type of corrosion, with which this monograph is primarily concerned, occurs by electrochemical reactions.

Economic losses resulting from corrosion of metals have been said to amount to billions of dollars per year and to be of the order of magnitude of 2 to 3% of the gross national product. The major losses are with steel, and most of the discussion in this monograph will deal with protection of steel against corrosion. The use of organic coatings is one of the most important approaches for minimizing the enormous waste. In some cases, bridges for example, coatings are applied for the sole purpose of corrosion protection. In other cases, such as automobile bodies, corrosion protection is an important, but not exclusive, reason for applying coatings. In still other cases, corrosion protection may be desirable, but cost reduction or a film property other than corrosion protection may be more important.

Initially, let us consider an electrochemical cell. If plates of two different metals connected by a conductive wire are

immersed in an electrolyte (water containing some dissolved salt), it will be found that an electric current will flow and that an electrochemical reaction will occur. If one of the plates is zinc and the other is copper, the zinc will be the anode of the cell and will dissolve (corrode) and the copper will be the cathode of the cell and will remain unchanged by the electrochemical reaction.

(TABLE 1) Electromotive Series of Metals

Magnesium
Aluminum
Zinc
Iron
Tin
Copper

The dissolved salt does not, at least initially, participate directly in the reaction but rather increases the electrical conductivity of the water in the cell. For the electrochemical reactions to occur, there must be a complete electric circuit. The conductivity of pure water is so low that the reactions would be slow.

By studying the reactions occurring using many combinations of metal plates, tables have been devised which arrange metals in what is called an electromotive series. A metal higher on the list will be the anode to any metal lower on the list which will be the cathode when the two are connected in an electrolytic cell. Table 1 lists in series the metals that will be mentioned in this monograph. As can be seen, with a zinc-iron pair, zinc will be the anode but, with an iron-copper pair, iron will be the anode. In the first case, the zinc would corrode and in the second case, the iron would corrode. Summarizing, corrosion of the anodic metal will occur if there is an electrical connection with a cathode when both the anode and the cathode are immersed in an electrolyte.

Title	Location	Edition / Series / Misc.
806 Corrosion-Resistant Linings and Coatings Author: Schweitzer, Philip A. Publish.: Marcel Dekker, Inc. - place: New York, NY - date: ©2001 Subject: Protective coatings Desc: vi, 427 p., illus., 24 cm.	Dynix: 99411 Call No.: 620.1 Sc ISBN: 0824705548 Shelf Adult Non-Fiction	Edition: Series: Corrosion Technology: Vol. 16 Year: 2001 Price: \$153.50

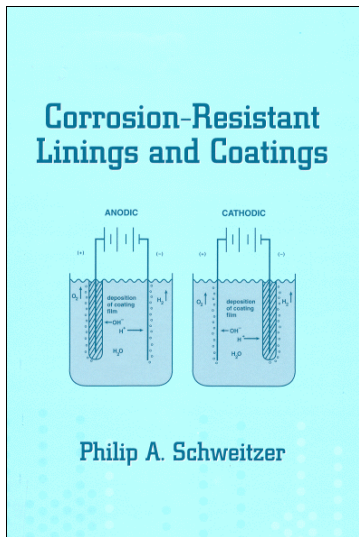


Table of Contents

- Introduction to Linings
- Sheet Linings
- Specific Thermoplastic Sheet Lining Materials
- Specific Elastomeric Sheet Linings
- Liquid Applied Linings
- Specific Liquid Applied Lining Materials
- Masonry Linings
- Glass Linings
- Comparative Corrosion Resistance of Lining Materials
- Introduction to Coatings
- Principles of Coating
- Corrosion Protection by Organic Coatings
- Specific Organic Coatings
- Selecting a Paint System
- Conversion Coatings
- Metallic Coatings
- Cementitious Coatings
- Coatings for Concrete
- Index

Reviews - Synopsis - Dust Jacket

This single-source reference covers a variety of specific coatings and solid sheet and liquid applied linings, focusing on surface preparation, installation, and application. Physical, mechanical, and corrosion resistance properties, as well as appropriate areas of application, are provided for each of the materials discussed.

Corrosion-Resistant Linings and Costings compares and contrasts the advantages and disadvantages of individual linings and coatings. It assesses polyester, acrylic, and urethane coatings that offer atmospheric protection; explains phenolics, epoxies, furans, and vinyl esters; evaluates polyester, perfluoroelastomers, and fluoroelastomers; discusses coalescence, sagging and slumping, leveling, and adhesion; analyzes organic, metallic, and monolithic coatings and paints for concrete; and more.

From the Preface: "Although many corrosion-resistant metals and alloys are available, they do not always represent the most practical or economical means to combat corrosion. In many situations, it is better to select a less resistant material and provide some type of coating or lining to protect it from corrosion...This book provides a thorough introduction to the various types of linings and coatings that can be used to provide corrosion resistance..."

Target Audience: Materials, chemical, mechanical, corrosion, industrial, civil, project, plant, and maintenance engineers; surface chemists; and upper-level undergraduate and graduate students in these disciplines.

Editorial Reviews

From Book News, Inc.
 Chemical engineering consultant Schweitzer examines the responses of various linings and coatings to temperature extremes and concentrates and describes which materials are more resistant to corrossions under certain conditions. Linings discussed include thermoplastic sheet, elastomeric sheet, liquid applied, masonry, and glass linings. Organic, metallic, cementitious coatings are also explored and the comparative corrosion resistances of the various materials are explored. Book News, Inc.®, Portland, OR

Subjects

247 .	Corrosion and anti-corrosives
324 .	Protective coatings

Title	Location	Edition / Series / Misc.
916 Design and Analysis of Experiments Author: Montgomery, Douglas C. Publish.: John Wiley & Sons - place: New York, NY - date: ©2001 Subject: Experimental design Desc: xii, 684 p., illus., 26 cm.	Dynix: 105708 Call No.: 001.4 Mo ISBN: 0471316490 Shelf: Adult Non-Fiction	Edition: 5th edition Series: Year: 2001 Price: \$101.50

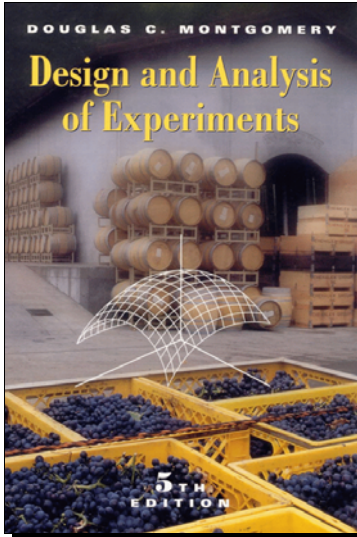


Table of Contents

1. Introduction
 2. Simple Comparative Experiments
 3. Experiments with a Single Factor: The Analysis of Variance
 4. Randomized Blocks, Latin Squares and Related Designs
 5. Introduction to Factorial Designs
 6. The 2k Factorial Design
 7. Blocking and Confounding the 2k Factorial Design
 8. Two-Level Fractional Factorial Design
 9. Three-Level and Mixed-Level Factorial and Fractional Factorial Designs
 10. Fitting Regression Models
 11. Response Surface Methods and Other Approaches to Process Optimization
 12. Experiments with Random Factors
 13. Nested and Split-Plot Designs
 14. Other Design and Analysis Topics
- Bibliography
 Appendix
 Tables
 Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:
 Learn How to Achieve Optimal Industrial Experimentation

Subjects

553 . Experimental design

Through four editions, Douglas Montgomery has provided statisticians, engineers, scientists, and managers with the most effective approach for learning how to design, conduct, and analyze experiments that optimize performance in products and processes. Now, in this fully revised and enhanced Fifth Edition, Montgomery has improved his best-selling text by focusing even more sharply on factorial and fractional factorial design and presenting new analysis techniques (including the generalized linear model). There is also expanded coverage of experiments with random factors, response surface methods, experiments with mixtures, and methods for process robustness studies.

The book also illustrates two of today's most powerful software tools for experimental design: Design-Expert and Minitab. Throughout the text, you'll find output from these two programs, along with detailed discussion on how computers are currently used in the analysis and design of experiments.

You'll also learn how to use statistically designed experiments to:

- . Obtain information for characterization and optimization of systems
- . Improve manufacturing processes
- . Design and develop new processes and products
- . Evaluate material alternatives in product design
- . Improve the field performance, reliability, and manufacturing aspects of products
- . Learn how to conduct experiments effectively and efficiently

Other important textbook features:

- . Student version of Design-Expert software is available.
- . Web site (www.wiley.com/college/montgomery) offers supplemental text material for each chapter, a sample syllabus, PowerPoint Lecture Slides, and sample student projects from the author's Design of Experiments course at Arizona State University.

PREFACE:

This is an introductory textbook dealing with the design and analysis of experiments. It is based on college-level courses in design of experiments that I have taught for over 25 years at Arizona State University, the University of Washington, and the Georgia Institute of Technology. It also reflects the methods that I have found useful in my own professional practice as an engineering and statistical consultant in the general areas of product and process design, process improvement, and quality engineering.

The book is intended for students who have completed a first course in statistical methods. This background course should include at least some techniques of descriptive statistics, the normal distribution, and an introduction to basic concepts of confidence intervals and hypothesis testing for means and variances. Chapters 10 and 11 require some familiarity with matrix algebra.

Because the prerequisites are relatively modest, this book can be used in a second course on statistics focusing on statistical design of experiments for undergraduate students in engineering, the physical and chemical sciences, mathematics, and other fields of science. For many years I have taught a course from the book at the first-year graduate level in engineering. Students in this course come from all the traditional fields of engineering, physics, chemistry, mathematics, operations research, and statistics. I have also used this book as the basis of an industrial short course on design of experiments for practicing technical professionals with a wide variety of backgrounds. There are numerous examples illustrating all of the design and analysis techniques. These examples are based on real-world applications of experimental design and are drawn from many different fields of engineering and the sciences. This adds a strong applications flavor to an academic course for engineers and scientists and makes the book useful as a reference tool for experimenters in a variety of disciplines.

ABOUT THE BOOK:

The fifth edition is a major revision of the book. I have tried to maintain the balance between design and analysis topics of previous editions; however, there are many new topics and examples, and I have reorganized much of the material. There is much more emphasis on the computer in this edition. During the last few years a number of excellent software products to assist experimenters in both the design and analysis phases of this subject have appeared. I have included output from two of these products, Minitab and Design-Expert, at many points in the text. Minitab is a widely available general-purpose statistical software package that has good data analysis capabilities, and which handles the analysis of experiments with both fixed and random factors (including the mixed model) quite nicely. Design-Expert is a package focused exclusively on experimental design. It has many capabilities for construction and evaluation of designs and extensive analysis features. A student version of Design-Expert is available with this book, and its use is highly recommended. I urge all instructors who use this book to incorporate computer software into your course. (In my course, I bring a laptop computer and an overhead display panel to every lecture, and every design or analysis topic discussed in class is illustrated with the computer.)

I have increased the emphasis on the connection between the experiment and the model that the experimenter can develop from the results of the experiment. Engineers (and physical and chemical scientists to a large extent) learn about physical mechanisms and their underlying mechanistic models early in their academic training, and throughout much of their professional careers they are involved with manipulation of these models. Statistically designed experiments offer the engineer a valid basis for developing an empirical model of the system being investigated. This empirical model can then be manipulated (perhaps through a response surface or contour plot, or perhaps mathematically) just as any other engineering model. I have discovered through many years of teaching that this viewpoint is very effective in creating enthusiasm in the engineering community for statistically designed experiments. Therefore, the notion of an underlying empirical model for the experiment and response surfaces appears early in the book and receives much more emphasis.

I have also made an effort to get the reader to the critical topics involving factorial designs much faster. To facilitate this, the introductory material on completely randomized single-factor experiments and the analysis of variance has been condensed into a single chapter (Chapter 3). I have expanded the material on factorial and fractional factorial designs (Chapters 5-9) in an effort to make the material flow more effectively from both the reader's and the instructor's viewpoint and to place more emphasis on the empirical model. The chapter on response surfaces (Chapter 11) immediately follows the material on factorial and fractional factorial designs and regression modeling. I have expanded this chapter, adding new material on alphabetically optimal designs, experiments with mixtures, and the robust parameter design problem. Chapters 12 and 13 discuss experiments involving random effects and some applications of these concepts to nested and split-plot designs. Chapter 14 is an overview of important design and analysis topics: nonnormality of the response, the Box-Cox method for selecting the form of a transformation, and other alternatives; unbalanced factorial experiments; the analysis of covariance, including covariates in a factorial design, and repeated measures.

Throughout the book I have stressed the importance of experimental design as a tool for practicing engineers to use for product design and development as well as process development and improvement. The use of experimental design in developing products that are robust to environmental factors and other sources of variability is illustrated. I believe that

the use of experimental design early in the product cycle can substantially reduce development lead time and cost, leading to processes and products that perform better in the field and have higher reliability than those developed using other approaches.

The book contains more material than can be covered comfortably in one course, and I hope that instructors will be able to either vary the content of each course offering or discuss some topics in greater depth, depending on class interest. There are problem sets at the end of each chapter (except Chapter 1). These problems vary in scope from computational exercises, designed to reinforce the fundamentals, to extensions or elaboration of basic principles.

My own course focuses extensively on factorial and fractional factorial designs. Consequently, I usually cover Chapter 1, Chapter 2 (very quickly), most of Chapter 3, Chapter 4 (excluding the material on incomplete blocks and only mentioning Latin squares briefly), and I discuss Chapters 5 through 8 on factorials and two-level factorial and fractional factorial designs in detail. To conclude the course, I introduce response surface methodology (Chapter 11) and give an overview of random effects models (Chapter 12) and nested and split-plot designs (Chapter 13). I always require the students to complete a term project that involves designing, conducting, and presenting the results of a statistically designed experiment. I require them to do this in teams, because this is the way that much industrial experimentation is conducted. They must present the results of this project, both orally and in written form.

THE SUPPLEMENTAL TEXT MATERIAL

For the fifth edition I have prepared supplemental text material for each chapter of the book. Often, this supplemental material elaborates on topics that could not be discussed in greater detail in the book. I have also presented some subjects that do not appear directly in the book, but an introduction to them could prove useful to some students and professional practitioners. Some of this material is at a higher mathematical level than the text. I realize that instructors use this book with a wide array of audiences, and some more advanced design courses could possibly benefit from including several of the supplemental text material topics. This material is in electronic form on the Instructor's CD-ROM and is on the World Wide Web site for this book.

WEB SITE

Current supporting material for instructors and students is available at the Web site www.wiley.com/college/montgomery. This site will be used to communicate information about innovations and recommendations for effectively using this text. The supplemental text material described above is available at the site, along with electronic versions of data sets used for examples and homework problems, a course syllabus, a complete set of Power Point lecture slides created by the author, and student term projects from the course at Arizona State University.

Title	Location	Edition / Series / Misc.
<p>910 Designing Safer Polymers Author: Anastas, Paul T., Paul H. Bickart and Mary M. Kirchhoff Publish.: Wiley - Interscience Publishers - place: New York, NY - date: [2000] Subject: Environmental chemistry -- Industrial applications -- Congresses Desc: x, 116 p., illus., 24 cm.</p>	<p>Dynix: 104502 Call No.: 668.9 An ISBN: 0471397334 Shelf Adult Non-Fiction</p>	<p>Edition: Series: Year: 2000 Price: \$69.95</p>

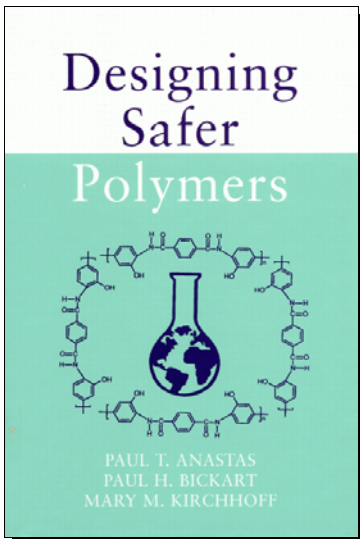


Table of Contents

PREFACE

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: THE ROLE OF POLYMERS IN SOCIETY AND THE ENVIRONMENT

1.1 Introduction

1.2 From the Stone Age to the Polymer Age

1.3 Characteristics of Polymers and the Associated Concerns

1.4 Characteristics of Polymer Manufacture and Synthesis

1.5 Conclusion

References

CHAPTER 2: GREEN CHEMISTRY AND ITS ROLE IN DESIGNING SAFER POLYMERS

2.1 Background

2.2 Principles of Green Chemistry

2.3 Designing Safer Chemicals

References

CHAPTER 3: REGULATION OF POLYMERS UNDER THE TOXIC SUBSTANCES CONTROL ACT

3.1 Background

3.2 New Chemical Responsibilities

3.3 Authority for Exemptions

3.4 Outline of the Approach

References

CHAPTER 4: THE TSCA POLYMER EXEMPTION: PROVISIONS AND GUIDANCE

4.1 Background

4.2 Definitions

4.3 Eligibility Requirements

4.3.1 Meeting the Definition of a Polymer

4.4 Substances Excluded from the Exemption

4.4.1 Exclusions for Cationic and Potentially Cationic Polymers

4.4.2 Cationic Polymers Not Excluded From Exemption

4.4.3 Exclusions for Elemental Criteria

4.4.4 Exclusions for Degradable or Unstable Polymers

4.4.5 Exclusions by Reactants

4.4.6 Exclusions for Water-Absorbing Polymers

4.4.7 Categories That Are No Longer Excluded from Exemption

4.5 Meeting the Exemption Criteria

4.5.1 The (e)(1) Exemption Criteria

4.5.2 The (e)(2) Exemption Criteria

4.5.3 The (e)(3) Exemption Criteria

4.6 Numerical Considerations

4.6.1 Calculating Number-Average Molecular Weight

4.6.2 Analytical Techniques for Determination of NAVG MW

4.7 The Two Percent Rule and Chemical Identity

4.7.1 Percent Charged Method

4.7.2 Percent Incorporated Method

4.8 Methods for Detection of Polymer Composition

Subjects

558 .	Environmental chemistry -- Industrial applications -- Congresses
559 .	Polymers -- Environmental aspects
560 .	Polymers -- Synthesis

- 4.8.1 Mass Spectrometry
- 4.8.2 Gas Chromatography
- 4.8.3 Infrared Spectroscopy
- 4.8.4 Nuclear Magnetic Resonance Spectroscopy
- 4.8.5 X-Ray Diffraction Analysis
- 4.9 Calculating Functional Group Equivalent Weight
 - 4.9.1 End-Group Analysis
 - 4.9.2 More Complex FGEW Calculations
 - 4.9.3 Determining FGEW by Nomograph
- 4.10 Other Regulations and Requirements
- 4.11 Frequently Asked Questions
- References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

A guide to designing safer polymers based on the principles of green chemistry and the EPA's Polymer Exemption Rule.

Green chemistry, the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances, is a powerful tool in designing safer polymers. By adhering to the principles of green chemistry, manufacturers can produce polymers that are better for the environment, and can do so in an economically sound manner.

The Polymer Exemption Rule delineates types of polymers that are expected to be of reduced risk. By following the guidelines contained within the Polymer Exemption Rule, manufacturers may decrease their regulatory requirements while designing polymers that are environmentally benign.

This valuable guide approaches the manufacture of polymers from two perspectives, incorporating the principles of green chemistry with the guidance of the Polymer Exemption Rule to design environmentally benign polymers. Designing Safer Polymers is an indispensable working resource for polymer scientists and engineers, as well as corporate decision makers working in the polymer and chemical industries.

PREFACE

In 1984, the Environmental Protection Agency published a Toxic Substances Control Act (TSCA) section 5(h)(4) rule granting an exemption for the manufacture and importation of certain polymers. The Agency has reviewed thousands of polymers in the interim and has developed internal guidelines for identifying polymers that do not pose an unreasonable risk of injury to human health or the environment. The final rule (USEPA 1995) reflects the Agency's extensive experience in evaluating polymers and expands the 1984 exemption criteria to allow more low-risk polymers to qualify for exemption.

The scope of this book extends beyond the polymer exemption rule itself. The fusion of green polymer chemistry with the regulatory provisions for polymers under TSCA provides a useful reference for industrial scientists and decision makers in the polymer industry. Research scientists in the polymer field will appreciate the diverse topics it addresses and the unique examples it offers.

This book is intended to assist those in the polymer industry in designing safer polymers, substances that adhere to the exemption criteria outlined in the polymer exemption rule. The first chapter recognizes the central role of polymers and plastics in society, while identifying some of the concerns associated with their use and manufacture. Chapter 2 focuses on green chemistry, the design of products and processes that eliminate or reduce the use and generation of hazardous substances. Industry can achieve substantive environmental gains by incorporating the 12 principles of green chemistry into process design and development. The third chapter examines the Toxic Substances Control Act and the exemptions permitted under this legislation, including the polymer exemption. Chapter 4 provides detailed guidance on meeting the polymer exemption criteria. In designing polymers that are exempt, industry is manufacturing products that are better for the environment while simultaneously reducing their regulatory obligations.

Title	Location	Edition / Series / Misc.
166 Development and Use of Polyester Products		Edition:
Author: Doyle, E. N.	Dynix: 31421	Series:
Publish.: McGraw-Hill Book Company	Call No.: 668.422 Do	
- place: New York, NY	ISBN: 1125256915	Year: 1969
- date: [1969]	Shelf Adult Non-Fiction	Price: \$25.00
Subject: Polyesters		
Desc: x, 371 p., illus., 23 cm.		

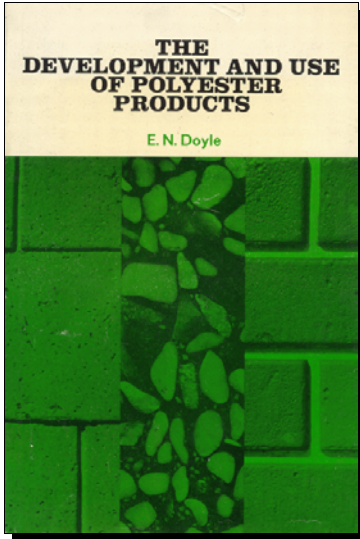


Table of Contents

Preface

1. WHY CHOOSE POLYESTERS
2. FLOOR-TILE MANUFACTURE
3. FLOORING MATERIALS MANUFACTURED IN PLACE
4. WALL PRODUCTS
5. BUILDING ACCESSORIES
6. SPECIALTY CONSTRUCTION MATERIALS
7. CORROSION CONTROL
8. THE ELECTRICAL INDUSTRY
9. THE OPTICAL INDUSTRY
10. MISCELLANEOUS MANUFACTURED PRODUCTS
11. GENERAL POLYESTER DATA FOR THE FORMULATOR

Appendix: SUPPLIERS OF RAW MATERIALS, INTERMEDIATES, RESINS, ADDITIVES, PIGMENTS, FILLERS, REINFORCING MATERIALS, EQUIPMENT, AND MACHINERY

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:
 This practical volume demonstrates the overwhelming advantages of polyester resins to everyone involved in the manufacture or use of building materials, coatings, automotive products, and a host of other items which require new and improved materials. Although thermosetting polyesters are specifically discussed, much of the information can be applied to other types of plastics — especially the thermosetting variety.

Subjects

265 .	Gums and resins
312 .	Polyesters

Significantly, the book deals with specific data, much of it available here for the first time. Important formulas for, each application and environment are fully discussed. In addition, processes for product manufacture are detailed both in writing and in care fully worked-out diagrams. Equally important, the entire book is presented in a straightforward style geared for immediate comprehension, regardless of your academic background.

Here you'll find full coverage of the raw materials and intermediates which may be used in these resins for specific end properties as well as scores of low- cost reinforcing materials, fillers, and aggregates. And because the volume presents the latest information available on polyester products, most of the fields covered are relatively new. Some of them are in the developmental stages, while others are just beginning to emerge into the marketplace. Perhaps the most significant advances covered are the uses of completely new raw materials and intermediates in the manufacture of the basic resins. These breakthroughs will open entirely new areas of polyester application.

The Development and Use of Polyester Products first examines every end product possible with polyester resins. Then, after each product is discussed, the specific resins best suited to its manufacture, fillers, pigments, and reinforcers are documented. In short, this fundamental offers all the basic facts, probable theories, and solid information you'll need to solve everyday polyester product problems.

PREFACE:

A great number of fine books, treatises, and technical articles have been written and published concerning polyester resins and their manufacture, processing, and uses.

The majority of these publications have been dedicated to the general- purpose resins and their uses for processing into the Fiberglass Rein forced Plastics (FRP) so well known in boats, translucent paneling, storage vessels, automobiles, aircraft, trays, and other such uses.

Very little has been written about the host of applications where polyesters can be utilized to such great advantage without the use of a reinforcing fiber or fabric.

Reinforced polyester resins have a well-defined place in industry. Their use is steadily growing and expanding to such applications as tooling, structural members, tubular goods, pipe, large storage tanks, silos for grains and feedstuff, and many other end products.

An effort is made here to make the industry aware of the many applications in which reinforcing materials such as fiberglass, can be replaced with very low-cost fillers, such as limestone, clay, silica, barytes, and other well-known fillers. In these applications, tensile strength is not a priority factor in the end product.

The author feels that the construction industry will provide the largest and most profitable market for polyester products in the fore seeable future. Recent building-materials surveys show that the plastics part of the building industry is a very small part of the total and that it mostly consists of the vinyl and vinyl-asbestos flooring materials.

In order that polyester products may be able to compete with more conventional types of building materials, resins, processes, and techniques must be developed to turn out top-quality merchandise at the lowest possible prices. This calls for large, well-equipped plants, with all the automation possible. Mass-production requires large capital investments; however, the investment in this type of manufacturing plant is the only way polyester building materials will be able to gain any appreciable segment of this market.

This is not to say, however, that there are not many end products that can be produced and marketed profitably with modest capital in vestments. Some of the products discussed in Chap. 10 can be manufactured with small- to medium-sized investments and still compete well in today's markets.

In the following chapters an attempt will be made to discuss almost every conceivable type of polyester product. A very short time ago, such products would not have been possible simply because the materials were not available at prices that would allow these products to be competitive. Much credit is due to the petrochemical industry, which has made the raw materials and intermediates available to resin manufacturers. Even more credit is due to the resin manufacturers themselves, who, through extensive research, are meeting the ever-increasing demand for better polyesters for specific processes and products. Much credit must go also to the manufacturers of equipment, who today are spending large sums in research and development of equipment to process these polymers into finished end products at the lowest possible price.

Thus, in effect, the progress of plastics and polyesters, in particular, into these new fields will be a joint effort of every phase of the industry. The cycle starts, for the most part, with the basic petroleum from which the plastics are derived. The petrochemical industry takes these petroleum products and turns them into intermediates, which the resin manufacturer processes into a finished polymer. Hundreds of other manufacturers turn out additives and ingredients that make the finished formulation for the end-product manufacturer, who is the crucial part of the joint effort. The whole sequence depends entirely on his investment, foresightedness, technical skills, and ability to market the finished product. The industries below him in the sequence cannot market their products unless the end-product manufacturer can successfully market his products to the consumer.

Marketing alone will be a great challenge. Consumers do not readily take to change. Many of these new products will be so vastly different from conventional products that good, solid selling will be necessary as to how and why they are advantageous to the consumer. Once these materials are understood and appreciated, the selling will consist mostly in the performance of the materials themselves.

The challenge to those in the polyester industry is not only to find new markets for their present products, but to find the means to manufacture polyester products to compete with conventional materials and other plastic products and to conceive completely new products for marketing.

It is very doubtful that anyone has realized the full potential of these polymers or can visualize even a small part of the many applications to which they can be put.

The basis for progress in this industry (as is the case in any industry) must be quality and cost to the consumer. All this is possible through good, solid research and development. Marketing is of no less importance. Here, truth in advertising will be perhaps the biggest asset for the industry.

This book attempts to give the reader many new ideas with which to begin and suggests processing methods and means with which to work. It is sincerely desired that renewed efforts in the industry will be sparked, and that perhaps completely new trends of thought along these lines will be inspired.

Progress is the lifeblood of any industry. To stay in existence, it must forge ahead. To stand still is fatal. In this rapidly changing world, industry must project its ideas many years ahead.

This book contains no bibliography or references. However, the Appendix lists names of all manufacturers and suppliers available to the author, as well as all materials and equipment discussed in the text.

Trade names have been purposely omitted, with the exception of instances where generic names are not available.

Any infringement on the patents, copyrights, trademarks, or statutory and proprietary rights of others is purely coincidental.

Title	Location	Edition / Series / Misc.
807 Dictionary of Colloid and Interface Science Author: Schramm, Laurier Lincoln Publish.: John Wiley & Sons - place: New York, NY - date: ©2001 Subject: Colloids -- Dictionaries Desc: x, 218 p., 25 cm.	Dynix: 99412 Call No.: 541.3 Di ISBN: 0471394068 Shelf Reference	Edition: 2nd edition Series: Year: 2001 Price: \$48.50

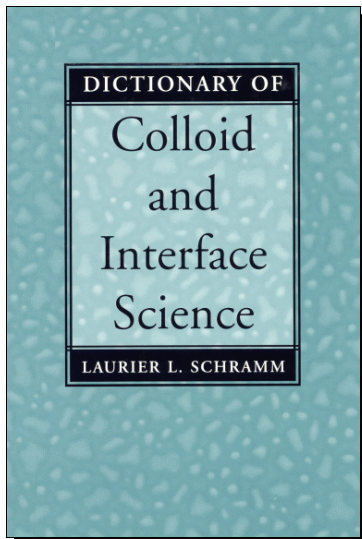


Table of Contents

About the Author
 Acknowledgments
 Introduction
 Dictionary of Terms
 Tables
 Table 1. Classifications for Atmospheric Aerosols of Liquid Droplets
 Table 2. Types of Colloidal Dispersion
 Table 3. Particle Size Classifications Extending Upwards from the Classical Colloidal Domain
 Table 4. Glossary of Viscosities
 Table 5. Equations for Predicting Viscosities of Dispersions
 Table 6. Equations for Predicting Conductivities of Dispersions
 Table 7. Equations for Predicting Relative Permittivities of Dispersions
 Table 8. Equations for Predicting Surface and Interfacial Tensions
 Table 9. Some Surface Techniques and Their Acronyms
 Table 10. Some Approximate Values of Shear Rate Appropriate to Various Processes
 Table 11. Some Descriptions Appropriate to Different Yield Stresses
 Table 12. Equations for Predicting Critical Micelle Concentrations
 Table 13. Index of Famous Names in Colloid and Interface Science
 Table 14. Some Units and Symbols in Colloid and Interface Science
 References

Subjects

522 .	Colloids -- Dictionaries
523 .	Surface chemistry -- Dictionaries

Reviews - Synopsis - Dust Jacket

The Dictionary of Colloid and Interface Science is a working resource for chemists and chemical engineers; it offers concise definitions — with synonyms, abbreviations, and acronyms — of more than 300 terms. This ready reference for navigating the colloidal and interfacial literature include tables, references, key equations and constants, important named colloids and phenomena, and profiles of over 60 major names in colloid and interface science.

From the Introduction: "...A vast lexicon is associated with the study of colloid and interface science because, in addition to the growth of the fundamental science itself, we recognize a great diversity of occurrences and properties of colloids and interfaces in industry and indeed in everyday life. Many other scientific disciplines become involved in the study and treatment of colloidal systems, each discipline bringing elements of its own special language. This book provides brief explanations for the most important terms that may be encountered in a study of the fundamental principles, experimental investigations, and industrial applications of colloid and interface science...Specific literature citations are given when the sources for further information are particularly useful, unique, or difficult to find..."

Target Audience: Chemists, chemical engineers, colloid scientists, and students of these disciplines.

FROM THE DUST JACKET:

"Dictionary of Colloid and Interface Science" includes more than 300 terms, with tables, references, and a biographical section that puts important developments in colloid and interface science into historical perspective. This dictionary is appropriate for professionals and students alike, and proves itself to be a ready reference for navigating the colloidal and interfacial literature.

A valuable working resource for chemists and chemical engineers, "Dictionary of Colloid and Interface Science" contains:

- Concise definitions of key terms in colloid and interface science and their synonyms, abbreviations and acronyms
- Key equations and constants
- Important named colloids and phenomena
- Profiles of over 60 major names in colloid and interface science

INTRODUCTION:

In the early 1800s Thomas Graham studied the diffusion, osmotic pressure, and dialysis properties of a number of substances, including a variety of solutes dissolved in water. He noticed that some substances diffused quite quickly through parchment paper and animal membranes and formed crystals when dried. Other substances diffused only very slowly, if at all, through the parchment or membranes and apparently did not form crystals when dried. Graham proposed that the former group of substances, which included simple salts, be termed "crystal bids," and that the latter group, which included albumen and gums, be termed "colloids." Although colloidal dispersions had certainly been studied long before this time, and the alchemists frequently worked with body fluids, which are colloidal dispersions, Graham is generally regarded as having founded the discipline of colloid science.

The test of crystal formation later turned out to be too restrictive, the distinction of crystalloids versus colloids was dropped, and the noun colloid was eventually replaced by the adjective colloidal, indicating a particular state of matter: matter for which at least one dimension falls within a specific range of distance values. The second property that distinguishes all colloidal dispersions is the extremely large area of the interface between the two phases compared with the mass of the dispersed phase. It follows that any chemical and physical phenomena that depend on the existence of an interface become very prominent in colloidal dispersions. Interface science thus underlies colloid science.

Now, 200 years later, a vast lexicon is associated with the study of colloid and interface science because, in addition to the growth of the fundamental science itself, we recognize a great diversity of occurrences and properties of colloids and interfaces in industry and indeed in everyday life. Many other scientific disciplines become involved in the study and treatment of colloidal systems, each discipline bringing elements of its own special language. This book provides brief explanations for the most important terms that may be encountered in a study of the fundamental principles, experimental investigations, and industrial applications of colloid and interface science. Even this coverage represents only a personal selection of the terms that could have been included were there no constraints on the size of the book.

I have tried to include as many important terms as possible. The difficulty of keeping abreast of the colloid science vocabulary has been worsened by the tendency for the language itself to change as the science has developed, just as the meaning of the word colloid has changed. Many older terms that are either no longer in common use, or worse, that now have completely new meanings, are included as an aid to the reader of the older colloid and interface science literature and as a guide to the several meanings that many terms can have. In addition, cross-references for the more important synonyms and abbreviations are included. Some basic knowledge of underlying fields such as physical chemistry, geology, and chemical engineering is assumed. Many of the important named colloids and phenomena (such as Pickering emulsions), equations, and constants are included, although again this selection represents only some of the terms that could have been included. Finally, I have also included a selection of brief biographical introductions to more than 60 scientists whose names are associated with famous named phenomena, equations, and laws in colloid and interface science. Students first become aware of the people that have laid the foundation for a scientific discipline as they encounter these eponyms. By adopting the "students' view" of famous names in the field, it will be seen that in some cases the scientists are very famous, and biographies are readily found. In other cases, the scientists are not as well known, and in some cases their contribution to colloid and interface science was otherwise slight. For those interested in this feature specifically, I have included an index of famous names in colloid and interface science for easy searching.

Title	Location	Edition / Series / Misc.
674 Electrodeposition and Radiation Curing of Coatings, 1970		<i>Edition:</i>
<i>Author:</i> Ranney, Maurice William, 1934-	<i>Dynix:</i> 35843	<i>Series:</i> Chemical Process Series
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 671.732 Ra	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815501348	
<i>- date:</i> ©1970	<i>Shelf:</i> Reference	<i>Year:</i> 1970
<i>Subject:</i> Electrophoretic deposition -- Patents		<i>Price:</i> \$50.00
<i>Desc:</i> 170 p., illus., 27 cm.		

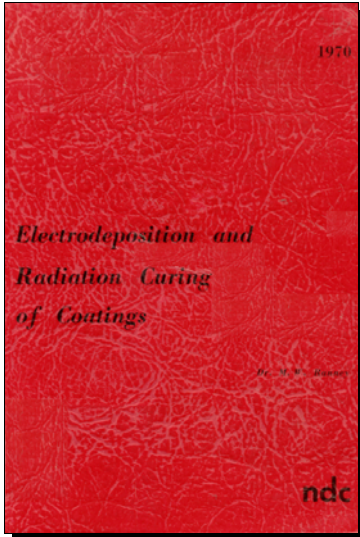


Table of Contents

INTRODUCTION

ELECTRODEPOSITION

1. PROCESS EQUIPMENT AND TECHNIQUES

- Control of Bath Stability
 - Continuous Unit for Coil Stock Utilizing Dialysis and Ion Exchange Systems
 - Electrodialysis
 - Ion Exchange Membrane
 - Membrane Separation
 - Diffusion Barrier Used for Feed Replenishment
 - Vapor-Liquid Separation Method for Removing Excess Amine from Bath
 - Two Phase Bath Employing n-Butanol
 - Use of n-Butoxy Propanol and Butyl Lactate as Cosolvents
 - Ion Exchange Resin for Polytetrafluoroethylene Emulsion
- Electrical Parameters
 - Cyclical Current Reversal
 - Variation of Electrical Inducement
 - Symmetrical Alternating Current
 - Intermittent Current with Pulse Rate of 30 to 90 Pulses per Minute
 - Control of Initial Amperage Surge
- Miscellaneous Feed Control
 - Feed Control Systems
 - Dual Feed System for Supplying Resin and Pigment to Bath
 - Dual Coating Lines Employing Common Bath
 - Anodic Conveyor Unit
 - Electrocoating Hollow Articles
 - Centrifugally Operating Apparatus
 - Apparatus for Deposition on Tubular Fabric
 - Removal of Gas Film Formed During Electrodeposition
 - Design Coatings
 - Use of Terminal Showering Step

2. COATING FORMULATIONS

- Acid-Containing Resins
 - Polycarboxylic Acid Resins Partially Neutralized with Soluble Amino Compounds
 - Phenolic Extended Polycarboxylic Acid Resins
 - Organic Acid Resins Containing Mineral Acid Groups
 - Polycarboxylic Acid Preparation Using Sulfonic Acid Catalyst
 - Interpolymers Containing Transesters of Alkoxy Melamines and Unsaturated Acids
 - Fatty Acid Ester-Unsaturated Dicarboxylic Acid Reaction Products
 - Amine-Aldehyde Condensation Products Reacted with Phenol or Polyol
 - Acrylic Interpolymers and an Amine-Aldehyde Product
 - Etherified Methylolated Melamines
 - Alkali-Soluble Esters of Epoxy Resins
 - Oxidized Polyethylene
 - Dual Feed Process for Two Phase Aqueous Systems
 - Predispersed Pigment in Alkyd and Acrylic Systems
- Cathode Deposition
 - Cataphoretic Deposition of Copolymers Containing Basic Nitrogen
 - Unsaturated Polyhydroxyether Esters

Subjects

511 .	Electrophoretic deposition -- Patents
512 .	Radiation curing -- Patents

- Epoxy Resin Esters
- Lead and Polytetrafluoroethylene
- Cationic Bituminous Emulsions
- Miscellaneous Aqueous Emulsions
- Ethylene Polymers
- Polyurethane Coatings
- Use of Complexing Agents
- Deposition of Acrolein Polymers
- Nonaqueous Systems
- Nonaqueous Colloidal Suspensions
- Addition of Polar Solvent to Bath
- Poly-p-Xylylene Precursors

3. GENERAL TECHNIQUES

- Metal Treatment
 - Phosphate-Chromate Treatment After Electrodeposition of Acid Resin
 - Zinc Electroplating Prior to Coating
 - Zinc Phosphate Treatment and Addition of Fluorides
 - Conductive Undercoat Application
 - Pretreatment Technique
- Fillers and Pigments
 - Use of Basic Lead Silico Chromate Pigment
 - Control of Soluble Chromate Ion Level
 - Metallic Zinc Paints
 - Use of Organophilic Cation Modified Clay
 - Use of Plastic Powders
- Miscellaneous
 - Repair of Electrical Conductors
 - Electrical Insulation for Cables

RADIATION CURING

4. COATING FORMULATIONS

- Polymeric Vehicles
 - Polyvinylidene Fluoride
 - Polybutadiene-Metal Laminates
 - Low Energy Irradiation of Polyethylene
 - Alpha-Beta Unsaturated Binders
 - Silicone Modified Coatings
 - Styrene-Polyester Laminates
 - Telomerized Polyamides
 - Hydrocarbon Coatings
- Monomers for Wood Impregnation
 - Vinyl Chloride Impregnation
 - Stabilization of Wood Using Acrylic, Styrene and Epoxy Monomers

5. PROCESS EQUIPMENT

- Irradiation of Coating Material Prior to Application
- Process Equipment for Coating Automobile Bodies
- Electron Discharge Control Device
- Simultaneous Electrostatic and Electron Bombardment Polymerization
- Decorating Glass Surfaces

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD:

The detailed, descriptive information in this book is based on U.S. Patents relating to techniques and formulations for electrodeposition and radiation curing of organic coatings.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. Patent literature in this field. By indicating only information that is significant, and eliminating much of the legal jargon in the patents, this book then becomes an advanced industrially oriented review of techniques and formulations for electrodeposition and radiation curing of organic coatings.

The U.S. Patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from the patent literature is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure".

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially utilizable information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

These publications are bound in paper in order to close the time gap between "manuscript" and "completed book". Industrial technology is progressing so rapidly that hard cover books do not always reflect the latest developments in a particular field, due to the longer time required to produce a hard cover book.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor, and patent number help in providing easily obtainable information.

INTRODUCTION:

Electrodeposition, developed largely by Ford Motor Company during the 1950's, was first used on a production basis by Ford to coat wheels in 1961 and for priming auto bodies in 1963. While operating costs are generally low, the initial installation costs for an electrodeposition process are rather high which has limited the broad acceptance of this technique. However, its major advantages such as the uniform, pinhole-free coating of all edges as well as flat surfaces coupled with automated operation, the elimination of fire hazards and air pollution problems and throughput (2—3 minutes for an auto body) have recently led to the use of electrodeposition coating of metal toys (Tonka Corp.), structural steel girders (Laclede Steel) and washing machine parts (Whirlpool).

Ford, Glidden, PPG Industries and Mobil have pioneered this area in the United States, with Imperial Chemical Industries and Pressed Steel Co. proceeding along similar lines in Great Britain. The first ICI unit for coating auto parts, has been operating since 1964. Approximately 100 tanks are now operating in the United States, with Ford and General Motors utilizing some seven tanks each. Overseas, acceptance has been considerably more dramatic with the number of operational tanks in Europe being estimated at more than 250, about 25% of which are in automotive plants. Some 50 tanks are in use for the electrodeposition of coatings in Japan. The current United States market for paints used in electrocoating tanks is about \$10 million, largely supplied by PPG Industries and Glidden for automotive use.

Electron beam curing has yet to reach significant commercial status, but the advantages of rapid curing (seconds), elimination of curing ovens, and the use of essentially solvent-free vehicles thus minimizing air pollution problems clearly indicate that radiation curing will take its place alongside electrocoating techniques in the industry over the next few years. While resin technology is limited, considerable effort is under way with polyester and acrylic formulations. Most recently urethane and epoxy systems look promising. Boise Cascade is utilizing Ford's Electro cure process to prepare various radiation-cured lumber products containing modified acrylic resins.

Ford is setting up an Electro cure line to cure painted acrylonitrile—butadiene—styrene plastic automotive parts, such as instrument panels and grilles at its Saline, Michigan plant. Eventual use on steel and aluminum is planned and, considering the speed of cure, the first large scale operations for electron beam curing may well be in the coil coating industry.

Title	Location	Edition / Series / Misc.
43 Electrofinishing Author: Brimi, Marjorie A. and James R. Luck Publish.: American Elsevier Publishing Company - place: New York, NY - date: ©1965 Subject: Electroplating Desc: v, 282 p., 24 cm.	Dynix: 14899 Call No.: 671.732 Br ISBN: Shelf Adult Non-Fiction	Edition: Series: Year: 1965 Price: \$25.00

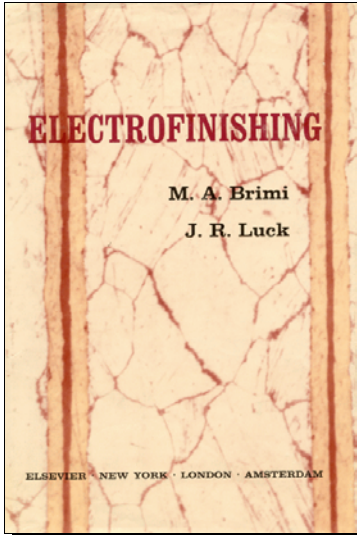


Table of Contents

Preface

1. Equipment and Supplies
2. Shop Practices
3. Safety and Hygiene
4. Waste Recovery and Disposal
5. Pretreatment and Conversion Coatings
6. Electropolishing and Anodizing
7. Copper Plating
8. Cadmium Plating
9. Zinc Plating
10. Silver Plating
11. Alloy Plating
12. Lead and Tin Plating
13. Nickel Plating
14. Chromium Plating
15. Precious Metals Plating
16. Miscellaneous Metals Plating

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The significance of electroplating and anodizing in our progressive industrial society necessitates updating the convenient presentation of technical developments to make them available to field workers. ELECTROFINISHING presents practical and comprehensive information on the entire subject of electrofinishing and related areas.

The metal finisher will be aided by this book in establishing a plant and operational equipment, facilities, specifications, methods, and community relations.

Plating processes covered include the common metals, such as zinc, copper, silver, nickel, chromium, cadmium, lead, and tin and some of the metals of more recent importance, such as cobalt-nickel, iron, and manganese.

Deposition methods are presented, offering alternatives to suit peripheral considerations. Chemical pretreatment and conversion processes complete the treatment program, while a chapter on anodizing concludes the electrofinishing picture.

In addition to thorough and current coverage of the important industrial plating processes, ELECTROFINISHING emphasizes the timely subjects of waste disposal and recovery and hygiene. A bibliography of 4,000 entries, contained in the references, is especially valuable for workers seeking further details on the processes discussed.

PREFACE:

This work is intended as a guide for the electrofinisher to the literature published during the period 1952-1964. A working quantity of detailed information is presented to the performance of most electrofinishing operations independent of additional information.

However, a liberal bibliography (nearly 4,000 references) will enable the worker to pursue his subject to the degree of completeness he desires.

The publication of processes or formulas in this work does not guarantee their satisfactory performance nor does it grant license to the reader to use the processes or formulas commercially in cases where proprietary rights are held by others. The reader assumes all risk should he use any of the processes, formulas, or procedures set forth in this work.

Subjects

254 .	Electroplating
368 .	Electrolytic polishing

Elements of Color: A Treatise on the Color System of Johannes Itten Based on His Book "The Art of Color"

LASCT Holdings - maximum detail by Title

E

Title	Location	Edition / Series / Misc.
167 Elements of Color: A Treatise on the Color System of Johannes Itten Based on His Book "The Art of		Edition:
Author: Itten, Johannes, 1888-1967 (Faber Birren, editor)	Dynix: 89726	Series: Basic Color Library
Publish.: Van Nostrand Reinhold Company	Call No.: 701.8 It	
- place: New York, NY	ISBN: 0442240384	
- date: [1970]	Shelf Adult Non-Fiction	Year: 1970
Subject: Color		Price: \$40.00
Desc: 96 p., illus. (part color) portraits, 21 cm.		

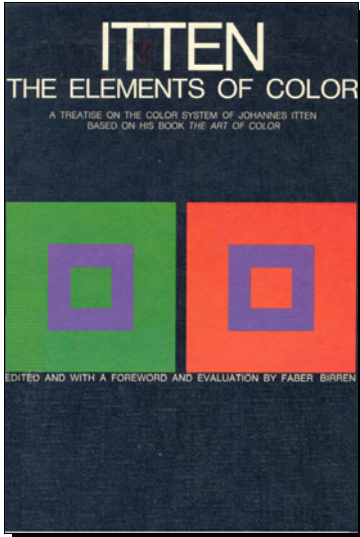


Table of Contents

- Foreword and evaluation by Faber Birren
- Introduction
- Color Physics
- Color Agent and Color Effect
- Concord of Colors
- Subjective Timbre
- Theory of Color Design
- The Twelve-Part Color Circle
- The Seven Color Contrasts
 - Hue
 - Light-Dark
 - Cold-Warm
 - Complementary
 - Simultaneous
 - Saturation
 - Extension
- Color Mixing
- The Color Sphere
- Color Harmony
- Form and Color
- Spatial Effect of Colors
- Theory of Color Impression
- Theory of Color Expression
- Composition
- Postscript

Subjects

245 .	Colors
286 .	Painting -- Technique

Reviews - Synopsis - Dust Jacket

Book Description

A useful simplification and condensation of Johannes Itten's major work. "The Art of Color", this book covers subjective feeling and objective color principles in detail. It presents the key to understanding color in Itten's color circle and color contrasts.

FORWARD:

This present book, The Elements of Color, by Johannes Itten, is a simplification and condensation of his major book, The Art of Color, published in Germany in 1961. The larger work has been translated into French, Italian, and Japanese. The English edition (also 1961), with the imprint of Van Nostrand Reinhold, is a sizeable volume, 11¼X 12½ inches in size. It has 155 pages, over 100 color illustrations and over 25 in black and white.

In reading Itten and studying his principles and illustrations, the remarkable nature of the man should be appreciated. He was fond of the philosophy of the Far East and studied the wisdom of the ancient Chinese and Hindus. An artist needs inner confidence and self control and yet must dwell within a real world and be conscious of its interests and requirements. Itten wrote, "We may take warning from the history of India, where, Out of preoccupation with exalted spiritual fulfillment, mystics forgot that material life, too, demands cultivation and direction." He recognized the basic laws of color and form, proportions, texture and rhythm as the foundation of his own concept of art education. This profundity of Itten, by advice and example, draws an effective portrait of the ideal artist. He must be born with some talent, as must a musician or singer. This talent then needs to be developed, enlarged, and perfected through expert training and application. And in the field of color, Itten is a most capable and wise instructor.

There are a number of unusual and original features evident in Itten's work as presented herewith. First, he has a wide knowledge of art in all nations and among all peoples. He has a keen perception of the genius of the old masters and

writes with rare enlightenment on their color expression. He has taken vital part in modern art movements.

He is particularly alert to the remarkable visual effects of simultaneous contrast and offers several dramatic examples in his color plates.

In a chapter on "Subjective Timbre" he calls for personal feeling. Expression should come from within. "To help a student discover his subjective forms and colors is to help him discover himself." And this Itten strives to do.

In color organization, he describes and illustrates a twelve-part star which he designed in Weimar in 1921. This is amplified by a color circle, a color sphere, and by beautifully graded scales of the twelve colors.

Throughout the book are suggested exercises, which, if carried out, will give a student color control in the sense that practice of music scales will strengthen the facility of a pianist or singer. When creative work is then attempted the student will know what he is about and will not be lost in ignorance or trial and error.

One of the chief features of Itten's contribution to the art of color is his discussion of "The Seven Color Contrasts." These principles compose an important part of his book and, properly absorbed and taken to heart, so to speak, will assure competence and well qualify any student for the rest of his life. The principles may not make a good artist where talent may be lacking, but they will nonetheless save him the embarrassment of making clumsy mistakes with the spectrum. There is sound advice on color mixture, on ways in which hues can be arranged for harmonious order, simple relationships between colors and form, spatial effects. The book ends with intriguing notes on color symbolism, com Any student or artist has the privilege of spending hours, days, or months perusing the conclusions of a great man and profiting from a lifetime of ardent inquiry and understanding.

Johannes Itten was considered one of the greatest teachers of the art of color of modern times. Few men of his stature have ever devoted so many years over five decades to instruction into the visual, psycho logical, and esthetic mysteries of color.

He was born near Thun, Switzerland, in 1888. Having a profound interest in painting and color, he went to Stuttgart in 1913 to study under Adolph Hölzel, a leading German color theorist and educator. Fascinated with color, Itten paid scholarly attention to the masterworks of Goethe, Schopenhauer, Runge of Germany, and Chevreul of France. He saw relationships between music and color and gave early attention to abstract color expression in geometrical paintings.

From Stuttgart he went to Vienna where during 1916-1919 he ran his own school. His insistence on spontaneity and personal expression with color supported by adequate knowledge, discipline, and training — became renowned. In 1919 fourteen of his students followed him to Weimar where he joined the famous Bauhaus founded by Walter Gropius. Here he became a master (1919-1923) and developed the basic course on form and color. Among the other Bauhaus masters were such great artists as Lyonel Feininger, Paul Klee, Oskar Schlemmer and Vasily Kandinsky.

Itten often started his classes with certain oriental exercises and body controls. He wrote, "He who wants to become a master of color must see, feel, and experience each individual color in its many endless combinations with all other colors. Colors must have a mystical capacity for spiritual expression, without being tied to objects."

After leaving the Bauhaus, Itten operated his own school in Berlin (1926-1934) where he formulated many of the principles he later put into book form: Design and Form, the basic course at the Bauhaus, published in the United States by Van Nostrand Reinhold. He also founded the School for Textile Design at Krefeld in Germany. Returning to Switzerland, he became director of the Arts and Crafts School-and- Museum of the Textile School at Zurich (1938-1954), and founded the Museum Rietberg.

In addition to many important exhibits in the Arts and Crafts museum, in 1944, long before his major book The Art of Co/or was published, Itten set up special color exhibits in a number of Swiss and German cities. Itten had always devoted much of his time to painting. Retrospective exhibitions were presented at the Stedelijk Museum in Amsterdam in 1957, at the Kunsthaus, Zurich, in 1964, at the Kunstverein, Dusseldorf, in 1965, and at the Venice Biennial of 1966. He has also been represented in several Bauhaus exhibitions, the most recent being a worldwide traveling exhibition.

Works by Johannes Itten are in the permanent collections of European and American Museums.

INTRODUCTION:

Learning from books and teachers is like traveling by carriage, so we are told in the Veda. The thought goes on, "But the carriage will serve only while one is on the highroad. He who reaches the end of the highroad will leave the carriage and walk afoot."

In this book I shall try to build a serviceable conveyance that will help all who are interested in the problems of color

artistry. One may travel carriageless and by unblazed trails, but progress is then slow and the journey perilous. If a high and distant goal is to be attained, then it is advisable to take a carriage at first in order to advance swiftly and safely.

Many of my students have helped me to find materials with which to build, and I am deeply indebted to them. The doctrine to be developed here is an aesthetic color theory originating in the experience and intuition of a painter. For the artist, effects are decisive, rather than agents as studied by physics and chemistry. Color effects are in the eye of the beholder. Yet the deepest and truest secrets of color effect are, I know, invisible even to the eye, and are beheld by the heart alone. The essential eludes conceptual formulation.

In the realm of aesthetics, are there general rules and laws of color for the artist, or is the aesthetic appreciation of colors governed solely by subjective opinion? Students often ask this question, and my answer is always the same: "If you, unknowing, are able to create masterpieces in color, then un-knowledge is your way. But if you are unable to create masterpieces in color out of your unknowledge, then you ought to look for knowledge."

Doctrines and theories are best for weaker moments. In moments of strength, problems are solved intuitively, as if of themselves.

Close study of the great master colorists has firmly convinced me that all of them possessed a science of color. For me, the theories of Goethe, Runge, Bezold, Chevreul and Hölzel have been invaluable.

I hope to be able to resolve a great many color problems in this book. We are not merely to expound objective principles and rules, but also to explore and survey the subjective predicament, as it pertains to critical taste in the realm of color.

We can be released from subjective bondage only through knowledge and awareness of objective principles.

In music the theory of composition has long been an important and accepted part of a professional education. However, a musician may know counterpoint and still be a dull composer, if he lacks insight and inspiration. Just so, a painter may know all the resources of composition in form and color, yet remain sterile if inspiration be denied him.

Title	Location	Edition / Series / Misc.
935 Emulsification and Polymerization of Alkyd Resins		<i>Edition:</i>
<i>Author:</i> Gooch, Jan W. (Jan Woodall), 1946-	<i>Dynix:</i> 105709	<i>Series:</i> Topics in Applied Chemistry
<i>Publish.:</i> Kluwer Academic / Plenum Publishers	<i>Call No.:</i> 668 Go	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0306467178	
<i>- date:</i> ©2002	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 2002
<i>Subject:</i> Alkyd resins		<i>Price:</i> \$91.50
<i>Desc:</i> xxii, 223 p., illus., 24 cm.		

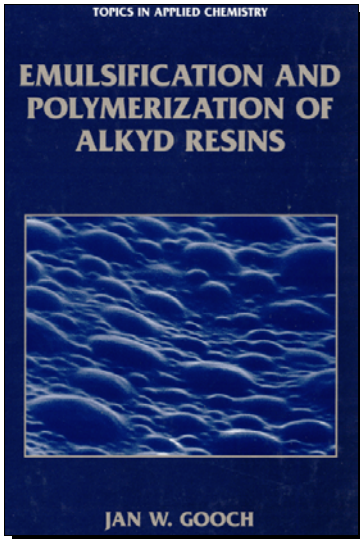


Table of Contents

1. ALKYD RESINS, VEGETABLE OILS AND AUTOXIDATNE POLYMERIZATION
 - 1.1. Goals of Research and Development in Alkyd Emulsions
 - 1.2. Historical Background of Alkyds, Oils and Emulsions
 - 1.2.1. Vegetable Oils and Resins
 - 1.2.2. Autoxidative Polymerization of Vegetable Oils and Resins
 - 1.2.3. Emulsified Oils and Resins
 - 1.3. Theoretical Considerations
 - 1.3.1. Intrinsic Viscosity
 - 1.3.2. Hydrophile-Lipophile Balance (HLB)
 - 1.3.3. Diffusion of Oxygen in an Emulsion
 - 1.3.4. Solubility of Air and Oxygen in Aqueous Phase
 - 1.3.5. Swelling Ratio
 - 1.4. Justification for Research and Development
2. SYNTHESIS AND POLYMERIZATION OF ALKYDS
 - 2.1. Alkyd Synthesis Procedure
 - 2.2. Emulsification Procedure
 - 2.3. Autoxidation Procedure
 - 2.4. Materials
 - 2.5. Characterization
 - 2.5.1. Emulsion Particle Size
 - 2.5.2. Emulsion Characterization
 - 2.5.3. Film Characterization
 - 2.5.4. Intrinsic Viscosity Measurement
 - 2.5.5. Swell Ratio
 - 2.5.6. Turbidimetric Measurement of Swelling Ratio
 - 2.5.7. Dissolved Oxygen in Aqueous Phase
3. EMULSION AND KINETIC STUDIES OF AUTOXIDATNE POLYMERIZATION
 - 3.1. Emulsifier Studies
 - 3.1.1. Emulsifier Sources and Chemical Structures
 - 3.1.2. Emulsifiers and Emulsion Stability
 - 3.1.3. Emulsifiers and Freeze-Thaw Stability
 - 3.1.4. Emulsifiers and Film Characterization
 - 3.2. Phase Ratio and Co-Solvent Study
 - 3.2.1. Solvent Alkyd Emulsions
 - 3.2.2. Co-Solvent Containing Emulsions
 - 3.3. Studies on the Autoxidative Crosslinking of Emulsified Soya Oil
 - 3.3.1. Autoxidation Reaction of Emulsified Soya Oil
 - 3.3.2. Catalysis of Autoxidation Reaction of Soya Oil
 - 3.4. Studies of the Autoxidative Crosslinking of Emulsified Alkyd Particles
 - 3.4.1. Autoxidation Reaction of Emulsified Alkyd Resins
 - 3.4.2. Non-catalyzed Autoxidation Reaction
 - 3.4.3. Benzoyl Peroxide Catalysis in the Alkyd Phase
 - 3.4.4. Cobalt Naphthenate Catalysis in Aqueous Phase
 - 3.4.5. Autoxidized Emulsion Characterization
 - 3.4.6. Post pH-Adjustment of Autoxidized Emulsion
 - 3.4.7. pH Adjustment Prior to the Autoxidation
 - 3.4.8. Cobalt Naphthenate Catalysis in Alkyd Phase
 - 3.4.9. Post-Addition of Emulsifier
 - 3.4.10. pH Effect on Reaction Rate

Subjects

570 .	Alkyd resins
571 .	Emulsification

- 3.4.11. Increased Oxygen Concentration and Catalysis
 - 3.4.12. Scanning Electron Microscopy
 - 3.4.13. Water Clean-Up of Emulsion
 - 3.4.14. Comparison to Alkyd-Solvent System
 - 3.4.15. Effect of Emulsifier Structure on Reaction Rate
 - 3.5. Kinetic Study
 - 3.5.1. Oxygen Concentration Relationship
 - 3.5.2. Correlation of Swell Ratio and Percent Transmittance
 - 3.5.3. Catalysis Effect
 - 3.5.4. Temperature Effect
 - 3.5.5. Agitation Rate Effect
 - 3.5.6. Molecular Weight Effect
 - 3.6. Studies on Emulsion Particle Size
 - 3.6.1. Particle Size with Reaction Time
 - 3.6.2. Average Particle Size with Homogenization
 - 3.6.3. Particle Size after One Year of Shelf Life
 - 3.7. Alkyd Oil Length and Conjugation Study
 - 3.7.1. Alkyd Oil Length Study
 - 3.7.2. Alkyd Conjugation Study
4. EXPERIMENTAL RESULTS, RESEARCH AND COMMERCIALIZATION OF TECHNOLOGY
- 4.1. Autoxidative Crosslinking of Vegetable Oil
 - 4.2. Autoxidative Crosslinking of Vegetable Oil Alkyds
 - 4.3. Emulsification
 - 4.4. Continuing Research and Developments
 - 4.5. Commercialization of Alkyd Emulsions

APPENDIX - FIGURES

APPENDIX - TABLES

REFERENCES

INDEX

Reviews - Synopsis - Dust Jacket

PREFACE:

The primary goal of this research and development effort was the utilization of renewable (non-petroleum-based) raw materials such as soybean oil in the next generation of waterborne surface coatings. Vegetable oil-based coatings are renewable natural resources, and they are "green technology" materials that are environmentally friendly in the workplace and home. These organic solvent-free coatings are commercially economical from both a manufacturing and a raw materials availability viewpoint, and they reduce the dependency on petroleum products and unpredictable erratic prices. The reader will benefit from the novel treatment of resins, synthesis and techniques of emulsification. The book consists of the following main subjects:

- . Alkyd resins and oils and autoxidative polymerization
- . Synthesis and polymerization of alkyd resins
- . Emulsion and kinetic studies of autoxidative polymerization
- . Experimental results, continuing research and applied research

The research and development was successful, and those innovations were patented by Gooch, Bufkin and Wildman (U.S. Patent 4,419,139) and the technology applied to commercial "emulsified alkyd" products, originally by the Cargill Corporation, but later by other resin manufacturers. Individual segments of the above work were applied to products involving the emulsification of alkyd resins, without autoxidative polymerization, and allowed to form a cured hard film on a surface using a metal drier. This has been referred to as a "green" technology because it is an environmentally friendly material and the materials utilized are renewable.

Alkyds, oils and oil-alkyd mixtures have been emulsified and subsequently autoxidatively polymerized (crosslinked) in the emulsion form to a near-gel or gelled state within the polymer particles. During the emulsification, the emulsifier type was carefully selected such that a stable emulsion was generated. The particle size of the emulsion droplets was then reduced to less than 1.0 micron and maintained at this size during the autoxidative process. The autoxidative process was continued until the maximum crosslink density that allowed proper flow, which was a function of the crosslink density, particle size and polymer and polymer type, was achieved. During coalescence, a small amount of further crosslinking, as well as flow, generated a dense uniform film.

This technology produced vegetable oil and alkyd resin-based emulsions which dried to touch rapidly and allowed water clean-up equivalent to that of acrylic and vinyl latex coatings. The many emulsification techniques may be applied to

different resins and oils, and they are described in detail within the book. This is a valuable handbook and formulation guide for the coatings manufacturer, a cosmetic product formulator, and anyone interested in emulsifying a material in water.

Paints have been used to improve aesthetic properties and protect almost all surfaces imaginable in the home, office and industry. Paints comprise a pigment (color), a vehicle or binder (resin or polymer) and a solvent (mineral spirits or other). The pigment functions primarily, although not always, for aesthetic purposes such as appearance including color and gloss, but also for practical purposes such as hardness and corrosion protection and, generally, outdoor durability. Indoor durability is important as well, and involves such details as washable surfaces and scuff resistance as well as aesthetic appearance. The polymer (or resin as it used to be called) binder was developed for its properties pertaining to a specific application. The term "paint" is an older, but widely used, term referring to materials made from natural materials such as vegetable oils. A "coating" is a more widely used term (urethanes, vinyls, etc.) since the 1950's pertaining to synthesized materials used in high performance materials not usually formulated from natural sources. Either term refers to a wet applied protective film for a substrate such as wood or metal.

The earliest paints were from Europe and Australia (Boatwright, 2000) and were created 20,000 years ago, when natural pigments (clay, carbon, ochre, and others) were mixed with natural binders such as vegetable oils (soya oil, linseed oils, etc.) and animal fats. The oily binders hardened by reaction with the oxygen in air to autoxidatively polymerize (also called drying) the chains of oil to each other, a process now referred to as crosslinking. The Greeks and Romans designed paints containing drying oils extracted from linseeds, soybeans and sunflower seeds. It was not until the thirteenth century that protective properties of drying oils began to be recognized in Europe. Oils usually consist of three fatty acids connected to a tri-functional alcohol called glycerol. It is the fatty acids that dry and harden. In the first part of the twentieth century, polyester resins were modified with the fatty acids from drying oils to form a resin called an alkyd. The term alkyd comes from the combination of the terms alcohol and acid. Alkyds demonstrate the same drying mechanism as drying oil, but have the advantages of higher molecular weight and harder dried films. However, due to the high viscosities of alkyds, they must be dissolved in solvents such as mineral spirits. Alkyd paints (or coatings) dominated the decorative and industrial markets for the first half of the twentieth century and continue to enjoy a large share of the total coatings market.

The disadvantages of alkyd-solvent coatings are the objectionable solvents which produce volatile organic compounds (VOC) that are restricted by the Environmental Protection Agency. Everyone wants the objectionable organic solvents out of coatings but also wants the use of the desirable alkyd- type coatings. Acrylic dispersions in ordinary non-toxic water (latex coatings) are widely used, but they do not have the tough, resilient and aesthetic properties of alkyds that outperform acrylics for protecting wood and metal. So, how can alkyds be dispersed in water and wet applied to a substrate without using solvents? This question was answered in two parts, both equally difficult. First, the alkyd resins were dispersed in water by carefully selected surfactants and then mechanically homogenized to form a stable emulsion. Then, the alkyd-water emulsion was oxidatively polymerized to crosslink; this caused it to form gel-like particles that flowed together during evaporation of water forming a continuous film. The aqueous dispersion was practically applied to a substrate, and it dried quickly and formed a continuous alkyd film. Commercialization of this process has been successful at least in part.

FOREWORD:

Emulsification of vegetable oil-based resins was a daunting task when the author began his research, but the subsequent technology spawned a generation of stable emulsions for waterborne coatings based on vegetable oil-based alkyd resins, oils and fatty acids. Autoxidative polymerization of emulsified alkyd resins is an innovative and original contribution to emulsion technology, because conventional emulsion-polymerization is not applicable to alkyd resins.

Emulsified alkyd particles are polymerized while dispersed in stable aqueous media -- an original and patented innovation. Smooth and fast-drying alkyd coatings are generated from non-polymerized emulsions and air-dried with conventional metal driers, and have met with marketing success. The pre-polymerization innovation for emulsified alkyd particles provides very fast air-drying coatings that have potential markets for interior architectural latex coatings and waterborne pressure-sensitive adhesives and inks.

The author demonstrates his knowledge of chemical reaction kinetics by employing a combination of oxygen concentration, internal reactor pressure and other reactor variables to finely control the rate and degree of autoxidative polymerization. He meticulously calculates surfactant chemistry by measuring hydrophile-lipophile balance values, and solubility parameters to emulsify characterized resins. The relationship between hydrophile-lipophile values and solubility parameters is shown in explicit equations.

Homogenization equipment used during the course of this research to generate emulsions is shown in detailed drawings together with concise particle size and distribution data.

The author reports research spawned internationally by his research in the fields of alkyd-acrylic hybrids, polyester and

oil-modified urethane resins.

Emulsification and Polymerization of Alkyd Resins contains a wealth of emulsion science, alkyd technology and autoxidative reaction kinetics that will benefit researchers, students and manufacturers studying and working with alkyd emulsions.

Title	Location	Edition / Series / Misc.
44 Emulsion and Water-Soluble Paints and Coatings		<i>Edition:</i>
<i>Author:</i> Martens, Charles R.	<i>Dynix:</i> 13002	<i>Series:</i>
<i>Publish.:</i> Reinhold Publishing Corporation	<i>Call No.:</i> 667.63 Ma	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0442155581	
<i>- date:</i> [1964]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1964
<i>Subject:</i> Paint		<i>Price:</i> \$25.00
<i>Desc:</i> viii, 160 p., illus., 24 cm.		

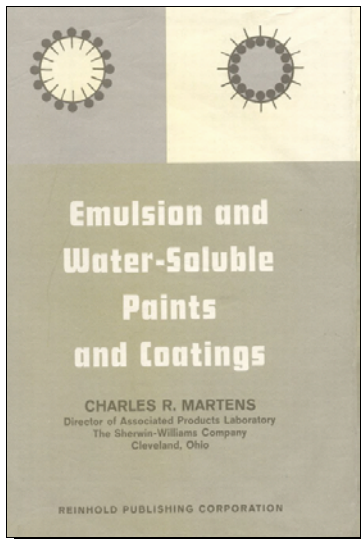


Table of Contents

Preface

1. Introduction
 - General
 - History
 - Definitions
 - Latex Paints
2. Types of Aqueous Coatings
 - Properties of Water
 - Solutions and Dispersions
 - Colloids
 - Water-soluble
 - Water-dispersible
 - Water-reducible
 - Emulsion
 - Molecular Weight
3. General Properties
 - Surface Tension
 - Source of Water
 - Film Formation
 - Factors Affecting Film Formation
 - Coagulation and Gelation
 - Freezing
 - Pigment Content
 - Permeability
 - Penetration and Holdout
 - Scrubability
4. Formulating Aqueous Coatings
5. Organic Binders
 - Acrylics
 - Alkyds
 - Amino
 - Bituminous
 - Cellulosics
 - Drying Oils
 - Epoxies
 - Chlorinated Polyethers
 - Fluorocarbons
 - Hydrocarbons
 - Phenolic
 - Polyamide
 - Polyethylene
 - Rubbers
 - Styrene
 - Vinyl
6. Surfactants.

Subjects

276 . Paint

Wetting Agents
Emulsifying Agents
Detergents
Dispersing Agents
Structure of Surfactants
Types of Surfactants
Solubility and Balance
Application
Selection of Surfactant

7. Protective Colloids and Thickeners

Starch
Alginates
Natural Gums
Gelatin and Glue
Casein
Alpha and Gamma Protein
Cellulose
Poly(acrylic) Acid, etc

8. Pigments and Extender Pigments

Opacity
Particle Shape
Oil and Water Absorption
Incorporation into Paint
White Pigments
Color Pigments

9. Preservatives and Fungicides

10. Miscellaneous Ingredients

Freeze-thaw Stabilizers
Buffers
Coalescing Agents
Anti-rust Agents
Driers

11. Emulsion Formation

Emulsion Polymerization
Polymerization
Theory
Ingredients
Post Emulsification
Stability of Emulsions
Phase Volume

12. Manufacture and Handling

Equipment for Post Emulsification
Emulsion Polymerization
Storage of Latex
Latex Paint Manufacture

13. Trade Sales

Cement Paints
Casein Paints
Latex Wall Primer and Sealers
Interior Wall Finishes
Emulsion Masonry Paints
Semigloss and Gloss Paints
Concrete Floor Coatings
Roof Paints
Universal Tinting Colors

14. Maintenance

Surface Preparation
Asphalt Coatings
Tank Linings
Portland Cement Compositions with Latex

15. Industrial Types
Advantages
Production Painting
Special Handling

16. Miscellaneous Coatings
Aluminum Paints
Strippable Coatings
High Temperature Coatings
Fire-retardant Coatings
Self Sanitizing Paints
Multicolored Lacquers

17. Paper, Textile, Leathercoatings, Wax Polishes, and Inks
Paper Coatings
Clear Functional Coatings
Pigmented Sheets
Textile Coatings
Leather Coatings
Wax Polishes
Printing Inks

Glossary of Terms
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This volume explains and classifies all types of water-base paints—emulsions, latex, water-soluble, water-reducible. It discusses the properties of water as a solvent or diluent. The book describes all of the raw materials used and the function of each. It covers all the known uses and applications for water-type paints.

The most significant development in the protective coating field since World War II has been the tremendous growth of water-base paints in trade sales, maintenance, and industrial applications. Although the technology of this field has been developing for over fifteen years, no authoritative work on the subject has appeared until now. Articles and monographs have occasionally been published, but this is the first complete book to cover the total development of emulsion and water-soluble paints.

The book begins with a brief history and a list of definitions. It then sets forth the various types of aqueous coatings and proceeds to a discussion of general properties. Following chapters deal in turn with the formation of emulsions and aqueous coatings, organic binders, surfactants, protective colloids and thickeners, pigments and extenders, preservatives and fungicides, miscellaneous ingredients, manufacture and handling, trade sales, maintenance, industrial types, and miscellaneous coatings. The final chapter covers paper, textile, leather coatings, wax polishes, and inks. There is a useful Glossary of Terms, and an Index.

Directed primarily to the protective coating chemist, this book will also prove of great value and usefulness to organic chemists, analytical chemists, and chemical engineers. It will also be of special interest to those industries using paints on a large scale, and to industries supplying raw materials to the manufacturers of paint.

PREFACE

The most significant development in the protective coating field since World War II has been the tremendous growth of water-base paints in trade sales, maintenance and industrial applications.

This book covers the development of water-base paints. It explains the types of water base, i.e., emulsions, latex, water soluble and water reducible, and the unusual properties of water as a solvent or diluent. It describes all of the raw materials used and the function of each. It covers the application and uses of water-type paints.

The author wishes to express his appreciation to the Sherwin Williams Company for the help, encouragement, information and photographs supplied for this book. The author is also indebted to many other companies, particularly raw materials suppliers, for data, information and photographs.

Title	Location	Edition / Series / Misc.
168 Encyclopedia of Basic Materials for Plastics		Edition:
Author: Simonds, Herbert R. (Herbert Rumsey), 1887- and James M. Church (	Dynix: 16492	Series:
Publish.: Reinhold Publishing Corporation	Call No.: 668.4 Si	
- place: New York, NY	ISBN: 0442155948	
- date: [1967]	Shelf Reference	Year: 1967
Subject: Plastics -- Dictionaries		Price: \$50.00
Desc: viii, 500 p., illus., 27 cm.		

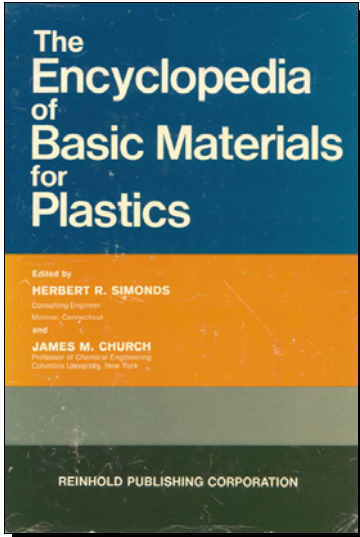


Table of Contents

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Directed to both the producer and supplier, this encyclopedic guide furnishes condensed, fundamental information on approximately 1,000 chemicals employed as the raw materials of modern plastics technology. There are more than 150 articles, supported by numerous half-tone and line illustrations, and each has been prepared by an expert selected for his ability to write with authority in a specific area. The content is of uniformly high level, fully descriptive, and to the point. In addition to standing on its own as an important contribution to contemporary plastics technology, this volume forms a logical and useful companion to The Encyclopedia of Plastics Equipment, published by Reinhold in 1964.

The articles are arranged alphabetically in the customary encyclopedic order. Pertinent references are placed as footnotes. There is an unusually comprehensive General Index, and most of the major articles are well supplied with cross-references to guide the user to additional data located in other, related articles. The text of the book has been editorially condensed in a most skillful manner to achieve directness and brevity of style while preserving intact the substance of the subject material. Because this Encyclopedia is something more than a specialized chemicals catalog, it describes also the functions of plasticizers, catalysts, and many other additives which together with the basic polymer materials compose most of the plastics.

Plastics manufacturers will find here specific and accurate information covering properties, characteristics, applications, processing methods, testing, and use. Among the contributors are many chemists, engineers, and technologists; since many of them are presently active in the industry, the articles they have written possess special validity. This is a carefully researched desk-reference for those who require at their fingertips the best and latest information on those basic materials employed as ingredients or constituents in the products manufactured for today's — and tomorrow's — plastics market.

Subjects

307 . Plastics -- Dictionaries

PREFACE:

Research chemists have at their disposal more than 5000 established chemicals. Of this large number of primary materials, perhaps one-fifth, or 1000 chemicals, form the basis of the plastics industry, which today produces some 30 different types of plastics.

This book is about the materials from which the various plastics are made. However, it is something more, because it describes such functions as those of plasticizers and catalysts, as well as the basic materials involved in plastics production.

In fact, the aim of the editors has been to cover in one book everything about plastics except the plastic products themselves. Therefore, polymers and formulated plastic compounds are not emphasized, except in relation to the basic-materials from which they are made.

The articles have been written by authorities on the various materials. In most cases the authors are active in the industries producing these materials and have taken time to write for this encyclopedia because they believe it will provide a new approach to a segment of the plastics industry — an approach both necessary and useful but heretofore not generally available.

The articles are arranged in alphabetical order, the so-called encyclopedia method. To save space, there are no formal bibliographies. Instead, pertinent references are placed as footnotes.

To keep the book within reasonable limits in size, the contributors were asked to condense their articles as much as possible without sacrificing useful information. In some cases, the editors have further condensed them to avoid duplication. Because of differences in terminology in the industry, the problem of eliminating duplication has been one of

the most difficult the editors have faced. For example, such terms as "curing agents" and "hardening agents," "fillers" and "extenders," are often used interchangeably.

Because of these and other editorial difficulties, the editors have included a complete index, and the reader should make use of it in seeking complete information about a given subject. Many articles have cross references to guide the reader to more extensive treatment of subjects perhaps too briefly described in an article that had to be drastically condensed because of duplication.

Title	Location	Edition / Series / Misc.
46 Epoxy Resin Technology: Developments Since 1979 Author: DiStasio, J. I. (editor) Publish.: Noyes Data Corporation - place: Park Ridge, NJ - date: ©1982 Subject: Epoxy resins -- Patents Desc: xii, 366 p., illus., 25 cm.	Dynix: 02315 Call No.: 668.374 Ep ISBN: 0815508883 Shelf Adult Non-Fiction	Edition: Series: Chemical Technology Review: No. 204 Year: 1982 Price: \$25.00

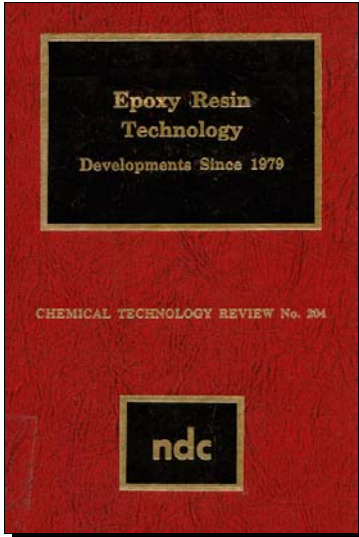


Table of Contents

INTRODUCTION

POWDER COATINGS
- Curing Agents and Accelerators
Amine Salts of Bisphenol A
Phenolic Curing Agents
Phenol-Modified Aminotriazines
Heterocyclic Accelerators
- Powder Coating Compositions
Nylon Coating Powders
Low Gloss Coating
Primer for Lacquer Finishes
Mixture of Rough and Spheroidized Resin Particles
Acrylic Resin Containing Glycidyl Groups
Furan-Epoxy Binder

ELECTRODEPOSITION AND WATERBORNE COATINGS
- Polyisocyanate Compositions
Carboxyl Terminated Diene Polymer, Epoxy Resin and Isocyanate
Epoxy-Containing Butadiene Polymer, Epoxy Resin and Isocyanate
Epoxy-Amino-Polyoxyalkylene Addition Product
Amino-Resins and Crosslinking Agents
Alkylaryl Polyether Amine and Polyepoxide
Epoxy Compound, Amine and Polyisocyanate
Mannich Base and Epoxy Resin
- Other Electrodeposition Coatings
Polyamino Polyhydroxy Polyether Resinous Adduct and Aminoplast
Binder System of High Base/Acid Ratio
Aqueous Epoxide-Amine Reaction Products
Polyepoxide-Amine-Monoepoxide Reaction Product
Compositions Containing Fatty Acid Derivatives
Zwitterion-Containing Coatings
Resinous Coating Cured by Michael Adduct Exchange
Chromate-Free Primer Composition
Polyamine/Epoxy Ether Graft Copolymers
- Waterborne Coatings
Polyepoxide Crosslinker in Two-Component Emulsion
Nonyellowing Alkyd Resin
Polyester Resin and Crosslinking Agent
Urethane Diamine and Diepoxy Compound
Self-Crosslinking Epoxy Ester-Acrylate Polymers
Epoxy Resin Modified by Graft Polymer
Epoxy Resin and Alkylated Melamine-Formaldehyde Resin
Aminoethylated Interpolymers
Epoxy Ester Copolymer and Amine
Polymeric Polyol Esters and Bisphenol-Ethylene Oxide Adduct
Porch and Floor Paint
Coating for Architectural Use

SOLVENT-BASED COATINGS
- High Solids Compositions

Subjects

261 . Epoxy resins -- Patents

Ester Diol Alkoxyate Derivatives
Acrylic-Fatty Acid Drying Oil Resins
Polyepoxide Resin and Organophosphate Ester
- Low Solvent Content Compositions
Esters of Glycidyl Polyethers of Saturated Phenols
Esters of Imidazolidinedione-Based Triepoxides
N,N'-Dihydroxyalkyl Ester Substituted Imidazolidinediones
Acrylate Resin-Epoxy Resin Compositions
- General Coating Formulations
Polyaminoamide and Epoxide Adduct
Polyepoxy, Hydroxyamine and Amino Resin Crosslinker
Blocked Acid Catalyst
Polymer and Polycarboxylic Acid
Amine-Containing Addition Interpolymers and Polyepoxides
Acrylic Interpolymer and Phosphated Epoxy Resin
Epoxy-Polysiloxane Interpenetrating Polymer Network
Coating for Polyolefins
- Specialty Applications
Weldable Coating Composition
Marking of Road Surfaces
Build-Up Suppressant Coating
In-Mold Coating Compositions
Frame-Releasing Agent
Coating for Asphalt Surfaces

PHOTOCURABLE COATINGS AND PRINTING INKS

- Photocurable Compositions
Partially Esterified Polyepoxides
Unsaturated Epoxy Resin Ester and Unsaturated Monomer
Urethanized Epoxy Resin and Ketone Resin
Polyisocyanate-Acid Compound and Epoxy-Acid Compound
Acrylic Phosphate Esters of Epoxidized Polybutadiene
Acrylated Epoxidized Soybean Oil Urethane Compositions
Uniform Blends of Vinyl Esters and Reactive Diluents
Epoxide and Mercaptan Composition
Thickly Coated Curable Composition
Radiation Cured Jet Printing Ink
- Photoinitiators
Triarylsulfonium Salts
Benzophenone Dianhydride
Combination of Photoinitiation and Controlled Heat

ADHESIVES, SEALANTS AND ELASTOMERS

- Elastomeric Compositions
Polyurethanes Containing Aryl Sulfonic Acid Alkyl Ester Groups
Peroxide-Cured Epihalohydrin Polymers
Epoxy Resin, Monohydric Alcohol Glycidyl Ether and Metal Salt of Carboxylic Acid
Alkyl Alkoxyethylbenzoates
Reaction Injection Molded Polyurethane
Thermoplastic Polyester Polyurethane Elastomers
Epichlorohydrin Elastomer and Fluoroelastomer
Fluoroelastomer Containing Oxirane Acid Acceptor
Stabilization of Poly(Alkylene Oxide) Compositions
Block Copolyetherester Compositions Stabilized by Polysulfide Polymers
Cut-Growth-Resistant Rubbers
Rubber-Fiber Composite
Covering for Rubber Hoses
- Sealants
Diamine, Diepoxy, and Diacrylic Acid Ester
Photocurable Sealant for Lighting Elements
Sealant for Skylights
- Adhesives
Epoxy, PVC, Polyamine and Carboxylic Acid
Polyester-Urethane-Epoxy Compositions

Epoxy Resin, Polyether Diureide, and Polyoxyalkylenepolyamine
Cycloaliphatic Epoxy-Polyimide Compositions
Adhesion Promoter System
Primer for Silicone Rubber Compositions
Light-Transmitting Adhesive Composition
Water-Soluble Binder
Heat-Activatable Adhesive Tape
Adhesive Antistatation Composition for Printing Forms
- Solder and Repair Putty
Imidazole Cured Epoxy-Polysulfide Rubber Body Solder
Solder Containing 1,1'-o-Phenylenebis-(3,3-Dimethylurea) and Dicyandiamide
Chelated Metal Catalysts for Acid/Epoxy Polymers
Kneadable Mastic Composition
Underwater Curing Composition

MOLDING AND LAMINATING COMPOSITIONS

- Resin Composite Molding Compositions
Stabilized Poly(Alkylene Terephthalate) Molding Materials
Block Polymers of Hydroxyalkyl Phthalate Esters and Tetrahydro furan/Alkylene Oxide Copolymers
Polyester Resin with Improved Hydrolytic Stability
Warp-Resistant Polyester Composition
Thermoplastic Polyester and Organic Sulfonates
Divinyl Polyester Compositions
Ether-Ester-Amide Block Polymers
Polyglycidyl Ether and 2,6-Dihydroxytoluene
Glycidylated Hydantoins and Polyhydric Phenols
Monoepoxide Containing Perfluoroalkyl Group and Epoxy Resin
Copolyetherester of Ethylene Oxide-Capped Poly(Propylene Oxide) Glycol and Branching Agent
Surfactant Coupling Agents
Polymeric Dispersant Additive
Sound Control Composite
- Fiber Impregnation
Surface Treating of Carbon Fibers
Epoxy Resin, Thermoplastic Resin and Dicyandiamide

SYNTHESIS OF VARIOUS EPOXY RESINS AND EPOXY PRODUCTS

- Synthesis of Various Epoxy Compounds
Poly(Allyl Halide Amine Silicate) Resins
Epoxide-Lignin Resins
Polyesters from 2,3-Di(Carboxyphenyl)Oxirane Compounds
Epoxy Resin from By-Product Tar
Ethylnyl-Terminated Epoxy Resin Derivatives
m-Isopropenylphenol Oligomers and Epihalohydrin
Phenolic Alkali Metal Salts and 1-Halo-2,3-Epoxyalkanes
Isopropenyl Phenol Linear Polymers and Epoxy Resins
a-Glycol Resin
Silyl-Group-Containing Polyester and Silicon Compound
Water-Soluble Glycidyl Ethers of Glycerin
Adducts from Hydantoin Diglycidyl Compounds and Binuclear Hydantoin Compounds
Adducts from Hydantoin Trisepoxides and Binuclear Hydantoins
Alkylenepolyamine and Polyepihalohydrin in Organic Solvent
Chemically Bonded Metal Atoms
Thickenable Thermosetting Vinyl Ester Resins
Succinimide Additive
Epoxy-Modified Polyolefin Wax
Cost Efficient Production of Epoxy Resins
- Other Processes
Gradient Polymers of Two or More Monomers
Controlled Degradation of Polyethylene Oxide
Sulfonation of Organic Polymers

CURING AGENTS

- Amine Hardeners
Amine Adduct of o-Hydroxybenzoic Acid

1,3-Diaminopropanes
 1,4-Diaminobutanes
 Bisanthranilates of Bis(Hydroxyalkyl)Ureas
 Bisanthranilates of Polyoxyethyl Urea
 Bisanthranilates of Polyoxyethylated Carboxylic Acid
 2-Amino-Alkyl Ethers of Polyhydric Polyphenols
 Polyamides from Polymerized Fatty Acids
 N-Alkyl Substituted Polyamine
 Polycyclic Polyamines
 Polyepoxide, Polyalkylene Polyether Polyol, and Polyamine
 Hydrogenated Polynitrile Mixture
 Hardening Agent from Mannich Bases
 Aging of Hexamine Catalysts
 2,5-Dimethyl-2,5-Hexanediamine
 Aromatic Bis(Amino-Imide) Compounds
 Curing Agent Suitable for Adhesives
 Noncrystallizing Curing Accelerator
 Dicyandiamide/Imidazoline Derivative
 N-Substituted Piperazine Adduct Cocuring Agent
 Oligomeric Poly(Ethylenepiperazine)
 Imidazolidone Polyamines
 Imidazole-Isocyanuric Acid Adducts
 Carboxylic Acid Metal Salt/Amine Complexes
 Pyrrolidone-5-Carboxylic Acid/Metal/Amine Complexes
 - Anhydride and Acid Hardeners
 Trimellitic Acid Ester
 Cyanoacetic Acid Derivatives
 Latent Lewis Acid Catalyst System
 Reaction Product of Lewis Acid Catalyst and Carboxylic Acid Anhydride
 Salicylic Acid and Methyliminobispropylamine
 - Other Catalysts
 Diaryliodonium Salt, Copper Salt and Reducing Agent
 Diaryliodonium Salt and Copper Chelate
 Stabilized Iodonium/Copper Salt Compositions
 Onium Salts and Reducing Agents
 Dialkyl Hydroxyaryl Sulfonium Salts and Organic Oxidant
 Hydroxy Functional Organophosphate Ester
 Fluoroaliphaticsulfonyl Substituted Ethylenes
 Glycidyl Ether Curing Agent for Polyurethane Emulsion

ELECTRICAL APPLICATIONS

- Electrical Molding Compositions
 Siloxane-Epoxy Molding Compound
 Metal-Containing Polymer
 Low Viscosity Casting Resin Composition
 Glycidyl Ether of a Monoalcohol and Metal Carboxylate
 Crack-Resistant Composition
 - Insulating Compositions
 Antifoaming Resin Compositions
 Insulating Film for Printed Circuits
 Polyester and Epoxy-Containing Reactive Compound
 Dual-Silane-Treated Hydrated Alumina Filler
 Carbonyl Latent Accelerators
 Maleimide and Phenoxy Resin
 Powder Coating for Wires
 Epoxidized Castor Oil and Aluminum
 - Laminating Compositions
 Flexible Substrate
 Internally Plasticized Phenolic Resins
 - Sealants
 Epoxy-Glass Microsphere Dielectric for Coaxial Structures
 Crack-Resistant Sealant of Improved Flexibility
 Semiconductor Sealant Containing Calcium Silicate and Silica Powder
 - Other Electrical Applications

Encapsulating Material Containing Microspheres
Electrically Conductive Adhesive
Strippable Solder Composition

SPECIALTY APPLICATIONS

- Ion Exchange and Chelate Resins
Weak Base Ion Exchange Resin
Chelate Resins
Oxidatively Stable Ion Exchange Resin
- Paper and Textile Processing
Ketone Dimer Paper Sizing Composition
Wet Strength Paper Additive
Halohydrin-Amine-Silicate Resinous Products
Quaternary Ammonium Salts of Epihalohydrin Polymers
Crosslinked Nitrogen-Containing Condensation Products
- Flame Retardant Compositions
Red Phosphorus and Epoxy Resin
Brominated Bisphenol A Compositions
- Foamed Systems
Polymer/Polyol Compositions
Toluenediamine Initiated Polyether Polyols
- Other Processes
Threadlocking Composition
Self-Locking Threaded Fastener
Iodine-Containing Block Copolymers for Disinfectants
Storage Material for Latent Heat Accumulators
Antifogging, Antiblocking Treatment for Vinyl Food Wraps
Ethylene Oxide Impact Modifier for PVC
Radiation Protective Liner
Ene diol Breaker for Consolidated Gravel Pack
Concrete Repair Composition
Antifouling Coating Material
Solventless Traffic Paint

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents, issued from January 1980 through June 1981, that deal with epoxy resins. This title contains new developments since our previous title, *Epoxy Resins and Products*, published in 1977.

This book is a data-based publication, providing information retrieved and made available from the U.S. patent literature. It thus serves a double purpose in that it supplies detailed technical information and can be used as a guide to the patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced commercially oriented review of recent developments in the field of epoxy resins.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open

up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have by-passed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The table of contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION:

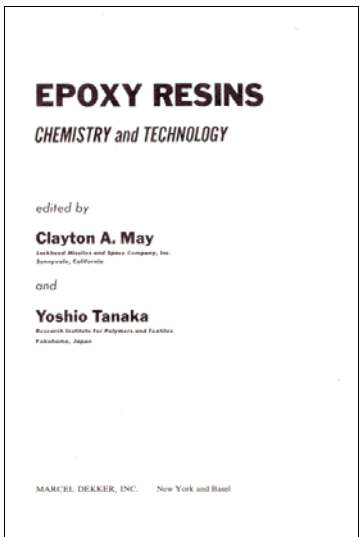
There are few products of the chemical industry today with the versatility and widespread applicability of the epoxy resins. It would be difficult to go through an entire day without coming into contact with some form of epoxy product, be it a glue or adhesive, an electrical component, a paint or coating, epoxy flooring material, or an epoxy-reinforced plastic.

Epoxy resins are characterized by the presence of one or more epoxide or oxirane groups, and it is these groups which impart to the resin material its marvelous versatility. Epoxy resins themselves are merely reactive intermediates which must be "cured" or crosslinked to provide useful products. The most important epoxy curing agents are aliphatic polyamines and their derivatives, aromatic amines and acid anhydrides, all of which receive considerable attention in this book. Dicyandiamide is a specialized type of curing agent which finds extensive application in electrical laminates and in powder coatings.

Through the proper selection of resin, modifier, and curing agent, the properties of the finished epoxy resin can be tailored to achieve specific performance characteristics. Properly cured epoxy resins exhibit excellent resistance to chemicals and physical abuse, and an outstanding resistance to corrosion. They show very high tensile, compressive, and flexural strengths, and a superior fatigue strength. They have excellent electrical insulation properties and exhibit little shrinkage on cure. Finally, they show excellent adhesion to a wide variety of substrates. With these attributes, it is little wonder that epoxy resin sales have experienced a steady growth since their introduction into the United States in the late 1940s.

This book contains about 250 processes relating to the production of epoxy resins and their various products dating from January 1980 to mid-1981. Although each product has been grouped according to its major application, it should be remembered that many processes can be used in a variety of different modes.

Title	Location	Edition / Series / Misc.
47 Epoxy Resins: Chemistry and Technology Author: May, Clayton A. and Yoshio Tanaka (editors) Publish.: Marcel Dekker, Inc. - place: New York, NY - date: ©1973 Subject: Epoxy resins Desc: xii, 801 p., illus., 26 cm.	Dynix: 49233 Call No.: 668.374 Ma ISBN: 0824714466 Shelf Adult Non-Fiction	Edition: Series: Year: 1973 Price: \$25.00

**Table of Contents**

Preface
Contributors

Chapter 1: INTRODUCTION TO EPOXY RESINS - Clayton A. May
I. Introduction
II. History
III. Growth
References

Chapter 2: SYNTHESIS AND CHARACTERISTICS OF EPOXIDES - Yoshio Tanaka, Akira Okada, and Isao Tomizuka
I. Introduction
II. Structure of Epoxides
III. Epoxidation of Unsaturated Hydrocarbons
IV. Dehydrohalogenation of Substituted Hydroxyl Compounds
V. Epoxidation by Condensation
VI. Conclusions
References

Chapter 3: EPOXIDE-CURING REACTIONS - Yoshio Tanaka and T. F. Mika
I. Introduction
II. The Effect of Epoxide Structure on Reactivity with Curing Agents
III. The Mechanism of the Curing Reaction
IV. Statistical Treatment of Curing
References

Chapter 4: CURING AGENTS AND MODIFIERS - T. F. Mika
I. Introduction
II. Polyaddition Reactions
III. Catalytic Curing Agents
IV. Miscellaneous Curing Agents
V. Diluents and Modifiers
References

Chapter 5: PHYSICAL AND CHEMICAL PROPERTIES OF CURED RESINS - D. H. Kaelble
I. Introduction
II. Solubility and Surface Properties
III. Network Structure and Physical Properties
IV. Aging and Chemorheology
V. Bisphenol A Epoxy Homopolymers and Copolymers
VI. Summary and Conclusions
References

Chapter 6: EPOXY-RESIN ADHESIVES - Armand F. Lewis and Robert Saxon
I. Introduction
II. Theories of Adhesion and Adhesive-Joint Strength
III. Physical and Mechanical Aspects of Epoxy-Resin Adhesives
IV. Chemical Aspects of Epoxy-Based Adhesives
V. Technological Properties of Epoxy-Adhesive Systems
VI. Summary
References

Subjects

260 . Epoxy resins

Chapter 7: EPOXY-RESIN COATINGS - George R. Somerville and I. T. Smith

- I. Introduction
- II. Epoxy-Resin Esters
- III. Solid-Epoxy-Resin Solution Coatings
- IV. Liquid Epoxy Resins in Solventless and Super-High Solids Systems
- V. Powder Coatings
- VI. Thermoplastic Epoxy Resins
- VII. Water-Reducible Epoxy-Resin Coatings
- References

Chapter 8: ELECTRICAL AND ELECTRONIC APPLICATIONS: SEALANT AND FOAMS - Alan J. Breslau

- I. Introduction
- II. Electronic and Electrical Applications
- III. Epoxy Sealants
- IV. Epoxy Foams
- V. Epoxy Strippers
- VI. Handling of Epoxy Casting Systems
- References

Chapter 9: EPOXY LAMINATES - John Delmonte

- I. Introduction
- II. Comparison of Resin Binders for Laminates
- III. Wet Versus Dry Laminating
- IV. Glass-Fiber Reinforcing Materials
- V. Glass Finishes--Effect on Epoxy Laminates
- VI. High-Strength Fibers
- VII. Laminating Techniques
- VIII. Filament-Wound Structures
- IX. Modification of Epoxy Resins for Laminating
- X. Applications
- References

Chapter 10: EPOXY COMPOUNDS AS POLYMER STABILIZERS AND PLASTICIZERS - William S. Port

- I. Introduction
- II. Stabilization of Halogen-Containing Polymers
- III. Stabilization of Cellulose Derivatives
- IV. Stabilization of Miscellaneous Polymers
- References

Chapter 11: ANALYSIS OF EPOXIDES AND EPOXY RESINS - Hans Jahn and Peter Goetzky

- I. Uncured Epoxy Resins
- II. Blends and Compounds
- III. Hardeners and Accelerators
- IV. The Curing Process
- V. Analysis of Cured Epoxy Resins
- References

Chapter 12: TOXICITY, HAZARDS, AND SAFE HANDLING - Harold H. Borgstedt and Charles H. Hine

- I. Introduction
- II. Toxicology
- III. Industrial Hazards
- IV. Safe Handling
- References

Addenda

Author Index

Subject Index

Reviews - Synopsis - Dust Jacket

PREFACE:

It is the objective of this book to provide up to date assistance to the many innovators who use, formulate, and synthesize epoxy resins. It is not intended to be a treatise on epoxides, which is a much broader subject. The chapters which follow contain information that will be of value to a broad spectrum of technical talents. This spectrum ranges from the chemists who are faced with the problems of synthesis, chemistry, and formulation of new and novel materials to the

engineers who use these materials to solve a complexity of problems. As a multi-authored text there is an added bonus as specific contributions will be most useful to the scientist, technologist, or engineer who is not necessarily an epoxy specialist. For example, the chapter on toxicology may serve as a handbook to the safety engineer who is responsible for a facility using these materials.

As editors we were fortunate in obtaining an outstanding group of contributors to the field of epoxy resins and their technology. The book has a truly international flavor. Our contributors come from Asia and Europe as well as the United States. Repetitions are common in multi-authored works and our editorial efforts have been aimed at avoiding this pitfall. With this risk in mind, however, we have given the writers the maximum possible latitude. Recurrences of fact can be found, but these remain in the interests of making a chapter more complete. Every effort has been made to give these experts no more than guidelines, seeking their ideas rather than our own.

Lest the reader be misled, this is not a complete text on epoxy resins. Had this been our intent the book would have been offered as a strict reference work with a different style and organization. There are already several texts of this type available. One of our objectives was that the efforts of a given contributor should stimulate the reader towards greater creativity in his area of interest. This was prerequisite so that the book would be valued by a broad and varied audience. The text has a high degree of chemical orientation. This is also a necessity. Successful use of epoxy resins requires a true understanding of the almost infinite combinations of resins and curing agents.

To the polymer chemist and the resin chemist the first four chapters should prove most useful. The currently available commercial products are well documented. Many of the rarer species of epoxy resins also appear in the texts and bibliographies. Further stimulation should come from the excellent coverage of cure mechanisms, curing agents and other modifiers. The chapters on applied technology which follow should be of value in the assessment of newly created materials. The physical chemist, polymer chemist, and rheologist should find Chapters 5 and 6 particularly attractive. Dynamic approaches to the subject matter have been used in conjunction with the more conventional static methods. Chapter 11 is aimed primarily at the analytical chemist but will also be quite useful for the resin and polymer chemists.

For those responsible for the applied or formulative side of epoxy resins, Chapters 1-4 are prerequisite. Chapters 5-10 further subdivide these technological areas into interests in physical properties, adhesives, surface coatings, electrical and electronic applications, reinforced plastics, and formulation of a wide variety of end use products.

From the engineering point of view the chapters dealing with the various applications are of prime importance. They help the user to better understand the thinking of the chemist and the formulator. Further, a plethora of useful physical property data is provided. Engineers who deal with aircraft, appliance, aerospace, tool and diemaking, marine, maintenance, electronic, automotive and civil applications will find this book a valuable aid to their end uses.

Finally, a few words should be devoted to Chapter 12. This is important to all. Toxicity, hazards, and safe handling is a subject which should be uppermost in the minds of all chemists and engineers who use and handle epoxy resins.

As editors we would like to express our gratitude to all of the contributors for their forbearance in our linguistic quibbling and their patience in smoothing out difficulties, obscurities, and differences of opinion. We hope that as a result of our efforts we have achieved a fair degree of clarity in a very complicated subject.

INTRODUCTION:

Since their conception epoxy resins have been the subject of a multitude of patents and technical publications. There has undoubtedly been more written about these products per pound of sales than any of the other commercially available thermosetting resins. This immediately poses the question, why? In the chapters that follow the answers become increasingly apparent.

The broad interest in epoxy resins originates from the extremely wide variety of chemical reactions that can be used for the curing and the many different properties that result. The chemistry is unique among the thermosetting resins. In contrast to the formaldehyde resins, no volatiles are given off during the cure. This means that minimum pressures are required for the various fabrication techniques generally employed. The shrinkage is much less than that encountered in the vinyl polymerizations used to cure unsaturated-polyester resins. This means reduced stresses in the cured product. Furthermore, a knowledge of the chemistry involved permits the user to cure the resins over a wide range of temperatures and to control the degree of crosslinking. The latter plays an important role in the physical properties.

Considering the range of attainable properties, the versatility of epoxy resins becomes even more apparent. Depending on the chemical structure of the curing agent and the curing conditions, it is possible to obtain toughness, chemical resistance, mechanical properties ranging from extreme flexibility to high strength and hardness, high adhesive strength, good heat resistance, and high electrical insulation. Uncured, the resins have a variety of physical forms, ranging from low-viscosity liquids to tack free solids that, along with the curing agents, afford the fabricator a wide range of processing conditions. As a result of this versatility these products have found use in protective coatings, adhesives for most

substrates, body solders and caulking compounds, flooring, tooling compounds for molds, stamping dies and patterns, foams, potting and encapsulation compounds, low-pressure molding resins, and glass-reinforced plastics. In the absence of curing agents the epoxies are also useful as plasticizers and stabilizers for vinyl resins.

As leading experts expand on the uses and properties it will become increasingly easier to see why these materials have captured the imagination of many investigators in the field of thermosetting resins. The complexity of the chemistry dictates not only an understanding of the numerous and varied applications but their characterization and safe handling as well.

Title	Location	Edition / Series / Misc.
808 European Coatings Handbook		<i>Edition:</i>
<i>Author:</i> Brock, Thomas, Michael Groteklaes and Peter Mischke	<i>Dynix:</i> 100380	<i>Series:</i> Coatings Compendia
<i>Publish.:</i> Vincentz-Verlag	<i>Call No.:</i> 667.9 Br	
<i>- place:</i> Hannover, Germany	<i>ISBN:</i> 387870559X	
<i>- date:</i> ©2000	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2000
<i>Subject:</i> Coatings -- Handbooks, manuals, etc		<i>Price:</i> \$108.00
<i>Desc:</i> 410 p., illus., 27 cm.		

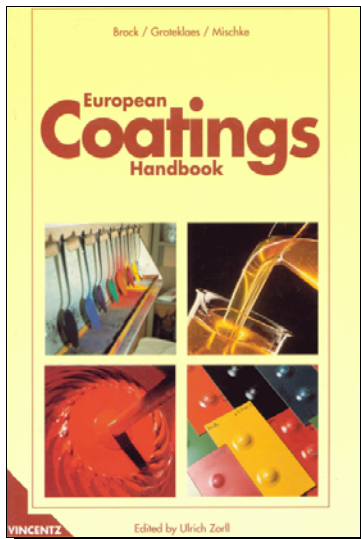


Table of Contents

- 1 Introduction
 - 1.1 Historical perspective
 - 1.2 The economic importance of paints and coatings
 - 1.3 Classification and material structure of coatings
 - 1.4 Technology of paints and coatings ("Coating technology")
- 2 Raw materials for coatings
 - 2.1 Film formers
 - 2.1.1 General polymer science
 - 2.1.2 Natural film formers (natural substances)
 - 2.1.3 Modified natural substances
 - 2.1.4 Synthetic film formers
 - 2.2 Solvents
 - 2.2.1 Classification and definitions
 - 2.2.2 Characterisation of solvents
 - 2.2.2.1 Hydrogen bridge linkage parameter
 - 2.2.2.2 Solvents with weak hydrogen bridge linkage
 - 2.2.2.3 Solvents with moderately strong hydrogen bridge linkage
 - 2.2.2.4 Solvents with strong hydrogen bridge linkage
 - 2.2.3 Properties
 - 2.2.3.1 Volatility
 - 2.2.3.2 Polarity
 - 2.2.3.3 Surface tension
 - 2.2.3.4 Density
 - 2.2.3.5 Viscosity
 - 2.2.3.6 Other physical properties
 - 2.2.3.7 Physiological properties
 - 2.2.4 Solvents in coating materials
 - 2.2.4.1 Influences of solvents on the properties of coatings and coating systems
 - 2.2.4.2 Solvents in low-solids and medium-solids coatings
 - 2.2.4.3 Solvents in high-solids coatings
 - 2.2.4.4 Solvents in water-borne coatings
 - 2.3 Pigments and fillers
 - 2.3.1 Definitions and classification of pigments
 - 2.3.2 Physical principles
 - 2.3.2.1 Pigment morphology
 - 2.3.2.2 Appearance of pigments
 - 2.3.2.3 Interactions between pigment and surrounding medium
 - 2.3.3 White pigments
 - 2.3.3.1 Titanium dioxide pigments
 - 2.3.3.2 Other white pigments
 - 2.3.4 Black pigments
 - 2.3.4.1 Classification
 - 2.3.4.2 Pigment blacks
 - 2.3.5 Inorganic coloured pigments
 - 2.3.5.1 General properties
 - 2.3.5.2 Oxide and oxide-hydroxide pigments
 - 2.3.5.3 Cadmium pigments
 - 2.3.5.4 Chromate pigments
 - 2.3.5.5 Bismuth vanadate pigments
 - 2.3.5.6 Iron-blue pigments

Subjects

- 524 .** Coating processes -- Handbooks, manuals, etc.
- 525 .** Coatings -- Handbooks, manuals, etc.
- 526 .** Finishes and finishing -- Handbooks, manuals, etc.
- 527 .** Materials -- Handbooks, manuals, etc.

- 2.3.5.7 Ultramarine pigments
- 2.3.6 Organic coloured pigments
 - 2.3.6.1 General properties
 - 2.3.6.2 Classification of organic pigments
 - 2.3.6.3 Optical properties of organic pigments
 - 2.3.6.4 Fields of application for organic pigments
- 2.3.7 Lustre pigments
 - 2.3.7.1 Metallic pigments
 - 2.3.7.2 Pearlescent and iridescent pigments
 - 2.3.7.3 Incorporating special effect pigments into coatings
 - 2.3.7.4 Formation of the special effect
- 2.3.8 Functional pigments
 - 2.3.8.1 Anti-corrosive pigments
 - 2.3.8.2 Conductive pigments
- 2.3.9 Fillers
 - 2.3.9.1 Definition and classification of fillers
 - 2.3.9.2 Manufacture of fillers
 - 2.3.9.3 Some commonly used fillers
- 2.3.10 Dyes
- 2.4 Additives
 - 2.4.1 Classification and definition
 - 2.4.2 Interface-active additives
 - 2.4.2.1 Defoaming and deaerating agents
 - 2.4.2.2 Surface-active additives
 - 2.4.3 Rheological additives
 - 2.4.3.1 General introduction
 - 2.4.3.2 Thickeners
 - 2.4.3.3 Thixotropic agents
 - 2.4.4 Light stabilisers
 - 2.4.5 Biocides
 - 2.4.6 Wetting and dispersing agents
 - 2.4.7 Catalysts and driers
 - 2.4.8 Flattening agents
- 3 Coating systems, formulation, film-forming
 - 3.1 Composition of coating materials
 - 3.2 Basic formulating parameters
 - 3.3 Pigment volume concentration and film properties
 - 3.4 Solvent-based coating materials
 - 3.4.1 Low-solids and medium-solids systems
 - 3.4.2 High-solids systems
 - 3.5 Aqueous coating materials
 - 3.5.1 Water-soluble and emulsifiable systems (water-borne coatings)
 - 3.5.2 Emulsion paints
 - 3.6 Radically-curing coating materials
 - 3.7 Coating powders
 - 3.7.1 Film formers
 - 3.7.2 Additives
 - 3.7.3 Pigments
 - 3.8 Inorganic coating materials
 - 3.8.1 Water glass paints (silicate paints)
 - 3.8.2 Alkyl silicate paints
 - 3.9 Formulating the mill base
 - 3.9.1 General introduction
 - 3.9.2 High-solids systems
 - 3.9.3 Aqueous systems
 - 3.10 Film-forming
 - 3.10.1 General introduction
 - 3.10.2 Physically drying coating materials
 - 3.10.3 Chemically curing coating materials
 - 3.10.3.1 Low-solids and medium-solids systems
 - 3.10.3.2 High-solids systems
 - 3.10.4 Aqueous coating materials
 - 3.10.4.1 Water-dissolved systems

- 3.10.4.2 Dispersions
- 3.10.5 Coating powders

- 4 Manufacture of paints and coatings
- 4.1 Preliminary comment
- 4.2 General introduction to the manufacture of paints and coatings - layout of a coating
- 4.3 Process stages in the manufacture of coatings
- 4.4 Production "from scratch" and from pastes - formulation example
- 4.5 Configuration of equipment for the manufacture of coatings
- 4.6 Method of manufacture of coating powders
- 4.7 Further information about mixing and dissolving
- 4.8 Kneading
- 4.9 Dispersion, dispersing units
- 4.9.1 General introduction to dispersion
- 4.9.2 Stress mechanisms during dispersion
- 4.9.3 Dispersion using agitators
- 4.9.4 Dispersion using triple roll mills
- 4.9.5 Dispersion using attrition mills
- 4.9.5.1 Dispersion mechanism in the presence of grinding media
- 4.9.5.2 Design and operating parameters for attrition mills
- 4.9.5.3 Residence time distribution in an attrition mill
- 4.9.5.4 Continuous and circulating processes
- 4.9.6 Dispersion in the extruder in the manufacture of coating powders
- 4.10 Filtration
- 4.11 Further information about the manufacture of water-borne paints and coatings

- 5 Substrates and pretreatment
- 5.1 General introduction
- 5.2 Principles of adhesion
- 5.3 Metal substrates
- 5.3.1 Metals and their surfaces
- 5.3.2 The most important metal substrates
- 5.3.2.1 Steel
- 5.3.2.2 Zinc, galvanised steel
- 5.3.2.3 Aluminium
- 5.3.2.4 Other metal materials
- 5.3.3 Removal of adherent coatings
- 5.3.3.1 Mechanical processes, abrasive blasting
- 5.3.3.2 Flame cleaning
- 5.3.3.3 Pickling
- 5.3.4 Cleaning, degreasing
- 5.3.5 Application of conversion coatings
- 5.3.6 Manual preparation of metal substrates
- 5.4 Plastic substrates
- 5.4.1 Plastics, plastic surfaces and their coatability
- 5.4.2 Pretreatment of plastics
- 5.5 Wood and wood products as substrates
- 5.5.1 Wood
- 5.5.2 Wood products
- 5.5.3 Pretreatment of wood and wood products
- 5.5.3.1 Facing and smoothing
- 5.5.3.2 Notes on the protection of wood
- 5.6 Mineral substrates
- 5.6.1 Composition and properties
- 5.6.2 Pretreatment of mineral substrates

- 6 Application and drying
- 6.1 Methods of application and criteria for use
- 6.2 Manual application by brushing, rolling, trowelling, wiping
- 6.3 Curtain coating
- 6.4 Roller coating
- 6.5 Dipping, flow coating and related processes
- 6.6 Electrodeposition coating
- 6.6.1 Principles of electrochemistry

- 6.6.2 Plant engineering and bath control
- 6.6.3 Developmental trends and fields of application
- 6.7 Spray application processes
 - 6.7.1 Atomisation methods without electrostatic charging
 - 6.7.1.1 Pneumatic atomisation
 - 6.7.1.2 Hydraulic (airless) atomisation
 - 6.7.1.3 Recent process variants
 - 6.7.2 Electrostatic atomisation
 - 6.7.3 Rapid-rotation atomisation
 - 6.7.4 Film-forming after spray application
 - 6.7.5 Two-component plant engineering for spray application
 - 6.7.6 Range of applications
- 6.8 Powder coating
 - 6.8.1 Powder sintering processes
 - 6.8.2 Electrostatic processes
- 6.9 Spray booths
 - 6.9.1 Booth ventilation techniques
 - 6.9.2 Waste air purification
 - 6.9.3 Supply systems
 - 6.9.4 Automated coating processes
 - 6.9.5 Conveyor systems
- 6.10 Drying installations
 - 6.10.1 Stoving conditions
 - 6.10.2 Overview of drying processes
 - 6.10.3 Circulating air (convection) drying processes
 - 6.10.4 Infra-red drying (IR radiation)
 - 6.10.5 Other radiation-curing processes ("chemical radiation drying")
 - 6.10.6 Electrical drying processes
- 7 Painting and coating processes
 - 7.1 Paints and coatings: market and fields of application
 - 7.2 Automotive assembly line coating (automotive primary finishing, OEM)
 - 7.3 Automotive refinishing coatings
 - 7.4 Industrial plastics coating systems
 - 7.5 Painting of rail vehicles
 - 7.6 Coil coating
 - 7.7 Electrical insulation systems
 - 7.8 Other metal coating systems
 - 7.9 Coating of wood and wood-based materials
 - 7.10 Building protection / coating of mineral substrates
 - 7.11 Separating, preparing and recycling paint and coating residues
 - 7.12 Removal of coatings
 - 7.13 Quality management, process safety and quality assurance
- 8 Test methods and measuring techniques
 - 8.1 Rheology and rheometry
 - 8.1.1 Rheological principles
 - 8.1.2 Practical relevance of viscosity behaviour
 - 8.1.3 Measuring flow behaviour
 - 8.1.4 Viscoelasticity
 - 8.2 Characteristics of solvents and liquid products
 - 8.2.1 Composition and purity of liquids
 - 8.2.2 Safety data
 - 8.2.3 Application-related data
 - 8.3 Analytical values for solids
 - 8.4 Testing of liquid paints and coatings
 - 8.4.1 Optical properties
 - 8.4.2 Emissions
 - 8.4.3 Film-forming, flow and crosslinking
 - 8.4.4 Ring circuit stability
 - 8.5 Specific tests for coating powders
 - 8.6 Features of coatings after application
 - 8.6.1 Film thickness measurement
 - 8.6.2 Optical film properties, colour and colorimetry

8.6.3 Mechanical engineering film properties
8.6.4 Light stability and weather resistance
8.7 Damage to coatings and coating systems

9 Environmental protection and safety at work
9.1 Air pollution control
9.2 Water pollution control
9.3 Waste legislation and waste management
9.4 Safe handling of paints and coatings
9.5 Transportation
9.6 Eco-audits: information and limits

Index
Appendix: Nomenclature

Reviews - Synopsis - Dust Jacket

This 410-page book features a comprehensive description of the composition of coatings and their constituents (resins, pigments, fillers, solvents, and additives), including their various interactions. Also covered are the modern ecologically acceptable formulations with high solids, water-based and powder coatings. Contemporary methods of production, application techniques, quality control, environmental protection, and health and safety are highlights.

FROM THE DUST JACKET:

European Coatings Handbook is the most comprehensive textbook on coatings technology available today. It is a complete treatment of the formulation, manufacture, application, specification and testing of paints, coatings and inks. All the types and classes of raw materials are presented in a unique reference/background section to provide in-depth knowledge. State-of-the-art production and application technology are discussed in detail, reflecting the need for high performance coupled with cost effectiveness. A showcase of all the relevant testing methods and key terms, easy-to-grasp, yet meeting and surpassing the demands of scientists and industry leaders, highlights the versatility and must-have profile of this major work for everyone involved with coatings and inks.

PREFACE

Anyone working in the coatings sector, whether in manufacturing or processing, knows - or will soon observe if they are new to the business - that an extremely broad knowledge base is a prerequisite for mastering this unique protective and finishing material. Coating chemistry in its widest sense, and especially polymer science, is of central importance. However, today's coatings specialist also requires a knowledge of process engineering in relation to the use of production or application equipment, an understanding of materials science in regard to substrate materials and more generally in terms of the quality of the paint system, and finally a familiarity with environmental and safety aspects.

Very few teaching institutions are able to offer a training program that is specially designed to cover such an extensive field of knowledge. The Fachhochschule Niederrhein in Krefeld, Germany, is one of these - an institution with a long tradition and good reputation, whose name comes up repeatedly in discussions with leading figures in the coatings sector. A good many of them proudly and gratefully acknowledge that the framework for their career was built in Krefeld.

For this reason the publishers and editors are extremely grateful to the current teaching faculty, represented here by Dr. Peter Mischke, Dr. Michael Groteklaes and Thomas Brock, for deciding to make a large part of the Krefeld curriculum available to practitioners in the field. The authors have produced a contemporary handbook of coating technology. Each was responsible for around a third of the content, based on his own specialist subject areas and written in roughly the above sequence. The work merits the title of handbook for two reasons: firstly because of its solid theoretical basis, augmented by "in-depth" explanations where necessary, and secondly because of its consistently relevant use of practical references to exemplify its themes. These features are underpinned by a constant awareness of emerging developments in the coatings sector, which remains as dynamic as ever.

The book seeks not only to convey the latest teaching but also to awaken an understanding of the multiple strands of knowledge underlying the successful use of coating materials. This work achieves a balance between the two, and if reading it gives the impression of attending a powerfully delivered lecture which at the same time inspires a desire to work in an industry with a most promising future, then this book will have achieved its objective.

FORWARD

Engineers have been trained in the science of paints and coatings in Krefeld since 1923: first at the state school of

textiles engineering and, since 1972, in the chemistry department of its successor, the Fachhochschule Niederrhein.

This book arose from Dr. Zoril's suggestion of combining the teaching experience distilled from lectures at Krefeld with practical experience drawn from work in industry and from a variety of collaborative projects to create a handbook. It is a joint work by the three authors, based on their own specialist interests and hence also on their own lecturing and research fields at the FH Niederrhein.

The book covers the principles of raw materials, manufacture, application and testing of coatings as a handbook, however, its principal aim is to illustrate and to create connections. Naturally only the essential themes could be addressed within the stated limits of the book. It does not wish or claim to be complete; the authors felt that it was more important to explain the foundations and principles as clearly as possible. For this reason also, the book does not contain all of the material taught to budding coating engineers at Krefeld; this would far exceed the scope of a single-volume handbook.

This work is intended to fill a gap in the current specialist literature: as an accompanying handbook it is intended on the one hand to provide a trainee or student with the basic knowledge to form a solid foundation for a closer study of coating technology; on the other hand it is designed to help people from other disciplines — scientists, engineers, business people — to find out more about this subject which, in its fascinating diversity, is difficult to assimilate. Experienced coating specialists may use it to refresh or to extend their knowledge. It may also enable them to take a glance over the "garden fence" into neighbouring disciplines, into the raw materials used every day or into the application and usage of coating materials.

No first edition is ever perfect. — There will certainly be specialists amongst our readers who can offer changes or improvements to particular topics; the authors will be grateful for any constructive suggestions!

Title	Location	Edition / Series / Misc.
48 Expanded Plastics and Related Products: Developments Since 1978		Edition:
Author: Meltzer, Yale L.	Dynix: 00747	Series: Chemical Technology Review: No. 221
Publish.: Noyes Data Corporation	Call No.: 668.4 Me	
- place: Park Ridge, NJ	ISBN: 0815509553	
- date: ©1983	Shelf Adult Non-Fiction	Year: 1983
Subject: Plastic foams		Price: \$25.00
Desc: x, 262 p., illus., 25 cm.		

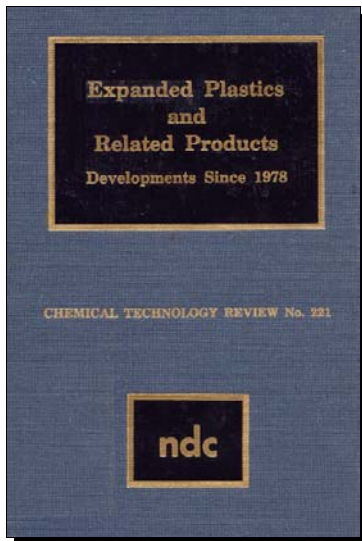


Table of Contents

INTRODUCTION: PRODUCT AND MARKET INFORMATION

- Product Classification
- Industrial Perspectives
- Statistical Classifications
- Future Prospects

POLYAMIDES AND POLYIMIDES

- Polyamides
- High Impact Polyamides
- Flameproof Polyamide Molding Compositions
- Linear, Flexible, High Tensile Strength Copolyamides
- Polyimides
- Fire- Retardant Imide Copolymers
- Closed Cell Polyimides
- Terpolyimides

POLYEPOXIDES AND EPOXY RESINS

- Epoxy Curing System
- Polyether Polyols with Epoxy Resins
- Laminates Comprising a Hard Foam Layer and a Fiber-Reinforced Synthetic Resin Layer
- Modification of Amino Polyols with Epoxy Resins

POLYESTERS

- Producing Expanded and Cured Polyester Resin
- Foamed Unsaturated Polyester Resins with Gel Coat
- Crosslinked Polyester
- Unsaturated Polyester Compositions with High Impact Strength
- Foam Crystallization of Condensation Polymers
- Acrylate Rubber Modification of Aromatic Polyesters

POLYISOCYANURATES AND POLYISOCYANATES

- Processing
- Foam-Cored Laminate Having Metal Facers and Rigid Polyisocyanurate Foam Core Prepared in the Presence of a Dipolar Aprotic Organic Solvent
- N,N'-Polyoxyalkylene Bis(Pyrrolidone-3-Carboxylic Acid) Compounds
- Production of Microcellular Elastomeric Moldings
- Ethylenically Unsaturated Polyisocyanurate-Containing Molding Compositions
- Flame Retardance
- Heat Resistant and Flame Resistant Polyisocyanurate Foams Using Little or No Organosilicone Surfactant
- Smoke- Retardant Polyisocyanurate Foam Containing an Organosilicate
- Applications
- Semiflexible Foam Polymer Used in Packaging Without the Use of a Polyol
- Liquid Polyisocyanate Compositions
- Portable, Expandable Mold for Fabricating Substantially Isotropic Isocyanate-Based Polymer Foam Buns
- Highly Stable Liquid Carbodiimide-Containing Polyisocyanate Compositions

POLYOLEFINS

- Processing
- Ethylenic Polymer Foams Having Improved Dimensional Stability
- Crosslinking/Foaming of Low Density Polyethylene Using Linear Peroxyketals
- Foaming Synthetic Resin Compositions Stabilized with Certain Higher Ethers, Esters or Anhydrides

Subjects

302 . Plastic foams

Polyolefin Foam with Small Uniform Cell Size
Continuous Production of Foamed Polyethylene Films
Reducing the Aging Period of Polyethylene Foams
Crosslinked Chlorinated Polyethylene Foam
- Applications
Fire-Retardant Anhydride Copolymers
Foamable Copolymers
Closed Cell Foamed Films and Sheets

POLYSTYRENE

- Processing
Polystyrene Foamable Blends
Foaming a Copolymer of Alkenyl Aromatic and Alkenyl Nitrile Monomers
Cellular Plastic Additive
Method and Apparatus for Manufacturing a Web of Foamed Thermoplastic Material
- Applications
Construction Adhesive
Impact Resistant Polystyrene Blends
Discoloration-Resisting Styrene Polymer
ABS-Molding Compositions Having High Notched Impact Strength

POLYURETHANES

- Flame Retardance
Low Molecular Weight Polyurethane Modifier Compounds Yielding Flame Retardance
Flame-Retardant Polyurethane Foam Prepared by Incorporating a Graft Polymer Having a Particle Size Greater than 0.5 Micron
Low Fire Hazard Rigid Polyurethane Insulation Foam
Intumescent Flexible Polyurethane Foam
Reduced Tendency to Form Embers When Burned
Flame Retardant Flexible Polyurethane Foam Containing Finely Divided Inorganic Salt
Stabilization of Flame Retardant Premix
Flame-and-Smoke Retardant Nonshrinkable Polyurethane Foam
- Catalysts
Use of Catalysts Containing Tertiary Nitrogen
Rigid, Semi-Rigid and Flexible Polyurethane Foams from Guanidine and Thiourea Catalysts
N,N,N',N'-Tetramethyl-a,w-Polymethylenediamines as Catalysts
Catalyst System for RIM Elastomers
- Flexible and Rigid Foams
Flexible Polyurethane Foam Prepared from a Reaction Mixture Which Includes a Polyether Triol
Stabilization of High Resilience Polyurethane Foam
Flexible Polyurethane Foams with Improved Thermal and Oxidative Stability
Siloxane Copolymer Mixtures in High Resilience Polyurethane Foam
Rigid Shrink Stable Polyurethane Foam Derived from an Adduct of an Alkylene Oxide
Rigid and Semiflexible Polyurethane Foams Produced with Phenol Aldehyde-Amine Resins
Flexible Foams with High Resiliency
- Imparting Special Properties
Carbamylbiuret-Modified Polyisocyanates
Antistatic Polyurethane Foams
Dispersible Vinylidene Chloride Polymer Microgel Powders as Additives for Polyurethane Foam
Reducing the Molecular Weights of Polyurethane Polymers to Desired Levels
Polyurethane Foam from an Oxyalkylated Product
Polyurethane Foam from a Copolymer/Polyol Composition
- Molding
Preparing Foams with Internal Mold-Release Agents
Molding a Rigid Integral Skin Foamed Resin Product
- Biomasses, Enzymes and Polypeptides
Polyurethane Containing Polypeptides
Polyurethane Plastics in Which Polyisocyanates Are Reacted with Reactive Organic Fillers Comprising Biomasses
Preparation and Use of Enzymes Bound to Polyurethane
- Reclamation of Products
Reclaiming Polyurethane Foam
Polyol Recovery from Polyurethane Foam Comprising Alcohol and Steam Hydrolysis
- Applications
Reinforced Foamed Resin Structural Material

Polyurethane Binders
Polyurea Polyurethane Foamed Sponge with High Wet Strength
Odorant Hydrophilic Foam Compositions
Polyurethane Auto Parts
Articles Coated with a Crushed Foam
Bonding Polyurethane Sheet to Acrylic or Polyurethane Sheet in Production of Transparent Windows
Forming a Layer of Blown Cellular Polyurethane on Carpet Backing
Reinforced Polyurethane Foams
Reaction Injection Molded Polyurethane
Making Castings of Thermosetting Polyurethane Materials
Water Skis Having a Reinforced, Foamed-in-Place, Plastic Hull Bonded to an Aluminum Deck

POLYVINYL CHLORIDE (PVC)

- Plasticized PVC Foams for Making Laminates of Filled Polyolefins
- Enhancement in Phase Compatibility of Elastomers with Relatively Rigid Polymers

RUBBER

- Reducing Smoke Evolution from Burning Neoprene Foam
- Rim Elastomers with Superior High Temperature Dimensional Stability
- Polybromostyrene Resin
- Thermoplastic Elastomer Blends with Olefin Plastic, and Foamed Products of the Blends
- Thermoplastic Ionomer Foams

OTHER PRODUCTS

- Ceramic Foams
Method for Bonding Gasket Seal to Surface of Ceramic Foam Filter
- Polyacid Foams
An Organic Polyacid Foam Matrix Containing PVA
- Melamine-Formaldehyde Foams
Resilient Foams Based on a Melamine- Formaldehyde Condensate

NEW TECHNOLOGIES

- Forming Automotive Headliners from Composite Foamed Resin Blanks
- Cooling Process Suitable for Foam Molding of a Synthetic Resin
- Flexible Foam Bonding Process
- Crosslinked and Foamed Resin Sheet
- Foamed Core Thermoplastic Sheet
- Apparatus for Continuously Fabricating Three-Dimensional Filament Reinforced Foam Insulation
- Curved Laminated Panels
- Method and Apparatus to Control the Density of Products from an Extrusion Process

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWARD:

The detailed, descriptive information in this book is based on U.S. patents, issued between January 1979 and June 1982, that relate to expanded and foamed plastics and related products. Our previous title *Foamed Plastics—Recent Developments* was published in 1976.

This book is a data-based publication, providing information retrieved and made available from the U.S. patent literature. It thus serves a double purpose in that it supplies detailed technical information and can be used as a guide to the patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced commercially oriented review of recent developments in the field of expanded plastics and related products.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent

literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The table of contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

Title	Location	Edition / Series / Misc.
49 Experimental Methods in Polymer Science: Modern Methods in Polymer Research and Technology		<i>Edition:</i>
<i>Author:</i> Tanaka, Toyochi (editor)	<i>Dynix:</i> 89756	<i>Series:</i> Series in Polymers, Interfaces and Biomaterials
<i>Publish.:</i> Academic Press	<i>Call No.:</i> 547.7 Ex	
<i>- place:</i> San Diego, CA	<i>ISBN:</i> 012683265X	
<i>- date:</i> ©2000	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2000
<i>Subject:</i> Polymers		<i>Price:</i> \$75.00
<i>Desc:</i> xii, 604 p., illus., 24 cm.		

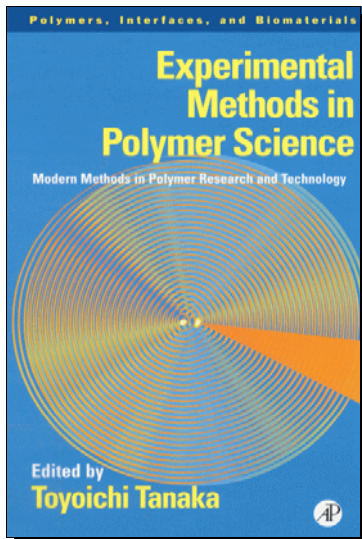


Table of Contents

- Contributors
- Preface by Series Editor
- Preface by Editor
- 1 Light Scattering
 - 1.1 Introduction
 - 1.2 Static Laser Light Scattering
 - 1.3 Dynamic Light Scattering
 - 1.4 Methods of Combining Static and Dynamic LLS
 - 1.5 Practice of Laser Light Scattering
- References
- 2 Neutron Scattering
 - 2.1 Introduction
 - 2.2 Neutron and Neutron Scattering
 - 2.3 Experiments
 - 2.4 Theory of Small-Angle Neutron Scattering
 - 2.5 Experimental Studies
- References
- 3 Fluorescence Spectroscopy
 - 3.1 Introduction
 - 3.2 Introduction to Fluorescence Processes
 - 3.3 Introduction to Fluorescence Measurements
 - 3.4 Application of the Fluorescent Probe Method to Polymer Science
 - 3.5 The Use of Fluorescence Measurements in Polymer Science
- 3.6 Concluding Remarks
- References
- 4 NMR Spectroscopy in Polymer Science
 - 4.1 Introduction
 - 4.2 Overall Survey of NMR
 - 4.3 NMR Parameters
 - 4.4 NMR Chemical Shift and Structure
 - 4.5 Basic NMR Techniques
 - 4.6 Solution NMR Method
 - 4.7 Solid-State NMR Method
 - 4.8 Spatial Distance Method
 - 4.9 NMR Imaging Method
 - 4.10 Applications to Some Polymer Systems
- References
- 5 Mechanical Spectroscopy of Polymers
 - 5.1 Introduction
 - 5.2 Mechanical Spectroscopy Experiment
 - 5.3 Data Analysis for Mechanical Spectroscopy
 - 5.4 Time-Resolved Mechanical Spectroscopy (TRMS)
 - 5.5 Temperature Effects and Time-Temperature Superposition
 - 5.6 Applications of the Relaxation Time Spectrum
- Appendices
- References
- 6 Polymer Hydrogel Phase Transitions
 - 6.1 Introduction
 - 6.2 General Experimental Considerations
 - 6.3 Neutral Hydrogels
 - 6.4 Polyelectrolyte Hydrogels

Subjects

313 .	Polymers
405 .	Polymers -- Experiments
453 .	Polymers -- Research -- Methodology

- 6.5 Polyampholyte Hydrogels
- 6.6 Conclusion
- References
- Index

Reviews - Synopsis - Dust Jacket

Successful characterization of polymer systems is one of the most important objectives of today's experimental research of polymers. Considering the tremendous scientific, technological, and economic importance of polymeric materials, not only for today's applications but for the industry of the 21st century, it is impossible to overestimate the usefulness of experimental techniques in this field. Since the chemical, pharmaceutical, medical, and agricultural industries, as well as many others, depend on this progress to an enormous degree, it is critical to be as efficient, precise, and cost-effective in our empirical understanding of the performance of polymer systems as possible. This presupposes our proficiency with, and understanding of, the most widely used experimental methods and techniques. This book is designed to fulfill the requirements of scientists and engineers who wish to be able to carry out experimental research in polymers using modern methods. Each chapter describes the principle of the respective method, as well as the detailed procedures of experiments with examples of actual applications. Thus, readers will be able to apply the concepts as described in the book to their own experiments.

KEY FEATURES

Addresses the most important practical techniques for experimental research in the growing field of polymer science
The first well-documented presentation of the experimental methods in one consolidated source
Covers principles, practical techniques, and actual examples
Can be used as a handbook or lab manual for both students and researchers
Presents ideas and methods from an international perspective
Techniques addressed in this volume include:

CONTENTS:

B. Chu and C. Wu, Light Scattering. M. Sibayama, H. Jinnai, and T. Hashimoto, Neutron Scattering. H. Itagaki, Fluorescence Spectroscopy. Ando et al., NMR Spectroscopy in Polymer Science. M. Mours and H.H. Winter, Mechanical Spectroscopy of Polymers. A. English and T. Tanaka, Gel-Phase Transitions.

From Book News, Inc.

A handbook for scientists and engineers who wish to carry out experiments on polymers using modern physical techniques to characterize polymer systems. Each of the six chapters describes the principle of a single technique along with detailed experimental procedures and examples of actual applications. The techniques covered are light scattering, neutron scattering, fluorescence spectroscopy, nuclear magnetic resonance spectroscopy, mechanical spectroscopy, and polymer hydrogel phase transitions. Other techniques are expected to be described by subsequent volumes in the series.

Title	Location	Edition / Series / Misc.
<p>668 Exposure Studies of Organic Pigments in Paint Systems</p> <p>Author: Vesce, Vincent C.</p> <p>Publish.: Allied Chemical Company, National Aniline Division</p> <p>- place: New York, NY</p> <p>- date: ©1959</p> <p>Subject: Pigments</p> <p>Desc: 143 p., illus., plates, tables, 23 cm.</p>	<p>Dynix: 12999</p> <p>Call No.: 667.623 Ve</p> <p>ISBN:</p> <p>Shelf Adult Non-Fiction</p>	<p>Edition:</p> <p>Series:</p> <p>Year: 1959</p> <p>Price: \$25.00</p>

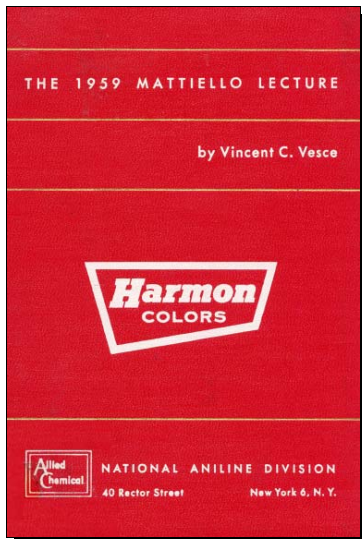


Table of Contents

Reviews - Synopsis - Dust Jacket

PREFACE

I wish at this time to express my deep appreciation to all the members of the Federation's 1959 Mattiello Lecture Committee, and its Chairman, Mr. Herbert E. Hillman, for this distinguished honor of being selected as your 1959 Mattiello Lecturer.

The Lecture is a tribute to the memory of Dr. Joseph J. Mattiello, whom I was proud to know as an intimate and personal friend during his professional years.

Much has been written about him, and of his great contributions to the paint industry, and, as time passes, more and more do we realize how much we miss his kindly counsel, his fund of knowledge, and his wonderful personality. His ever willing desire to help his friends was always in evidence.

Joe was always a willing subject while I practiced my hobby of photography, but I never thought that one day I would be face to face here with an enlargement of one of these pictures, on such an important occasion.

In giving this lecture, I have kept in mind the spirit of Dr. Mattiello's early pioneering work, and dedicate it to his memory.

INTRODUCTION

Organic pigments are necessary to the paint industry. They make possible the production of decorative coatings in the widest variety of hues. The richness and beauty and depth of shade demanded by the paint industry are obtainable only with organic pigments.

There are many organic pigments available in every hue category. While the hue is the most important property of a color pigment, the tinctorial strength and light fastness are generally agreed to be the other factors on which a choice of colorant is most frequently made.

The light fastness properties of organic systems have been the subject of considerable study. Most of the work reported in the literature is incomplete. The user of organic pigments should have a single source of reliable and objective information regarding the stability of organic pigments on exposure. Therefore, this presentation is devoted to a study of the light fastness characteristics of organic pigments.

In an attempt to provide this information, a large number of organic colors have been exposed outdoors in several paint systems. The resultant color changes are reported in objective units of change.

I shall present to you the results of this study of the light fastness of organic pigments, which will help you in the selection of specific colors for a particular application.

When paints are subjected to outdoor exposure, they undergo a change. They are discolored and very often bleached. This is particularly true of bright pastel coatings. The rate and degree of change may vary depending upon the chemical identity of the particular coloring matter, and the depth of shade or tone at which it is exposed. The vehicle or system used may very often influence this change, sometimes accelerating the degradation of color and, at other times, protecting the color from any change.

Many organic pigments of similar shades are being used every day. Some of these have good light fastness, and others poor light fastness. Economic considerations and application properties, other than light fastness, often influence the selection of a pigment in a specific formulation.

Subjects

293 .	Pigments
513 .	Paint industry and trade

During my career, I have prepared and examined hundreds of different organic colors of every chemical classification. Most of these never passed the laboratory stage, others have been used extensively by a variety of color consuming industries. I am impressed by the fact that only a small handful, perhaps a dozen at most, have been accepted as truly permanent in those fields where light fastness, especially in pastel tones, is of highest importance.

For this study, I have examined a large number of organic pigments, and recorded in objective and quantitative terms their light fastness in a variety of paint systems. Included in this study are all of the most widely used organic pigments. I have also included some of the older types to serve for comparison purposes. At the same time, some of the newer types were evaluated.

Each of these pigments was incorporated into five different paint systems. Each pigment—vehicle system was prepared at three concentrations with white. After Florida exposure, the degree of color change was measured.

Data obtained in this fashion can serve as a guide in the consideration and selection of colorants for any degree of permanence consistent with the commercial requirement of the pigmented coating.

Title	Location	Edition / Series / Misc.
50 Exterior Water-Based Trade Paint Formulations		Edition:
Author: Flick, Ernest W.	Dynix: 64075	Series:
Publish.: Noyes Data Corporation	Call No.: 667.63 FI	
- place: Park Ridge, NJ	ISBN: 0815508204	
- date: ©1980	Shelf Adult Non-Fiction	Year: 1980
Subject: Emulsion paint -- Handbooks, manuals, etc.		Price: \$36.00
Desc: xvi, 349 p., 24 cm.		

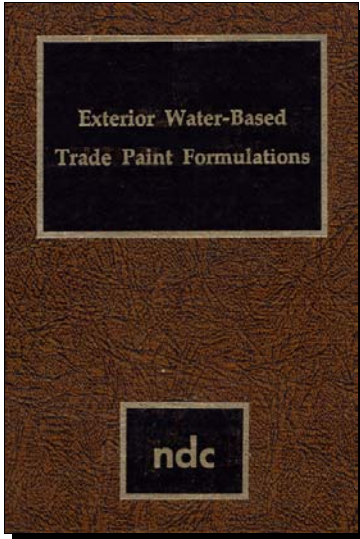


Table of Contents

Introduction

Section I: Exterior White Paints and Topcoats
 Exterior White Paints
 Exterior Flat White Paints
 Exterior Sheen White Paints
 Exterior Semi-Gloss White Paints
 Exterior Gloss White Paints
 Exterior White House and Masonry Paints
 Exterior White Topcoats
 Exterior White Trim Paints
 Exterior High Hiding White Paints
 Exterior High Quality White Paints
 Exterior Low Cost (Economy) Paints

Section II: Exterior White and Tint Base Paints
 Exterior White and Tint Base Paints

Section III: Exterior Tint Base Paints and Topcoats
 Exterior Tint Base Paints
 Exterior Light and Medium Tint Base Paints
 Exterior Deeptone Tint Base Paints
 Exterior Low Cost Tint Base Paints and Topcoats

Section IV: Exterior Tinted Paints
 Exterior Tinted Paints
 Exterior Tinted House Paints
 Exterior Tinted Trim Paints

Section V: Exterior Stains
 Exterior Tint Base Stains
 Exterior Tinted Stains

Section VI: Exterior Primers
 Exterior Primers

Section VII: Exterior Miscellaneous End Uses
 Exterior Block Fillers and Surfacer
 Exterior Roof Coatings
 Exterior Tennis Court Paint and Topcoat
 Exterior Texture Coating

Section VIII: Trademarked Raw Materials

Section IX: Base Chemical Descriptions

Section X: Suppliers' Addresses

Subjects

258 . Emulsion paint -- Handbooks, manuals, etc.

Reviews - Synopsis - Dust Jacket

FORWARD:

This book of 292 exterior water-based paint formulations has been compiled for the paint industry. It will be of value to technical and managerial personnel in paint manufacturing companies and companies which supply raw materials or services to these companies. This book will be useful to both those with extensive experience as well as those who are novices in the field.

The data consist of selections of manufacturers' formulations made at no cost to, nor influence from, the makers or distributors of these materials.

Only the most recent data have been included. Only water-based formulations are included. Any solvent contained is in the form of high boiling point modifiers.

The table of contents is organized in such a way as to serve as a subject index.

INTRODUCTION

This book is a compilation of 292 exterior water-based paint formulations. It is the result of information received from numerous industrial companies and other organizations. The data represent selections from manufacturers' descriptions made at no cost to, nor influence from, the makers or distributors of these materials. Only the most recent formulas have been included. I believe that all of the trademarked raw materials listed here are currently available, which will be of utmost concern to readers who are familiar with the raw material shortages and discontinuances of recent years.

There are no lead-containing raw materials in any of the formulations. Only water-based formulations are included and any solvent contained is in the form of high boiling point modifiers, which fact will be of interest to readers concerned with OSHA, EPA and CARB regulations.

The formulations in this book are divided into the following seven sections:

- Section I Exterior White Paints and Topcoats
- Section II Exterior White and Tint Base Paints
- Section III Exterior Tint Base Paints and Topcoats
- Section IV Exterior Tinted Paints
- Section V Exterior Stains
- Section VI Exterior Primers
- Section VII Exterior Miscellaneous End Uses

Each formula is indexed in the section which is most applicable. The reader, if he is seeking a formula for a specific end use, should check each section which could possibly apply. In addition to the above, there are three other sections which will be helpful to the reader:

Section VIII: A chemical trademark section where each tradenamed raw material included in the book is listed with a chemical description and the supplier's name. The specifications which each raw material meets are included, if applicable.

Section IX: A base chemical description section listing all the latexes and alkyds which are found in the formulations, plus any other related ones from the suppliers which we consider to merit attention for paints. It is the most reliable compilation we could derive and is based on the best information we could obtain from our data. This section lists chemical type, average physical property test data and the key outstanding properties for each base listed.

Section X: Main office addresses of the suppliers of trademarked raw materials, some of which are not available in the usual reference books.

Each formulation in this book lists the following information, which has been standardized as much as possible:

- (1) Description of end use and most outstanding properties.
- (2) Base chemical and modifier(s) in the heading. The first chemical listed is the base. A dash signifies the other monomer of a copolymer, whenever identified. The chemical listed after the slash is the major modifier included in the formula.
- (3) The formulas include the following:
 - (A) A listing of each raw material contained.
 - (B) A capsule description of each trademarked raw material or the name of any common chemical.
 - (C) The number of pounds of each raw material included in the formula, sometimes to a decimal figure.
 - (D) Conversion of the pounds to gallons, expressed as a decimal figure to hundredths.
 - (E) The total of each of the pounds and gallons figures.
 - (F) Formulation notes which list formula modifications or improvements which may be made and any other formula

suggestions.

(G) Physical constants of the finished formulation. These list the test results obtained on the formula, whenever available.

(H) Key properties of the formula, which are the features that the source considers to be more outstanding than other formulations of the same type.

(I) The formula source, which is the company or organization that supplied the formula. The secondary source may be the originating company and/or the primary source's publication title, or both. A formula number is included, if applicable.

Title	Location	Edition / Series / Misc.
809 Failure Analysis of Paints and Coatings Author: Weldon, Dwight G. Publish.: John Wiley & Sons - place: Chichester, [West Sussex], UK - date: ©2001 Subject: Paint -- Testing Desc: xii, 285 p., illus., 24 cm.	Dynix: 99413 Call No.: 667.6 We ISBN: 0471490725 Shelf Adult Non-Fiction	Edition: Series: Year: 2001 Price: \$105.00

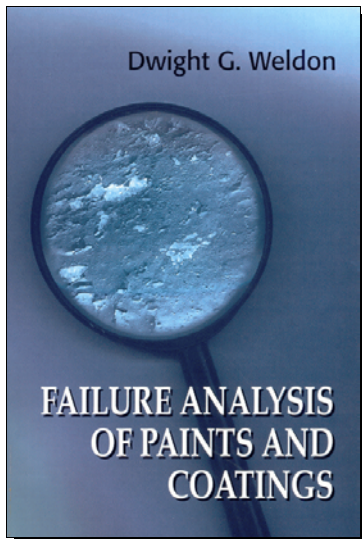


Table of Contents

- Preface
- Acknowledgements
- 1 General Principles of Coating Formulation
 - 1.1 Introduction
 - 1.2 Binder
 - 1.3 Pigments
 - 1.4 Solvents
 - 1.5 Additives
 - 1.6 Formulation Concepts: Pigment-to-Binder Ratio
 - 1.7 Formulation Concepts: Pigment-Volume Concentration
 - 1.8 Formulation Concepts: Density, Weight Solids and Volume Solids
- Reference
- 2 Why Coatings Work and Why They Fail
 - 2.1 Why Coatings Work
 - 2.2 Why Coatings Fail
- References
- 3 Pigments
 - 3.1 Inorganic Pigments
 - 3.2 Extender Pigments
 - 3.3 Corrosion-Resistant Pigments
 - 3.4 Organic Pigments
- References
- 4 Additives and Solvents
 - 4.1 Additives
 - 4.2 Solvents
- References
- 5 Coating Types and Common Failure Modes
 - 5.1 Natural Resins and Oils
 - 5.2 Alkyds and Epoxy Esters
 - 5.3 Epoxies
 - 5.4 Modified Epoxies
 - 5.5 Phenolics
 - 5.6 Amino Resins
 - 5.7 Acrylics
 - 5.8 Polyesters
 - 5.9 Polyurethanes
 - 5.10 Vinyls
 - 5.11 Bituminous Coatings
 - 5.12 Inorganic and Silicone-Modified Coatings
- References
- 6 Application-Related Problems
 - 6.1 Brush and Roller
 - 6.2 Spray Applications
 - 6.3, Flow Coating
 - 6.4 Roll Coating

Subjects

528 .	Coatings -- Testing
529 .	Paint -- Testing

- 6.5 Powder Coating
- 6.6 Coating Failures Related to Application Problems
- Reference

- 7 Field Methods

- 8 Analytical Methods
 - 8.1 Light Microscopy
 - 8.2 Infrared Spectroscopy
 - 8.3 Gas Chromatography
 - 8.4 Gel Permeation Chromatography
 - 8.5 Ion Chromatography
 - 8.6 Scanning Electron Microscopy
 - 8.7 Differential Scanning Calorimetry
 - 8.8 Standard Methods of Analysis
- References

- 9 Physical Methods
 - 9.1 Adhesion
 - 9.2 Flexibility and Impact Resistance
 - 9.3 Solvent Resistance
 - 9.4 Weathering Resistance
 - 9.5 Chemical Resistance
 - 9.6 Freeze—Thaw
 - 9.7 Application Variables Reference

- 10 Examples of Coating Failures
 - 10.1 Urethane Top Coat Disbonding from Epoxy
 - 10.2 Blistering of an Epoxy Tank Coating
 - 10.3 Cracking and Delamination of Epoxy Coating Systems on Masonry Walls
 - 10.4 Discoloration of Coil Coated Aluminum Siding
 - 10.5 Discoloration and Delamination of Plastisol
 - 10.6 Delamination of Floor Coating
 - 10.7 Delamination of Dry-Fall Alkyd
 - 10.8 Coal Tar Epoxy Failure
 - 10.9 Splitting of Inorganic Zinc-Rich Primer
- References

- 11 The Repair of Coating Failures

- Index

Reviews - Synopsis - Dust Jacket

This is the first book to be devoted entirely to failure analysis of coatings. It deals with the field and laboratory methods (both analytical and physical) used to determine the causes of premature paint and coatings failures in the commercial and industrial arena. Practical examples are included to show both the thought processes behind such investigations and how the individual techniques complement one another.

Failure Analysis of Paints and Coatings begins with a basic review of coatings technology and the chemistry of commonly encountered coatings types — this introduction makes prior in-depth knowledge of the underlying chemistry unnecessary. It combines coatings chemistry with analytical techniques; discusses the advantages and limitations of various analytical techniques; and integrates theory with demonstrations of practical applications.

Target Audience: Coatings chemists, corrosion engineers, paint technicians, consultants, and applicants of paints and other coatings; also forensic scientists, upper-level undergraduate and graduate students studying these disciplines.

FROM THE DUST JACKET:

Failure Analysis of Paints and Coatings is intended to provide the reader with an understanding of how to investigate, and solve, the premature failures of industrial coatings. The cracking, peeling, and blistering of coatings can result in widespread damage to the substrates which they are intended to protect, and can result in serious financial consequences. A sound knowledge of coatings chemistry, coupled with a firm understanding of the many field and laboratory techniques available for analyzing such problems, will aid the investigator in solving such failures.

Beginning with a basic review of coatings technology and the chemistry of commonly encountered coatings types, this book:

- looks at both the field and laboratory practices leading to the elucidation of failure mechanisms
- combines coatings chemistry and analytical techniques
- gives both theory and applications
- discusses both the advantages and limitations of various analytical techniques
- discusses the thought process involved in solving coating failures
- includes step by step examples of case studies

Written by an analytical chemist and coatings consultant with eighteen years of experience solving coatings problems for a wide range of industries, this title will be essential reading for coatings chemists, corrosion engineers, paint technicians, and consultants in the paints and coatings industry.

PREFACE

From the author's point of view there are few things more satisfying than solving a problem. The failure analysis of paints and coatings is all about problem solving, and is both a fascinating and a challenging endeavor. It requires the blending of polymer chemistry, analytical chemistry, coatings science and microscopy with the curiosity of a detective. All of these skills, with the possible exception of the last, can be studied in school or learned from books. It is putting them all together that is the trick, and which was the impetus for writing this present book.

Perhaps the most difficult part of writing this book was deciding how to organize it. A thorough knowledge of analytical techniques, including weaknesses as well as strengths, is essential in solving a coatings failure problem. However, an understanding of the chemical and physical properties of the substrate/coating system is equally important, as are the more mundane areas of samples and background information.

The approach finally decided upon was to begin with a basic review of coatings technology. Without this knowledge, it is virtually impossible to decide what to look for in the laboratory. While there are several excellent and expansive texts on the subject, it seemed impossible to write a manuscript on failure analysis without first describing the nature of what it is that we are investigating. Readers familiar with the technology may wish to skip some of these chapters, although it should be pointed out that the chapter on resins and polymers contains some specific information on failure mechanisms.

Likewise, it seemed impossible to write about the various analytical methods without first discussing their theoretical background. These discussions are admittedly very brief, as entire volumes have been written about each and every technique. Indeed, as I am personally particularly fond of analytical chemistry, it was tempting not to be more expansive here. I hope that I have adequately resisted the temptation, and have written a failure analysis book rather than an analytical chemistry one. It is, however, important to understand the basics of the various techniques, in order to appreciate their limitations. Without knowing what a technique cannot do, it is possible to make serious errors in judgment.

In a perfect world there would be no paint failures and I would have to find a different line of work. In a nearly perfect world, one would have unlimited time, excellent samples, and a handsome budget with which to solve the problems that occur. Usually, none of these three conditions exist. Furthermore, although great strides have been made there are still substantial gaps in our basic knowledge of paints and coatings. Without knowing exactly why something works, it can be difficult to say exactly why it doesn't.

As a consequence of the above, there are times when it is not possible to unequivocally determine the cause of a coating failure. However, starting with a firm understanding of coatings technology, applying the many powerful analytical techniques available, and keeping an open and inquisitive mind, the majority of coating failures can be solved. It is hoped that this text will be a step forward in that direction.

Title	Location	Edition / Series / Misc.
52 Fifty-Five Colorful Years: The Story of Paint in America Author: Trigg, Ernest T., b. 1877. Publish.: Pequot Press - place: Stonington, CT - date: [1954] Subject: Paint industry and trade -- United States Desc: xvi, 307 p., illus., portraits., 22 cm.	Dynix: 12994 Call No.: 667.6 Tr ISBN: Shelf Adult Non-Fiction	Edition: [1st edition] Series: Year: 1954 Price: \$25.00

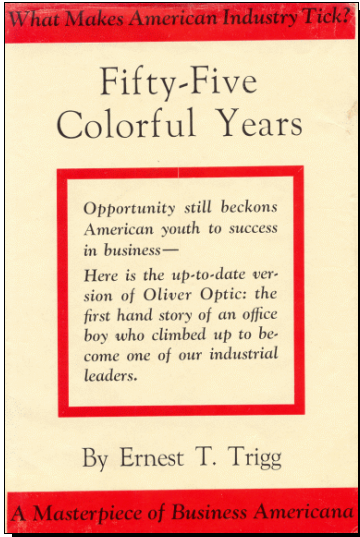


Table of Contents

1. I Was There
2. "Paint in My Eye"
3. Pageantry of Paint
4. Strength in Unity
5. Our Organized Allies
6. Educational Bureau
7. Scientific Section
8. Competition—Fair and Unfair
9. "Tempest in a Teapot" (Formula labeling)
10. Paint Goes to War
11. The Plus Element
12. Paint and the NRA
13. Back to War We Go
14. Weathering the OPA
15. Our Advertising Campaigns
16. Clean-Up... Paint-Up... Fix-Up
17. "Paint Power" Points the Way
18. Tribute to a Great Leader
19. Leaves from a Personal Notebook
20. In Conclusion
- Appendix

Subjects

282 . Paint industry and trade -- United States

Reviews - Synopsis - Dust Jacket

Introduction
 By Dr. Archibald Rutledge

In reading the manuscript of this book, I have been deeply impressed by certain outstanding qualities of the work. The first is, I believe, the modesty of the author; for I feel that he constantly understates the importance of the part he has played as one of the foremost industrialists of our era. Another pleasing feature is the presentation, in simple yet vivid form, of the history of one of America's greatest industries.

As a rule the inner workings of great corporations remain rather unknown and therefore mysterious. Here, however, we have revealed, by one most capable to tell us, the fascinating story of the paint, varnish and lacquer industry. It is a story told with directness, sincerity and honesty. Here are recorded the doubts and the hopes, the triumphs and defeats, the constant striving, against great odds, for a finer product, distributed more economically to a greater number of people.

This book has a fine flavor of Americanism; it is a wholesome story of initiative and ceaseless individual industry. Although it records a brilliant success, it is told in a most unassuming manner. Reading it has given me renewed faith in our American Dream.

Title	Location	Edition / Series / Misc.
788 Film Formation Author: Wicks, Zeno W., Jr. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1986 Subject: Coatings -- Periodicals Desc: 19 p., illus., 28 cm.	Dynix: 55947-01 Call No.: 667.9 Fe ISBN: 0934010196 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS1 Year: 1986 Price: \$50.00



Table of Contents

- I. INTRODUCTION
- II. FILM FORMATION BY SOLVENT EVAPORATION FROM SOLUTIONS OF THERMOPLASTIC POLYMERS
- III. FILM FORMATION FROM SOLUTIONS OF THERMOSETTING POLYMERS
- IV. FILM FORMATION BY COALESCENCE OF POLYMER PARTICLES
 - A. Latex Systems
 - B. Other Coalescing Systems
- V. EFFECT OF PIGMENTATION ON FILM FORMATION
 - A. Effects on Solvent Evaporation and Crosslinking
 - B. Porous Substrate Effects
 - C. Effects of Pigmentation on Paint and Film Properties
- VI. TESTING
- VII. SUMMARY
- VIII. REFERENCES

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

Reviews - Synopsis - Dust Jacket

Published as part of the FSCT Series on Coatings Technology, Film Formation includes discussion on film formation by solvent evaporation from solutions of thermoplastic and thermosetting polymers, and by coalescence of polymer particles. (FSCT) 20 pages, soft cover (1986)

INTRODUCTION:

Perhaps the most critical step involved in coating is film formation. In most cases, coating materials are liquids with a viscosity appropriate for application to the object to be coated. This viscosity depends upon the application method used, but is generally in the range of 0.05 to 1 Pa*s [0.5-10 poise] at the shear rate involved in the application process. After application, the liquid coating must be converted to a "solid" film.

At first thought, it is evident what a solid film is. However, when one tries to define the term solid, one finds that it is not as simple as it appeared. A useful definition of a solid film is that it is a material that does not flow significantly under the forces to which it is subjected or conditions of observation. Thus, one can define whether a material is a solid under a set of conditions by stating the minimum viscosity required so that flow will not be observable in the specified time interval. A film is called "dry" or a solid, when it develops certain properties or passes some test. For example, it has been reported that a film will be "dry to touch" if its viscosity is greater than 1,000 Pa*s. On the other hand, it is said that a viscosity greater than 1,000,000 Pa*s is required if the definition of "dry" is that the film should resist blocking when two of the coated surfaces are put against each other for two seconds under a pressure of 20 psi [14,000 Pa*s).

Two broad classes of resins (polymers) are used in coatings: thermoplastic polymers and thermosetting polymers. In the case of thermoplastic polymers, the final polymer is formulated into a coating and then applied to the substrate. In the case of thermosetting polymers, a lower molecular weight resin is formulated into a coating, the coating is applied, and then after application, the resin is further reacted chemically to form the final polymer.

First, let us consider the relatively simple case of an unpigmented coating made from an amorphous thermoplastic polymer. What controls the viscosity of such a film? Viscosity depends upon the availability of free volume. Free volume is the unoccupied volume between molecules in an amorphous solid. The amount of this free volume varies with

temperature. Free volume increases as temperature increases beyond the glass transition temperature. The increase is attributed to segmental motion of the molecules which creates sub-microscopic voids called holes. Flow of amorphous materials is thought to occur by molecules or polymer chain segments jumping from one hole to another. As temperature increases, free volume increases, flow becomes easier, and viscosity decreases. The relationship between viscosity and temperature is expressed mathematically by the Williams, Landel and Ferry (WLF) equation, where viscosity, has units of Pa*s, T and Tg are absolute temperatures (K), constants A and B are related to the slopes of the volume dependence on temperature above and below Tg, and η_{Tg} is the viscosity at Tg.

It is not sufficient in practical coatings just to form a film; the film must also have some minimum level of strength depending upon the end use of the product. The strength of the film in the printing ink on the pages of this booklet need not be as high as that of a film for the coating of the exterior of an automobile body. Film strength depends upon many factors, but one critical factor is molecular weight. For a thermoplastic binder in a printing ink for a monograph such as this, a weight average molecular weight of the order of magnitude of 2,000 might well be adequate (provided that the Tg was sufficiently high to prevent offsetting of the ink onto the back of the facing page). On the other hand, the minimum weight average molecular weight required for a thermoplastic acrylic polymer for use in an automotive lacquer top coat is probably above 75,000. Viscosity of polymer solutions is a function of, among other things, molecular weight of the polymer. In good solvents, in the range of concentration required so that the viscosity will be approximately that necessary for the application of the coating, the logarithm of the viscosity of the solution increases proportionately to the half power of the molecular weight. As a result of the high molecular weight required for the acrylic polymer, automotive acrylic lacquers can have a volume solids of only 10-12% when sprayed.

It is desirable to apply coatings at higher solids than 10-12% when possible to reduce the cost and air pollution from the large amount of volatile organic solvents (VOC). Higher application solids for solution coatings require that lower molecular weight resins be used. However, for applications such as automotive top coats, the low molecular weight resin must be chemically reacted (polymerized) after application to the automobile. Films of thermosetting coatings dry by a combination of solvent evaporation and crosslinking.

Thermoplastic solution coatings and thermosetting solution coatings will be discussed in the following two sections. The section after these will be devoted to formation of films by coalescence of particles. For ease of understanding, the discussion in all three of these sections will be limited to unpigmented coatings. Then a section follows devoted to the effects of the presence of pigments in coatings on film formation. Finally, we will deal with methods for determining whether and when films are "dry."

Title	Location	Edition / Series / Misc.
917 Film Formation in Coatings: Mechanisms, Properties, and Morphology		<i>Edition:</i>
<i>Author:</i> Provder, Theodore, 1939- and Marek W. Urban, 1953- (editors)	<i>Dynix:</i> 105710	<i>Series:</i> ACS Symposium Series: No. 790
<i>Publish.:</i> American Chemical Society	<i>Call No.:</i> 667 Fi	
<i>- place:</i> Washington, DC	<i>ISBN:</i> 0841237123	
<i>- date:</i> ©2001	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 2001
<i>Subject:</i> Protective coatings		<i>Price:</i> \$93.50
<i>Desc:</i> viii, 304 p., illus., 24 cm.		

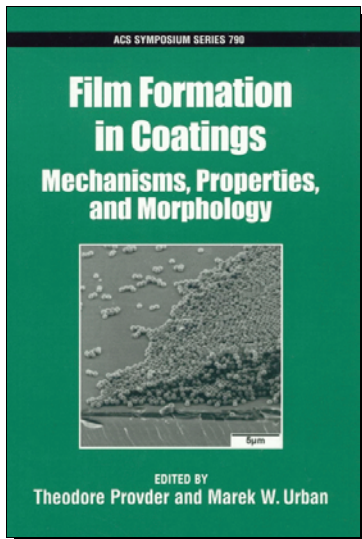


Table of Contents

Preface

MECHANISM STUDIES

1. Drying Modes of Polymer Colloids
-- Y. Holl, J. L. Keddie, P. J. McDonald, and W. A. Winnik
2. On Capillary Forces and Stress in Drying Latex Coating
-- L. A. Pekurovsky and L. E. Scriven
3. Mobility and Molecular Interactions during Latex Film Formation
-- Yaqiu Zhao and Marek W. Urban
4. Molecular Weight Effects on the Film Formation of Latex and on Surfactant Distribution and Morphology
-- A. Tzitzinou, J. L. Keddie, J. L. Geurts, M. Mulder, R. Satguru, and K. E. Treacher
5. Film Formation from Blends of Carbodiimide and Carboxylic Acid-Functional Latex
-- Hung H. Pham and Mitchell A. Winnik

FILM PROPERTIES

6. Dynamic Mechanical Analysis of Property Development during Film Formation
-- Loren W. Hill
7. Property Development during Film Formation of Two Component Waterborne Polyurethane Using Dielectric Spectroscopy
-- John E. Dewhurst, A va S. Drayton-Elder, Xiaoping Gao, Thomas M. Santosusso, Chao-fong Tien, and Tracy L. Wickmann
8. On-Line In Situ Sensor Monitoring of Rapidly Curing Coatings-Films
-- D. Kranbuehl, J. Rogozinski, A. Meyer, L. Hoipkemeier, and N. Nikolich
9. Acetal Functionalized Latex Films Capable of Cross-Linking at Ambient Temperatures
-- C. Soares, B. Charleux, J.-P. Vairon, C. Verge, and K. Luyen

MORPHOLOGY AND FILM STRUCTURE

10. Cryogenic Scanning Electron Microscopy of Early Stages of Film Formation in Drying Latex Coatings
-- Erwin Sutanto, Yue Ma, H. T. Davis, and L. E. Scriven
11. Confocal Microscopy and Environmental SEM Applied to Matting Water-Based Lacquers
-- C. Patrick Royall and Athene M. Donald
12. Influence of Carboxyl Groups on the Morphology and Surface Properties of Films Prepared from Model Carboxylated Latex Blends
-- Jiansheng Tang, Eric S. Daniels, Victoria L. Dimonie, Andrew Klein, and Mohamed S. El-Aasser
13. Studies on Porosity in Polymer Latex Films
-- Ian C. Hodges, John Hearn, and Michael C. Wilkinson
14. Creation of Polymer Films with Novel Structures and Properties by Processing with Inclusion Compounds
-- L. Huang, M. Gerber, H. Taylor, J. Lu, E. Tapaszi, M. Wutkowski, M. Hill, F. N. Nunalee, A. Harvey, C. C. Rusa, F. Porbeni, E. Edeki, and A. E. Tonelli

Indexes

Author Index

Subject Index

Reviews - Synopsis - Dust Jacket

FORWARD:

The ACS Symposium Series was first published in 1974 to provide a mechanism for publishing symposia quickly in book form. The purpose of the series is to publish timely, comprehensive books developed from ACS sponsored symposia based on current scientific research. Occasionally, books are developed from symposia sponsored by other organizations when the topic is of keen interest to the chemistry audience.

Subjects

324 .	Protective coatings
334 .	Surfaces (Technology)

Before agreeing to publish a book, the proposed table of contents is reviewed for appropriate and comprehensive coverage and for interest to the audience. Some papers may be excluded to better focus the book; others may be added to provide comprehensiveness. When appropriate, overview or introductory chapters are added. Drafts of chapters are peer-reviewed prior to formal acceptance or rejection, and manuscripts are prepared in camera-ready format.

As a rule, only original research papers and original review papers are included in the volumes. Verbatim reproductions of previously published papers are not accepted.

PREFACE:

Coatings technologies are still heavily influenced by the "Clean Air Act" of 1990 and its subsequent updates that keep reducing the volatile organic content (VOC) of coatings. The continuing development of high solids, powder, waterborne and radiation-curable coating technologies is highly focused on reducing the emission of VOCs while maintaining and/or improving product properties in a cost-effective manner. Understanding the film formation process is one of the key enablers in the further development of these coatings technologies. This understanding involves continued elucidation of film formation mechanisms, the evolution of film properties during film formation, and the resultant morphology and structure of the films. The film formation knowledge base continues to grow facilitated by advances in instrumentation that has been applied to this area of investigation, as well as progress made in modeling various aspects of the film formation process.

The first section of this book focuses on aspects of the mechanism of film formation including the modeling of drying of polymer colloids, modeling and understanding capillary forces and stress involved in drying latex coatings, and understanding the effect of molecular weight and molecular interactions on film formation. Instrumental methods such as fluorescence decay spectroscopy, Fourier transform infrared spectroscopy (attenuated total reflectance and photo-acoustic), atomic force microscopy (AFM), ellipsometry, and thermogravimetric analysis have contributed to our understanding of various aspects of film formation. The second section focuses on film properties developed during the film formation process for waterborne thermoplastic and cross-linkable systems as well as radiation curable systems. The focus on property development in this section involves the use of dynamic mechanical analysis, dielectric spectroscopy, and swelling measurements. The third section focuses on the morphology, and film structure resulting from the film formation process. This is a very active area of study utilizing advanced morphological instrumentation, such as transmission electron microscopy, cryogenic scanning electron microscopy (SEM), confocal microscopy, environmental SEM, AFM, as well as routine measurements of gloss and film porosity. The instrumentation used in these studies also facilitates the determination of unique and novel film structures in some of these studies.

We hope this book will encourage and foster continued studies to further our understanding of the scientifically challenging and commercially relevant issue of film formation in waterborne coatings.

Finishes for Exterior Wood: Selection, Application and Maintenance

LASCT Holdings -
maximum detail by Title

F

Title	Location	Edition / Series / Misc.
939 Finishes for Exterior Wood: Selection, Application and Maintenance		Edition:
Author: Williams, R. Sam, Mark T. Knaebe and William C. Feist	Dynix: 106363	Series:
Publish.: Forest Products Society	Call No.: 698.12 Wi	
- place: Madison, WI	ISBN: 0935018832	Year: 1996
- date: ©1996	Shelf Adult Non-Fiction	Price: \$28.00
Subject: Wood Finishing		
Desc: 127 p., illus. (some color), 28 cm.		



Table of Contents

- INTRODUCTION
- CHAPTER 1. WOOD PROPERTIES AND FINISH DURABILITY
 - Natural Characteristics
 - Density
 - Earlywood and Latewood
 - Texture
 - Heartwood and Sapwood
 - Extractives, Pitch, and Oils
 - Juvenile Wood
 - Manufacturing Characteristics
 - Ring Orientation
 - Surface Texture
 - Knots and Other Irregularities
 - Mill Glaze
 - Moisture Content
 - Finishing Characteristics
- CHAPTER 2. CONSTRUCTION PRACTICES
 - Control of Moisture Content
 - Installation of Siding
 - Fasteners
 - Lumber Siding
 - Plywood and Other Sheet Siding
 - Installation Over Rigid-Foam Insulation
- CHAPTER 3. WOOD PRODUCTS USED OUTDOORS
 - Lumber
 - Plywood
 - Composite Wood Products
 - Treated Wood Products
 - Preservative Treatments
 - Fire-Retardant Treatments
- CHAPTER 4. WEATHERING OF WOOD
 - Weathering Process
 - Rate of Weathering
 - Surface Deterioration
 - Artificial Weathering
 - Weathering of Wood-Based Composites
- CHAPTER 5. TYPES OF EXTERIOR WOOD FINISHES
 - Volatile Organic' Compounds
 - Effect of Finishes on Moisture Absorption
 - Opaque Finishes
 - Paint
 - Solid-Color Stains
 - Natural Finishes
 - Water-Repellent Preservatives
 - Oils
 - Semitransparent Penetrating Stains

Subjects

437 .	Finishes and finishing
564 .	Stains and staining
565 .	Wood finishing

- Transparent Film-Forming
- Finishes Fire-Retardant Finishes

- CHAPTER 6. APPLICATION OF EXTERIOR WOOD FINISHES
- Conditions that Affect the Finish
 - Weathering
 - Preservative Treatment
 - Moisture Content
- Opaque Finishes
 - Paint
 - Solid-Color Stains
- Natural Finishes
 - Water-Repellent Preservatives
 - Oils
 - Semitransparent Penetrating Stains
 - Transparent Film-Forming Finishes

- CHAPTER 7. SPECIAL APPLICATIONS
- Decks
 - Penetrating Finishes
 - Film-Forming Finishes
 - Methods for Finishing New Decks
 - Methods for Cleaning Decks
- Porches
- Fences
- Roofs
 - Wood Properties
 - Application of Shingles and Shakes
 - Application of Finish
 - Preservatives and Fire Retardants
 - Maintenance
- Log Structures
- Structures in Marine Environments

- CHAPTER 8. REFINISHING OF WOOD
- Opaque Finishes
- Natural Finishes
 - Water-Repellent Preservatives
 - Oils
 - Penetrating Stains
 - Transparent Film-Forming Finishes
- Removal of Finish
 - Sanding
 - Wet Sandblasting and Pressurized Water Spray
 - Electric Heat
 - Chemicals

- CHAPTER 9. DISCOLORATION OF WOOD AND FINISHES
- Dirt
- Mildew
 - Effect of Paint Composition
 - Prevention and Removal
- Extractives Bleed
 - Diffused Discoloration
 - Streaked Discoloration
- Wax Bleed
- Exudation of Pitch
- Stains
 - Iron Stains
 - Blue Stain
 - Brown Stain Over Knots
 - Water Stain
- Chalking

CHAPTER 10. DEGRADATION OF FINISHES

- Peeling and Cracking
 - Peeling From Substrate
 - Intercoat Peeling
 - Cracking
 - Cross-Grain Cracking
- Blistering
 - Temperature Blisters
 - Moisture Blisters

CHAPTER 11. HEALTH AND ENVIRONMENTAL CONSIDERATIONS

- EPA-Approved Information Sheets
 - Inorganic Arsenical Compounds, Pentachlorophenol, and Creosote
 - Consumer Information
 - Use Precautions
 - Handling Precautions
 - Pentachlorophenol or Creosote Pressure-Treated Wood — Additional Considerations
 - Use Precautions
 - Handling Precautions
- Lead-Based Paint

CONCLUSIONS

ADDITIONAL SOURCES OF INFORMATION

GLOSSARY

INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The proper selection and application of a finish for an exterior wood product is highly dependent on the characteristics of the wood product, its intended use, and the climatic conditions to which it is exposed. Given the wide variety of exterior wood products, climatic conditions, and product performance requirements, there often is no single 'best' answer to finish election and application. However, armed with a basic understanding of wood properties, finish characteristics, and mechanisms of finish degradation, the selection of a finish for a particular use can be made without guesswork. The information and recommendations provided in this comprehensive manual on the painting/staining and maintenance of homes, decks, log structures, and other exterior wood products, provide a troublefree guide for obtaining maximum service life for finished exterior wood products.

INTRODUCTION

The versatility and unique characteristics of wood have permitted the extensive use of wood and wood products in North America. Knowledge of these characteristics has been gained through practical experience over thousands of years and through scientific investigations during the last 200 years. The abundant forests in the United States have made wood and wood products an important part of our cultural heritage.

Forests continue to be an abundant part of our resources and, on an annual basis, natural regeneration, planting, and replanting of trees continues to be greater than the amount harvested. Although changes in harvesting practices (e.g., the decrease in harvest of old-growth forests of the Pacific Northwest) are not likely to affect the overall availability of wood and wood products, the species mix and the selection of wood products has changed and will continue to change. Large logs from old-growth and/or virgin timber have been replaced by small logs from second- and third-growth forests. Composite wood products continue to replace dimension lumber. Many of these composites are panel products. Hardwoods are being used to a greater degree for dimension lumber and siding. Nevertheless, because wood is a renewable resource, younger forests, smaller logs, different species, and wood composites can continue to provide economical building material for future generations. In addition, the environmental costs of wood (measured as energy required to produce) are roughly one tenth of competitive materials such as steel, aluminum, and concrete.

Wood continues to play an important role as a structural and decorative material in today's high-tech society. The availability of wood species varies somewhat by region within the United States. Climatic conditions also vary tremendously. Consequently, wood durability, structure design, construction practices, and finish formulations also vary.

Lumber and other wood-based composites products (plywood, particleboard, laminated beams, etc.) are used for countless exterior and interior applications. Many of these wood products serve as the first defense against the

degrading effects of weather. Degradation caused by sunlight and moisture can be controlled by using good design and construction practices, and the selection and application of the finish is crucial. This is especially true in the South and similar climates, where excessive moisture can quickly cause wood decay and sunlight can cause weathering.

Just as wood and wood-based materials are a structure's first defense against degradation, finishes work in concert with these wood materials to protect both the structure and the wood elements exposed to the weather. A variety of finishes can be applied to wood to retard degradation. These finishes include clear finishes, which reveal and accentuate the natural color and figure of wood; stains, which impart a rustic appearance and partially block the natural color and figure; and paints, which totally obscure the wood color and figure.

This manual describes the characteristics of wood finishes and their proper application to solid and composite wood products. It describes how manufacturing and construction practices affect the surfaces of wood products, how various types of finishes interact with the surface, and how weathering affects the wood and finished wood surfaces. Methods for selecting and applying various exterior wood finishes are presented. Finally, the degradation and discoloration of wood finishes are discussed, and methods are given for preventing these problems.

Title	Location	Edition / Series / Misc.
789 Finishing Exterior Wood Author: Feist, William C. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1996 Subject: Coatings -- Periodicals Desc: 44 p., illus., 28 cm.	Dynix: 55947-27 Call No.: 667.9 Fe ISBN: 0934010218 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS27 Year: 1996 Price: \$50.00

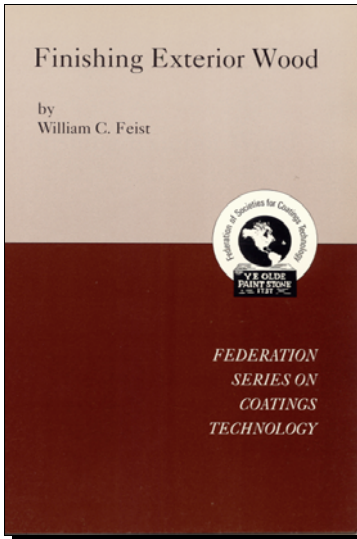


Table of Contents

- I. INTRODUCTION
- II. WOOD PROPERTIES AND FINISH DURABILITY
 - A. Natural Characteristics
 - 1. Density
 - 2. Earlywood and Latewood
 - 3. Texture
 - 4. Compression Wood
 - 5. Heartwood and Sapwood
 - 6. Extractives, Pitch, and Oils
 - B. Manufacturing Characteristics
 - 1. Ring Orientation
 - 2. Surface Texture
 - 3. Knots and Other Irregularities
 - 4. Mill Glaze
 - 5. Moisture Content
- III. FINISHING CHARACTERISTICS
- IV. CONSTRUCTION PRACTICES
 - A. Controlling Moisture Content
 - B. Siding Application
 - 1. Lumber Siding
 - 2. Plywood and Other Sheet Siding
 - 3. Applying Siding Over Rigid Foam Insulation
- V. WOOD PRODUCTS USED OUTDOORS
 - A. Lumber
 - B. Plywood
 - C. Reconstituted Wood Products
 - D. Treated Wood Products
 - E. Fire Retardants and Fire-Retardant Coatings for Wood
- VI. WEATHERING OF WOOD
 - A. Steps in the Weathering Process
 - 1. General Aspects of Wood Weathering
 - 2. Weathering Factors
 - B. Rate of Weathering
 - C. Surface Deterioration
 - D. Wood-Based Composites
 - E. Artificial Weathering
 - F. Precautions for Weathering Wood
 - G. Acidic Deposition
- VII. TYPES OF EXTERIOR WOOD FINISHES
 - A. Opaque Finishes
 - 1. Paint
 - 2. Solid-Color Stains
 - B. Natural Wood Finishes
 - 1. Water-Repellent Preservatives
 - 2. Oils

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

- 3. Semitransparent Penetrating Stains
- 4. Transparent Film-Forming Coatings
- 5. Varnish Stains
- 6. Other Types
- C. Fire-Retardant Coatings
- D. Volatile Organic Compounds

VIII. APPLICATION OF EXTERIOR WOOD FINISHES

- A. Opaque Coatings
 - 1. Paint
 - 2. Solid-Color Stains
- B. Natural Finishes
 - 1. Water-Repellent Preservatives
 - 2. Oils
 - 3. Semitransparent Penetrating Stains
 - 4. Transparent Film-Forming Coatings

IX. SPECIAL APPLICATIONS

- A. Decks and Porches
 - 1. Penetrating Finishes
 - 2. Methods for Finishing New Deck
 - 3. Cleaning Decks
- B. Fences
- C. Roofs
 - 1. Wood Properties
 - 2. Application of Shingles and Shakes
 - 3. Application of Finish
 - 4. Preservatives and Fire Retardants
- D. Log Structures
- E. Structures in Marine Environments
- F. Treated Wood
 - 1. Preservative Treatments
 - 2. Fire-Retardant Treatments

X. FINISH FAILURE OR DISCOLORATION PROBLEMS AND THEIR CURE

- A. Dirt
- B. Mildew
 - 1. Effect of Paint Makeup
 - 2. Prevention and Removal
- C. Peeling and Cracking
 - 1. Intercoat Peeling
 - 2. Cross-Grain Cracking
- D. Blistering
 - 1. Temperature Blisters
 - 2. Moisture Blisters
- E. Discoloration Due to Water-soluble Extractives
 - 1. Diffused Discoloration
 - 2. Streaked Discoloration
 - 3. Wax Bleed from Hardboard
- F. Chalking
- G. Iron Stains
 - 1. Rust
 - 2. Chemical Stains
- H. Blue Stain
- I. Brown Stain Over Knots
- J. Exudation of Pitch
- K. Water Stain

XI. REMOVAL OF FINISHES

- 1. Sanding
- 2. Wet Sandblasting and Pressurized Water Spray
- 3. Heat
- 4. Chemicals
- 5. Other Methods

XII. SUMMARY

XIII. ACKNOWLEDGMENT

XIV. REFERENCES

XV. APPENDIX A — GLOSSARY OF WOOD RELATED TERMS

XVI. APPENDIX B — EPA CONSUMER INFORMATION SHEET: INORGANIC ARSENICAL PRESSURE-TREATED WOOD (INCLUDING CCA, ACA, and ACZA)

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Wood is a naturally durable material long recognized for its versatile and attractive engineering and structural properties. Contrary to the common misconception that old wood is not sound, wood in a favorable environment can last for centuries. The tomb of the Egyptian Tutankhamen, who ruled in the 14th Century B.C., contained wood objects that were in perfect condition when recovered in the 20th Century. Some Japanese temples constructed with wood date back 13 centuries. In Norway, stave churches date back more than four centuries. In Lucerne, Switzerland, a covered bridge built in 1440 is still in service, and in the United States, some 950 covered bridges built during the 19th Century still remain. Many wood dwellings in the United States and Europe are centuries old.

However, like other biological materials, wood is susceptible to environmental degradation. When wood is exposed outdoors above ground, a complex combination of chemical, mechanical, and light energy factors contribute to what is described as weathering. Weathering can be detrimental to the surfaces and appearance of wood. Thus, weathering must be taken into account when considering the preservation and protection of outdoor wood. Weathering of wood is not to be confused with wood decay (rot), which results from organisms (fungi) acting in the presence of excess moisture and air for an extended period. Under conditions suitable for decay, wood can deteriorate rapidly, and the result is far different from that observed for natural outdoor weathering.

The degradation of wood by any biological or physical agent modifies some of the organic components of wood. These components are primarily polysaccharides (cellulose, hemicelluloses) and polyphenolics (lignin). Extractives are also present in relatively small quantities, and their concentration determines color, odor, and other non-mechanical properties of a wood species. A change in the organic components may be caused by an enzyme, a chemical, or electromagnetic radiation, but invariably the net result is a change in molecular structure through some chemical reaction. The most serious threat to wood indoors comes from thermal energy, and outdoors, from weathering — the combination of chemical, mechanical, and light energies.

The abundance and versatility of wood have generated the extensive use of wood products in North America and throughout the world. The unique characteristics of wood make it suitable for many applications. Much of the knowledge about these characteristics has been learned through practical experience rather than through scientific investigation. As virgin timber was cut and used by early settlers in the United States, another forest was growing. Wood cut from this second-growth, or in some cases third-growth, forest varies somewhat from the wood cut from virgin growth. Nevertheless, if properly used and maintained, the younger forest can provide economical building material that, unlike many other resources, can be renewed for future generations. Furthermore, a minimal amount of energy is consumed during the manufacturing process. Once in place, wood continues to conserve energy, for it is a good natural insulator.

The availability of wood species varies somewhat by regions within the United States. Climatic conditions also vary tremendously — hot, humid climates cause the most rapid deterioration of wood products and finishing systems. Consequently, construction practices, finish formulations, and durability also vary.

A variety of finishes can be applied to wood exposed outdoors and indoors. These finishes include clear finishes, which reveal and accentuate the natural beauty of wood; stains, which impart a rustic appearance; and paint, which can be obtained in a multitude of colors and provides the most protection for wood.

This report describes the characteristics of wood and wood finishes and their proper application to solid and reconstituted wood products. It describes the importance of protecting the wood and wood finish against weathering, how manufacturing and construction practices affect the surfaces of wood products, how various types of finishes interact with the surface, and how weathering affects the finished surfaces. Methods for selecting and applying various exterior wood finishes are presented. Finally, the failure and discoloration of wood finishes are discussed.

Title	Location	Edition / Series / Misc.
53 Fire Retardant Building Products and Coatings, 1970 <i>Author:</i> Ranney, Maurice William, 1934- <i>Publish.:</i> Noyes Data Corporation <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1970 <i>Subject:</i> Fireproofing agents -- Patents <i>Desc:</i> 186 p., illus., 28 cm.	<i>Dynix:</i> 16503 <i>Call No.:</i> 691 Ra <i>ISBN:</i> 0815503121 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Chemical Process Reviews <i>Year:</i> 1970 <i>Price:</i> \$50.00

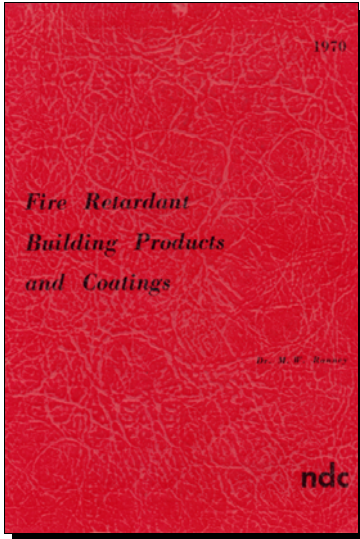


Table of Contents

INTRODUCTION

1. WOOD IMPREGNATION

- Phosphorus Compounds
 - Dicyandiamide and Phosphoric Acid
 - Bis-(2-Bromoethyl)-2-Bromoethane Phosphonate
 - Phosphoric Acid Esters
 - Di- and Monoammonium Phosphates
 - Tetrakis(Hydroxymethyl)Phosphonium Chloride
 - Water-Soluble Organic Phosphorus Esters and Polyesters
 - Linear Tertiary Phosphine Oxide Polymers
 - Tris(1-Aziridiny)Phosphine Oxide and Thiourea
 - Tris[2,2,2-Tris(Chloromethyl)Ethyl] Phosphate
 - Fluoroxyphosphoranes
 - Immersion in Ammonia Solution Prior to Phosphate Treatment
 - In Situ Reaction of Ammonia and Phosphorus Esters
 - Phosphorus Oxychloride with Vinylchloride-Vinyl Acetate Binder
 - Pinene-Phosphorus Pentasulfide Reaction Products
- Zinc Chloride and Borates
 - Zinc Chloride, Boric Acid, Ammonium Sulfate
 - Basic Zinc Chloride
 - Basic Zinc Salts Formed in Situ
 - Ammonium Fluoroborates
 - Trimethyl Borate
 - Silicate-Borate Treatment Followed by Carbon Dioxide Reaction
 - Borate and Chlorinated Phenol Emulsions

2. FIBERBOARD

- Impregnation, Pulp Treatments
 - Ammonium Sulfamate, Sodium Tetraborate Impregnation
 - Boric Acid Impregnation Followed by Clay Coating
 - Anhydrous Borax
 - Boric Acid, Ammonium Sulfate
 - Hydrated Borates
 - Disodium Octaborate
 - Urea Resin Binder and Aluminum Hydrate
 - Dicyandiamide-Formaldehyde-Metaphosphoric Acid Condensation Products
 - Magnesium Oxide, Aluminum Sulfate
 - Use of Urea as Decomposition Inhibitor with Ammonium Phosphates
 - Hydrophilic Colloids
- Coatings
 - Latex Dispersions, Scrub Resistant Formulations
 - Polyvinyl Acetate Dispersions Containing a Borate
 - Latex Applied over Intumescent Coating
 - Kaolin Clay, Starch Prime Coat, Latex Top Coat
 - Kaolin Clay Coatings
 - Monocalcium Phosphate, Starch Coating
 - Phenolic Binder, Sodium Tetraborate, Boric Acid
 - Guanidine-Phosphoric Acid Resin Salts
 - Dicyandiamide-Formaldehyde-Starch Reaction Product
 - Aminoplast, Dicyandiamide and Carbohydrate

Subjects

264 .	Fireproofing agents -- Patents
374 .	Fireproofing of wood
446 .	Paint, Fireproof
479 .	Fireproofing agents

- Halogenation of Cellulosic Fibers
 - In Situ Halogenation of Cellulosic Materials
 - Halogenation of Lignocellulosic Structures
 - Phosphorylation of Halogenated Lignocellulosics
- Plaster
 - Cementitious Plaster Composition
 - Use of Unexpanded Vermiculite of Specified Particle Size Prevents Spalling

3. CEILING TILE AND PANEL CONSTRUCTION

- Acoustical Ceiling Tile
 - Acoustical Correction Ceiling Panels
 - Mineral Fiber Ceiling Tile
 - Fibrous Acoustical Ceiling Panels
- Building Panels
 - Structural Honeycombs for Curtain Wall Panels
 - Sandwich Building Panels
 - Veneer Panels
 - Air Permeable Fire Retarding Partitions and Doors
 - Acoustical and Thermal Insulating Siliceous Fiber Boards
- Miscellaneous
 - Composite Metal Sheets
 - Insulative Structure for Roof Deck Construction

4. ASPHALTIC PRODUCTS

- Roofing Materials and Shingles
 - Asbestos and Vermiculite Fillers
 - Mineralized Roofing Material
 - Bituminous Shingles Coated with Thermosetting Acrylic Resin
 - Hydrocarbon Dispersion Containing Borax and Diammonium Phosphate
 - Weathering Sheet Containing Glass Fibers
 - Intumescent Coated Roofing Granules
 - Polyester and Alkyd Resin Additives
 - Chlorinated Paraffin with Soda Ash
 - Halogenated Cyclopentadiene Based Additives
 - Low Penetration Asphalt and Polyhalogenated Polyphenyls
- Thermal Insulation
 - Use of Phenol-Aldehyde Resins
 - Backing Sheet for Thermal Insulation
- Miscellaneous Coatings
 - Aerogel Thickened Formulation
 - Gilsonite Formulation
 - Metal Tetraborate and Mineral Fillers
 - Creosote Formulations
 - Tar Composition
 - Perhalopentadienoic Acid and Derivatives
 - Resinous Hydrocarbon-Phosphorus Pentasulfide Reaction Products
 - Emulsion Formulations
 - Bituminous Top Coat

5. INTUMESCENT COATINGS

- Phosphorylamides
 - Polyphosphorylamide, Aminoplast Formulations
 - Phosphorylamides, Chlorinated Binders
 - Dicyandiamide and Nitrogen-Phosphorus Complex
 - Melamine-Formaldehyde, Dicyandiamide, Polyphosphorylamide
- Other Phosphorus-Nitrogen Compounds
 - Melamine-Formaldehyde Phosphate Ether Polyol Resins
 - Water-Resistant Carbonific Polyurethanes and Spumific Polyaminotriazine Phosphates
 - Organo-Phosphorus Amides
 - Tris(Haloalkyl)Phosphate, Nitro-Containing Polyhydric Alkanol
- Aminoplasts and Inorganic Phosphates
 - Aminoplast and Ammonium Phosphate Formulations
 - Urea-Formaldehyde and Ammonium Orthophosphates
 - Water-Soluble Melamine-Formaldehyde

Insoluble Metal Metaphosphates
Urea-Formaldehyde-Acrolein Resin
Halogen-Containing Formulations
Chloroprene Binder, Diammonium Phosphate
Halogen-Containing Film Former, Dicyandiamide
Isobutylene Copolymers with Vermiculite
Hexachlorocyclopentadiene Condensation Products
Miscellaneous
Phenol-Sulfonate-Urea Condensates
Microcrystalline Wax, Hexamethylene Triamine and Ammonium Phosphate
Use of Glass Fibers in Coatings
Isano Oil and Polyamide Resins — Intumescent Agents
Polyesters Prepared from Conjugated Diacetylene Diols — Intumescent Agent

6. GENERAL COATING FORMULATIONS

Silicates
Silicate and Phosphate Formulation
Sodium Silicate
Water Resistant Silicate Coating
Lithium-Sodium Silicate Solution
Nitrile Rubber Containing Silicate and Refractory
Borates and Inorganic Fillers
Alkali Metal Glycol Monoborates
Ceramic Frit Comprised of Boric Acid, Lead Oxide and Sodium Fluoride
Alumina Particles Coated with Hydrolyzed Polyacrylonitrile
Reflective Coatings Containing Fibrous Potassium Titanate
Miscellaneous
Epoxy Novolac-Polyhalogenated Phenol Reaction Products
Barium Sulfate and Chlorinated Wax
Chlorinated Rubber and Mineral Fillers
Bentonite Thickened Compositions

7. ADHESIVES

Laminates
Brominated Soybean Oil
Polyvinyl Acetate — Fire Barrier
Tapes
Pressure-Sensitive Adhesive
Fire Retardant Tape
Miscellaneous
Polyisocyanate-Phosphorus Derivatives

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD:

The detailed, descriptive information in this book is based on U.S. Patents relating to the production of fire retardant building products and coatings.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. Patent literature in this field. By indicating only information that is significant, this book then becomes an advanced review of processes for fire retardant building products and coatings.

The U.S. Patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial timely process information assembled here than is available from any other source. The technical information obtained from the patent literature is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure".

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially utilizable information. This information is overlooked by those who rely

primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

These publications are bound in paper in order to close the time gap between "manuscript" and "completed book". Industrial technology is progressing so rapidly that hard cover books do not always reflect the latest developments in a particular field, due to the longer time required to produce a hard cover book.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor, and patent number help in providing easily obtainable information.

—

INTRODUCTION:

The National Fire Protection Association statistics published in 1967, indicate that in the United States a fire starts every two seconds; a home is destroyed by fire every two minutes; and every 44 minutes someone dies from burns received in these fires. Annual property damage due to fire is estimated to be 1.5 to 1.8 million dollars. Increasingly, the construction industry is faced with the necessity of complying with more stringent local and national fire protection standards.

The processing of wood to impart fire retardancy has been studied in considerable depth over the years. Because of economic considerations, much of the commercial effort has centered on the use of inorganic salts such as mono— and diammonium phosphates, zinc chloride and borax-boric mixtures. The method of processing generally involves the vacuum treatment of wood in a suitable vacuum chamber, immersion of the wood in the treating solution while still under reduced pressure, and finally, pressurizing of the vessel with the lumber submerged in the salt solution. In addition to controlling cost, care must be exercised to avoid excessive changes in the physical properties, hygroscopicity, paintability and other desirable properties of the treated wood. A number of phosphorus based organic systems have given very promising results, using impregnation methods.

Approaches to imparting fire retardancy to fiberboard products generally involve treatment of the pulp slurry with the inorganic salts with considerable effort being made to increase the degree of deposition of the fire-retardant salt during normal slurry processing. In situ halogenation of cellulosic materials, perhaps followed by phosphorylation also provides built-in retardancy. Similar efforts have been made to develop fire retardant acoustical ceiling tile and panels.

The demand for fire—retardant coatings is increasing rapidly due to the large scale use of wood and plywood wall finishes. The rate of flame spread for these products is already relatively high, and may be even further increased by the use of decorative, but highly flammable coatings. The most common type of fire—retardant coating comprises:

- (a) phosphorus compounds such as ammonium phosphates and phosphorus—containing amides capable of producing phosphoric acid during thermal degradation.
- (b) Nonresinous materials, referred to as carbonific agents, commonly carbohydrates or polyfunctional alcohols such as pentaerythritol which yield large volumes of nonflammable gas and carbon in the presence of phosphoric acid.
- (c) Gas—producing components, such as urea or dicyandiamide, which release large quantities of gas under the influence of the phosphoric acid produced at elevated temperatures.

To improve the generally poor water resistance of these coatings, formulations incorporating scrub resistant latex binders have been developed.

Fire—retardant asphaltic products such as roofing, coatings, shingles, backing for thermal insulation and for general use on utility poles, etc., have been produced using inorganic fillers, phosphorus and chlorine containing additives and general intumescent formulations.

This report summarizes the patent literature through 1969 as it relates to some 145 different processes for imparting fire retardancy to wood, Fiberboard, asphaltic materials, coatings, and other common building products.

Title	Location	Edition / Series / Misc.
617 Flame Retardant Coatings and Building Materials		Edition:
Author: Williams, Alec	Dynix: 34102	Series: Chemical Technology Review: No. 25
Publish.: Noyes Data Corporation	Call No.: 667.9 Wi	
- place: Park Ridge, NJ	ISBN: 081550523X	
- date: ©1974	Shelf Adult Non-Fiction	Year: 1974
Subject: Fireproofing agents -- United States -- Patents		Price: \$25.00
Desc: x, 310 p., illus., 25 cm.		

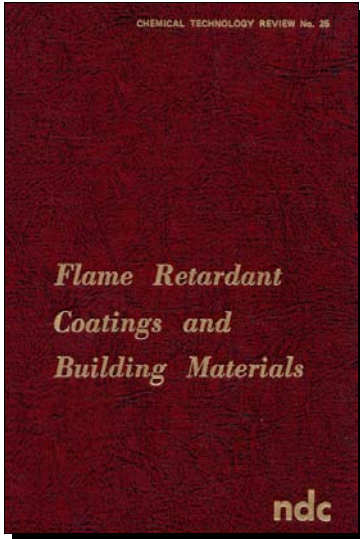


Table of Contents

INTRODUCTION

INTUMESCENT COATINGS

- Phosphorus-Nitrogen Compounds
- Melamine-Formaldehyde Phosphate Ether Polyol Resins
- Water-Resistant Carbonific Polyurethanes and Foaming Polyaminotriazine Phosphates
- Organophosphorus Amides
- Tris(Haloalkyl) Phosphate, Nitro-Containing Polyhydric Alkanol
- Ammonium Polyphosphate and Diatomaceous Earth
- Polyvinyl Acetate and Water-Insoluble Ammonium Polyphosphate
- Water-Insoluble Ammonium Polyphosphates
- Ammonium Derivatives of Glyoxylic Acid
- Acid Sulfates of Aromatic Nitroamino Compounds
- Halogen-Containing Formulations
- Hexachlorocyclopentadiene Condensation Products
- Inorganic Additives and Halogenated Binder
- Bis(Benzenesulfonamide) with Melamine Pyrophosphate and Dipentaerythritol
- Vinyl Chloride-Ethylene-Unsaturated Ester Terpolymers
- Phosphorus- and Halogen-Containing Derivatives of Diallyl Chloride
- Halogenated Phenoxy Ether and Reactive Phosphates
- Paint Resistant to Fuel Fires
- Other Formulations
- Nitrile Rubber
- Bis(Aromatic Sulfonamides)
- Benzoquinone Dioxime-Acid Reaction Products
- Microcrystalline Wax
- Use of Glass Fibers in Coatings
- Powdered Glass and Blowing Agent
- Polyesters Prepared from Conjugated Diacetylene Diols
- Water-Insoluble Solvent-Based Resin Overcoat
- Microspheres Containing Intumescent

GENERAL COATINGS FORMULATIONS

- Silicates
- Ceric Oxide and Alkyl Trialkoxy Silanes as Rehydration Suppressants
- Silicate Formulation in Aqueous Caustic Solution
- Silicone-Silicate Composition for Resistors
- Resistor Coating with Low Alkali Metal Content
- High Sheen Coating
- Water-Resistant Silicate Coating
- Lithium-Sodium Silicate Solution
- Borates and Other Inorganics
- Alkali Metal Glycol Monoborates
- Sprayable Gypsum Plaster
- Vermiculite Slurry
- Reflective Coatings Containing Fibrous Potassium Titanate
- Organic Coatings
- Epoxy Novolac-Polyhalogenated Phenol Reaction Products
- Bentonite Thickened Compositions
- Phosphorus Polyols and Brominated Compounds as Latex Additives
- Silicate Latex Additive

Subjects

514 .	Fireproofing agents -- United States -- Patents
515 .	Fire resistant materials -- United States -- Patents

Halogenated Carboxylic Latexes and Hydrated Alumina
Polyimide, Chlorinated Polyphenol and Antimony Trioxide
Polyurethane
Polyester Masonry Coating
Polyvinyl Chloride Formulation

WOOD IMPREGNATION AND TREATMENT

- Phosphorus Compounds
Phosphorus Trichloride
Heavy Metal Salts of Acid Phosphate Esters
Phosphoric Acid Esters
Tetrakis(Hydroxymethyl)Phosphonium Chloride
Water-Soluble Organic Phosphorus Esters and Polyesters
Linear Tertiary Phosphine Oxide Polymers
Tris(1-Aziridinyl)Phosphine Oxide and Thiourea
Tris Phosphate
Fluoroxyphosphoranes
In Situ Reaction of Ammonia and Phosphorus Esters
In Situ Polymerization of Urea, Phosphoric Acid and Cellulose
Phosphorus Oxychloride with Vinyl Chloride-Vinyl Acetate Binder
Halogenated Phosphonates and Heat Treatment
Roll Pressing or Calendering After Impregnation
- Metal Salts
Basic Zinc Salts
Acoustical Board Containing Barium Sulfate
- Borates
Ammonium Fluoroborates
Trimethyl Borate
Silicate-Borate Treatment Followed by Carbon Dioxide Reaction
Borate and Chlorinated Phenol Emulsions
Ammonium Borate
- Other Treatments
Two-Stage Bromination
Carboxycellulose-Alkali Metal Hydroxide Reaction Products

CEILING TILE, BUILDING PANELS AND FIBERBOARD

- Ceiling Tile
Mineral Fiber Tile
Fibrous Acoustical Ceiling Panels
Lightweight Tile
- Building Panels and Laminates
Silicate, Asbestos and Perlite Coating Compositions
Panel Containing Cavities Filled with Borax
Urea-Formaldehyde Powder and Wood Chips
Sandwich Building Panels
Veneer Panels
Acoustical and Thermal Insulating Siliceous Fiberboards
Composite Metal Sheets
Insulative Structure for Roof Deck Construction
Melamine-Formaldehyde Laminate with Decorative Coating
Polyurethane Impregnated with Phenol-Formaldehyde Resin
Laminated Sheeting
Phenolic Laminates for Wall Covering
- Fiberboard
Hydrated Borates
Disodium Octaborate
Magnesium Oxide and Aluminum Sulfate
Use of Urea as Decomposition Inhibitor with Ammonium Phosphates
Hydrophilic Colloids
Halogenation of Lignocellulosic Structures
Phosphorylation of Halogenated Lignocellulosics
- Plaster
Cementitious Plaster Composition
Use of Unexpanded Vermiculite to Prevent Spalling

INSULATION AND ELECTRICAL PRODUCTS

- Insulation — Inorganic Composites
Low Density Gypsum Wallboard
Plasticized Vinyl Chloride Facing Layer
Molded and Foamed Inorganic Structures
Boron Coated Inorganic Oxides
Fibrous Asbestos Board with Starch and Bentonite Binder
Perlite Board-Organic Foam Composite
Fire Brick
Magnesium Oxychloride Binder for Brick
- Electrical Laminates
Flexible Foil-Clad Laminates
Tetrabromobisphenol A and Trixylenyl Phosphate
Kraft Paper Barrier
Polyester Resins
- Electrical Insulation
Polyethylene and Aluminum Trihydrate
Polyamide Compositions
Polyimide Coated Conductors
Silicone Elastomer Containing Sodium Bicarbonate
Water-Based Coating for Cables

ASPHALTIC AND ADHESIVE PRODUCTS

- Asphaltic Roofing Materials
Bituminous Shingles Coated with Thermosetting Acrylic Resin
Hydrocarbon Dispersion Containing Borax and Diammonium Phosphate
Weathering Sheet Containing Glass Fibers
Intumescent Coated Roofing Granules
Intumescent Vermiculite Ore
Halogenated Cyclopentadiene-Based Additives
Low Penetration Asphalt and Polyhalogenated Polyphenyls
Phosphate Rock
Asbestos Vapor Barrier System
Mineral Wool, Trap Rock and Asbestos Covering
- Asphaltic Coatings
Aerogel Thickened Formulation
Perhalopentadienoic Acid and Derivatives
Resinous Hydrocarbon-Phosphorus Pentasulfide Reaction Products
Emulsion Formulations
- Adhesives
Phenolic Resole Resin and Halo Aryl Phosphates
Diammonium Phosphate
Ammonium Polyphosphate with Urea Resin
Neoprene Latex
Plastic Adhesive
Brominated Soybean Oil
Polyvinyl Acetate for Fire Barrier
Pressure-Sensitive Adhesive Tape
Fire-Retardant Tape

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents since the early 1960s relating to the composition and use of flame retardant coatings and building materials.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of modern flame retardant coatings and

building materials.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure."

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring our new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION

At last count, over thirty different government agencies or bureaus of the Federal government were concerned with fire-retardant chemicals, coatings and building products. This extensive commitment is resulting in increasingly stringent regulations for a wide range of consumer goods.

In the past three years, many serious, highly publicized fires have occurred in nursing homes, high rise office buildings, airport terminals and, of continual concern, in residential construction. Losses due to fire have been enormous: Loss of 12,000 human lives each year, and property damage in excess of \$2.5 billion annually. This clearly points to the need for a national policy for fire safety and building codes. A concerted effort in this field would in the long run be of great benefit to the public.

Intumescent paints, which produce a dense foam under intense heat in order to protect the substrate, have been available for some twenty years. With little incentive and a generally high raw material cost, these paints have captured less than 0.1% of the billion gallons per year paint market. However, this market is beginning to show some strength, with growth rates of some 30 to 35% per year predicted with sales approaching one million gallons this year. The city of St. Louis recently passed legislation requiring use of fire-retardant paints on all schools and public buildings. Other cities will undoubtedly follow the lead, providing a sales boost to this type of specialty coatings.

Intumescent paints generally contain a material such as pentaerythritol and melamine formaldehyde which in the presence of an ammonium phosphate catalyst provides foam-like char when subject to intense heat. A large number of flame-retardant coating formulations containing various phosphorus- and nitrogen-containing compounds, along with binder resins, particularly the halogenated vehicles, have been developed in recent years.

The impregnation of wood with inorganic salts such as borates and mono- or diammonium phosphates continues to be the subject of considerable research effort and commercial development. Fiberboard, thermal and electrical insulation and many asphalt based products which are commonly used in the construction industry are increasingly being fabricated with built-in flame-resistance.

This report summarizes the patent literature through 1973 as it relates to the research effort over the past nine years in the development of flame-resistant coatings, adhesives and building products.

Title	Location	Edition / Series / Misc.
<p>942 Free Radical Radiation Curing</p> <p><i>Author:</i> Koleske, Joseph V. <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1997 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 29 p., illus., 28 cm.</p>	<p><i>Dynix:</i> 55947-30 <i>Call No.:</i> 667.9 Fe <i>ISBN:</i> 0934010226 <i>Shelf:</i> Reference</p>	<p><i>Edition:</i> Revised edition <i>Series:</i> Federation Series on Coatings Technology: No. FS2R97 <i>Year:</i> 1997 <i>Price:</i> \$50.00</p>

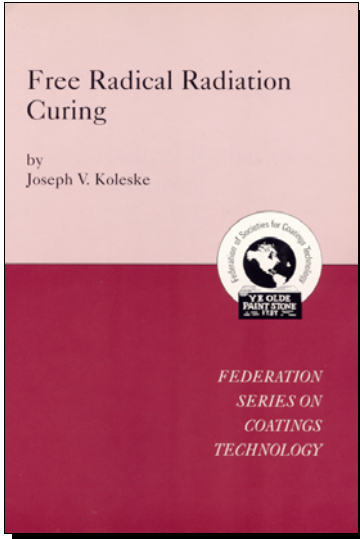


Table of Contents

- I. Introduction
- II. Curing Sources and Processes .
 - A. Electron Beams
 - B. Ultraviolet Light
 - C. Xenon Pulsed Systems
 - D. Visible Light
- III. Mechanism
 - A. Unsaturated Polyesters
 - B. Polyene/Thiol Systems
 - C. Acrylates
- IV. Acrylates Used in Radiation Curing.
 - A. Monomeric Acrylates
 - B. Acrylated Epoxides
 - C. Urethane Acrylates
- V. Vinyl Ethers
- VI. Photoinitiators
 - A. Hydrogen Abstraction
 - B. Homolytic Fragmentation
 - C. Sensitizers
 - D. Oxygen Inhibition
- VII. Formulation
 - A. General Coating System
 - B. Specific Coating Systems
 - C. Adhesives
 - D. Release Coatings
 - E. Powder Coatings
- VIII. Storage Stability
- IX. Analysis
- X. End Uses
- XI. Safe Use
- XII. Bibliography
- XIII. References

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Imagine a liquid coating composed of monomers and oligomers, easily pourable, and, in general, easy to handle. Apply it to a substrate and place it under an energy source. Then, in a length of time it takes to snap your fingers, the liquid is transformed into a solid that adheres well and forms a barrier against hostile environments. Seems fantastic and out of touch with reality, doesn't it? Yet, this is radiation curing!

Radiation curing is the essentially "instantaneous" conversion of a usually liquid, low-viscosity combination of reactive ingredients that is polymerized—a process often termed "cure"—by exposure to a radiation energy source, into a crosslinked, polymerized mass with functional and/or decorative properties. The radiation source is usually an ultraviolet light lamp or an electron beam though both laser and visible light sources are used. Radiation cured systems have wide and strongly growing acceptance in the coating, ink, adhesive, and sealant areas because of high performance characteristics, desirable environmental considerations, and low energy requirements.

While it is readily appreciated that radiation curing eliminates or markedly decreases the need for volatile solvents, there are a number of other attributes associated with radiation curing that are not apparent at first glance. The areas in which these attributes apply as well as a description of the consequences of the attribute are given in Table 1.

Initiation of polymerization in radiation-cure systems is accomplished principally by one of two mechanisms or a combination of the two mechanisms. These are:

- Free-radical initiation
- Cationic initiation.

This publication will be concerned mainly with free-radical initiation and polymerization and therefore with acrylate or other ethylenically-unsaturated technology. Cationic initiation and the chemistry of onium-salt photoinitiators, cycloaliphatic epoxides, vinyl ethers, polyols, and other ingredients involved in it are treated in another Federation publication in this series as well as elsewhere. A "Bibliography of General References, A through K" is provided just before the "References" section. This bibliography provides a series of books and papers that will well serve those who have an interest in radiation-curing technology. Cationic cure will not be discussed in detail herein, but rather will only be used in logical comparisons between the technologies. Free-radical cure of acrylates, maleates, and polyene/thiols has been commercialized for a relatively long time. Even though cationic cure is commercially established, it is a relatively new technology and one that is rapidly gaining in importance.

As will become apparent, the lines that can be drawn between these two technologies is often blurred and there is overlap. Free radicals are generated when cationic photoinitiators are used and therefore unsaturated compounds such as acrylates can be combined in the cycloaliphatic epoxide-based systems. Vinyl ethers are usually thought of as compounds that cure by a cationic mechanism, but they can be and are being used in free radically cured systems.

Table 1 — Attributes of Radiation Curing

Capital Investment — Equipment for photocuring (UV) technology requires low capital investment. If electron beam technology is used, investment is high, but these systems are usually used for large volume production coupled with very high line speeds or for specialty applications.

Energy Costs — Radiation-cure systems have low power requirements and little heating of the substrate takes place. These factors result in decreased energy costs. It also improves the working environment for employees by making ambient temperatures easier to control.

High Solids — Radiation-cure systems are either 100% solids or very high solids in nature. *voca is nil*, since all or essentially all of the formulation reacts.

Multi-Operations Possible — More than one operation can be accomplished in a single pass through the finishing line. That is, a substrate can be printed in one or more colors, overcoated with a clear finish, turned over, and coated on the reverse side. Each formulation applied may have a different composition.

Plastics and Other Heat Sensitive Substrates — Heat sensitive substrates such as plastics, printed circuit assemblies, and the like, can be coated and cured because little heat is built up in the substrate. This can be of particular utility in the electronics industry.

Rapid Cure — Improved economics and efficiency result from the "instantaneous" cure characteristics. Rapid curing allows increased line speeds and therefore increased production.

Space Requirements Low — Space requirements for coating and curing line as well as for liquid coating storage are relatively small. Space requirements are often only 25 to 50% of that needed for a solvent- or water-borne system with no need for a large thermal oven.

Use of Existing Equipment — Often only minor costs are involved in adapting an existing solvent-based coating line into a photocuring line.

CURING SOURCES AND PROCESSES:

A variety of radiation sources and processes exist including electron beam, ultraviolet light, lasers, gamma-rays, visible

light, sunlight and sun lamps. Sun lamps, which are inexpensive and readily available, are often used by those just starting in the radiation curing area. They emit ultraviolet, visible, and infrared radiation and provide a quick way to ascertain feasibility and a simple understanding of the radiation curing process. However, only electron beam and ultraviolet light sources and processes, which represent the main commercial ways to cure coatings and related products, will be mainly discussed.

Selection of electron beam or ultraviolet light curing equipment is a balance between the versatility of the energy generated, the particular curing chemistry to be used (free radical or cationic), and equipment complexity or cost. In a general, theoretical sense, electron beam curing can be used in a wider range of applications than ultraviolet light curing due to inherent limitations in the latter—particularly the difficulty to cure thick, opaque, or translucent films. However, even with this limitation, ultraviolet light curing is far more widely used than electron beam curing. This is mainly due to cost or equipment complexity. If desired, ultraviolet light lamps can be easily installed at low cost to the end of an existing coating or printing production line to cure a coating and eliminate a costly, large-size, energy-consuming oven. A comparison of certain process features involved in these technologies is given in Table 2 and elsewhere.

A. Electron Beams

Electron beams are a form of atomic radiation and are composed of high-energy electrons. Electrons are high-energy, negatively-charged atomic particles that are absorbed by almost all substances and that have the ability to penetrate into and through both liquids and solids such as:

- coatings, adhesives, inks, sealants
- substrates
- pigment particles.

Thus formulations that are used as clear or colored coatings to protect and/or decorate substrates, that function as inks to carry a message or to otherwise decorate substrates, that are used to adhere opaque substrates, or that act as thick sealants of various types, can be used when electron beam technology is employed.

Electron beams are generated by heating a cathodic element that is exposed to a high voltage field in an evacuated acceleration chamber. As electrons are stripped from the cathode, they are aligned and directed through a metal foil window located near the system to be cured. As these electrons pass through the system, they have an opportunity to collide with electrons that belong to molecules of uncured coating formulation. These collisions can remove electrons from molecules, and in the process of so doing, they generate free radicals. In the presence of ethylenic unsaturation such as that found in acrylates, the free radicals will readily initiate polymerization. Surrounding the free radicals are unsaturated molecules that are capable of polymerizing and that will propagate to form long molecular chains that are usually crosslinked in nature. Finally, the free radicals will terminate by a process that will be discussed later. Because free radicals are generated in the electron exchange process, a photoinitiator is not needed in formulations cured with electron beams.

Electron beam systems are principally used for curing large volume items, pigmented or otherwise opacified inks and coatings, and adhesives wherein deep penetration of the electrons is required to reach the curable adhesive that is overlaid with a substrate or sandwiched between substrate layers. The depth to which electron-beam radiation can penetrate into a material is dependent on the electron density of the material being irradiated and the energy of the electron beam. By proper selection of these parameters, radiation energy usage can be optimized and any damage to the substrate by the radiation can be minimized. Smaller, compact electron beam units that cure relatively small objects are available and there are electron-beam developments for the expanding markets that exist for this well established technology.

There are two generic types of electron beam systems— scanned beam and curtain processors. Both types typically use 440-volt, three-phase electrical power as the energy source for operation. In the scanned beam-type processor, a relatively narrow beam of electrons is generated and accelerated in a vacuum through a high voltage section. An electric or magnetic field is then used to move or scan the beam of electrons back and forth over a foil window. The beam of electrons passes through the window into the process area where it contacts the liquid coating and induces polymerization. The second type of electron beam processor generates a broad band or curtain of electrons without back and forth movement. The curtain of electrons is sent to the process area where polymerization takes place at an extremely rapid rate.

Title	Location	Edition / Series / Misc.
54 Fundamental Principles of Polymeric Materials Author: Rosen, Stephen L., 1937- Publish.: John Wiley & Sons - place: New York, NY - date: ©1982 Subject: Polymers Desc: xvi, 346 p., illus., 24 cm.	Dynix: 13052 Call No.: 668.9 Ro ISBN: 0471087041 Shelf Adult Non-Fiction	Edition: Series: SPE (Society of Plastics Engineers) Monographs Year: 1982 Price: \$25.00

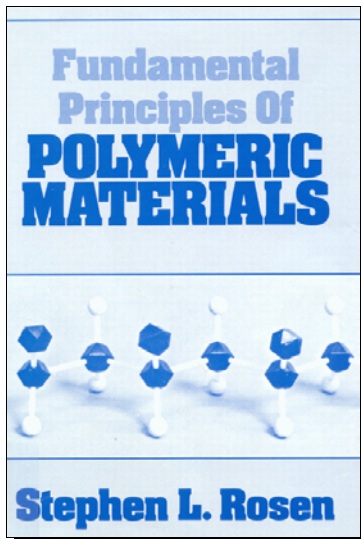


Table of Contents

- 1 Introduction
- PART 1: POLYMER FUNDAMENTALS
- 2 Types of Polymers
 - 2.1 Reaction to Temperature
 - 2.2 Chemistry of Synthesis
 - 2.3 Structure
- 3 Bonding in Polymers
 - 3.1 Types of Bonds
 - 3.2 Bond Distances and Strengths
 - 3.3 Bonding and Response to Temperature
 - 3.4 Action of Solvents
- 4 Stereoisomerism
 - 4.1 Introduction
 - 4.2 Stereoisom in Vinyl Polymers
 - 4.3 Stereoisomerism in Diene Polymers
- 5 Crystallinity
 - 5.1 Requirements for Crystallinity
 - 5.2 The Fringed-Micelle Model
 - 5.3 Folded-Chain Crystallites
 - 5.4 Extended-Chain Crystals
 - 5.5 Spherulites
 - 5.6 The Effects of Crystallinity on Polymer Properties
- 6 Characterization of Molecular Weight
 - 6.1 Introduction
 - 6.2 Average Molecular Weights
 - 6.3 Determination of Average Molecular Weights
 - 6.4 Molecular-Weight Distributions
 - 6.5 Gel-Permeation Chromatography (GPC)
- 7 Polymer Solubility and Solutions
 - 7.1 Introduction
 - 7.2 General Rules for Polymer Solubility
 - 7.3 The Thermodynamic Basis of Polymer Solubility
 - 7.4 The Solubility Parameter
 - 7.5 Hansen's Three-Dimensional Solubility Parameter
 - 7.6 Properties of Dilute Solutions
 - 7.7 Polymer—Polymer Common Solvent Systems
 - 7.8 Concentrated Solutions — Plasticizers
- 8 Transitions in Polymers
 - 8.1 The Glass Transition
 - 8.2 Molecular Motions in an Amorphous Polymer
 - 8.3 Determination of Tg
 - 8.4 Factors Tg
 - 8.5 Tg's of Copolymers
 - 8.6 The Thermodynamics of Melting

Subjects

313 . Polymers

- 8.7 The Influence of Copolymerization on Properties
- 8.8 General Observations about Tg and Tm
- 8.9 Effects of Crosslinking
- 8.10 Other Transitions

PART 2: POLYMER SYNTHESIS

9 Polycondensation Reactions

- 9.1 Introduction
- 9.2 Statistics of Polycondensation
- 9.3 Number-Average Chain Lengths
- 9.4 Chain Lengths on a Weight Basis
- 9.5 Gel Formation
- 9.6 Kinetics of Polycondensation

10 Free-radical Addition Polymerization

- 10.1 Introduction
- 10.2 Mechanism of Polymerization
- 10.3 Kinetics of Homogeneous Polymerization
- 10.4 Instantaneous Average Chain Lengths
- 10.5 Temperature Dependence of Rate and Chain Length
- 10.6 Chain Transfer
- 10.7 Instantaneous Distributions in Free-radical Addition Polymerization
- 10.8 Instantaneous Quantities
- 10.9 Cumulative Quantities
- 10.10 Relations between Instantaneous and Cumulative Average Chain Lengths
- 10.11 Emulsion Polymerization
- 10.12 Kinetics of Emulsion Polymerization in Stage II, Case 2

11 Non-radical Addition Polymerization

- 11.1 Cationic Polymerization
- 11.2 Anionic Polymerization
- 11.3 Anionic Kinetics
- 11.4 Heterogeneous Stereospecific Polymerization

12 Copolymerization

- 12.1 Mechanism
- 12.2 Significance of Reactivity Ratios
- 12.3 Variation of Composition with Conversion
- 12.4 Copolymerization Kinetics
- 12.5 Penultimate Effects and Charge-Transfer Complexes

13 Polymerization Practice

- 13.1 Bulk Polymerization
- 13.2 Solution Polymerization
- 13.3 Interfacial Polycondensation
- 13.4 Suspension, Bead, or Pearl Polymerization
- 13.5 Emulsion Polymerization

PART 3: POLYMER PROPERTIES

14 Rubber Elasticity

- 14.1 Introduction
- 14.2 Thermodynamics of Elasticity
- 14.3 Statistics of Ideal Rubber Elasticity

15 Purely Viscous Flow

- 15.1 Introduction
- 15.2 Basic Definitions
- 15.3 Relations between π and γ — Flow Curves
- 15.4 Time-Dependent Behavior
- 15.5 Polymer Melts and Solutions
- 15.6 Quantitative Representation of Flow Behavior
- 15.7 Temperature Dependence of Flow Properties
- 15.8 Influence of Molecular Weight on Flow Properties
- 15.9 The Effects of Pressure on Viscosity

16 Viscometry and Tube Flow
16.1 Introduction
16.2 Viscous Energy Dissipation
16.3 Poiseuille Flow
16.4 Determination of Flow Curves
16.5 Entrance Corrections
16.6 The Couette Viscometer
16.7 Cone-and-Plate Viscometer
16.8 Disk—Plate Viscometer
16.9 Turbulent Flow
16.10 Drag Reduction

17 Introduction to Continuum Mechanics
17.1 Three-Dimensional Stress and Strain
17.2 General Constitutive Relations
17.3 Viscometric Flows
17.4 Interpretation of the Normal Stresses

18 Linear Viscoelasticity
18.1 Introduction
18.2 Mechanical Models for Linear Viscoelastic Response
18.3 The Four-Parameter Model and Molecular Response
18.4 Viscous or Elastic Response? The Deborah Number
18.5 Quantitative Approaches
18.6 The Boltzmann Superposition Principle
18.7 Dynamic Mechanical Testing
18.8 Time—Temperature Superposition

PART 4: POLYMER TECHNOLOGY

19 Processing
19.1 Introduction
19.2 Molding
19.3 Extrusion
19.4 Blow Molding
19.5 Rotational, Fluidized-Bed, and Slush Molding
19.6 Calendering
19.7 Sheet Forming
19.8 Stamping
19.9 Solution Casting
19.10 Casting
19.11 Reinforced Thermoset Molding
19.12 Fiber Spinning
19.13 Compounding

20 Plastics
20.1 Introduction
20.2 Mechanical Properties of Plastics
20.3 Contents of Plastic Compounds
20.4 Sheet Molding Compound

21 Rubbers
21.1 Introduction
21.2 Thermoplastic Elastomers
21.3 Contents of Rubber Compounds
21.4 Rubber Compounding

22 Synthetic Fibers
22.1 Introduction
22.2 Fiber Processing
22.3 Dyeing
22.4 Effects of Heat and Moisture

23 Surface Finishes

23.1 Introduction
23.2 Traditional Types of Surface Finishes
23.3 Solventless Coatings
23.4 Electrodeposition

24 Adhesives

Selected Readings
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Emphasizing immediate practical application, here is a comprehensive introduction to the fundamental aspects of polymer science. This completely up-to-date edition features an abundance of worked-out examples, drawn primarily from real-world situations.

Organized for easy self-study and review, *Fundamental Principles of Polymeric Materials* is a practical working reference for chemists, engineers, and materials scientists in industry and research. It also serves advanced students as a fundamental development of polymer properties from first principles. It offers in-depth discussions of:

- **Polymer Fundamentals**—the basic materials science of polymers: molecular structure and how it determines polymeric properties.
- **Polymer Synthesis**—illustrating the kinetics and mechanisms of the various commercially important polymerization reactions, and describing how the polymerization reaction and conditions determine the molecular structure of the polymer formed.
- **Mechanical Properties**—dealing quantitatively with the interesting and unusual mechanical properties of polymers—and illustrating how these properties arise from polymeric structure.
- **Polymer Technology**—discussing current technologies based on application of the fundamentals treated in previous sections.

Discussions begin with qualitative explanations before attempting quantitative treatments. References and selected readings are included for readers who wish to pursue topics in greater depth.

PREFACE:

This book was written to provide an appreciation of those fundamental principles of polymer science and engineering that are currently of practical relevance. I hope that the reader will obtain both a broad, unified introduction to the subject matter that will be of immediate practical value and a foundation for more advanced study.

The first edition of the book was intended primarily as a self-study guide for practicing engineers and scientists. Despite the fact that it was a well-kept secret, it also achieved modest success as an academic text. In this edition I have included additional material which I hope will make it more suitable as a text. By so doing I sincerely hope that I have not made it any less useful to the original audience. To this end, all the problems are still presented as worked-out examples. I have tried to emphasize a qualitative understanding of the underlying principles before tackling the mathematical details, so that the former may be appreciated independently of the latter (I don't recommend trying it the other way around, however), and I have included practical illustrations of the material whenever possible.

The treatments of gel permeation chromatography, linear viscoelasticity, and what has been termed "polymer reaction engineering" have been expanded considerably. New material has been included on gel formation, the three-dimensional solubility parameter and molecular weight distributions. There has been a general updating of the material, particularly in the section on technology, although this is like shooting at a rapidly moving target.

Obviously, the choice of material to be covered involves subjective judgment on the part of the author. This, together with space limitations and the rapid expansion of knowledge in the field, has resulted in omission or shallow treatment of many interesting subjects. The references and selected readings have been specifically chosen to aid the reader who wishes to pursue a subject in greater detail.

A word to the student: To derive maximum benefit from the worked-out examples, make an honest effort to answer them before looking at the solutions. If you can't do one, you've missed some important points in the preceding material, and you ought to go back over it.

INTRODUCTION:

Since World War II, polymeric materials have been the fastest growing segment of the United States chemical industry. It has been estimated that more than 25% of the chemical research dollar is spent on polymers, with a correspondingly large proportion of technical personnel working in the area.

A modern automobile contains over 200 lbs (100kg) of plastics, and this does not include paints, the rubber in tires, or the fibers in tires and upholstery. With the increasing need to save fuel and therefore weight, polymers will continue to replace traditional materials in the automotive industry. Similarly, the applications of polymers in the building construction industry (piping, resilient flooring, siding, thermal and electrical insulation, paints, decorative laminates, etc., etc.) are already impressive and will become even more so in the future. A trip through a supermarket will quickly convince anyone of the importance of polymers in the packaging industry (bottles, films, trays, etc.). Many other examples could be cited, but, to make a long story short, the use of polymers now outstrips that of metals on a volume basis.

Since nearly all modern polymers have their origins in petroleum, it has been argued that this increased reliance on polymers constitutes an unnecessary drain on energy resources. However, the raw materials for polymers account for less than 2% of total petroleum consumption; so while the petroleum shortage will continue to drive the price of polymers up (along with everything else), even the total elimination of synthetic polymers would not contribute significantly to the conservation of hydrocarbon resources. Furthermore, when total energy costs (raw materials plus energy to manufacture) are compared, the polymeric item often comes out well ahead of its traditional counterpart, for example, glass versus plastic beverage bottles.

There are five major areas of application for polymers: (1) plastics, (2) rubbers or elastomers, (3) fibers, (4) surface finishes and protective coatings, and (5) adhesives. Despite the fact that the five applications are all based on polymers, and in many cases the same polymer is used in two or more, the industries grew up pretty much separately. It was only after Dr. Herman Staudinger proposed the "macromolecular hypothesis" in the 1920s explaining the common molecular makeup of these materials (for which he won the 1953 Nobel Prize in chemistry in belated recognition of the importance of his work) that polymer science began to evolve from the independent technologies. Thus a sound fundamental basis was established for continued technological advances.

Economic considerations alone would be sufficient to justify the impressive scientific and technological efforts expended on polymers in the past several decades. In addition, however, this class of materials possesses many interesting and useful properties that are completely different from those of the more traditional engineering materials and that cannot be explained or handled in design situations by the traditional approaches. A description of three simple experiments should make this obvious.

"Silly putty," a silicone polymer, bounces like rubber when rolled into a ball and dropped. On the other hand, if the ball is placed on a table, it will gradually spread to a puddle. The material behaves like an elastic solid under certain conditions and like a very viscous liquid under others.

If a weight is suspended from a rubber band and the band is then heated (taking care not to burn it), the rubber band will contract appreciably. All materials other than polymers will undergo the expected thermal expansion upon heating (assuming no phase transformation has occurred over the temperature range).

When a rotating rod is immersed in a molten polymer or a fairly concentrated polymer solution, the liquid will actually climb up the rod. This phenomenon, the Weissenberg effect, is contrary to what is observed with nonpolymer liquids, which develop a parabolic surface profile with the lowest point at the rod as the material is flung outward by centrifugal force.

Although such behavior is unusual in terms of the more familiar materials, it is a perfectly logical consequence of the molecular structure of polymers. This molecular structure is "the key to an understanding of the science and technology of polymers, and underlies the chapters to follow.

The word polymer comes from the Greek "many-membered." Strictly speaking, it could be applied to any large molecule that is formed from a relatively large number of smaller units or "mers," a sodium chloride crystal, for example, but it is most commonly (and exclusively, here) restricted to materials in which the "mers" are held together by covalent bonding, that is, shared electrons. It is always a good idea to "count the bonds" in any written structure. A brief, concise review of organic chemistry from the polymer standpoint is available.

The most important constituents of living organisms, cellulose and proteins, are naturally occurring polymers, but we confine our attention largely to synthetic polymers or to important modifications of natural polymers.

Title	Location	Edition / Series / Misc.
55 Fundamentals of Aerosol Science Author: Shaw, David T. (editor) Publish.: John Wiley & Sons - place: New York, NY - date: ©1978 Subject: Aerosols Desc: ix, 372 p., illus., 24 cm.	Dynix: 00014 Call No.: 541.345 Fu ISBN: 0471029491 Shelf Adult Non-Fiction	Edition: Series: Year: 1978 Price: \$25.00



Table of Contents

1. Aerosol Impactors (A Review) [N. A. FUCHS]
2. Brownian Coagulation: Experimental Methods and Results [T. T. MERCER]
3. Evaporation of Airborne Droplets [C. N. DAVIES]
4. The Theory of Aerosol Filtration with Fibrous Filters [A. A. KIRSCH and I. B. STECHKINA]
5. Sampling and Analysis of Fibrous Aerosol Particles [K. R. SPURNY, J. W. GENTRY, and W. STOBBER]
6. Theory of Electrostatic Mechanism of Aerosol Filtration [J. PICH]

Index

Reviews - Synopsis - Dust Jacket

PREFACE

This monograph contains six invited papers presented at the Symposium on Aerosol Science and Technology held in Atlantic City, New Jersey, August 30-September 1, 1976. In addition, there are still another thirteen invited papers which will be published in a separate volume entitled Recent Developments in Aerosol Technology. Early in 1976, when I was asked to organize an aerosol conference, it seemed a good idea to assemble a small group of research workers who could authoritatively discuss various aspects of aerosol science and to provide a state-of-art review in the area of fundamental and applied aerosol science. The people I approached responded enthusiastically, and we agreed to put together after the conference all invited papers in two monographs, which should be a valuable source of information and reference for students and researchers in this rapidly growing field of aerosol science and technology.

Subjects

220 . Aerosols

The opening chapter by Fuchs provides a thorough review on the subject of aerosol impactors. The chapter starts with detailed descriptions of the principle of operation, the criterion of impactor efficiency, and the method of calibration. A very important and difficult task in the operation of impactors is the efficiency of particle collisions with the impactor plate. The methods of improving this collision efficiency are discussed. Then, the use of impactors under reduced pressure for the collection of atmospheric and bacterial particles is examined. Finally, the principal error sources in commercially available cascading impactors and the methods of processing the experimental data obtained by such impactors are evaluated. The chapter ends with an extensive bibliography.

Considerable confusion exists on the values of the coagulation constant in a wide range of the Knudsen number. Measured values derived from closed-chamber experiments usually exceed those predicted on experimental grounds. More recently, experimental values in closer agreement with theory have been obtained by measurement of concentration changes in flowing aerosols. In Chapter 2, the experiments and their results are reviewed by Mercer, with special emphasis on sources of experimental error or of deviations from theoretical results.

The subject of the evaporation of airborne droplets falls into three distinct regions: (1) control of rate of diffusion of vapor through the surrounding gas, (2) control at the surface of the liquid, and (3) very small droplets for which the Kelvin increment of vapor pressure and the Knudsen number of the droplet are decisive factors in determining the rate of evaporation. With this classification, Davies describes in Chapter 3 the evaporation theories, with experimental verification, and criteria are given for choosing the correct method of calculation according to the conditions.

A number of models have been developed for fibrous filters. These are reviewed by Kirsch and Steckina in Chapter 4, with special attention to the fan model, which can be used to describe satisfactorily the properties of real filters. An experimentally verified method for the prediction of filter efficiency due to diffusion and interception is discussed, allowing for gas slip, fiber polydispersity, and inhomogeneity of the filter structure.

Asbestos fibers have been found to be globally disseminated in the atmosphere, and the consumption of asbestos,

glass, and other man-made fibers is increasing each year. Therefore, the need for more knowledge of the aerosol mechanics of fibrous particles, methods for sampling, methods for measurement, and identification of these aerosols is evident. In Chapter 5 Spumy, Gentry and Stober review and discuss the theories of fiber aerodynamic diameter, fiber sedimentation and diffusion, the problem of fiber filtration, and the optical, electrical and thermophoretal behavior of fibrous particles.

The last chapter of this book is an academic study of the theory of electrostatic mechanisms of aerosol filters by Pich. The problem is discussed in three parts: (1) deposition of charged particles on charged filters, (2) deposition of charged particles on neutral filters, and (3) deposition of neutral particles on charged filters. Approximate analytical theories are developed for all three cases, and the results are of considerable practical use in aerosol science.

Title	Location	Edition / Series / Misc.
56 Fundamentals of Paint, Varnish and Lacquer Technology		Edition:
Author: Singer, Elias	Dynix: 34098	Series:
Publish.: American Paint Journal Company	Call No.: 667.6 Si	
- place: St. Louis, MO	ISBN:	
- date: [©1957]	Shelf Adult Non-Fiction	Year: 1957
Subject: Paint		Price: \$25.00
Desc: 330 p., 21 cm.		

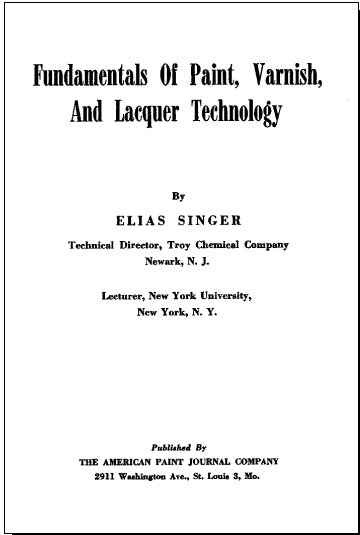


Table of Contents

- Chapter I — The Surface Coating
- Chapter II — The Oils—Linseed Oil
- Chapter III — Other Drying Oils
- Chapter IV — The Resins
- Chapter V — Driers
- Chapter VI — The Volatile Vehicle
- Chapter VII — Pigments
- Chapter VIII — Oils
- Chapter IX — Formulation
- Chapter X — The Clear Oleoresinous Finish
- Chapter XI — Interior Architectural Finishes
- Chapter XII — Exterior Finishes For Houses and Buildings
- Chapter XIII — Other Exterior Finishes
- Chapter XIV — Industrial and Special Maintenance Finishes—Air Dry
- Chapter XV — Industrial Finishes—Baking
- Chapter XVI — Emulsion and Water Thinnable Paints,
- Chapter XVII — Water Thinnable Paints—Latex Type.
- Chapter XVIII — Lacquers and Solvent Type Finishes—Raw Materials
- Chapter XIX — Lacquers and Solvent Finishes— Formulation
- Chapter XX — Specialty Finishes; Special Purpose Finishes
- Chapter XXI — Paint Troubles and How To Cure Them
- Subject Index
- Formula Index

Subjects

276 .	Paint
423 .	Varnish and varnishing
441 .	Lacquer and lacquering

Reviews - Synopsis - Dust Jacket

FORWARD

Whenever someone decides to write a series of Technical articles, he should ask himself two questions. First, is there a need for such a series, and secondly, has a similar series already been written. The answer to the first of these questions must be "yes", and the answer to the second one must be "no" before such a project should be attempted.

Until about fifteen years ago, as a matter of fact, there was practically no book of any kind available which would open the windows of knowledge and let the light of day shine on and reveal some of the so-called secrets of the coating industry.

Several books have therefore been published during the past few years that have done a magnificent job in lifting this veil of secrecy. They have imparted much valuable information and thus rectified a condition which was almost beyond understanding in an industry as old and respected as ours.

In the main, however, these books have consisted of a series of chapters, each one written by an expert in his field, on the topic of his specialty. Little or no attempt was made to logically correlate this work. Even more important, little or no attempt was made to write what might be considered a text book—a book which started from the simple and went to the complex.

If we would go back to our school days and remember what sort of books were used in learning a subject, even if it was an advanced one, we will recall that most of these books had one thing in common. They started with the known and went to the unknown—from the elementary principles to the more advanced. As the unknown became known, there would be still further progression.

This is basically what we are attempting in these articles. We are assuming that the reader has little more than a fundamental knowledge of chemistry. Even this is not absolutely necessary, though it is definitely helpful. From this, we will attempt to give him a basic and fairly advanced knowledge of the coatings industry.

Each chapter will be organized and will logically follow the previous chapter. It will be a step by step progression.

This series should be able to be used to advantage by both the Inexperienced and experienced. The raw material salesman who wants to know something about what he is selling, or the laboratory assistant who wants to learn the basic facts of the profession he is entering, the advanced chemist who wants to know some of the tricks in formulating, even the applier and the storekeeper who want to know some thing about the items they are handling— all should find something to their advantage In reading or studying these articles.

This series of articles will be divided basically into two sections. In the first part, we take up the different basic raw materials that are used in the coatings Industry. We go into a study of their makeup, their properties that are of Importance In the coatings they will be used in, and into an examination of what types of coatings the properties peculiar to that raw material should play an important part.

In the second section we combine these raw materials to make the finished coating. We show how, using the properties of the raw materials and combining them in the proper proportions, we can obtain a finished coating that has all the necessary characteristics. We go into a detailed study of different types of formulations, explaining the whys and wherefores of the ingredients used, the proportions they are used in, etc. In this section we also included a chapter on what o do if our coating requires some improvement In one or more respects, and another on manufacturing problems.

Title	Location	Edition / Series / Misc.
918 Getting Permission: How to License and Clear Copyrighted Materials Online and Off		<i>Edition:</i> 1st edition
<i>Author:</i> Stim, Richard	<i>Dynix:</i> 105689	<i>Series:</i>
<i>Publish.:</i> Nolo Press	<i>Call No.:</i> 346.730 St	
<i>- place:</i> Berkeley, CA	<i>ISBN:</i> 087337536X	
<i>- date:</i> ©2001	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2001
<i>Subject:</i> Copyright -- Computer programs -- United States		<i>Price:</i> \$25.00
<i>Desc:</i> [various pagings], illus., forms, 28 cm., + 1 computer laser optical disc (4¾")		

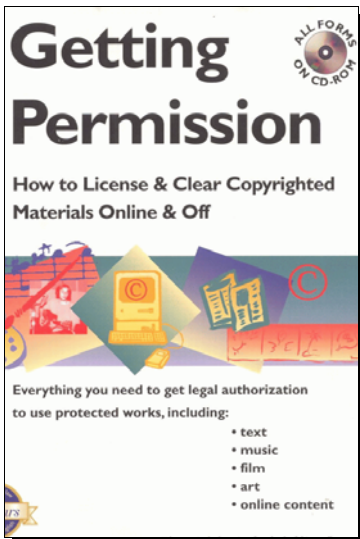


Table of Contents

- 1 Introduction to the Permissions Process
 - A. Permission: What Is It and Why Do I Need It?
 - B. The Basics of Getting Permission
 - C. Overview of Intellectual Property Laws
 - D. Permission Tools: Licenses and Releases
 - E. How to Use This Book
- 2 Getting Permission to Use Text
 - A. Who Owns the Text?
 - B. Start With Online Permissions Services
 - C. Locate the Publisher
 - D. Contacting the Author
 - E. Special Situations: Ann Landers and Beyond
 - F. When You Can't Find the Rights Holder
 - G. Paraphrasing, Omissions and Facts
 - H. Negotiating Text Permission and Fees
- 3 Getting Permission to Use Photographs
 - A. The World of Stock Photos
 - B. Obtaining Rights to a Photo You've Found
 - C. Celebrity Photos and Movie Stills
 - D. Using Photo Researchers
 - E. Photo Fees
 - F. Photo Permission Agreements
 - G. When the Photograph Includes Art, Trademarks or People
 - H. Stock Photo Resources
- 4 Getting Permission to Use Artwork
 - A. Acquiring Rights to Artwork
 - B. Fine Art: Paintings, Sculptures and Limited Editions
 - C. Graphic Art
 - D. Comics and Cartoons
 - E. Royalty-Free and Public Domain Clip Art
 - F. Researching Art
 - G. Artwork Fees and Agreements
 - H. Artwork Resources0
- 5 Getting Permission to Use Music
 - A. Acquiring Rights to Music
 - B. Song and Sound Recording Copyrights
 - C. Reprinting Music or Lyrics
 - D. Playing Music at a Business or Event
 - E. Releasing Music for Sale
 - F. Using Music in a Commercial, Radio Show or Background Music Services
 - G. Using Music With a Film, Television Show or Video
 - H. Using Music in Software, Videogames or Multimedia Programs
 - I. Using Music at a Website
 - J. Using Music Samples
 - K. Finding Music Publishers
 - L. Finding Record Companies
 - M. Music Clearance Companies

Subjects

550 .	Copyright -- Computer programs -- United States
551 .	Copyright licenses -- United States
552 .	Online information services -- Law and legislation -- United States

N. Music Resources

6 Website Permissions

- A. Websites: Five Ways to Stay Out of Trouble
- B. Transferring Information to and From a Website
- C. Connecting to Other Websites

7 Academic and Educational Permissions

- A. Academic Coursepacks
- B. Educational Uses of Non-Coursepack Materials
- C. Proposed Educational Guidelines on Fair Use
- D. Library Photocopying
- E. Academic Permission Resources

8 The Public Domain

- A. Welcome to the Public Domain
- B. Public Domain Trouble Spots

9 Fair Use

- A. What Is Fair Use?
- B. Measuring Fair Use: The Four Factors
- C. Summaries of Fair Use Cases
- D. Disagreements Over Fair Use: When Are You Likely to Get Sued?

10 Getting Permission to Use Trademarks

- A. Trademark Basics
- B. When You Need Permission to Use a Trademark
- C. Locating a Trademark Owner
- D. Trademark Licensing

11 Art & Merchandise Licenses

- A. Merchandise Licensing Overview
- B. Merchandise License Agreement
- C. Explanation for Merchandise License Agreement
- D. Merchandise License Worksheet
- E. Short-Form Merchandise License Agreement

12 Releases

- A. The Legal Risks If You Don't Obtain a Release
- B. When to Use a Release
- C. Personal Release Agreement
- D. Interview and Property Releases

13 Copyright Research

- A. Copyright Ownership and Transfers FAQ
- B. Starting Your Copyright Research
- C. Searching the Copyright Office and Library of Congress Records

14 After Permission Is Granted

- A. The Permission Tracking Sheet
- B. Good Permissions Gone Bad
- C. Insurance

15 Assignments and Works Made for Hire

- A. Copyright Assignments
- B. Works Made for Hire

16 Help Beyond This Book

- A. Resources for More Detailed Permissions Research
- B. Conducting Legal Research
- C. Working With an Attorney

Appendices

A How to Use the CD-ROM

B Forms

Text Permission Worksheet

Text Permission Letter Agreement

Text Permission Agreement

Photo Permission Worksheet

Photo Permission Agreement

Artwork Permission Agreement

Agreement to Use Artwork in Motion Picture

Lyric Permission Letter Agreement

Notice of Intention to Obtain Compulsory License for Making and Distributing Sound Recordings

Music Synchronization and Videogram License Agreement

Master Use and Videogram License

Linking Agreement

APS/CCC Coursepack Agreement

Coursepack Permission Request Form

Coursepack Permission Agreement

Basic Permission to Use a Trademark in a Book or Magazine

Basic Permission to Use a Trademark in a Movie

Basic Permission to Use a Trademark in a Photograph or Artwork

Trademark License Agreement

Merchandise License Agreement

Merchandise License Worksheet

Short-Form Merchandise License Agreement

Unlimited Personal Release Agreement

Limited Personal Release Agreement

Interview Release

Property Release Agreement

Search Request Form

Permissions Tracking Sheet

Basic Copyright Assignment Agreement

Musician Assignment Agreement

Artwork Assignment Agreement

Work-Made-for-Hire Agreement

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Whether using that Wascally Wabbit, or a friend's high school poetry, you'd better...GET PERMISSION FIRST!

If you want to use any copyrighted material for your own purposes, you need to get permission first from the owners of that work. If you don't, you could find yourself slapped with a lawsuit.

"Getting Permission" tackles the permissions process head on. The book shows you whom to ask for permission, as well as when -- and how much -- to expect to pay. Comprehensive and easy to read, the book covers:

- . the permissions process
- . the public domain (or "free" content)
- . how to figure out who owns a copyright
- . the "fair use" rule
- . academic permissions
- . license and merchandise agreements
- . using trademark or fictional characters
- . website permissions
- . and much more

This cutting-edge book includes agreements for acquiring authorization to use text, photographs, artwork and music. "Getting Permission" will help you obtain rights, permissions and clearance -- and stay out of legal hot water.

Getting Rid of Graffiti: A Practical Guide to Graffiti Removal and Anti-Graffiti Protection

LASCT Holdings - maximum detail by Title

G

Title	Location	Edition / Series / Misc.
57 Getting Rid of Graffiti: A Practical Guide to Graffiti Removal and Anti-Graffiti Protection <i>Author:</i> Whitford, M. J. (Maurice J) <i>Publish.:</i> E & FN Spon (Chapman & Hall) <i>- place:</i> London, UK <i>- date:</i> ©1992 <i>Subject:</i> Masonry -- Cleaning <i>Desc:</i> xvi, 160 p., [16] p. of plates (some color) illus., 24 cm.	<i>Dynix:</i> 31811 <i>Call No.:</i> 667 Wh <i>ISBN:</i> 0442314906 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 1st edition <i>Series:</i> <i>Year:</i> 1992 <i>Price:</i> \$25.00

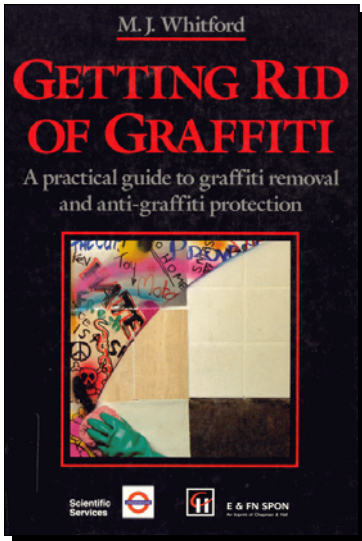


Table of Contents

- Foreword
- Preface
- Acknowledgements
- 1. History and trends in graffiti
 - 1.1 Definitions and vocabulary
 - 1.2 The evolution of graffiti
 - 1.3 The psychology of graffitiists
 - 1.4 Public perception of graffiti
- 2. Anti-graffiti policy
- 3. Assessing the problem
 - 3.1 Trial procedures
 - 3.2 General considerations
 - 3.3 Location of target surfaces
- 4. Graffiti marker types
 - 4.1 Felt-tip marker pens
 - 4.2 Aerosol spray paints
 - 4.3 Brush-applied paint
 - 4.4 Ball-point pen
 - 4.5 Lipstick and wax crayon
 - 4.6 Chalk
 - 4.7 Pencil
 - 4.8 Knives and other scratching implements
 - 4.9 Self-adhesive stickers
 - 4.10 Pasted fly posters (bill posters)
- 5. Graffiti removal agents
 - 5.1 Solvent-based graffiti removers
 - 5.2 Bleach-based graffiti removers
- 6. Graffiti removal equipment
 - 6.1 Manual graffiti removal equipment
 - 6.2 Mechanical graffiti removal equipment
- 7. Graffiti removal methods
 - 7.1 General aspects
 - 7.2 Manual graffiti removal methods
 - 7.3 Mechanical graffiti removal methods
 - 7.4 Costs of equipment
- 8. Selection guide to graffiti removal methods
 - 8.1 How to use the selection guide
 - Graffiti removal method one GRM1
 - Graffiti removal method two GRM2
 - Graffiti removal method three GRM3
 - Graffiti removal method four GRM4
 - Graffiti removal method five GRM5
 - Graffiti removal method six GRM6
 - Graffiti removal method seven GRM7
 - Graffiti removal method eight GRM8
 - Graffiti removal method nine GRM9
 - Graffiti removal method ten GRM10
 - Graffiti removal method eleven GRM11
 - Graffiti removal method twelve GRM12
 - Graffiti removal method thirteen GRM13
 - Graffiti removal method fourteen GRM14

Subjects

238 .	Coating Technology
273 .	Masonry -- Cleaning
347 .	Buses -- Cleaning
439 .	Graffiti

- Graffiti removal method fifteen GRM15
- 9. Graffiti removal in common target locations
 - 9.1 Building exteriors and interiors
 - 9.2 Open-air structures
 - 9.3 Public lavatories
 - 9.4 Train cars
 - 9.5 Buses and coaches
 - 9.6 Transport buildings, surface and sub-surface stations
- 10. Surface type and graffiti removal
 - 10.1 Types of surface material
 - 10.2 Permeable surface materials
 - 10.3 Hardness of surface materials
 - 10.4 Surface resistance to chemical cleaners
 - 10.5 Surface resistance to weathering
 - 10.6 Surface texture and graffiti resistance
- 11. Graffiti resistant surface material
 - 11.1 Inherent graffiti resistance of material surfaces
- 12. Anti-graffiti protective coatings
 - 12.1 Clear (unpigmented) coatings
 - 12.2 Pigmented coatings
 - 12.3 Sacrificial coatings
 - 12.4 Obliterative coatings
 - 12.5 Textured coatings
 - 12.6 Fleck coating systems
 - 12.7 Flake coating systems
- 13. Applying protective coatings
 - 13.1 Surface preparation
 - 13.2 Equipment and application methods
- 14. Contractual aspects
 - 14.1 Comparative costs for graffiti removal and surface protection
 - 14.2 Choosing a contractor
 - 14.3 Faulty approaches to graffiti removal and surface protection
- 15. Health and safety in graffiti removal and surface protection
 - 15.1 Graffiti removal
 - 15.2 Surface protection
- 16. Graffiti prevention - alternative countermeasures
 - 16.1 Success in New York
 - 16.2 European experience
- Further reading
- Appendix A: Addresses of manufacturers and suppliers
 - A.1 Pressure washers
 - A.2 Other graffiti removal equipment
 - A.3 Graffiti removal products
 - A.4 Graffiti-resistant coatings
- Appendix B: Advisory and official organizations
 - B.1 Health and safety
 - B.2 Buildings and the environment
 - B.3 Transport
 - B.4 Cleaning and conservation
- Appendix C: Metric/Imperial conversion tables
- Appendix D: Solvent properties
- Appendix E: The COSHH Regulations
- Index

Reviews - Synopsis - Dust Jacket

PREFACE:

This book owes its existence to the work carried out over a period of years by London Underground Limited on methods of removing, and other means of counteracting, graffiti. The Underground, like the New York subway and similar systems in major cities around the world, is a prime target for producers of graffiti (whom we call 'graffitists' throughout this volume).

Since its property includes trains, buildings, platforms, passageways, concourses, waiting rooms, public lavatories, bridges, other structures and more than 250 miles of rail track, the Underground has as great a variety of vulnerable

surfaces as any other authority in Great Britain, and the amount of graffiti to which it is subjected is among the largest of any enterprise in the world.

Initiatives by London Underground to combat the problem have included reviews of security at train depots, the installation of surveillance equipment, the use of security patrols, a study of the psychology of graffitiists and the impact of graffiti on passengers, liaison with other sections of London Regional Transport and consultation and exchange of information with other authorities both in the United Kingdom and abroad. However, the most intensive and sustained anti-graffiti activity has consisted of:

- > laboratory research into the nature of graffiti markings and the means of getting rid of them;
- > site trials on graffiti removal and the protection of vulnerable surfaces;
- > the development of substances, methods, equipment and instructions for the removal of graffiti from various surfaces;
- > research into protective measures and graffiti-resistant surface materials and coatings;
- > training and deployment of staff to remove graffiti.

The bulk of this book is devoted to describing in some detail the methods and procedures that have been found to achieve the best results in graffiti removal. Although these methods were developed for London Underground, the techniques can be used elsewhere. Better removal agents and equipment may come on to the market in future, and different formulations for graffiti-removal agents may be needed when graffitiists get hold of new types of marking material, but we are confident that the methods set out in the chapters that follow are, in general, at least as effective as any in use elsewhere. What is important is to ensure that the operators engaged in the process of graffiti removal use only approved materials, equipment and methods. It is not uncommon for operators to ignore instructions, use unauthorized types of solvent, neglect quality standards, fail to clean up after completing the work, depart from laid down procedures and find a host of ingenious ways to circumvent safety rules. Departures from approved procedures result in inadequate cleaning, often leaving the surface looking worse than before work began on it. In addition, by neglecting to obey safety instructions, operators put themselves and others at risk. Sound training and good supervision are essential for a successful anti-graffiti operation.

Title	Location	Edition / Series / Misc.
638 Glossary of Color Terms		<i>Edition:</i>
<i>Author:</i> Inter-Society Color Council Committee, Federation of Societies for Coat	<i>Dynix:</i> 44466	<i>Series:</i>
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 535.6 GI	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i>	
<i>- date:</i> ©1981	<i>Shelf</i> Reference	<i>Year:</i> 1981
<i>Subject:</i> Color -- Dictionaries		<i>Price:</i> \$25.00
<i>Desc:</i> vii, 87 p., 23 cm.		

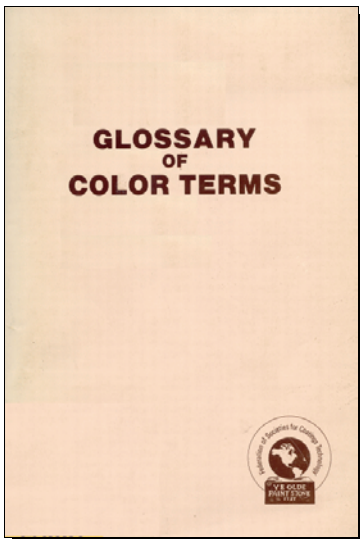


Table of Contents

- Preface
- Abbreviations
- Definitions
- Thesaurus
- Bibliography

Reviews - Synopsis - Dust Jacket

PREFACE:

The Glossary of Color Terms evolved from work done by members of the Inter-Society Color Council Committee of the Federation of Societies for Coatings Technology (in conjunction with the FSCT Definitions Committee), which resulted in publication of the Paint/Coatings Dictionary in 1978.

Color is a unique and separate discipline in the coatings industry, and is a quality which frequently must be correlated with products of other industries, such as plastics and textiles, and communicated with persons of very different backgrounds, such as designers and architects. Accordingly, the FSCT Board of Directors authorized separate publication of these terms as a service to those in allied industries and professions interested in the science of color.

The ISCC Committee, under the direction of Ruth Johnston-Feller, compiled more than 400 color-related terms and their definitions, and their efforts are reflected in the pages of this booklet. Included are such topics as color difference equations, optical phenomena, gloss, hiding, color instrumentation, etc.

Subjects

516 . Color -- Dictionaries

There are more entries than definitions, inasmuch as a number of entries are synonyms cross-referenced to the defined terms. Also, since color interfaces with so many fields, some of the jargon and vocabulary of related fields have been included (e.g., architecture, art, decorating, pigments and dyes, printing inks, and test methods).

A thesaurus is included at the back of the book. Each term is listed in this section in alphabetical order under "Color" or "Optical Properties," or both. Also included is a bibliography of books and journals for handy reference.

Changes in definitions of the International Commission on Illumination (CIE), approved or proposed since issuance of the Dictionary, are not included. When a subsequent edition is published, the accepted CIE definitions current at that time will be incorporated.

Title	Location	Edition / Series / Misc.
58 Guide to Solvent Waste Reduction Alternatives: Final Report		<i>Edition:</i>
<i>Author:</i>	<i>Dynix:</i> 41634	<i>Series:</i>
<i>Publish.:</i> ICF Consulting Associates, Inc.	<i>Call No.:</i> 363.728 Gu	
<i>- place:</i> Los Angeles, CA	<i>ISBN:</i>	
<i>- date:</i> [1986]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1986
<i>Subject:</i> Solvents		<i>Price:</i> \$25.00
<i>Desc:</i> 272 p. in various pagings, 28 cm.		

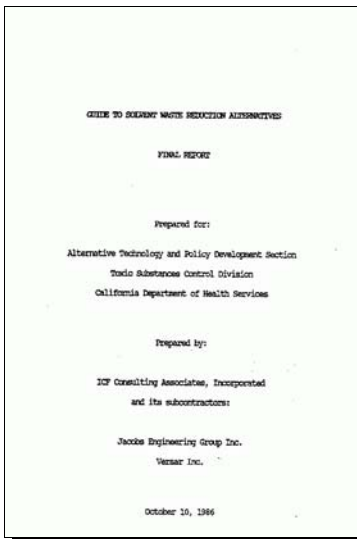


Table of Contents

- Abstract
- Acknowledgements
- Disclaimer
- Contracts
- List of Figures
- List of Tables
- Summary and Conclusions
- Chapters
 - 1. Introduction
 - 2. Solvent Waste Generation
 - 3. Waste Minimization -- General Perspective
 - 4. Source Reduction
 - 5. Recycling
 - 6. Treatment and Pretreatment
 - 7. Regulatory Perspective
- Glossary of Terms
- Glossary of Abbreviations
- Appendices
 - A. Major Solvent User Industries
 - B. Usage of Solvents
 - C. Additional Sources of Information
 - D. Small Packaged Distillation Equipment
 - E. Air Pollution Control Districts in California

Subjects

330 .	Solvents
379 .	Hazardous wastes

Reviews - Synopsis - Dust Jacket

Abstract

This Guide presents the results of ICF's study of solvent waste reduction alternatives. The focus of the study is on practical waste management alternatives to land disposal that have potential for reducing the amount and/or toxicity of solvent waste generated. Several tasks were performed for this study, including: (1) identifying major solvent-user industries in California; (2) reviewing current waste management methods and technologies; (3) characterizing source reduction alternatives for minimizing solvent waste; (4) characterizing on-site and off-site solvent recycling alternatives; and (5) characterizing treatment alternatives.

The analysis of solvent waste minimization primarily focuses on in-plant changes (source reduction) that could be implemented to reduce or eliminate the generation of solvent waste. Source reduction options are described for parts cleaning, equipment cleaning, coating application and solvent air emission control operations. As a source reduction measure, good operating practice is of paramount importance in discrete operations and is described separately. The secondary focus is on recycling and treatment options. Related regulatory background is described separately.

Title	Location	Edition / Series / Misc.
675 Handbook of Adhesive Raw Materials Author: Flick, Ernest W. Publish.: Noyes Publications - place: Park Ridge, NJ - date: ©1982 Subject: Adhesives Desc: xxx, 303 p., 24 cm.	Dynix: 33820 Call No.: 668.411 FI ISBN: 0815508972 Shelf Adult Non-Fiction	Edition: Series: Year: 1982 Price: \$45.00

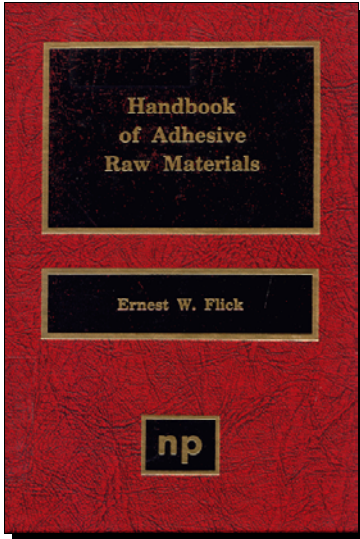


Table of Contents

INTRODUCTION

SECTION I: ACIDS
 Emery Industries, Inc.
 Procter and Gamble Distributing Co
 Reichhold Chemicals, Inc

SECTION II: ALUMINUM SILICATES
 Burgess Pigment Co
 Georgia Kaolin Co
 Gross Minerals Corp
 R.T. Vanderbilt Co., Inc

SECTION III: ANTISKINNING AGENTS
 The Ames Laboratories, Inc
 Ferro Chemical Division

SECTION IV: CALCIUM CARBONATES
 Calcium Carbonate Co
 Commercial Minerals Co
 Flintkote Stone Products Co
 Georgia Marble Co
 Mississippi Lime Co
 Pfizer Minerals, Pigments & Metals Division
 Thompson-Hayward Chemical Co

SECTION V: CATALYSTS, CROSS-LINKING AND CURING AGENTS
 BASF Corp
 Ciba-Geigy Resins
 Cincinnati Milacron Chemicals
 Crosby Chemicals, Inc
 Henkel Corp
 Pacific Anchor Chemical Co
 The Sherwin-Williams Co
 Synthron, Inc
 Texaco, Inc
 Union Camp Corp
 R.T. Vanderbilt Co., Inc

SECTION VI: CLAYS
 Commercial Minerals Co
 Georgia Kaolin Co
 Minerals and Chemicals Division
 Thiele Kaolin Co
 R.T. Vanderbilt Co., Inc

SECTION VII: CORN STARCH AND STARCH DERIVATIVES
 Clinton Corn Processing Co
 Corn Products
 Penick & Ford, Ltd

SECTION VIII: DEFOAMERS AND ANTIFOAMS

Subjects

217 . Adhesives

Chemical Components, Inc
Colloids, Inc
Emkay Chemical Co
Henkel Corp
Interstab Chemicals, Inc
Isochem
Mooney Chemicals, Inc
Polymer Research Corp. of America
Tri-Star Chemical Co

SECTION IX: DISPERSING AND EMULSIFYING AGENTS

Allied Colloids, Inc.
Chemical Components, Inc
Interstab Chemicals, Inc
Synthron, Inc
Uniroyal Chemical
R.T. Vanderbilt Co., Inc

SECTION X: EPOXY RESIN DILUENTS

AZS Chemical Co
Procter and Gamble Distributing Co
R.T. Vanderbilt Co., Inc

SECTION XI: FILLERS AND EXTENDER PIGMENTS

Commercial Minerals Co
Composition Materials Co., Inc
Georgia Marble Co
Grefco, Inc
Martin Marietta Chemicals
R.T. Vanderbilt Co., Inc

SECTION XII: FIRE AND FLAME RETARDANTS

Dover Chemical Corp
GAF Corp
Great Lakes Chemical Corp
Hercules, Inc
Humphrey Chemical Corp
Mayco Oil and Chemical Co., Inc
Nyacol, Inc
Velsicol Chemical Corp

SECTION XIII: LATICES

Dow Chemical U.S.A
Essential Chemicals Corp
Firestone Synthetic Rubber & Latex Co
GAF Corp
W.R. Grace & Co
PVO International, Inc
Rohm and Haas Co
Chas. S. Tanner Co
Union Chemicals Division
Witco Chemical

SECTION XIV: OILS

Arizona Chemical Co
PVO International, Inc
Reichhold Chemicals, Inc

SECTION XV: PLASTICIZERS

Argus Chemical
BASF Corp
East Coast Chemicals Co
Velsicol Chemical Corp

SECTION XVI: POLYBUTENES

Amoco Chemicals Corp
Cosden Oil & Chemical Co
Exxon Chemicals

SECTION XVII: POLYVINYL ACETATES

AZS Chemical Co

SECTION XVIII: PRESERVATIVES AND FUNGICIDES

Cosan Chemical Corp
Dow Chemical U.S.A
ICI Americas, Inc
International Dioxide, Inc
Ottawa Chemical Division
Thiokol/Ventron Division
R.T. Vanderbilt Co., Inc

SECTION XIX: RESINS—ACRYLIC

AZS Chemical Co
Rohm and Haas Co

SECTION XX: RESINS—EPOXY

AZS Chemical Co
Ciba-Geigy Resins
Henkel Corp
Reichhold Chemicals, Inc
R.T. Vanderbilt Co., Inc

SECTION XXI: RESINS-ESTER GUMS

Crosby Chemicals, Inc
FRP Co
Reichhold Chemicals, Inc

SECTION XXII: RESINS-ETHYLENE/VINYL ACETATE

Allied Chemical, Fibers and Plastics Co
DuPont Co
U.S. Industrial Chemicals Co

SECTION XXIII: RESINS-MALEIC

FRP, Co

SECTION XXIV: RESINS—MISCELLANEOUS

Allied Chemical
Amoco Chemicals Corp
BASF Corp
Ciba-Geigy Resins
Crowley Chemical Co
GAF Corp
The Goodyear Tire and Rubber Co
Neville Chemical Co
Pioneer Division
Reichhold Chemicals, Inc
Thiokol/Specialty Chemicals Division
Upjohn Polymer Chemicals

SECTION XXV: RESINS-NATURAL

O.G. Innes Corp
S. Winterbourne & Co., Inc

SECTION XXVI: RESINS-PHENOLIC

Ashland Chemicals
Durez Division
Reichhold Chemicals, Inc
Schenectady Chemicals, Inc

SECTION XXVII: RESINS-POLYAMIDE

AZS Chemical Co
Henkel Corp
R.T. Vanderbilt Co., Inc

SECTION XXVIII: RESINS-POLYETHYLENE

Allied Chemical
Bareco Division
DuPont Co
U.S. Industries Chemicals Co

SECTION XXIX: RESINS-POLYPROPYLENE

Crowley Chemical Co

SECTION XXX: RESINS-POLYTERPENE

Arizona Chemical Co
Crosby Chemicals, Inc
Goodyear Chemicals
Reichhold Chemicals, Inc

SECTION XXXI: RESINS-POWDER COATING

Hercules, Inc

SECTION XXXII: RESINS-PROPRIETARY COMPOSITION

Exxon Chemicals
Hercules, Inc
Lawter Chemicals, Inc
Neville Chemical Co
Reichhold Chemicals, Inc
Virginia Chemicals, Inc

SECTION XXXIII: RESINS-RADIATION COATING

Cargill, Inc
Thiokol Corp

SECTION XXXIV: RESINS-URETHANE

Chemical Components, Inc

SECTION XXXV: RESINS-VINYL CHLORIDE

Firestone Plastics Co

SECTION XXXVI: RESIN EMULSIONS AND DISPERSIONS

Schenectady Chemicals, Inc

SECTION XXXVII: RESIN ESTERS

Arizona Chemical Co
FRP Co

SECTION XXXVIII: ROSINS

Crosby Chemicals, Inc
Natro Chem, Inc.
Reichhold Chemicals, Inc

SECTION XXXIX: SILICAS (SILICON DIOXIDE)

BASF Corp
Davison Chemical Division
Degussa Corp
Grefco, Inc
Illinois Minerals Co
PPG Industries, Inc
Tammco, Inc

SECTION XL: STABILIZERS

Argus Chemical

SECTION XLI: SURFACTANTS/SURFACE ACTIVE AGENTS

American Cyanamid Co
BASF Corp
W.A. Cleary Chemical Corp
Diamond Shamrock Corp
GAF Corp
Interstab Chemicals, Inc
Mona Industries, Inc
Raybo Chemical Co
Texaco, Inc
Thompson-Hayward Chemical Co
Uniroyal Chemical

SECTION XLII: TALCS

Cyprus Industrial Minerals Co
Minerals and Chemicals Division
Pfizer Minerals, Pigments & Metals Division

SECTION XLIII: THICKENERS AND THIXOTROPIC AGENTS

Allied Colloids, Inc
American Cyanamid Co.
BASF Corp
Cabot Corp
Degussa Corp
Ferro Chemical Division
GAF Corp
Henkel Corp
Hercules, Inc.
Interstab Chemicals, Inc
Raybo Chemical Co
Rohm and Haas Co

SECTION XLIV: WAXES

Bareco Division
International Wax Refining Co., Inc
Micro Powders, Inc
Moore-Munger Marketing, Inc
Frank B. Ross Co., Inc

SECTION XLV: MULTIFUNCTIONAL AND MISCELLANEOUS COMPOUNDS

Argus Chemical
Bareco Division
BASF Corp
Carey Canada Inc.
Dynamit Nobel Chemicals
Essential Chemicals Corp.
Ethyl Corp
GAF Corp
Henkel, Inc
Hercules, Inc
ICI Americas, Inc
Interstab Chemicals, Inc
Isochem
ITT Rayonier, Inc
Johns-Manville
Mackenzie Chemical Works, Inc
M. Michel and Co., Inc
Micro Powders, Inc
Mobay Chemical Products
Mobil Chemical Co
Pacific Smelting Co
Raybo Chemical Co

Sherwin-Williams Co
Texaco, Inc
Uniroyal Chemical
Virginia Chemicals, Inc

SECTION XLVI: SUPPLIERS' ADDRESSES

Reviews - Synopsis - Dust Jacket

PREFACE:

This handbook contains descriptions of hundreds of raw materials which are available to the adhesives industry. It will be of value to technical and managerial personnel in adhesives manufacturing companies and companies which supply raw materials or services to these companies. This book will be useful to both those with extensive experience as well as those who are novices in the field.

The data consist of selections of manufacturers' raw materials made at no cost to, nor influence from, the makers or distributors of these materials. The coverage of raw materials is as complete as it could possibly be and any omissions are not intentional.

Only the most recent data have been compiled. Basically, only trademarked raw materials are included. Common chemicals are mostly excluded. Most solvent-based raw materials are omitted, with some exceptions which were considered of value to the book.

A detailed table of contents lists, in alphabetical order, the companies included in each section. The company names are listed in alphabetical order, and the raw materials from each company are listed in alphabetical and numerical order.

Title	Location	Edition / Series / Misc.
59 Handbook of Adhesives		Edition: 2nd edition
Author: Skeist, Irving (editor)	Dynix: 13021	Series:
Publish.: Van Nostrand Reinhold Company	Call No.: 668.3 Sk	
- place: New York, NY	ISBN: 0442276346	
- date: ©1977	Shelf Adult Non-Fiction	Year: 1977
Subject: Adhesives		Price: \$25.00
Desc: xviii, 921 p., illus., 27 cm.		



Table of Contents

Preface to Edition
 Preface to First Edition
 Standard Definitions of Terms Relating to Adhesives

Section A — FUNDAMENTALS

- 1 Introduction to Adhesives, (Irving Skeist and Jerry Miron)
- 2 The Role of Adhesives in the Economy, (Arnold Brief)
- 3 Influence of Constitution on Adhesion, (W. A. Zisman)
- 4 Roll Application of Adhesives, (Raymond R. Myers and Carl J. Knauss)
- 5 Properties, Testing, Specification and Design of Adhesives, (Marco Petronio)

Section B — ADHESIVE MATERIALS

- 6 Inorganic Adhesives and Cements, (John H. Wills)
- 7 Animal Glues, (John R. Hubbard)
- 8 Fish Glue, (Robert E. Norland)
- 9 Casein Glues and Adhesives, (H. K. Salzberg)
- 10 Soybean Glues, (Alan L. Lambuth)
- 11 Blood Glues, (Alan L. Lambuth)
- 12 Starch-Based Adhesives, (Wadym Jarowenko)
- 13 Cellulosics, (Walter D. Paist)
- 14 Resins for Rubber-Based Adhesives, (John S. Autenrieth)
- 15 Natural Rubber and Reclaimed Rubber Adhesives, (W. C. Wake)
- 16 Butyl Rubber and Polyisobutylene, (N. E. Stucker and J. J. Higgins)
- 17 Nitrile Rubber Adhesives, (John P. Morrill and Lance A. Marguglio)
- 18 Styrene-Butadiene Rubber Adhesives, (P. T. Stricharczuk and D. E. Wright)
- 19 Thermoplastic Rubber (A-B-A Block Copolymers) in Adhesives, (J. T. Harlan and L. A. Petershagen)
- 20 Carboxylic Polymers in Adhesives, (M. E. Gross and C. D. Weber)
- 21 Neoprene Adhesives: Solvent and Latex, (Murray Steinfink)
- 22 Polysulfide Sealants and Adhesives, (Julian R. Panek)
- 23 Phenolic Resin Adhesives, (Bruce P. Barth)
- 24 Resorcinolic Adhesives, (Roy H. Moulton)
- 25 Amino Resin Adhesives, (Manilal Sayla)
- 26 Epoxy Resin Adhesives, (Manilal Savla)
- 27 Polyurethane and Isocyanate-Based Adhesives, (C. S. Schollenberger)
- 28 Polyvinyl Acetate Emulsions and Polyvinyl Alcohol for Adhesives, (A. E. Corey, P.M. Draghetti and J. Fanti)
- 29 Vinyl Acetate-Ethylene Copolymer Emulsions in Adhesives, (C. E. Blades)
- 30 Ethylene Copolymer-Based Hot Melt Adhesives, (J. D. Domine and R. H. Schaufelberger)
- 31 Polyvinyl Acetal Adhesives, (Edward Lavin and James A. Sneigrove)
- 32 Acrylic Adhesives and Sealants, (K. Eisentrager and W. Druschke)
- 33 Anaerobic Adhesives, (Bruce D. Murray, Martin Hauser, and John R. Elliot)
- 34 Cyanoacrylate Adhesives, (H. W. Coover, Jr., and J. M. McIntire)
- 35 Polyamide Adhesives, (R. D. Dexheimer and L. R. Vertnik)
- 36 Polyethylenimine in Adhesives, (Anthony M. DeRoo)
- 37 Aromatic Polyimide Adhesives and Bonding Agents, (Irving Serlin, Edward Lavin, and Albert H. Markhart)
- 38 Other High Temperature Adhesives, (T. J. Aponyi)
- 39 Silicone Adhesive Sealants, M. Dale Beers
- 40 Organofunctional Silane Coupling Agents, (James G. Marsden and Samuel Sterman)

Section C — ADHERENDS AND BONDING TECHNOLOGY

- 41 Bonding Plastics, (Jerry Miron and Irving Skeist)
- 42 Bonding Textiles to Rubber, (Roy H. Moulton)

Subjects

217 . Adhesives

- 43 Wood Adhesion, (Ben S. Bryant)
- 44 Water-Based and Solvent-Based Adhesives, (Jacob Lichman)
- 45 Sealants and Caulks, (Joseph W. Prane)
- 46 Water Remoistenable Adhesives, (Armand J. Gauthier)
- 47 Pressure-Sensitive Tapes and Labels, (C. W. Bemmels)
- 48 Bonded and Coated Abrasives, (Charles J. Seller and William F. Zimmer, Jr.)
- 49 Adhesives for Building Construction, (Richard F. Blomquist and Charles B. Vick)
- 50 Adhesives in the Electrical Industry, (Leonard S. Buchoff)
- 51 Adhesives in the Automobile Industry, (G. L. Schneberger)
- 52 Nonwoven Fabrics, (Samuel C. Temin and Philip A. Mitchell)
- 53 Medical and Biological Adhesives, (Leo Gross and Robert Hoffman)
- 54 Metallization of Plastics, (W. P. Townsend)
- 55 The Mechanical Handling of Multi-Component Adhesives, (G. M. Scales and J. A. Vasile)
- 56 Adhesives Guide for Designers, (D. K. Rider)

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Here's an updated edition of a popular reference, first published in 1962 and reprinted six times since. Handbook of Adhesives is addressed primarily to chemists and engineers concerned with raw materials for adhesives, formulation of adhesives for optimum properties at lowest cost, and utilization of adhesives in the manufacture of thousands of end products. At the same time, it will be welcomed by manufacturers contemplating a change to adhesive bonding from other assembly methods, as well as by a wide variety of other personnel who found the previous edition to be of great value.

The Handbook has been written by 75 leading specialists, including consultants, professors, government scientists, medical researchers, and inventors who bring unique authority to the subjects they present. Its first five chapters discuss relevant theory, economics, properties, testing and ASTM definitions. Adhesives are delineated by origin and chemical composition, mode of application and setting, cost, and suitability for various end products. The role of adhesives in the economy is appraised for each key market. A classical view of the mechanism of adhesion is presented by Dr. W. A. Zisman, dean of adhesion scientists.

The next 35 chapters are devoted to the important adhesive materials, including natural products, elastomers, thermosetting resins, and thermo plastics. The Second Edition features new chapters on thermoplastic rubbers, VA-E latexes and EVA hot melts, acrylic adhesives and sealants, anaerobic adhesives, silicones, and polyimides and other high temperature adhesives. Expanded information has been included on tackifiers, neoprene cements, phenolic resins, epoxy resins, polyurethane and isocyanate based adhesives, and silane coupling agents. Coverage of each material is detailed, specific, and liberally illustrated with suggested formulations which are central to the Handbook's value as a practical "how-to" guide.

The final 16 chapters examine varied problems of bonding technology—the bonding of plastics, textiles, rubber, wood and paper; sealants and caulks; pressure-sensitive tapes and labels; utilization of adhesives in a variety of industries; and equipment for multi-component adhesives. Also discussed here are topics new to this edition, including medical/biological adhesives and the metallizing of plastics. The chapter on non-woven fabrics is a self contained monograph, while the concluding chapter, "Adhesives Guide for Designers," is a comprehensive, detailed manual in tabular form.

PREFACE TO THE SECOND EDITION:

Adhesives offer a technological model for society. In a world of ominous disruption, the adhesives go about their business of combining and uniting. Not only do they bond wood to wood and steel to steel; they also bring together pairs of materials as disparate as glass and paper, fibers and rubber, aluminum foil and plastic film.

The adhesive materials are rich in diversity. Of the 56 chapters in this edition of the Handbook of Adhesives, 35 are devoted to chemically distinct families of adhesive materials. They vary in origin, cost, suitability for each substrate, modes of application and setting, and properties. Other chapters deal with theory, economics, application, testing, and key end products.

This volume, like the first edition, seeks to provide the knowledge needed for optimum selection, preparation, and utilization of adhesives and sealants. The information is detailed and explicit with several hundred illustrative formulations.

This Handbook is the product of 75 specialists in polymers, adhesives, and bonding technology. Fifty-eight are from industrial companies; the others are consultants, professors, government scientists, and medical researchers. They include pioneers in the science and technology of adhesion, as well as inventors who bring unique authority to their

subjects. Two chapters from across the Atlantic span more than a century of adhesives development, from natural rubber to acrylics. We are grateful that so many busy experts have diverted time from their R&D, teaching and consulting to prepare these chapters.

It is a pleasure to acknowledge the secretarial aid of Mrs. Ruth Hecht and the editorial expertise of Mrs. Alberta Gordon of Van Nostrand Reinhold.

Title	Location	Edition / Series / Misc.
60 Handbook of Analytical Toxicology		<i>Edition:</i> 1st edition
<i>Author:</i> Sunshine, Irving (editor)	<i>Dynix:</i> 44570	<i>Series:</i> CRC Handbook Series
<i>Publish.:</i> CRC (Chemical Rubber Company) Press	<i>Call No.:</i> 547.33 Ha	
<i>- place:</i> Cleveland, OH	<i>ISBN:</i> 0849335515	
<i>- date:</i> [1969]	<i>Shelf</i> Reference	<i>Year:</i> 1969
<i>Subject:</i> Analytical toxicology -- Laboratory manuals		<i>Price:</i> \$50.00
<i>Desc:</i> xiv, 1081 p., illus., 28 cm.		

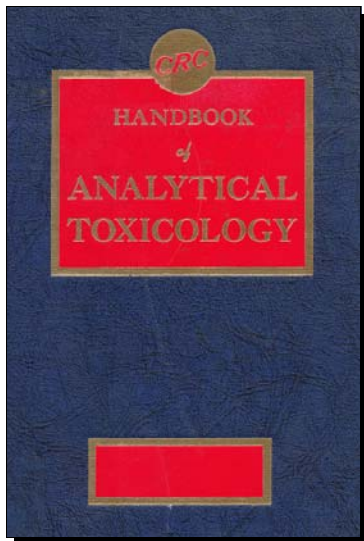


Table of Contents

Preface
Introduction

SECTION I

UNIT I — DRUGS
Introduction
Physical, Toxicological and Analytical Data
Synonyms, Chemical Names, CAS Registry Numbers and Structural Formulas
Clinical and Physical Data of Volatile Anesthetics
Solubilities of Antibiotics
Ultraviolet Spectrophotometry
 Ultraviolet Absorption Spectra of Drugs
 Ultraviolet Spectrophotometric Absorption Data
Optical Crystallographic Characteristics
Absorption, Metabolism and Excretion Data
Identification of Drugs
 Isolation Procedures
 "Normal" Extracts of Blood and Urine
 Thermal Microscopy
 Microcrystal Tests

UNIT II — ECONOMIC POISONS
Introduction
Physical, Toxicological and Analytical Data
Synonyms, Chemical Names, CAS Registry Numbers and Structural Formulas
Estimated Relative Acute Toxic Hazards of Pesticides to Pesticide Appliers
Recommended Threshold Limit Values for Selected Pesticides in Breathing Air of Working Environments
Concentration of Chlorinated Pesticides or their Metabolites in Human Material
Chlorinated Hydrocarbon Pesticides in Surface Waters
Pesticides in Irrigation Waters
48-Hour TLm Values of Pesticides from Static Bioassay for Various Types of Fresh-Water Organisms

UNIT III — INDUSTRIAL CHEMICALS
Introduction
Physical, Chemical Hazard and Analytical Data
Direct Reading Colorimetric Indicators
 Measuring Ranges
 Characteristics and Sources of Detector Tubes

UNIT IV — AIR POLLUTION
Introduction
Air Quality Standards
Air Pollutants and Their Effects on Man and Plants
Automated Analyses of Air Samples

UNIT V — WATER ANALYSIS
Analysis of Water
Automated Analytical Techniques
Criteria for Public Water Supplies
Criteria for Farmstead Water Supplies

Subjects

222 .	Analytical toxicology -- Laboratory manuals
400 .	Poisons

Criteria for Industrial Water Supplies

SECTION II

UNIT I — DRUGS

Chromatography

Paper

Thin-layer

Detection Reagents

Gas

Melting Points

Ultraviolet Spectrophotometric Absorption Data

Sadtler Infrared SpecFinder Pharmaceuticals

UNIT II — ECONOMIC POISONS

Chromatography

Paper

Thin-Layer

Detection Reagents

Gas

Melting Points

Refractive Indices

Sadtler Infrared SpecFinder Agricultural Chemicals

SECTION III

UNIT — OPERATIONS

Fluorescence Analysis

Infrared Spectroscopy

Standards for Checking the Calibration of Spectrophotometers, 200-1000 nm

Automated Analysis

Atomic Absorption

Chromatography

Thin-Layer

Gas

Microdiffusion Analysis

SECTION IV

Index

Drugs

Economic Poisons

Industrial Chemicals

General

Reviews - Synopsis - Dust Jacket

PREFACE:

This handbook collates, in one volume, many data that are essential to scientists concerned with the analysis of drugs, environmental hazards, economic poisons and industrial chemicals. Subsequent volumes will supply those data unavailable for this first edition. This improvement will ensue as more scientists, in their interest to have a more valuable desk-side handbook, recognize the value of this compendium and willingly volunteer to fill the gaps.

In addition to collating the physical and chemical properties of drugs and chemical hazards, summaries of published methods for their detection in biological specimens are presented. The minutiae of the analyses are beyond this volume, but the reader is given an insight into the analytical approach to the analysis of many compounds and a specific reference wherein the essential details can be found. These references will help those analysts who are requested to determine one of the many substances listed in the handbook with which they have had no previous analytical experience. Frequently, the converse is true. The analyst elaborates a series of physical and chemical facts about an "unknown substance" and has to try to determine its identity. To facilitate this, the various chemical and physical properties of each substance have been arranged in sequential order in a separate section of the handbook. These compilations should help the analyst narrow the list of probabilities and identify the "unknown substance". Their potential value will increase as the data grow in volume.

The result of a quantitative analysis is usually interpreted by comparing it with suitable reference data. These data, as

they refer to exposed humans, have been collected and tabulated. They should prove valuable, not only to analysts, but also to those who must interpret analytical results—physicians, pharmacologists, toxicologists, industrial hygienists and scientists in the drug industry and governmental agencies. Since many of these scientists are also interested in how the body handles the products described, data on human absorption, excretion and metabolism also have been assembled and tabulated for easy reference.

The facts presented in this volume originate from many different sources. Editorial selection has been made to present the best available data. Since many were obtained in different laboratories, using different instruments or reference substances of varying degrees of purity, the reported values may differ from those of primary standards for the same substances, where available. Since the latter are seldom available and usually are not those involved in daily problems, the published data should be adequate.

Many contributors provided the data for this volume. Without their help, the handbook would not have been possible. Everyone is indebted to them for their assistance. May this continue and be augmented by others so that subsequent volumes will be even more valuable.

INTRODUCTION:

This Handbook has three major sections. Each section is further divided into units on drugs, economic poisons, industrial chemicals, air and water pollutants. Material in the first section is arranged alphabetically so that information about a specific substance can be easily located.

Each unit in the first section contains an alphabetically arranged index which includes common synonyms, cross-referenced to the accepted names. This is followed by a tabulation of the accepted names, chemical names, the Chemical Abstracts Registry Number, when known, and structural formulas. A third tabulation includes the physical properties, toxicity data and a brief description of published analytical methods for the detection of a given substance in biological samples. Depending on their availability, tables containing additional physical, toxicological or analytical data are presented in some units.

The second section is a sequential tabulation of physical properties. These tables are designed to facilitate the identification of unknown substances whose physical properties have been elaborated during the course of an analysis. Many substances may have similar values for a given physical property, such as a melting point, an R value in a given solvent or an ultraviolet absorption maximum. The analyst can use the sequentially arranged tables to determine which substances are compatible with a given physical constant. Repeating this comparison for the several constants revealed in a given analysis will yield several groups. The unknown can be identified by noting the one substance that appears in each of these groups.

The third section presents a brief discussion of some physical methods of instrumental analysis and their application to substances of toxicological interest. Bibliographic appendices are included for those who have the equipment described in Section III and want to apply it to the analysis of particular substances.

Section four consists of a detailed index. The various items contained in each unit have been tabulated opposite the name of each product so that the reader may more easily find the specific information he seeks. For easy access, the index has been sub-divided into units on drugs, economic poisons and industrial chemicals. These units are followed by a general index encompassing all other material.

Usage Common to all Tabulations

Optimal nomenclature is a relatively subjective choice. Many acceptable systems are in common use. Arbitrarily, the names accepted for use in this Handbook and their chemical formulas conform as closely as possible with the system of nomenclature adopted by the International Union of Pure and Applied Chemistry and used by the Chemical Abstracts Service, American Chemical Society. Some of the sources for the other recorded data include the "Handbook of Chemistry and Physics," 49th edition, Robert C. Weast, Ed., The Chemical Rubber Co., Cleveland, Ohio, 1968; "The Merck Index," 8th edition, Paul G. Stecher, Ed., Merck & Co., Inc., Rahway, N.J., 1968; "The Extra Pharmacopoeia, Martindale," 25th edition, R. G. Todd, Ed., The Pharmaceutical Press, London, 1967; "The Pharmacopoeia of the U.S.A.," 17th edition, Mack Printing Co., Easton, Pa., 1965; "Analytical Methods for Pesticides, Plant Growth Regulators and Food Additives," Vol. 1, II, III, IV, V, Gunter Zweig, Ed., Academic Press, New York, N.Y., 1963—1967; "Guide to The Analysis of Pesticide Residues," Vol. I, II, H. P. Burchfield and Donald E. Johnson, U.S. Department of Health, Education & Welfare, U.S. Public Health Service, Washington, D.C., 1965 and "Industrial Hygiene and Toxicology," Vol. II, Frank A. Patty, Ed., Interscience Publishers, Inc., New York, N.Y., 1963; and "Pesticide Index," 3rd edition, Donald E. H. Frear, Ed., College Science Publishers, State College, Pa.

The Chemical Abstracts Registry Number was taken from the 1965 SOCMA Handbook of Commercial Organic Chemical Names or was provided by the Chemical Abstracts Service. This Registry Number uniquely identifies organic compounds and serves to identify the compound throughout the CAS Registry System. Access to Chemical Abstracts

and other computer-stored data using this number, may be obtained.

The Sadtler Reference Number refers to the compound's identification number in their collection of infrared absorption data. Space precludes publication of the actual absorption spectra, but the wavelength of the major absorption peak in each millimicron region is given in the Spec-Finders data published in Section II.

The chromatographic data include an Rf value followed by a number in parentheses. This number refers to the Table in Section II which contains complete information on all the analytical parameters used to obtain the chromatographic data and original source of the data. Not only do these tables contain the available information for the given substance but they also include additional data on many related compounds, arranged in sequential order. If several spots were reported, the Rf of the major spot is listed. Whenever relative Rf data are presented, these data are italicized.

The general principles of the analytical procedures for the detection of the many substances listed in the Handbook are given in terms of the unit operations required to isolate and quantitate each substance. These unit operations were coded using capital letters to signify the several operations involved. Those common solvents required to carry out the extraction operations were designated by lower case italic letters. These codes were then used to describe each analytical procedure. Should the reader require specific details, the original source is cited using a number in the reference column. This number refers to the literature citation of the reference in question and will be found in the bibliography at the end of the Table. For ready access, the codes for the analytical procedures have been imprinted on both the inside back and front covers. With a little practice, decoding the procedures becomes relatively easy.

The proteins in the sample of blood are precipitated by trichloroacetic acid. The filtrate is made alkaline and distilled. The distillate is made basic and extracted with chloroform. The chloroform is extracted with acid and this in turn is made basic and extracted with ether. The ether is evaporated and the residue is dissolved in acetone. The acetone is used for gas chromatographic analysis.

Handbook of Emergency Response to Toxic Chemical Releases: A Guide to Compliance

LASCT Holdings - maximum detail by Title



Title	Location	Edition / Series / Misc.
61 Handbook of Emergency Response to Toxic Chemical Releases: A Guide to Compliance		Edition:
Author: Cheremisnoff, Nicholas P.	Dynix: 50457	Series:
Publish.: Noyes Publications	Call No.: 363.17 Ch	
- place: Park Ridge, NJ	ISBN: 0815513658	
- date: ©1995	Shelf Adult Non-Fiction	Year: 1995
Subject: Hazardous substances -- Safety measures -- Handbooks, manuals, etc.		Price: \$64.00
Desc: x, 315 p., illus., 28 cm.		

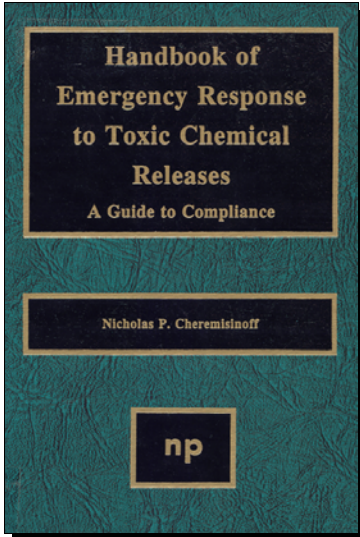


Table of Contents

Section I: Emergency Response Basics and Hazards Awareness
 Section Overview
 First Responder
 Hazardous Materials Technician
 Hazardous Materials Specialist
 Definitions
 How Hazardous Material is Harmful to People
 Protective Clothing vs. Ordinary Clothing
 Selfcare Precautions for Victim Assistance
 Detecting Hazardous Materials Presence
 Definitions
 Isolation/Evacuation
 Incident Command System (ICS)

Section II: Toxic Chemical Release Inventory Report
 Section Overview
 General Information
 How to Determine if Your Facility Must Submit EP A Form R
 Instructions for Completing EPA Form R
 Appendix A-Blank Toxic Chemical Release Inventory Reporting Form R
 Appendix B-Reporting Codes for EPA Form R
 Appendix C-Example of How a Hypothetical Facility Prepared Section 313 Reporting Form R
 Appendix D-Most Common Errors Found on Form R Reports
 Appendix E-Supplier Notification Requirements
 Appendix F-How to Determine Latitude and Longitude from Topographic Maps
 Appendix G-State Designated Section 313 Contacts
 Appendix H-Section 313 EPA Regional Contacts

Section III: Corrective Action Technologies
 Section Overview
 List of Acronyms
 Engineering Overview of the Corrective Action Program
 Engineering Considerations in the Facility Investigation
 Containment Options
 Engineering Considerations for the Corrective Measures Study
 Technology Options for the Treatment of Wastes and Waste Streams
 Pretreatment and Post Treatment Options
 Engineering Considerations for Corrective Measures Implementation

Section IV: Employer's Guide to Community Right-to-Know Reporting
 Section Overview
 Environmental Hazardous Substance List
 List of Extremely Hazardous Substances and Their Threshold Planning Quantities
 Standard Industrial Classification Codes

Section V: Computer Systems for Chemical Emergency Planning
 Section Overview
 Technical Guidance for Hazards Analysis
 Suggested Procedure for Evaluating Emergency Response Planning Software Applications
 Hazards Identification

Subjects

267 .	Hazardous substances -- Safety measures -- Handbooks, manuals, etc.
377 .	Hazardous substances -- Accidents -- Handbooks, manuals, etc.
430 .	Chemical spills -- Reporting -- Handbooks, manuals, etc.

Vulnerability Analysis
Risk Analysis
Emergency Response Planning
Identification of Regulatory Requirements
List of Computer Applications and Systems of Potential Use Under SARA Title III

Index

Reviews - Synopsis - Dust Jacket

Title	Location	Edition / Series / Misc.
62 Handbook of Fillers and Reinforcements for Plastics		<i>Edition:</i>
<i>Author:</i> Katz, Harry S. and John V. Milewski (editors)	<i>Dynix:</i> 13025	<i>Series:</i>
<i>Publish.:</i> Van Nostrand Reinhold Company	<i>Call No.:</i> 668.4 Ha	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0442253729	
<i>- date:</i> ©1978	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1978
<i>Subject:</i> Plastics -- Additives -- Handbooks, manuals, etc.		<i>Price:</i> \$25.00
<i>Desc:</i> viii, 652 p., illus., 26 cm.		



Table of Contents

Foreword, by J. Harry DuBois
Preface

Section I: Introduction

1. Introduction, John V. Milewski and Harry S. Katz

Section II: Guide to the Selection and Usage of Fillers and Reinforcements

2. Principles of Filler Selection and Use, Thomas H. Ferrigno
3. Concise Fundamentals of Fiber Reinforced Composites, Harry S. Katz
4. Packing Concepts in the Utilization of Filler and Reinforcement Combinations, John V. Milewski

Section III: Mineral Fillers

5. Calcium Carbonate, Paul Kummer and George Crowe
6. Kaolin, Hydrous and Anhydrous, Thomas H. Ferrigno and Michael Taranto
7. Feldspar and Nepheline Fillers, Thomas H. Ferrigno
8. Silica Fillers, Extenders, and Reinforcements, James E. Moreland
9. Talc, Joseph A. Radosta and Nikhil C. Trivedi
10. Miscellaneous Mineral Fillers, Benjamin M. Walker

Section IV: Metallic, Conductive, and Magnetic Fillers

11. Metal Fillers, John Delmonte
12. Magnetic Fillers, Zoltan E. Kerekes

Section V: Fire Retardants

13. Antimony Oxide, H. H. Waddell and Irving Touval
14. Alumina Trihydrate, E. A. Woycheshin and I. Sobolev
15. Miscellaneous Flame Retardants, John V. Milewski and Harry S. Katz

Section VI: Organic and Special Purpose Fillers

16. Carbon Black, Errol J. Queen
17. Organic Fillers, Benjamin M. Walker

Section VII: Spherical Fillers

18. Solid Spherical Fillers, Bob Ryan and Barbara Tardy
19. Hollow Spherical Fillers, Bob Ryan and Barbara Tardy

Section VIII: Flake Reinforcements

20. High Aspect Ratio Mica and Other Flake Reinforcements, R. T. Woodham and M. Xanthos

Section IX Ribbon Reinforcements

21. Ribbon Reinforcements, S. T. Gulati

Section X: Short Fiber Reinforcements

22. Wollastonite, L. W. Choate
23. Asbestos, J. W. Axelson
24. Micro and Short Fibers, John V. Milewski
25. Whiskers, John V. Milewski and Harry S. Katz

Section XI: Continuous Filament Reinforcements

26. Fiber Glass, J. Gilbert Mohr
26A. Basalt Fibers, R. V. Subramanian and H. F. Austin
27. High Modulus Organic Fibers, D. L. G. Sturgeon and R. 1. Lacy

Subjects

305 .	Plastics -- Additives -- Handbooks, manuals, etc.
372 .	Fillers (Materials) -- Handbooks, manuals, etc.

- 28. Boron Filaments, Val Krukonis
- 29. Carbon-Graphite Filaments, Harry S. Katz
- 30. Aluminum Oxide and Other Ceramic Filaments, John V. Milewski
- 31. Metal Filaments, John A. Roberts

Section XII

- 32. Procedures, Equipment and Utilization Technology, Benjamin M. Walker

Section XIII

- Appendix: Metric Conversion Tables, Harry S. Katz and Harold E. Brandmaier Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Recent plastic shortages and price escalations have vastly increased the need for higher filler loadings. Yet selecting and using the right fillers and reinforcements is often an arduous task—one that usually requires extensive research and requests to suppliers for further data.

With this volume, you can quickly choose both material and supplier; the book has numerous lists of suppliers and their products, frequent comparisons of competitive materials, and hundreds of tables containing practical and immediately useful data. Its 30 contributing author-specialists draw upon their vast and diversified experience in covering every filler and reinforcement used in plastics.

The Handbook begins by showing how to select and use fillers most efficiently. A concise review of fiber reinforced composites is followed by information on packing combinations of fillers and reinforcements. Thoroughly explained is how synergistic effects can be obtained if the proper combinations of fillers and fibers are made. Detailed descriptions and concrete examples show how the technology can and should be applied to formulating combinations of fibers and spheres to produce economically efficient composites.

Each of the high-volume particulate mineral fillers, such as clay and calcium carbonate, is discussed. Included is detailed and practical information on formulations with every major resin system. The Handbook covers metallic, magnetic and conductive fillers, various fire retardants, and organic and special purpose fillers. Coverage of spherical fillers encompasses all aspects of sphere-filled composites, including glass, ceramic, plastic and metallic coated spheres.

Explanations of flake and ribbon reinforcements are followed by in-depth information on Wollastonite, asbestos and other established short fiber reinforcements, as well as short fibers with tremendous potential as super reinforcements, such as whiskers and microfibers. Comprehensive coverage is given to Kevlar filaments, metal filaments, graphite filaments, boron filaments, and aluminum oxide and other ceramic filaments, including experimental ceramic fibers.

To help you use fillers and reinforcement more effectively, the Handbook explain procedures for blending and mixing the filler/reinforcements with the polymer, and using the proper molding methods and equipment. Included are descriptions available processing machines and equipment specifically designed for highly filled resins.

FOREWARD:

Plastics are playing an increasingly important role in our daily lives—in our homes, businesses, and environment. Until recently, their plentiful supply and low cost had been taken for granted. However, the oil shortage and subsequent materials shortages, plus escalating prices for monomers and polymers, have resulted in a rude awakening to the fact that new initiatives must be exerted in our field.

A more important role must now be accorded to the increased and more efficient use of fillers and reinforcements as a means for stretching the resin supply and lowering the cost of molding compounds.

In my past years of plastics engineering, I have strived to bring to the industry a greater awareness of the proper materials, design, fabrication methods, and economics. I consider this Handbook a giant step forward in that direction, and believe that it will accelerate the proper use of fillers and reinforcements and therefore be beneficial to the plastics industry.

PREFACE:

Until recently, the plastics industry lived in a fool's paradise, where resins were low in cost and plentiful, a condition that was expected to persist. Then came the rude awakening during the oil embargo of 1973, which caused a shortage of raw materials and resins, and initiated a series of escalations in the prices of polymers. This situation led to an increased interest in the use of fillers and reinforcements as a means of reducing the price of molding compounds and extending the supply of resins. The editors were among those who considered it desirable, for many reasons, to make

more extensive use of fillers and reinforcements, and realized that this goal would be aided by a unified compilation of information and data that would enable the rapid choice of a satisfactory filler or reinforcement. At the present time, the choice of a filler or reinforcement usually involves many contacts with materials suppliers, compounders, design engineers, and molders in order to select candidate materials and formulations.

During recent years, while this manuscript was being prepared, there has been a great increase in technical magazine articles related to fillers and reinforcements, and other factors that indicated a growing need for this type of Handbook. We hope that the consensus of opinion will be that this is a timely and useful compilation, which will serve as a standard reference of information for everyone involved in the plastics industry.

The Introduction, Chapter 1, discusses basic reasons for the use of fillers and reinforcements, and also describes the organization of each chapter. There are subjects in this Handbook that have not been treated in depth elsewhere, such as detailed information on new materials including Kevlar Filaments, ribbon reinforcements, microfibers, Basalt Fibers, and flakes, and the theoretical considerations for the selection of mineral fillers and fiber combinations. The editors are thankful to the expert contributors of the chapters in this Handbook and to the many companies and individuals who contributed information and data.

This Handbook is directed toward all individuals involved in the production, design, or specification of a molded end product. This includes design engineers, materials scientists, polymer chemists, compounders, and molders. The editors will welcome comments from every profession so that future editions of the Handbook will provide the information required for more efficient utilization of fillers and reinforcements.

Title	Location	Edition / Series / Misc.
63 Handbook of Fire Retardant Coatings and Fire Testing Services		Edition:
Author:	Dynix: 21899	Series:
Publish.: Technomic Publishing Company, Inc.	Call No.: 667.69 Ha	
- place: Lancaster, PA	ISBN: 0877626901	
- date: ©1990	Shelf Reference	Year: 1990
Subject: Fire resistant materials -- Catalogs		Price: \$50.00
Desc: v, 255 p., illus., 29 cm.		

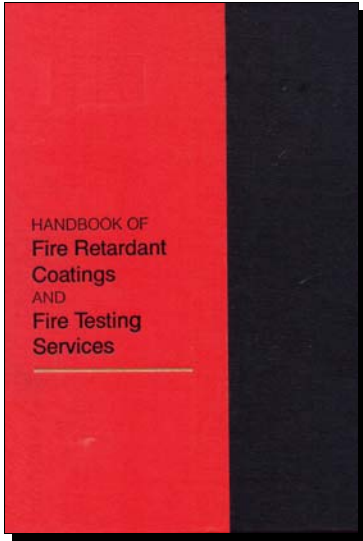


Table of Contents

Foreword

Introduction:

- FIRE RETARDANT COATINGS
- FIRE RETARDANT COATINGS—MARKET AND INDUSTRY PERSPECTIVE
- OVERVIEW OF VARIOUS FIRE TEST METHODS FOR BUILDING MATERIALS
- BUILDING CODES — A PERSPECTIVE

Flame Retardant Coating Companies:

- ALBI MANUFACTURING
- AMERICAN VAMAG COMPANY, INC
- BARNARD PRODUCTS, INC
- CARBOLINE COMPANY
- FIBER MATERIALS, INC
- FIRE RESEARCH LABORATORIES
- FLAME CONTROL COATINGS, INC
- FLAME STOP, INC
- FLAMORT CHEMICAL COMPANY
- GILMAN PAINT
- M. A. BRUDER & SONS
- MARATHON COATINGS TECHNOLOGY LTD
- OCEAN COATINGS, INC
- PPG INDUSTRIES, INC
- PRESERVATIVE PAINT COMPANY
- TECHNICAL COATINGS INC
- THERMAL SCIENCE INCORPORATED
- TRI-CON TECHNOLOGY, INC
- VIMASCO CORPORATION

Fire Testing Laboratories:

- AMBRIC TESTING & ENGINEERING ASSOCIATES, INC
- AMERICAN STANDARDS TESTING BUREAU, INC
- ANDERSON LABORATORIES INCORPORATED
- ARTHUR D. LITTLE, INCORPORATED
- BATTELLE-COLUMBUS DIVISION
- COMMERCIAL TESTING COMPANY
- FACTORY MUTUAL RESEARCH
- FLORIDA INSTITUTE OF TECHNOLOGY
- THE GOVMARK ORGANIZATION INC
- INTER-CITY TESTING AND CONSULTING CORPORATION
- OHIO STATE UNIVERSITY
- OMEGA POINT LABORATORIES, INC
- UNDERWRITERS' LABORATORIES OF CANADA
- UNDERWRITERS' LABORATORIES INC. (U.S.)
- UNIVERSITY OF CALIFORNIA, BERKELEY
- U.S. TESTING CO., INCORPORATED
- VTEC LABORATORIES, INC
- WARNOCK HERSEY PROFESSIONAL SERVICES, LTD
- WEYERHAEUSER FIRE TECHNOLOGY LABORATORY

Subjects

238 .	Coating Technology
263 .	Fire resistant materials -- Catalogs
373 .	Fire resistant materials industry -- United States -- Directories
442 .	Materials testing laboratories -- United States -- Directories
496 .	Paint Technology

Appendix:

UNDERWRITERS' LABORATORIES OF THE UNITED STATES
UNDERWRITERS' LABORATORIES OF CANADA
FEDERAL SPECIFICATION TT-P-26C — PAINT, INTERIOR, WHITE, TINTS AND BLACK, FIRE RETARDANT
AMENDMENT-1: FEDERAL SPECIFICATION TT-P-26C — PAINT, INTERIOR, WHITE, TINTS AND BLACK, FIRE
RETARDANT
ABSTRACT TO FEDERAL SPECIFICATION TT-P-26C — PAINT, INTERIOR, WHITE, TINTS AND BLACK, FIRE
RETARDANT
MILITARY SPECIFICATION DOD-C-24596 — COATING COMPOUNDS, NONFLAMING, FIRE-PROTECTIVE
(METRIC)
MILITARY SPECIFICATION DOD-C-24596(SH) APPENDIX A: DETERMINATION OF THE FLASHOVER
POTENTIAL OF A LINING MATERIAL USING A QUARTER-SCALE ROOM FIRE TEST
PROPOSED MILITARY SPECIFICATION — ENAMEL, GENERAL PURPOSE, NONEMISSIVE, FIRE RETARDANT,
SOFT WHITE, SEMIGLOSS, FORMULA NO. 25A
MILITARY SPECIFICATION MIL-C-46081A — COATING COMPOUND, THERMAL INSULATING (INTUMESCENT)
MILITARY SPECIFICATION MIL-C-81904A(AS) — COATING COMPOUND, THERMAL INSULATION, ABLATIVE
AMENDMENT-3: MILITARY SPECIFICATION MIL-C-81904A(AS) — COATING COMPOUND, THERMAL
INSULATION, ABLATIVE
THIS METHOD TESTS FIRE PROTECTIVE COATINGS
COMPOUNDS, FIRE PROTECTIVE SYSTEMS DOD-C-XXXXX(SH) FOR ELECTRIC CABLES AND CABLE
PENETRATIONS
MILITARY SPECIFICATION MIL-C-81945B(AS) — COATING COMPOUNDS, WEAPON INSULATION,
INTUMESCENT

Index:

APPLICATIONS
FIRE RETARDANT COATINGS BY COMPANY
RESIN BINDER
SPECIFICATION — FEDERAL OR OTHER
TRADENAMES — COMPANY

Reviews - Synopsis - Dust Jacket

FORWARD:

Fire retardant coatings and mastics have been used for many years in various applications to improve fire safety. These coatings are used on various substrates including wood, paper, metal, and plastics. Fire retardant coatings can be water based or solvent based or inorganic or organic and can use different mechanisms of fire retardancy.

The major portion of the fire retardant coatings is sold to the U.S. government — both military and non-military. Other major consuming application areas are: commercial/institutional, industrial and recreational/theme park type applications. Military specifications and building codes are very important for market identification and product approvals.

Fire safety has been receiving an increasing amount of attention in recent years from many disciplines and industries. Smoke detection, heat sensors and detection, sprinklers, early warning systems, hazard analysis, risk analysis and other devices or assessment systems are being promoted by various groups. All of these devices have merit and in many circumstances do improve fire safety. However, in many cases they are promoted as a replacement for other fire safety measures such as the use of fire retardant coatings when they should be promoted as part of a fire safety system. Some building codes are using either/or wording, i.e., either sprinkler or fire retardant coatings. Unfortunately this rarely gives the optimum fire safety scenario.

Fire retardant coatings serve a definite place in improving fire safety. Sprinklers and the various detectors and early warning systems also have a contribution to make to improving fire safety. These two approaches are not incompatible. In most cases they are most effective when they are used together. An educational approach to fire safety and the use of fire retardant coatings is definitely needed.

Technomic Publishing Company has compiled this Handbook designed to provide basic information on the technology, applications and toxicity of fire retardant coatings and on the companies that produce them, as well as the various services provided by Fire Testing Laboratories.

The Editor believes that this book will fill a void in the fire safety field and provide valuable information to users of fire retardant coatings, fire safety engineers, architects, product specific code consultants and others who have fire safety responsibilities. It is hoped that any additional information not included in this publication will be sent to the Editor. And finally we invite your comments and suggestions, so that future editions will be even more useful to those involved with fire safety.

INTRODUCTION:

Fire retardant coatings are specially formulated coatings having the unique ability to delay ignition and reduce the spread of flame along a surface. The concept of a fire retardant coating is not new, in fact, the first Albi patent for a fire retardant coating was issued 40 years ago in 1948.

In any discussion concerning fires and fire protection it is useful to establish some definitions. Terms such as "fireproof," "fire resistant," "fire retardant," "fire inert," and "fire endurance" are frequently misused. A glossary of commonly used terms associated with fire protection can be found at the end of this paper. The most recent ASTM definition of a fire retardant coating is: "A fluid applied surface covering on a combustible material which delays ignition and reduces flame spread when the covering is exposed to flame impingement." A simpler and perhaps more direct definition is used by the British in their standard BS4422: "Flame retardant — a substance or material applied to a combustible material to decrease its tendency to propagate flame across its surface."

The key point made by both definitions is that a fire (or flame) retardant coating reduces the rate of flame spread across the surface of a combustible material.

It is important not to confuse the function of a fire retardant coating with that of a fire resistant coating. A fire resistant coating (historically referred to as "fire-proofing") provides protection from a fire and extends the time that a structure can survive exposure to a fire.

Just as the functions of these two types of coatings are different, so are the standard test methods for evaluating the performance of individual coatings.

In the United States fire resistant (or "fireproofing") coatings are evaluated by the test methods of ASTM E119. The objective of an E119 test is to determine the period of resistance to a standard exposure before the first critical point in behavior is observed. The standards of E119 apply to building columns, beams, walls, ceilings, and floors. The fire endurance, or period of resistance before failure, is determined by exposure to a standard fire (time-temperature curve). Failure can occur by means of the tested structure reaching a critical temperature, failing under load, or losing its structural integrity and permitting hot gases to escape.

This paper will be limited to a discussion of the properties of fire retardant coatings. The fire resistant or "fireproofing" type of coatings merit a separate discussion.

MEASURING THE PERFORMANCE OF FIRE RETARDANT COATINGS

The ability of a fire retardant coating to slow the rate of flame spread is also measured by a standardized test. In the United States the most frequently used test is the Steiner Tunnel Test. This test is also identified as ASTM E 84, NFPA 255, and UL 723. The test was developed by A. I. Steiner at Underwriters Laboratories, Inc. (ULI) after World War I. The method was recognized by ASTM and NFPA in 1958. In this test a 20 inch by 25 foot specimen is placed on a ledge at the top of the tunnel and the cover is set in place. A double gas burner at the front of the tunnel provides a controlled heat source. The tunnel is calibrated using inorganic reinforced cement board and red oak. The cement board is assigned a flame spread rating of zero and red oak 100. Smoke development is also measured during this test.

The E 84 test procedure requires that coatings intended for application to combustible surfaces be tested when applied to that specific surface. The one exception being that coatings intended for application to any wood surface be tested when applied to Douglas fir. Coatings intended for application to noncombustible surfaces are to be tested when applied to 1/4 inch inorganic reinforced cement board.

There are a number of independent testing agencies throughout the United States that are equipped to conduct the E 84 test. The formal test report or listing (if published in a directory) should, as a minimum, contain the information shown in the following examples. These examples were taken from the Underwriters Laboratory Building Materials Directory. Some information has been deleted in order to avoid identifying the specific product or manufacturer.

Title	Location	Edition / Series / Misc.
810 Handbook of Industrial Surfactants Author: Ash, Michael and Irene Ash (compilers) Publish.: Synapse Information Resources, Inc. - place: Endicott, NY - date: ©2000 Subject: Surface active agents Desc: xiii, 2129 p., 28 cm.	Dynix: 101997 Call No.: 620 As ISBN: 1890595217 Shelf Reference	Edition: 3rd edition Series: Year: 2000 Price: \$395.00

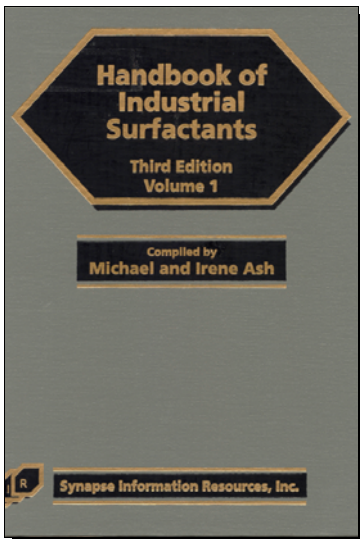


Table of Contents

Volume 1

- Preface
- Abbreviations
- Part 1 - Trade Name Reference
- Part 2 - Discontinued Trade Name Reference

Volume 2

- Preface
- Abbreviations
- Part 3 - Chemical Component Cross-Reference
- Part 4 - Functional / Application Index
- Part 5 - Manufacturers Directory
- Appendix 1 - CAS Number Index
- Appendix 2 - EINECS / ELINCS Number Index
- Appendix 3 - Ionic Classification Index
- Appendix 4 - HLB Classification Index
- Glossary

Subjects

332 . Surface active agents

Reviews - Synopsis - Dust Jacket

This comprehensive international two-volume reference is the new standard guide in this field. The third edition is extensively revised, with more than 21,000 trade names and generic chemical products that are used as surfactants throughout the chemical and related industries. Information was collected from more than 1200 worldwide manufacturers, distributors, trade magazines, reference books, and chemical databases.

The Third Edition is completely updated from the 1997 printed edition. This reference is the standard source for anyone involved in the formulation, research, marketing, or procurement of surfactant materials. The 2002 Electronic Version has been extensively updated. This reference is the standard source for anyone involved in the formulation, research, marketing, or procurement of surfactant materials.

Target information on components by:
 Trade Name • Chemical Name • Synonym • Function • Application • CAS Number • EINECS Number • Manufacturer • HLB Classification • Ionic Classification

Find Surfactants that function as:
 Antifoamers • Defoamers • Detergents • Dispersants • Emulsifiers • Foaming agents • Foam boosters • Foam stabilizers • Solubilizers • Surfactant intermediates • Surfactant raw materials • Wetting agents

For these Industries:
 Adhesives • Agricultural/Soil remediation • Asphalt • Cement • Construction • Cosmetics/Personal Care • Fire extinguishing • Food/Beverage • Gasoline/Fuel additives • Household/Industrial/Institutional cleaners • Inks • Leather/Fur processing • Metalworking fluids • Oil spill control • Oilfield/Refining chemicals • Ore flotation/Mining • Paints/Coatings • Paper/Pulp • Pharmaceuticals • Photography • Plastics/Elastomers • Polishes • Polyurethane foam • Slurries • Textiles • Water/Waste treatment

More Features of Book and Software Versions

More than 25,000 trade name products
 More than 4,000 generic products with 22,000 fully cross-referenced synonyms (hyperlinked in software)
 HLB Classification Index

Ionic Classification Index

More than 19,000 Functional/Application Categories in a detailed index format
CAS, EINECS/ELINCS number and Chemical Formula index
More than 2,900 International Manufacturers
Book Version in two volumes has more than 2000 oversized pages
Software Version:

Full-text Search with boolean operators

19 browseable keyword indexes

Hyperlinks enable instant access/previews of other reference topics

Web and Email access to Chemical Manufacturers

Click and Go Table of Contents: Left Pane Explorer-like icons enable you to instantly go to any section of this Title or any other installed Synapse Chemlib products

CONTENTS:

Trade Name Reference

This section provides an alphabetical listing of more than 25,000 trade name chemicals and materials that are used as surfactants. Each entry includes the manufacturer's name; chemical/material description; its detailed functions and applications in all aspects of industry; physical properties, such as HLB, ionic classification, form, molecular weight, density, solubility, boiling point, cloud point, flash point, pH, freezing point, activity; toxicology, storage, precautions, etc.

Software features: Full-text Search with Boolean operator support

Keyword Indexes: Comprehensive Index, Trade Name X-Ref, Generic Chemical X-Ref, Manufacturers X-Ref, CAS X-Ref, EINECS/ELINCS X-Ref, Functional/Applications X-Ref., Environmental X-Ref., Toxicity and Precautions X-Ref, HLB X-Ref, Ionic X-Ref

Hyperlinking: Trade name manufacturers to Manufacturers Directory and Generic chemicals to Generic Products, Trade Name Cross-Reference

Generic Products, Trade Name Cross-Reference

This section covers more than 4,000 chemicals and materials that are contained in the trade name products profiled in Part I or generic chemicals that are not linked to trade names but are used as surfactants. Each entry contains information including the following: CAS, EINECS/ELINCS, and UN/DOT numbers, classification, definition, synonyms, formulas, properties, toxicology, precautions, storage, uses, use level, regulatory details, manufacturers and distributors. Chemical/material synonyms are cross-referenced back to the main entry. Entries are followed by a listing of the trade name products that are either equivalent to the entry or contain it as one or more of its ingredients. Manufacturing and distribution sources for the generic chemical are also included.

Software features: Full-text Search with Boolean operator support

Keyword Indexes: Comprehensive Index, Trade Name X-Ref, Generic Chemical X-Ref, Manufacturers X-Ref, CAS X-Ref, EINECS/ELINCS X-Ref, Functional/Applications X-Ref., Environmental X-Ref., Toxicity and Precautions X-Ref., Molecular Formula Dir., HLB X-Ref, Ionic X-Ref

Hyperlinking: Trade names to Trade Name Reference generic manufacturers to Manufacturers Directory, all cross-references (synonyms) to main entries

Function/Application Index

is a powerful tool for locating chemicals based on functions and industrial application areas. By searching for functional key words such as defoamer, emulsifier, dispersant, wetting agent or application key words, such as oil field, coatings, water treatment, .etc, the user is directed to the trade names and/or chemicals that have that specific functional/application attribute.

Software features: Full-text Search with Boolean operator support

Hyperlinking: Trade names to Trade Name Reference, Generics to Generic Products, Trade Name Cross-Reference

Manufacturers Directory

contains detailed contact information for the more than 2,900 manufacturers of the trade name products and generic chemicals that are referenced in this source book. Wherever possible, telephone, telefax, toll-free 800 numbers, Email and Internet addresses, and complete mailing addresses are included for each manufacturer. Software features: Full-text Search with Boolean operator support

Keyword Indexes: Comprehensive Index, Manufacturers Dir., Manufacturers X-Ref., MFG Web&Email Directory

Hyperlinking: All cross-references (alternate names) to main entries, Manufacturer Web sites, Manufacturer Email

CAS Registry Number to Synonym Index

EINECS/ELINCS Registry Number to Synonym Index

Ionic Classification Index

HLB Classification Index

Glossary

Software features: Full-text Search with Boolean operator support

Keyword Indexes: Comprehensive Index, CAS-to-Chemicals Dir., Chemicals-to-CAS Dir., EINECS/ELINCS-to-Chemicals Dir., Chemicals-to-EINECS/ELINCS Dir. and more!

Hyperlinking: Trade names to Trade Name Reference, Generics to Generic Products, Trade Name Cross-Reference

PREFACE:

The surfactant industry is complex because of the multitude of markets served, the diversity of product types, and the dynamic transfer of products from manufacturer to manufacturer as a result of mergers and acquisitions. This two-volume reference set, in its third edition, serves both to integrate information on surfactant chemicals and materials that are currently available throughout the world and to document surfactant products that are no longer sold but still need to be identified. This reference contains detailed profiles on more than 26,000 trade name surfactants, 4000 generic chemicals that function as surfactants or are blended into trade name surfactants, 24,000 index entries describing how and where these products are used, and full contact information on more than 1900 manufacturers and distributors.

Surfactants are versatile materials that function as: antifoamers, defoamers, detergents, dispersants, emulsifiers, foam builders, foam control agents, foam stabilizers, solubilizers, surfactant intermediates, surfactant raw materials, and wetting agents. The application areas for surfactant products cover a broad spectrum from agricultural chemicals, paints/coatings, paper, plastics/elastomers, and textiles to consumer-based products such as household detergents and cleaners, cosmetics/personal care, pharmaceuticals, and foods.

The global surfactant market is valued at more than \$12 billion a year. Suppliers are challenged to maintain their position in the marketplace while facing the pressures of globalization, demand for specialty products, price increases, and environmental constraints. Availability of a variety of surfactant materials from many different sources have added to the complexity of the research and selection process. By providing information gleaned from thousands of sources, this comprehensive reference is essential to all professionals involved in the surfactants field.

This third edition has been extensively revised and contains more than 12,000 trade name products that are new or completely updated. There are now more than 10,000 generic chemical synonyms that are cross-referenced to the main chemical entry. For the first time, there is a detailed functional/application index for these products.

This reference is divided into the following sections:

Part I—Trade Name Reference provides an alphabetical listing of more than 22,000 trade name chemicals and materials that function as surfactants or are used to manufacture surfactants. Entries include: manufacturer's name; chemical description; detailed functions and applications in all aspects of industry; physical properties, such as form, molecular weight, density, solubility, boiling point, cloud point, flash point, pH, freezing point, HLB number, Draves wetting, Ross Miles foam height, activity; ionic nature, toxicology, environmental data, storage requirements, precautions, and hazard ratings. This information is provided by the manufacturer or derived from other reference sources. Not all entries contain information for every category as product descriptions are dependent, in many cases, on the literature that the individual manufacturers provide.

Part II—Discontinued Trade Name Reference provides an alphabetical listing of more than 3600 trade name products that have been discontinued by a manufacturer or are associated with a manufacturer that is no longer in business. This section is important for anyone who is trying to identify the composition of a surfactant product for storage/handling concerns, or trying to find a substitute for this product to be used in a required application.

Part III—Chemical Component Cross-Reference covers more than 4000 chemicals and materials that are contained in the trade name products profiled in Part I or are generic chemicals and materials that are not linked to trade names but are used for surfactant applications. Each entry contains the following: CAS (Chemical Abstract Service), EINECS/ELINCS (European Inventory of Existing Commercial Chemical Substances/European List of Notified Chemical Substances), and UN/DOT reference numbers, classification, definition, ionic nature, chemical synonyms, empirical and molecular formulas, properties, toxicology, precautions, storage, uses, use level, regulatory details, manufacturers and distributors. All chemical/material synonyms are cross-referenced back to the main entry. These entries are followed by a listing of the trade name products that are either equivalent to the monograph entry or contain it as one or more of its blended ingredients.

Part IV—Functional/Application Index is a powerful tool for locating the trade names and chemicals based on their function and application. By searching for key functional words such as defoamer, emulsifier, or solubilizer in a specific application area, such as food, de-inking, paint, agriculture, etc., the user is directed to the trade names and/or chemicals with those performance attributes in a specified application. The generic component names are distinguished from the trade names by italic type.

Part V—Manufacturers Directory contains detailed contact information for more than 1900 worldwide manufacturers and their branches of these trade names and chemicals that are referenced in this handbook. Wherever possible, telephone, fax, toll-free 800/888 numbers, e-mail and Internet addresses, and complete mailing addresses are included for each manufacturer.

Appendix I—CAS Number Index contains CAS number entries followed by a listing of their trade name product and chemical equivalents in alphabetical order. The chemical name is in boldfaced type.

Appendix II—EINECS/ELINCS Number Index contains EINECS/ELINCS number entries followed by a listing of its trade name product and generic chemical equivalents in alphabetical order. The chemical name is in boldfaced type.

Appendix III—Ionic Classification Index orders the trade name and generic chemicals based on their principal solubilizing group and consists of four major classes: anionic, cationic, nonionic, amphoteric, and their synergistic blends.

Appendix IV—HLB Classification index orders the trade name and generic chemicals based on this scale. It can be used as an indicator for surfactant selection based on functional requirements, e.g., a value of 3-6 for water-in-oil emulsifiers, 7-9 for wetting agents, 8-15 for oil-in-water emulsifiers, 12-15 for detergents, and 15-18 for solubilizers and hydrotropes. However, products with similar HLB values may still exhibit disparate performance because of differences in chemical structure or physical chemistry. These values can be used as one of many criteria for selection but not as an unequivocal indicator.

Glossary contains definitions of terminology associated with surfactant chemicals and materials.

We are confident that those involved in any aspect of surfactants, from identifying, formulating, purchasing, and/or researching, will find this two-volume set to be an important addition to their reference library. We are also pleased to provide this information as an electronic product, Industrial Surfactants Electronic Handbook— 2000 Edition.

This reference is the culmination of many years of research, investigation of product sources acquired through personal contacts and correspondences with major chemical manufacturers worldwide, as well as toxicological databases, chemical reference books, trade magazines and journals.

Title	Location	Edition / Series / Misc.
64 Handbook of Organic Coatings: A Comprehensive Guide for the Coatings Industry		<i>Edition:</i>
<i>Author:</i> Seymour, Raymond Benedict, 1912- and Herman F. Mark	<i>Dynix:</i> 23956	<i>Series:</i>
<i>Publish.:</i> Elsevier Science Publishing Company, Inc.	<i>Call No.:</i> 667.92 Se	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0444015191	<i>Year:</i> 1990
<i>- date:</i> ©1990	<i>Shelf:</i> Adult Non-Fiction	<i>Price:</i> \$25.00
<i>Subject:</i> Plastic coatings -- Handbooks, manuals, etc.		
<i>Desc:</i> ix, 350 p., illus., 24 cm.		

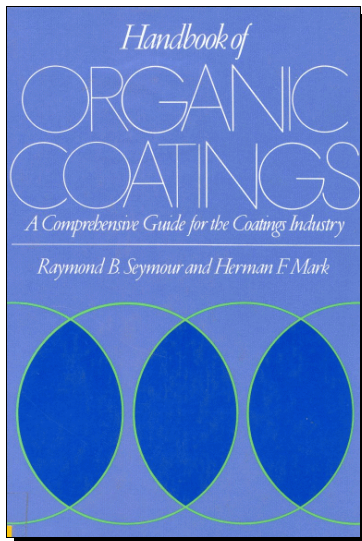


Table of Contents

- Preface
- 1. History of Paints
- 2. Film Formation Fundamentals
- 3. An Introduction to Polymer Science
- 4. Paint Production Techniques
- 5. Application Techniques
- 6. Pigments
- 7. Extenders and Other Additives
- 8. Solvents, Plasticizers, and Coalescent Agents
- 9. Oleoresinous Paints
- 10. Acrylic Polymers
- 11. Alkyds
- 12. Amino Resins
- 13. Asphalts, Bitumens, Coal Tar, and Petroleum Resins
- 14. Cellulosics
- 15. Engineering Resins
- 16. Epoxies
- 17. Fluorocarbons
- 18. Phenolics
- 19. Polyesters
- 20. Polyolefins
- 21. Polyvinyl Acetate
- 22. Rubber Resins
- 23. Silicones and Phosphazenes
- 24. Styrene Polymers
- 25. Urethane Coatings
- 26. Vinyl Chloride Polymers
- 27. Testing of Coatings
- 28. Corrosion Resistant Coatings
- 29. Toxicity
- 30. The Modern Coatings Industry

- Appendix A - Pigments
- Appendix B - Structural Formulas for Resins
- Appendix C - Conversion Tables

Subjects

298 . Plastic coatings -- Handbooks, manuals, etc.

Reviews - Synopsis - Dust Jacket

PREFACE

Too few books are available on coatings science which is a major consumer of synthetic polymers. Some of the available books emphasize practical applications and others emphasize polymer science theories.

We have not neglected either of these approaches in our self sufficient handbook but have placed most of our emphasis on readily understandable concepts which should be useful to practitioners in all phases of the coatings industry.

We have not used the metric system but have supplied a table in Appendix C for converting the English system to the metric system. For reasons of simplicity, we have avoided the use of structural formulas in the text but have identified most materials by simple chemical formulas and shown many structural formulas in Appendix B. We have also supplied a glossary, a list of pigments in Appendix A and a list of pertinent references at the end of each chapter.

It is our hope that the reader will find this handbook to be useful and that this and other contributions will help to continue

to upgrade coating science and technology.

Title	Location	Edition / Series / Misc.
811 Handbook of Paint and Coating Raw Materials Author: Ash, Michael and Irene Ash (editors) Publish.: Gower Publishing Limited - place: Aldershot, [Hampshire], UK - date: ©1996 Subject: Paint -- Handbooks, manuals, etc. Desc: (v.1: xvi, 1000 p.); (v.2: xvi, 589 p.), 24 cm.	Dynix: 100255 Call No.: 667.9 Ha ISBN: 0566077876 Shelf Reference	Edition: Series: Year: 1996 Price: \$575.00

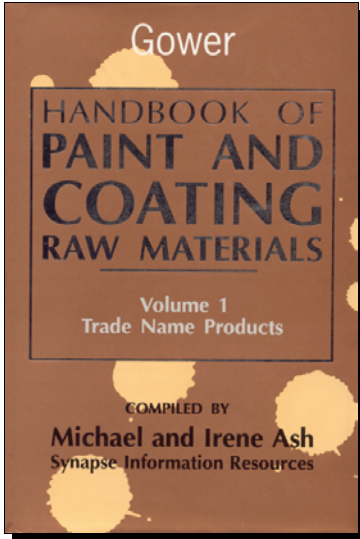


Table of Contents

- Preface
- Abbreviations
- Part I: TRADE NAME REFERENCE
- Part II: TRADE NAME FUNCTIONAL CROSS-REFERENCE
- Accelerators
- Adhesion Promoters -- Bonding Agents
- Antiblocking Agents
- Anticaking Agents
- Antifloating Agents
- Antiflooding Agents
- Antifreeze Agents
- Antimicrobials -- Bactericides -- Fungicides -- Mildewcides
- Antioxidants
- Antisagging Agents
- Antisettling Agents
- Antiskinning Agents
- Antislip Agents
- Antistats
- Antistripping Agents
- Binders
- Carriers -- Vehicles
- Catalysts
- Coalescing Agents
- Corrosion Inhibitors
- Coupling Agents
- Crosslinking Agents
- Curing Agents
- Deaerators
- Defoamers -- Antifoams
- Detergents
- Diluents
- Dispersants
- Driers
- Emulsifiers
- Fillers -- Extenders
- Flame Retardants -- Fire Retardants
- Flattening Agents -- Matte Agents
- Flow Control Agents
- Gloss Aids
- Grinding Aids
- Hardeners
- Intermediates
- Leveling Agents
- Lubricants
- Mar Resistance Aids -- Marproofing Agents
- Modifiers
- Opacifiers
- Pigments -- Colorants -- Dyes
- Plasticizers

Subjects

279 .	Paint -- Handbooks, manuals, etc.
525 .	Coatings -- Handbooks, manuals, etc.

Volumes

Vol 1: Trade Name Products
Vol 2: Chemical Products

Preservatives
 Processing Aids
 Resin Raw Materials
 Slip Agents
 Solubilizers
 Solvents
 Stabilizers
 Surfactants
 Suspending Agents
 Tackifiers
 Thickeners -- Bodying Agents -- Gelling Agents -- Rheology Control Agents -- Viscosity Modifiers
 UV Absorbers -- UV Stabilizers
 Water Repellents
 Waxes
 Wetting Agents

Part III: MANUFACTURERS DIRECTORY
 Appendices
 CAS Number to Trade Name Cross-Reference
 EINECS Number to Trade Name Cross-Reference
 Glossary

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The two volumes of this reference work describe more than 11,000 trade name and generic chemical ingredients that are used in the formulation of paint and coating products for industry and commerce. Extensive information, gathered from more than 1,300 manufacturers, distributors, trade and research journals world-wide, is presented for each product profiled.

The \$13 billion paints and coatings market is experiencing profound changes that significantly impact the composition of paint formulations. Mounting environmental concerns have created a race to find material alternatives that reduce volatile organic compound (VOC) content and hazardous air pollutants (HAPs).

With a world-wide focus on alternative materials, it is essential for those associated with this industry to have immediate access to current, accurate and comprehensive information on these ingredients so that material selection for end formulations can be based on informed decision making. This reference provides such a resource.

The Handbook is published in two volumes. The first contains 9,000 alphabetical entries of trade name paint and coatings raw materials, followed by an extensive Trade Name Functional Cross-Reference. The second is organized around chemical components, with a Cross-Reference of 2,000 paint and coating chemicals followed by a Chemical Product Functional Cross-Reference. Each volume additionally provides a Manufacturers' Directory and Glossary of Terms, with Appendices cross-referencing CAS Number and EINECS Numbers to Trade Names (in Volume 1) and Chemical Product (in Volume 2).

PREFACE

The two volumes of the Handbook of Paint and Coating Raw Materials reference work describe more than 11,000 trade name and generic chemical ingredients that are used in the formulation of paint and coating products for industry and commerce. Extensive information, gathered from more than 1300 worldwide manufacturers, distributors, trade and research journals, is presented for each product profiled in this publication.

The \$13 billion paints and coatings market is experiencing profound changes that significantly impact the composition of paint formulations. Mounting environmental concerns have created a race to find material alternatives that reduce VOC (volatile organic compound) content and HAP's (hazardous air pollutants). Thus, with a worldwide focus on alternative materials for the development of efficient coatings, it is essential for those associated with this industry to have immediate access to current, accurate and comprehensive information on these ingredients so that material selection for end formulations can be based on informed decision making. This reference provides such a resource.

This volume covers Trade Name Products and is divided into:

PART I - TRADE NAME REFERENCE contains approximately 9000 alphabetical entries of trade name paint and coating raw materials. Each entry references its manufacturer, chemical composition, associated CAS (Chemical Abstract Service) and EINECS (European Inventory of Existing Commercial Chemical Substances) identifying numbers, general

properties, applications and functions, toxicology, and compliance and regulatory information as provided by the manufacturer and other sources.

PART II -TRADE NAME FUNCTIONAL CROSS-REFERENCE contains an alphabetical listing of major coating ingredient functional categories. More than 70 categories are included, e.g., carriers/vehicles; coalescing agents; defoamers; diluents; fillers and extenders; flame/fire retardants, flattening/matte agents; flow control agents; gloss aids; mar resistance aids; pigments and dyes; plasticizers; preservatives; slip agents; solvents; stabilizers; suspending agents; tackifiers; thickeners; UV absorbers/stabilizers; water repellents; wetting agents, etc. Each functional category entry is followed by an alphabetical listing of the trade name products that possess that functional attribute.

PART III -MANUFACTURERS DIRECTORY contains detailed contact information for the manufacturers of the trade name products and generic chemicals that are referenced in the two volumes of this handbook. Wherever possible, telephone, telefax, and telex numbers, toll-free 800 numbers, and complete mailing addresses are included for each manufacturer.

The Appendices contain the following cross-references:

CAS Number to Trade Name Cross-Reference orders many trade names found in Part I by identifying CAS numbers; it should be noted that trade names contain more than one chemical component and the associated CAS numbers in this section refer to each trade name product's primary chemical component.

EINECS Number to Trade Name Cross-Reference orders many trade names found in Part I by identifying EINECS numbers that refer to each trade name product's primary chemical component.

The Glossary contains important terms associated with paint and coating technology.

Title	Location	Edition / Series / Misc.
65 Handbook of Paint Raw Materials <i>Author:</i> Flick, Ernest W. <i>Publish.:</i> Noyes Publications <i>- place:</i> Park Ridge, NJ <i>- date:</i> ©1989 <i>Subject:</i> Paint materials <i>Desc:</i> xxvii, 998 p., 25 cm.	<i>Dynix:</i> 07912 <i>Call No.:</i> 667.6 FI <i>ISBN:</i> 0815511841 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 1989 <i>Price:</i> \$25.00

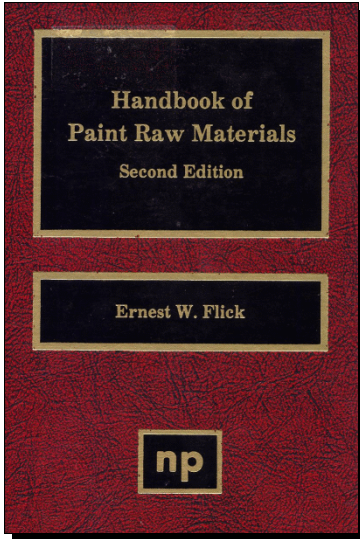


Table of Contents

- Section 1: Antifoams, Defoamers, Dispersants, Surfactants
- Section 2: Driers and Antiskinning Agents
- Section 3: Extenders, Fillers, Pigments
- Section 4: Flame/Fire Retardants
- Section 5: Flatting Agents
- Section 6: Latex Emulsions
- Section 7: Oils
- Section 8: Preservatives, Bactericides, Fungicides
- Section 9: Resins
- Section 10: Rheological/Viscosity Control Agents
- Section 11: Silicone Additives
- Section 12: Titanium Dioxides
- Section 13: Miscellaneous
- Suppliers' Addresses
- Trade Name Index

Reviews - Synopsis - Dust Jacket

PREFACE:

This handbook contains descriptions of nearly 4,000 raw materials which are currently available to the paint industry. It will be of value to technical and managerial personnel in paint manufacturing companies and companies which supply raw materials or services to these companies. This book will be useful to both those with extensive experience as well as those new in the field.

The data included represent selections from manufacturers' descriptions made at no cost to, nor influence from, the makers or distributors of the materials. Only the most recent information has been included. Lead-based chemicals and color pigments are excluded. It is believed that all of the products listed here are currently available, which will be of utmost interest to readers concerned with product discontinuances.

The raw materials have been divided into the following 13 sections:

1. Antifoams, Defoamers, Dispersants, Surfactants (258)
2. Driers and Antiskinning Agents (194)
3. Extenders, Fillers, Pigments (420)
4. Flame/Fire Retardants (33)
5. Flatting Agents (28)
6. Latex Emulsions (102)
7. Oils (92)
8. Preservatives, Bactericides, Fungicides (80)
9. Resins (2,064)
10. Rheological/Viscosity Control Agents (125)
11. Silicone Additives (51)
12. Titanium Dioxides (33)
13. Miscellaneous (469)

The numbers in parentheses indicate the number of products to be found in each section. When searching for a particular type of product, the reader is advised to consult each section which might be pertinent.

In addition to the sections listed above, a list of Suppliers' Addresses and a Trade Name Index are included.

The table of contents is organized in such a way as to serve as a subject index to the book. Companies are presented

Subjects

283 . Paint materials

alphabetically in each section and appropriate products are listed for each company. The book lists the following product information, as available, in the manufacturer's own words:

- (1) Company name and product category.
- (2) Trade name and product numbers.
- (3) Product description: a description of the product, its properties, and possible applications, as presented by the supplier.

Title	Location	Edition / Series / Misc.
<p>919 Handbook of Plastics, Elastomers and Composites</p> <p>Author: Harper, Charles A. (editor-in-chief)</p> <p>Publish.: McGraw-Hill Book Company</p> <p>- place: New York, NY</p> <p>- date: ©2002</p> <p>Subject: Plastics -- Handbooks, manuals, etc.</p> <p>Desc: xii, 884 p., illus., 24 cm.</p>	<p>Dynix: 105711</p> <p>Call No.: 668.4 Ha</p> <p>ISBN: 0071384766</p> <p>Shelf Adult Non-Fiction</p>	<p>Edition: 4th edition</p> <p>Series: McGraw-Hill Handbooks</p> <p>Year: 2002</p> <p>Price: \$103.50</p>

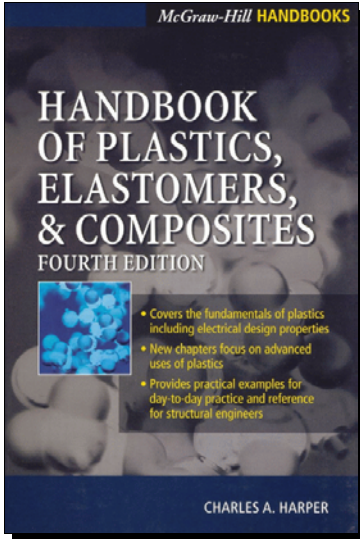


Table of Contents

Preface
Contributors
About the Editor

Chapter 1: Thermoplastics
1.1 Introduction
1.2 Polymer Structure and Synthesis
1.3 Solid Properties of Polymers
1.4 Mechanical Properties
1.5 General Classes of Polymers
1.6 Processing of Thermoplastics
References

Chapter 2: Thermosets, Reinforced Plastics, and Composites
2.1 Resins
2.2 Thermosetting Resin Family
2.3 Liquid Resin Processes
2.4 Laminates
2.5 Molding Compounds
References

Chapter 3: Elastomeric Materials and Processes
3.1 Introduction
3.2 Thermoplastic Elastomers
3.3 Polyurethane Thermoplastic Elastomers (TPUs)
3.4 Polyamides
3.5 Melt Processable Rubber(MPR)
3.6 Thermoplastic Vulcanizate(TPV)
3.7 Synthetic Rubbers (SRs)
3.8 Natural Rubber(NR)
3.9 Conclusion
References

Chapter 4: Composite Materials and Processes
4.1 Introduction
4.2 Material Systems
4.3 Ply Orientations, Symmetry, and Balance
4.4 Quasi-isotropic Laminate
4.5 Analysis
4.6 Composite Failure and Design Allowables
4.7 Composite Fabrication Techniques
4.8 Analysis
4.9 Design of Composite Structures
4.10 Damage Tolerance
4.11 Composite Repairs
4.12 Adhesive Bonding and Mechanical Fastening
4.13 Environmental Effects
4.14 Composite Testing
4.15 Safety Issues with Composite Materials
References

Subjects

309 .	Plastics -- Handbooks, manuals, etc.
557 .	Elastomers -- Handbooks, manuals, etc

Chapter 5: Metal Matrix Composites, Ceramic Matrix Composites, Carbon Matrix Composites, and Thermally Conductive Polymer Matrix Composites

- 5.1 Introduction
- 5.2 Comparative Properties of Composite Materials
- 5.3 Overview of Mechanical and Physical Properties
- 5.4 Manufacturing Considerations
- 5.5 Polymer Matrix Composites
- 5.6 Metal Matrix Composites
- 5.7 Carbon Matrix Composites
- 5.8 Ceramic Matrix Composites
- 5.9 Acknowledgements
- References

Chapter 6: Plastics in Coatings and Finishes

- 6.1 Introduction
- 6.2 Environment and Safety
- 6.3 Surface Preparation
- 6.4 Coatings and Finishes Selection
- 6.5 Coating and Finishing Materials
- 6.6 Application Methods
- 6.7 Curing
- 6.8 Summary
- References

Chapter 7: Plastics and Elastomers in Adhesives

- 7.1 Introduction to Adhesives
- 7.2 Design and Testing of Adhesive Joints
- 7.3 Surface Preparation
- 7.4 Types of Adhesives
- 7.5 Selecting an Adhesive
- 7.6 Effect of the Environment
- 7.7 Processing and Quality Control of Adhesive Joints
- References

Chapter 8: Plastics Joining

- 8.1 Introduction
- 8.2 General Types of Plastic Materials
- 8.3 Types of Plastic Joining Processes
- 8.4 Direct Heat Welding
- 8.5 Indirect Heating Methods
- 8.6 Friction Welding
- 8.7 Solvent Cementing
- 8.8 Methods of Mechanical Joining
- 8.9 Recommended Assembly Processes for Common Plastics
- 8.10 More Information on Joining Plastics
- References

Chapter 9: Design and Processing of Plastic Parts

- 9.1 Introduction
- 9.2 Design Procedure
- 9.3 Prototyping
- 9.4 Processes for Producing Plastic Parts
- 9.5 Assembly and Machining Guidelines
- 9.6 Postmolding Operations
- 9.7 Process-Related Design Considerations
- 9.8 Mold Construction and Fabrication
- 9.9 Summary

Chapter 10: Automotive Plastics and Elastomer Applications

- 10.1 Introduction
- 10.2 Plastics
- 10.3 Elastomers
- 10.4 Disclaimer

References
Trademarks

Chapter 11: Plastics in Packaging
11.1 Packaging Plastics
11.2 Properties of Packaging Plastics
11.3 Mass Transfer in Polymeric Packaging Systems
References

Chapter 12: Plastics Recycling
12.1 Introduction
12.2 Recycling Processes
12.3 Polyethylene Terephthalate Recycling
12.4 High-Density Polyethylene Recycling
12.5 Recycling of Low-Density Polyethylene and Linear Low-Density Polyethylene
12.6 Recycling of Polypropylene
12.7 Recycling of Polystyrene
12.8 Recycling of Polyvinyl Chloride
12.9 Recycling of Nylon and Carpet
12.10 Recycling of Polyurethane
12.11 Recycling of Polycarbonate
12.12 Recycling of Acrylonitrile/Butadiene/Styrene Copolymers
12.13 Recycling of Other Plastics
12.14 Commingled Plastics and Plastic Lumber
12.15 Recycling Plastics from Computers and Electronics
12.16 Recycling Automotive Plastics
12.17 Design Issues
12.18 Legislation
References

Appendix A: Glossary of Terms and Definitions
Appendix B: Some Common Abbreviations Used in the Plastics Industry
Appendix C: Important Properties for Designing with Plastics
Notes for Appendix C
Names and Addresses of Suppliers Listed in Appendix C
Appendix D: Electrical Properties of Resins and Compounds
Appendix E: Sources of Specifications and Standards for Plastics and Composites
E.1 Names and Addresses of Organizational Sources of Specifications and Standards for Plastics and Composites
References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:
Select the Right Plastics For Your Design in Seconds!

Here in one definitive volume are the latest information and guidelines on plastics, elastomers, and composites -- for all types of designs, including molded and thermoformed products, protective and decorative coatings, and more.

The Fourth Edition offers new chapters on the advanced use of plastics in automotive and packaging designs and the recycling of plastic composites.

Whether you're a mechanical, electrical, materials, or chemical engineer, this powerful reference will help you to design better and faster -- and take advantage of new stronger and cheaper materials.

Featuring a comprehensive treatment of the chemical, mechanical, and electrical properties of plastics, elastomers, and composites, the Handbook gives you state-of-the-art coverage of:

- . Plastic compositions and optimizations of plastic product design
- . Advances in thermoplastic elastomers
- . New developments in applying and processing advanced composition materials
- . Plastics and elastomers for high-volume, high-performance automotive and packaging applications
- . Important factors in recycling of plastics
- . And much more

PREFACE:

Welcome to this new, heavily revised and updated Fourth Edition of "Handbook of Plastics, Elastomers, and Composites". The continued development of new and improved polymers, and their application in new and improved products, have led to almost unlimited product opportunities. In fact, there are probably few who would not rate this area of product growth as one of the most important in industry growth areas. The impact of polymers-plastics, elastomers, and composites -- in all of their material forms -- has been little short of phenomenal. New polymers and improvements in established polymer groups regularly extend the performance limits of plastics, elastomers, and composites. These achievements in polymer and plastic technology offer major benefits and opportunities for the myriad of products in which they can be used.

With all these achievements, however, a major impediment exists to the successful use of plastics, elastomers, and composites in products. This impediment is the lack of fundamental understanding of plastics, elastomers, and composites by product designers. Along with this lack of understanding is the absence of a useful consolidated source of information, data, and guidelines that can be practically used by product designers, most of whom do not "speak plastics." The usual practice is to use random supplier data sheets and data tables for guidance. It is, therefore, the object of this handbook to present, in a single source, all of the fundamental information required to understand the large number of materials and material forms, and to provide the necessary data and guidelines for optimal use of these materials and forms in the broad range of industry products. At the same time, this handbook will be invaluable to the plastics industry in acquainting its specialists with product requirements for which they must develop, manufacture, and fabricate plastics materials and forms.

This new Fourth Edition of "Handbook of Plastics, Elastomers, and Composites" has been prepared as a thorough sourcebook of practical data for all ranges of interests. It contains an extensive array of property and performance data, presented as a function of the most important product variables. Further, it presents all important aspects of application guidelines, fabrication-method trade-offs, design, finishing, performance limits, and other important application considerations. It also fully covers chemical, structural, and other basic polymer properties. The handbook's other major features include thorough lists of standards and specifications sources, a completely cross-referenced easy-to-use index, a comprehensive glossary, useful end-of-chapter reference lists, and several appendices containing individual data and information for product engineers.

The chapter organization and coverage of the handbook is equally well suited for reader convenience. The first three chapters present the fundamentals and the important information, data, and guidelines for the three basic material categories of thermoplastics, thermosets, and elastomers, thus enabling readers to more fully understand the presentation in the following chapters. The next four chapters are devoted to major plastic product forms that are so important to product design. The first two of these chapters cover composites, one chapter covering basic and structural composites and one chapter covering the increasingly growing area of composites in electronics. These two chapters are followed by one chapter each on plastics in coatings and finishes, and plastics in adhesives. After this, one chapter very thoroughly covers the critical and important subject of area of joining of plastic parts. The understanding of this design area, almost always a major factor in the quality of plastic products, is most expertly covered in this chapter, which provides excellent guidelines for designers of plastic products.

Next, appropriately following the above listed chapters on basic plastics and plastic forms, a special chapter is devoted to a clearly illustrated presentation of all the important considerations for the design and fabrication of molded plastic products. The following two chapters thoroughly cover the use of plastics and elastomers in two of the largest application fields, namely, automotive and packaging.

The final chapter is an excellent presentation on a subject of increasingly vital importance to all of those in all areas of plastics and elastomers -- the recycling of waste products.

The result of these presentations is an extremely comprehensive and complete single reference and text -- a must for the desk of anyone involved in any aspect of product design, development, or application of plastics, elastomers, and composites. This handbook will be invaluable for every reference library.

Title	Location	Edition / Series / Misc.
66 Handbook of Polymer Testing: Physical Methods		<i>Edition:</i>
<i>Author:</i> Brown, Roger P. (editor)	<i>Dynix:</i> 89755	<i>Series:</i> Plastics Engineering: No. 50
<i>Publish.:</i> Marcel Dekker, Inc.	<i>Call No.:</i> 620.13 Ha	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0824701712	
<i>- date:</i> ©1999	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1999
<i>Subject:</i> Plastics -- Testing		<i>Price:</i> \$193.50
<i>Desc:</i> x, 845 p., illus., 26 cm.		

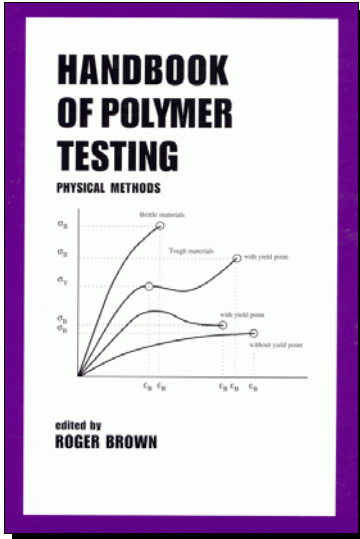


Table of Contents

- Preface iii
- 1. Introduction 1
Roger Brown
- 2. Putting Testing in Perspective 5
Ivan James
- 3. Quality Assurance of Physical Testing Measurements 15
Alan Veith
- 4. Standardization 105
Paul P. Ashworth
- 5. Sample Preparation 125
Freddy Boey
- 6. Conditioning 141
Steve Hawley
- 7. Mass, Density, and Dimensions 157
Roger Brown
- 8. Processability Tests 171
John Dick and Martian Gale
- 9. Strength and Stiffness Properties 225
Roger Brown
- 10. Fatigue and Wear 245
Roger Brown
- 11. Time-Dependent Properties 255
Roger Brown
- 12. Effect of Temperature 263
Roger Brown
- 13. Environmental Resistance 271
Roger Brown
- 14. Other Physical Properties 279
Roger Brown
- 15. Testing of Rubber 285
Peter Lewis
- 16. Particular Requirements for Plastics 309
Steve Hawley
- 17. Cellular Materials 375
Ken Hillier
- 18. Particular Requirements for Composites 407
Graham D. Sims
- 19. Textile Polymers 427
Frank Broadbent
- 20. Coated Fabrics 483
Barry Evans
- 21. Dynamic Mechanical (Thermal) Analysis 501
John Gearing
- 22. Fracture Mechanics Properties 533
Mustafa Akay
- 23. Friction 589
Ivan James
- 24. Thermal Properties 597
David Hands
- 25. Electrical Properties 617
Cyril Barry

Subjects

310 .	Plastics -- Testing
407 .	Polymers -- Testing

- 26. Optical Properties 647
Roger Brown
- 27. Testing for Fire 657
Keith Paul
- 28. Gathering 697
Dieter Kockott
- 29. Lifetime Prediction 735
Roger Brown
- 30. Permeability 747
David Hands
- 31. Adhesion 761
Roger Brown
- 32. Nondestructive Testing 773
Xavier L. Gros
- Index 841

Reviews - Synopsis - Dust Jacket

Highlights all the main polymer classes - including rubber, plastics, foams, textiles, coated fabrics, & composites. Provides a reference for plastics, polymer, chemical, & design engineers of all currently used techniques for measuring & testing the physical properties of polymers. DLC: Plastics - Testing - Handbooks, manuals, etc.

Adhesives & Sealants Newsletter, 2000

"...provides comprehensive coverage of physical testing of polymers in plastics, rubbers, cellular materials, textiles, coated fabrics, and composites...an excellent reference."

PREFACE:

It is essential for design, specification, and quality control to have data covering the physical properties of materials. It is also essential that meaningful data is obtained by using test methods relevant to the materials. The different characteristics and behavior of materials dictate that particular test procedures be developed, and often standardized, for each material type. Polymers, especially, have unique properties that require their own measurement techniques.

There is a wide range of polymers from soft foams to rigid composites for which separate industries have developed. Each has its own individual test methods and, for the major types of polymers, texts exist that detail these procedures. There are, however, many similarities between different polymer types and frequently it is necessary for laboratories to consider a spectrum of materials. Consequently, there are advantages in a book that comprehensively covers the whole polymer family, describing the individual methods as well as discussing the approaches taken in different branches of the industry.

Handbook of Polymer Testing provides in one volume that comprehensive coverage of physical test methods for polymers. The properties considered cover the whole range of physical parameters, including mechanical, optical, electrical, and thermal as well as resistance to degradation, nondestructive testing, and tests for processability. All the main polymer classes are included: rubbers, plastics, foams, textiles, coated fabrics, and composites. For each property, the fundamental principles and approaches are discussed and particular requirements and the relevant international and national standards for the different polymer classes considered, together with the most-up-to-date techniques.

This book will be of particular value to materials scientists and technologists, and to all those who need to evaluate a spectrum of polymeric materials, including students, design engineers, and researchers. Its structure allows reference for the main properties at both the general and the detailed level, thus making it suitable for different levels of knowledge.

Chapter 29 is based on material produced for the "Testing Knowledge Base" at Rapra Technology, Ltd. Extracts from British Standards were reproduced with the permission of BSI. Users of standards should always ensure that they have complete and current information. Standards can be obtained from BSI Customer Services, 389 Chiswick High Road, London W 4 4AL, England.

The other contributors and I gratefully acknowledge the support, information, and helpful advice given by our colleagues during the preparation of this book

Title	Location	Edition / Series / Misc.
67 Handbook of Pressure-Sensitive Adhesive Technology		<i>Edition:</i>
<i>Author:</i> Satas, Donatas (editor)	<i>Dynix:</i> 00015	<i>Series:</i>
<i>Publish.:</i> Van Nostrand Reinhold Company	<i>Call No.:</i> 668.3 Ha	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0442257244	
<i>- date:</i> ©1982	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1982
<i>Subject:</i> Adhesives		<i>Price:</i> \$25.00
<i>Desc:</i> xvi, 620 p., illus., 24 cm.		



Table of Contents

- Contributors
- Preface
- 1. PRESSURE-SENSITIVE ADHESIVE PRODUCTS IN THE UNITED STATES, Donatas Satas
 - Production Volume
 - History
 - Tapes
 - Labels
 - Other Products
 - Manufacturers
 - Adhesive Compounding
 - Adhesive Raw Materials
- 2. PRESSURE-SENSITIVE BUSINESS IN JAPAN AND ASIA, Keiji Fukuzawa
 - Japan
 - Korea
 - Taiwan
 - China
 - Southeast Asia
- 3. TACK, Fred H. Hammond, Jr.
 - Rolling Ball Tack Test
 - Peel Tests for Tack
 - Probe Tack Tests
 - Surface Chemistry and Tack
 - Rheology and Tack
 - Compounding and Tack
 - Conclusion
- 4. PEEL, Donatas Satas
 - Testing
 - Transition from Cohesive to Adhesive Failure
 - Transition to Oscillating Failure
 - Effect of Temperature
 - Effect of Adhesive Thickness
 - Effect of Backing
 - Effect of Other Variables
 - Stress Distribution
 - Analysis of Peel
- 5. CREEP, Carl A. Dahlquist
 - Short-Term Creep and Tack
 - Long-Term Creep
 - Long-Term Creep and Steady State Viscosity
 - Creep and Non-Newtonian Viscosity
 - Chemical Cross Linking and Creep Resistance
 - Physical Crosslinks
 - Degradation and Creep
 - Mechanical Property Measurements
 - Summary

Subjects

217 . Adhesives

- 6. ELECTRICAL PROPERTIES, Erhard Braeunling
 - Dielectric Strength
 - Electrolytic Corrosion
 - Insulation Resistance, Volume Resistivity
 - Dielectric Constant, Dielectric Dissipation Factor, Loss Index
 - Temperature-Time Limits
 - Other Important Test Methods
 - International Specifications

- 7. BOND STRENGTH AND ITS PROGNOSIS, Valentinas Rajeckas
 - Strength Concept and Failure Mechanism
 - Bond Strength/ill Stress Concentration in Adhesive Bonds
 - The Effect of Mechanical Properties of the Adhesive and the Substrate
 - The Influence of Scale Factor
 - The Influence of Temperature and Loading Regime
 - The Evaluation of Long-Term Strength at Variable Loads
 - The Influence of Temperature and the Deformation Rate
 - Heat Resistance
 - The Application of Analogies for Strength Prognosis
 - Evaluation of Complex Strength

- 8. AGING PROPERTIES, Keiji Fukuzawa
 - Effect of Tackifying Resins
 - Effect of Antioxidants
 - The Correlation Between Accelerated Aging Tests and the Shelf-Life

- 9. ANALYTICAL TECHNIQUES FOR IDENTIFICATION AND CHARACTERIZATION, David N. Kendall
 - Infrared Methods
 - Multiple Internal Reflection
 - Analysis of Backing Material
 - Identification of Component Parts
 - Characterization of Pressure-Sensitive Adhesives

- 10. NATURAL RUBBER ADHESIVES, G. L. Butler
 - Composition of Adhesives
 - Manufacture
 - Mechanisms of Tack and Adhesion
 - Specially Modified Adhesives
 - Emulsion Adhesives
 - Major Applications
 - Summary and Future Trends

- 11. BLOCK COPOLYMERS, William H. Korcz, David J. St. Clair, Earle E. Ewins, Jr. and Dirk de Jager
 - Nature of the Basic Molecule
 - General Formulating Principles
 - Application of Formulating Principles
 - Formulating to Meet Constraints

- 12. BUTYL RUBBER AND POLYISOBUTYLENE POLYMERS, J. J. Higgins, F. C. Jagisch and N. E. Stucker
 - Basic Properties
 - Adhesives Compounding
 - Solvents and Solution Preparation Procedures
 - Applications and Formulations

- 13. ACRYLIC ADHESIVES, Donatas Satas
 - Monomers
 - Copolymerization
 - Molecular Weight
 - Crosslinking
 - Secondary Bonding
 - Ionic Binding
 - Functional Groups
 - Compounding
 - Coating Methods

14. VINYL ETHER POLYMERS, Helmut W. J. Mueller

Monomers
Production of Polymers
Commercial Products
Properties
Stabilization
Application

15. SILICONE PRESSURE-SENSITIVE ADHESIVES, Duane F. Merrill

Manufacturing and Products
Crosslinking
Test Methods
Primers
Tapes
Lamination

16. TACKIFIER RESINS, James S. Schlademan

Rosin and Rosin Derivatives
Hydrocarbon Tackifier Resins
Evaluating Tackifier Resins

17. RELEASE COATINGS, Donatas Satas

Polymer Coatings
Waxes
Silicones
Long Chain Branched Polymers
Amines
Chromium Complexes
Miscellaneous
Testing of Release Quality

18. SILICONE RELEASE COATINGS, Mary D. Fey and John E. Wilson

Physical Properties
Chemistry
Coating Types
Solvent-Borne Release Coatings
Water-Borne Systems
Solventless Silicone Coatings
Coating Application
Coating Evaluation
Summary

19. SATURATED PAPER AND SATURATED PAPER TAPES, Charles Bartell

Physical Properties
Saturation
Raw Paper
Saturated Papers
Paper Tapes

20. HOSPITAL AND FIRST AID PRODUCTS, Donatas Satas

Tape Uses
Skin Irritation
Nonocclusive Tapes
Other Products
Adhesives

21. PACKAGING TAPES, Keiji Fukuzawa and Donatas Satas

Polypropylene Tapes
Unplasticized Vinyl Film Tapes
Kraft Paper Tapes
Cloth Tapes
Saturated Paper Tapes
Japanese Paper Tape

Reinforced Tapes
Other Film Tapes
Tape Dispensing
Tape Testing

22. AUTOMOTIVE APPLICATIONS, Whiteford D. Grimes

Paint
Bright Metals
Plastics
Applications
Exterior Woodgrain Films
Striping Films
Interior Woodgrains
Informational Decals
Exterior Automotive Tops
Adhesive System Tapes

23. PLASTIC TAPE PIPELINE COATINGS, G. M. Harris

History
Basic Composition
Types of Tape Coatings
Long Line Tape Coatings
Polyethylene Tape Plant Coating Systems
Specification
In-Service Performance

24. GRAPHIC ART APPLICATIONS, Norman DeBastiani

Graphic Tapes
Graphic Films
Die Cut Pressure-Sensitive Products
Dry Transfer Lettering

25. LABELS AND DECALS, Jim Komerska

Adhesives Composition
Methods of Application
Release Liners
Liner Backings
Release Coatings
Release Levels
Delayed Action Adhesives
Labels Nameplates
Protective and Decorative Sheets
Decals
Embossable-Imagible Tapes

26. COATING, Donatas Satas

Machineability
Coating Methods
Knife and Blade Coaters
Analysis of Knife and Blade Coating
Air Knife Coating
Bar Coaters
Reverse Roll Coaters
Mechanism of Roll Coating
Other Roll Coaters
Gravure Coating
Calendering

27. DRYING, Donatas Satas

Mass Transfer Mechanism
Drying Curves
Solvent Retention
Drying of Latexes
Heat Transfer



Infrared Drying
Coating Imperfections
Curling
Equipment
Convection Dryers
Floater Dryers

28. HOT MELT APPLICATION, Christopher Watson and Donatas Satas
Products
Adhesives
Equipment Selection
Slot Orifice Coaters
Roll Coaters
Extrusion Coaters
Coater Operation

29. POLYMERIZATION, Donatas Satas
Solution Polymerization
Emulsion Polymerization Mechanism
Emulsifiers
Initiators
Equipment

30. RADIATION CURING, A. Dowbenko
Ultraviolet and Electron Beam Polymerization
Free Radical Polymerization
Photoinitiators
Radiation Cure Equipment
Polymerizable Compositions for Radiation Pressure-Sensitive Adhesives
Adhesive Syrups
Adhesive Polymers for Radiation Cure
Conclusion

Name Index
Subject Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Handbook of Pressure-Sensitive Adhesive Technology is the first printed guide to extensively cover an increasingly important subject area. It arms you with essential information ranging from how to compound adhesives to how to design and manufacture tapes and other products. Over 25 experts from around the world have contributed their knowledge to this compilation of adhesive technology.

Information on new pressure-sensitive products and new technological trends accompanies descriptions of high solid and 100% solid adhesives. You'll find out about developments in silicone release coatings, hot melt adhesives, and radiation curing of pressure-sensitive adhesives. Polymers used for adhesives, polymerization of acrylic monomers, radiation curing, analytical techniques for identification and characterization, coating and drying, and the business aspects of adhesive manufacturing are also discussed in detail.

Electrical properties relevant to electrical applications of pressure-sensitive tapes are fully explored. Among these properties are dielectric strength...electrolytic corrosion...insulation resistance...volume resistivity...dielectric constant...dielectric dissipation factor...and loss index. In addition, practical test methods are clearly evaluated.

Applications of adhesive products for hospital and first aid uses and methods of producing other non-occlusive tapes are examined. Pressure-sensitive labels and decals are another fast-growing section of the industry covered in this all-encompassing handbook. Release coatings, embossible-imagable tapes and other specialty applications are all given careful attention.

Of special interest will be the coverage of acrylic pressure-sensitive adhesives. Clearly described is the tailoring of these adhesives during polymerization. The utilization of functional groups for crosslinking, and the effect that functional groups have on adhesive properties are analyzed. You'll find discussions drawn from the patent literature on the use of various comonomers.

Chemists, chemical engineers, and engineers working with the design of coating and drying equipment, as well as

research personnel, polymer scientists, general executives in pressure-sensitive adhesive manufacturing, and salespeople should have this expertly compiled reference close at hand to stay well informed of this technology.

PREFACE:

Pressure-sensitive adhesive products are used in most industries as well as at home, in the office, and in hospitals. These products constitute one of the fastest growing segments of the adhesives industry, which in itself is growing at above the average rate. Such an active area deserves a compilation of technical information. The absence of an extended treatment so far perhaps could be explained by the lack of published information in some segments of this industry. Patent disclosures are still the best source of up-to-date information in many areas of the pressure-sensitive adhesive technology. The situation is gradually improving, mainly due to the publishing effort of raw material suppliers interested in providing better organized information to their customers. The pressure-sensitive adhesive products industry has not been eager to disseminate technical information beyond the description of the products.

The book is aimed mainly at the technologist in the pressure-sensitive adhesive industry. While an average worker might have considerable experience in some areas, surpassing the depth and detail presented in the book, he usually has not had the opportunity to be exposed to all aspects of this technology. The book should contribute in increasing the breadth of his outlook. It should also be of interest to the technologist in related areas of other adhesives, sealants, and coatings industries. Much of the technology is interrelated and transferable. A businessman engaged in sales or manufacturing of pressure-sensitive tapes, labels, or other products should benefit by a better insight into the technical problems. While a portion of the material deals with technical details of interest to a specialist only, a large part should be of sufficiently general interest. A better understanding of technical tasks should improve the communication with the technical personnel.

An attempt is made to cover most of the aspects of the pressure sensitive technology. This leads into various disciplines: mechanical details of the equipment, polymer chemistry and physics, business and marketing. In some areas, a highly technical discussion is required; in others, fairly simple descriptive presentation is sufficient. Such is the nature of this technology.

My gratitude is expressed to all contributors as well as to numerous authors whose work we have discussed. My appreciation goes to Susan Munger and Denis Riney of Van Nostrand Reinhold for their help in processing the manuscript. I am also grateful to my son Paul V. for preparation of many drawings, my daughter Audrone M. for her help in typing, and also to my wife Saule for her assistance in the preparation of indexes.

Title	Location	Edition / Series / Misc.
813 Handbook of Solvents Author: Wypych, George (editor) Publish.: ChemTec Publishing - place: Toronto, Canada - date: ©2001 Subject: Solvents -- Handbooks, manuals, etc. Desc: xxix, 1675 p., illus., 24 cm.	Dynix: 99414 Call No.: 660 Ha ISBN: 1895198240 Shelf Reference	Edition: Series: Year: 2001 Price: \$213.50

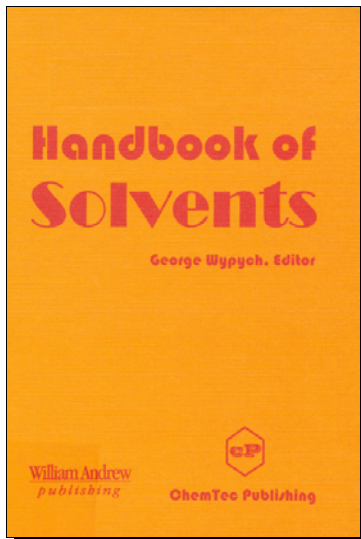


Table of Contents

Preface

1. INTRODUCTION
2. FUNDAMENTAL PRINCIPLES GOVERNING SOLVENTS USE
 - 2.1 Solvent effects on chemical systems
 - 2.1.1 Historical outline
 - 2.1.2 Classification of solute-solvent interactions
 - 2.1.2.1 Electrostatic
 - 2.1.2.2 Polarization
 - 2.1.2.3 Dispersion
 - 2.1.2.4 Repulsion
 - 2.1.2.5 Specific interactions
 - 2.1.2.6 Hydrophobic interactions
 - 2.1.3 Modelling of solvent effects
 - 2.1.3.1 Computer simulations
 - 2.1.3.2 Continuum models
 - 2.1.3.3 Cavity surfaces
 - 2.1.3.4 Supermolecule models
 - 2.1.3.5 Application example: glycine in solution
 - 2.1.4 Thermodynamic and kinetic characteristics of chemical reactions in solution
 - 2.1.4.1 Solvent effects on chemical equilibria
 - 2.1.4.2 Solvent effects on the rate of chemical reactions
 - 2.1.4.3 Example of application: addition of azide anion to tetrafuranosides
 - 2.1.5 Solvent catalytic effects
 - 2.2 Molecular design of solvents
 - 2.2.1 Molecular design and molecular ensemble design
 - 2.2.2 From prediction to design
 - 2.2.3 Improvement in prediction method
 - 2.2.4 Role of molecular simulation
 - 2.2.5 Model system and paradigm for design Appendix. Predictive equation for the diffusion coefficient in dilute solution
 - 2.3 Basic physical and chemical properties of solvents
 - 2.3.1 Molecular weight and molar volume
 - 2.3.2 Boiling and freezing points
 - 2.3.3 Specific gravity
 - 2.3.4 Refractive index
 - 2.3.5 Vapor density and pressure
 - 2.3.6 Solvent volatility
 - 2.3.7 Flash point
 - 2.3.8 Flammability limits
 - 2.3.9 Sources of ignition and autoignition temperature
 - 2.3.10 Heat of combustion (calorific value)
 - 2.3.11 Heat of fusion
 - 2.3.12 Electric conductivity
 - 2.3.13 Dielectric constant (relative permittivity)
 - 2.3.14 Occupational exposure indicators
 - 2.3.15 Odor threshold
 - 2.3.16 Toxicity indicators

Subjects

530 . Solvents -- Handbooks, manuals, etc.

- 2.3.17 Ozone-depletion and creation potential
- 2.3.18 Oxygen demand
- 2.3.19 Solubility
- 2.3.20 Other typical solvent properties and indicators

3. PRODUCTION METHODS, PROPERTIES, AND MAIN APPLICATIONS

- 3.1 Definitions and solvent classification
- 3.2 Overview of methods of solvent manufacture
- 3.3 Solvent properties
 - 3.3.1 Hydrocarbons
 - 3.3.1.1 Aliphatic hydrocarbons
 - 3.3.1.2 Aromatic hydrocarbons
 - 3.3.2 Halogenated hydrocarbons
 - 3.3.3 Nitrogen-containing compounds (nitrates, nitriles)
 - 3.3.4 Organic sulfur compounds
 - 3.3.5 Monohydric alcohols
 - 3.3.6 Polyhydric alcohols
 - 3.3.7 Phenols
 - 3.3.8 Aldehydes
 - 3.3.9 Ethers
 - 3.3.10 Glycol ethers
 - 3.3.11 Ketones
 - 3.3.11 Acids
 - 3.3.12 Amines
 - 3.3.13 Esters
- 3.3.14 Comparative analysis of all solvents
- 3.4 Terpenes
 - 3.4.1 Definitions and nomenclature
 - 3.4.2 Occurrence
 - 3.4.3 General
 - 3.4.4 Toxicology
 - 3.4.5 Threshold limit values

4. GENERAL PRINCIPLES GOVERNING DISSOLUTION OF MATERIALS IN SOLVENTS

- 4.1 Simple solvent characteristics
 - 4.1.1 Solvent power
 - 4.1.2 One-dimensional solubility parameter approach
 - 4.1.3 Multi-dimensional approaches
 - 4.1.4 Hansen's solubility
 - 4.1.5 Three-dimensional dualistic model
 - 4.1.6 Solubility criterion
 - 4.1.7 Solvent system design
- 4.2 Effect of system variables on solubility
 - 4.2.1 General considerations
 - 4.2.2 Chemical structure
 - 4.2.3 Flexibility of a polymer chain
 - 4.2.4 Crosslinking
 - 4.2.5 Temperature and pressure
 - 4.2.6 Methods of calculation of solubility based on thermodynamic principles.
- 4.3 Polar solvation dynamics: Theory and simulations
 - 4.3.1 Introduction
 - 4.3.2 Continuum dielectric theory of solvation dynamics
 - 4.3.3 Linear response theory of solvation dynamics
 - 4.3.4 Numerical simulations of solvation in simple polar solvents: The simulation model
 - 4.3.5 Numerical simulations of solvation in simple polar solvents: Results and discussion
 - 4.3.6 Solvation in complex solvents
 - 4.3.7 Conclusions
- 4.4 Methods for the measurement of solvent activity of polymer solutions.
 - 4.4.1 Introduction
 - 4.4.2 Necessary thermodynamic equations
 - 4.4.3 Experimental methods, equipment and data reduction
 - 4.4.3.1 Vapor-liquid equilibrium (VLE) measurements
 - 4.4.3.1.1 Experimental equipment and procedures for VLE-measurements
 - 4.4.3.1.2 Primary data reduction

- 4.4.3.1.3 Comparison of experimental VLE-methods
- 4.4.3.2 Other measurement methods
 - 4.4.3.2.1 Membrane osmometry
 - 4.4.3.2.2 Light scattering
 - 4.4.3.2.3 X-ray scattering
 - 4.4.3.2.4 Neutron scattering
 - 4.4.3.2.5 Ultracentrifuge
 - 4.4.3.2.6 Cryoscopy (freezing point depression of the solvent)
 - 4.4.3.2.7 Liquid-liquid equilibrium (LLE)
 - 4.4.3.2.8 Swelling equilibrium
- 4.4.4 Thermodynamic models for the calculation of solvent activities of polymer solutions
 - 4.4.4.1 Models for residual chemical potential and activity coefficient in the liquid phase
 - 4.4.4.2 Fugacity coefficients from equations of state
 - 4.4.4.3 Comparison and conclusions
- Appendix 4.4A

5. SOLUBILITY OF SELECTED SYSTEMS AND INFLUENCE OF SOLUTES

- 5.1 Experimental methods of evaluation and calculation of solubility parameters of polymers and solvents.
 - Solubility parameters data
 - 5.1.1 Experimental evaluation of solubility parameters of liquids
 - 5.1.1.1 Direct methods of evaluation of the evaporation enthalpy
 - 5.1.1.2 Indirect methods of evaluation of evaporation enthalpy
 - 5.1.1.3 Static and quasi-static methods of evaluation of pair pressure
 - 5.1.1.4 Kinetic methods
 - 5.1.2 Methods of experimental evaluation and calculation of solubility parameters of polymers
 - 5.2 Prediction of solubility parameter
 - 5.2.1 Solubility parameter of polymers
 - 5.2.2 Glass transition in polymers
 - 5.2.2.1 Glass transition enthalpy
 - 5.2.2.2 C at the glass transition
 - 5.2.3 Prediction from thermal transition enthalpies
 - 5.3 Methods of calculation of solubility parameters of solvents and polymers
 - 5.4 Mixed solvents, a way to change the polymer solubility
 - 5.4.1 Introduction .
 - 5.4.2 Solubility-cosolvency phenomenon
 - 5.4.3 New cosolvents effects. Solubility behavior
 - 5.4.4 Thermodynamical description of ternary systems. Association equilibria theory of preferential adsorption
 - 5.4.5 Polymer structure of the polymer dependence of preferential adsorption. Polymer molecular weight and tacticity dependence of preferential adsorption
 - 5.5 The phenomenological theory of solvent effects in mixed solvent systems
 - 5.5.1 Introduction
 - 5.5.2 Theory
 - 5.5.2.1 Principle
 - 5.5.2.2 The intersolute effect: solute-solute interactions
 - 5.5.2.3 The solvation effect: solute-solvent interaction
 - 5.5.2.4 The general medium effect: solvent-solvent interactions
 - 5.5.2.5 The total solvent effect
 - 5.5.3 Applications
 - 5.5.3.1 Solubility
 - 5.5.3.2 Surface tension
 - 5.5.3.3 Electronic absorption spectra
 - 5.5.3.4 Complex formation
 - 5.5.3.5 Chemical kinetics
 - 5.5.3.6 Liquid chromatography
 - 5.5.4 Interpretations
 - 5.5.4.1 Ambiguities and anomalies
 - 5.5.4.2 A modified derivation
 - 5.5.4.3 Interpretation of parameter estimates
 - 5.5.4.4 Confounding effects
- Solute-solute interactions
- Coupling of general medium and solvation effects
- The cavity surface area
- The role of interfacial tension

- 6. SWELLING
 - 6.1. Modern views on kinetics of swelling of crosslinked elastomers in solvents
 - 6.1.1 Introduction
 - 6.1.2 Formulation of swelling for a plane elastomer layer
 - 6.1.3 Diffusion kinetics of plane layer swelling
 - 6.1.4 Experimental study of elastomer swelling kinetics
 - 6.1.5 Conclusions
 - 6.2 Equilibrium swelling in binary solvents
 - 6.3 Swelling data on crosslinked polymers in solvents
 - 6.4 Influence of structure on equilibrium swelling

- 7 SOLVENT TRANSPORT PHENOMENA
 - 7.1 Introduction to diffusion, swelling, and drying
 - 7.1.1 Diffusion
 - 7.1.2 Swelling
 - 7.1.3 Drying
 - 7.2 Bubbles dynamics and boiling of polymeric solutions
 - 7.2.1 Rheology of polymeric solutions and bubble dynamics
 - 7.2.1.1 Rheological characterization of solutions of polymers
 - 7.2.1.2 Dynamic interaction of bubbles with polymeric liquid
 - 7.2.2 Thermal growth of bubbles in superheated solutions of polymers .
 - 7.2.3 Boiling of macromolecular liquids
 - 7.3 Drying of coated film
 - 7.3.1 Introduction
 - 7.3.2 Theory for the drying
 - 7.3.2.1 Simultaneous heat and mass transfer
 - 7.3.2.2 Liquid-vapor equilibrium
 - 7.3.2.3 Heat and mass transfer coefficient
 - 7.3.2.4 Prediction of drying rate of coating
 - 7.3.2.5 Drying regimes: constant drying rate period (CDRP) and falling drying rate period (FDRP)
 - 7.3.3 Measurement of the drying rate of coated film
 - 7.3.3.1 Thermo-gravimetric analysis
 - 7.3.3.2 Rapid scanning FT-JR spectrometer analysis
 - 7.3.3.3 High-airflow drying experiment using flame ionization detector (FID) total hydrocarbon analyzer
 - 7.3.3.4 Measurement of drying rate in the production scale dryer
 - 7.3.4 Miscellaneous
 - 7.3.4.1 Drying of coated film with phase separation
 - 7.3.4.2 Drying defects
 - 7.3.4.2.1 Internal stress induced defects
 - 7.3.4.2.2 Surface tension driven defects
 - 7.3.4.2.3 Defects caused by air motion and others
 - 7.3.4.3 Control of lower explosive level (LEL) in a multiple zone dryer

- 8. INTERACTIONS IN SOLVENTS AND SOLUTIONS
 - 8.1 Solvents and solutions as assemblies of interacting molecules
 - 8.2 Basic simplifications of the quantum model
 - 8.3 Cluster expansion
 - 8.4 Two-body interaction energy: the dimer
 - 8.4.1 Decomposition of the interaction energy of a dimer: variational approach
 - The electrostatic term
 - The induction term
 - The exchange term
 - The charge transfer term
 - The dispersion term
 - The decomposition of the interaction energy through a variational approach: a summary
 - 8.4.2 Basis set superposition error and counterpoise corrections
 - 8.4.3 Perturbation theory approach
 - 8.4.4 Modeling of the separate components of delta-E
 - The electrostatic term
 - The induction term
 - The dispersion term
 - The exchange (or repulsion) term
 - The other terms
 - A conclusive view

- 8.4.5 The relaxation of the rigid monomer constraint
- 8.5 Three- and many-body interactions
 - Screening many-body effects
 - Effective interaction potentials
- 8.6 The variety of interaction potentials
- 8.7 Theoretical and computing modeling of pure liquids and solutions . . .
 - 8.7.1 Physical models
 - 8.7.1.1 Integral equation methods
 - 8.7.1.2 Perturbation theories
 - 8.7.2 Computer simulations
 - 8.7.2.1 Car-Parrinello direct QM simulation .
 - 8.7.2.2 Semi-classical simulations
 - Molecular dynamics
 - Monte Carlo
 - QM/MM
 - 8.7.3 Continuum models
 - 8.7.3.1 QM-BE methods: the effective Hamiltonian
- 8.8 Practical applications of modeling
 - Dielectric constant
 - Thermodynamical properties
 - Compressibilities
 - Relaxation times and diffusion coefficients
 - Shear viscosity
- 8.9 Liquid surfaces
 - 8.9.1 The basic types of liquid surfaces
 - 8.9.2 Systems with a large surface/bulk ratio
 - 8.9.3 Studies on interfaces using interaction potentials
- 9. MIXED SOLVENTS
 - 9.1. Introduction
 - 9.2 Chemical interaction between components in mixed solvents
 - 9.2.1 Processes of homomolecular association
 - 9.2.2 Conformic and tautomeric equilibrium. Reactions of isomerization.
 - 9.2.3 Heteromolecular association
 - 9.2.4 Heteromolecular associate ionization
 - 9.2.5 Electrolytic dissociation (ionic association)
 - 9.2.6 Reactions of composition
 - 9.2.7 Exchange interaction
 - 9.2.8 Amphoterism of mixed solvent components
 - 9.2.8.1 Amphoterism of hydrogen acids
 - 9.2.8.2 Amphoterism of L-acids
 - 9.2.8.3 Amphoterism in systems H-acid-L-acid
 - 9.2.8.4 Amphoterism in binary solutions amine-amine
 - 9.3 Physical properties of mixed solvents
 - 9.3.1 The methods of expression of mixed solvent compositions
 - 9.3.1.1 Permittivity
 - 9.3.1.2 Viscosity
 - 9.3.1.3 Density, molar volume.
 - 9.3.1.4 Electrical conductivity .
 - 9.3.2 Physical characteristics of the mixed solvents with chemical interaction between components
 - 9.3.2.1 Permittivity
 - 9.3.2.2 Viscosity
 - 9.3.2.3 Density, molar volume
 - 9.3.2.4 Conductivity
 - 9.3.3 Chemical properties of mixed
 - 9.3.3.1 Autoprotolysis constants
 - 9.3.3.2 Solvating ability
 - 9.3.3.3 Donor-acceptor properties
 - 9.4 Mixed solvent influence on the chemical equilibrium
 - 9.4.1 General considerations
 - 9.4.2 Mixed solvent effect on the position of equilibrium of homomolecular association process
 - 9.4.3 Mixed solvent influence on the conformer equilibrium
 - 9.4.4 Solvent effect on the process of heteromolecular association
 - 9.4.4.1 Selective solvation. Resolution

- 9.4.5 Mixed solvent effect on the ion association process
- 9.4.6 Solvent effect on exchange interaction processes
 - Systems with non-associated reagents
 - Systems with one associated participant of equilibrium
 - Systems with two associated participants of equilibrium
- 9.4.7 Mixed solvent effect on processes of complex formation
- 9.5 The mixed solvent effect on the chemical equilibrium thermodynamics

10 ACID-BASE INTERACTIONS

- 10.1 General concept of acid-base interactions
- 10.2 Effect of polymer/solvent acid-base interactions: relevance to the aggregation of PMMA
 - 10.2.1 Recent concepts in acid-base interactions
 - 10.2.1.1 The nature of acid-base molecular interactions
 - 10.2.1.1.1 The original Lewis definitions
 - 10.2.1.1.2 Molecular Orbital (MO) approach to acid-base reactions
 - 10.2.1.1.3 The case of hydrogen bonding
 - 10.2.1.2 Quantitative determination of acid-base interaction strength
 - 10.2.1.2.1 Perturbation theory
 - 10.2.1.2.2 Hard-Soft Acid-Base (HSAB) principle
 - 10.2.1.2.3 Density functional theory
 - 10.2.1.2.4 Effect of ionocity and covalency: Drago's concept
 - 10.2.1.2.5 Effect of amphotericity of acid-base interaction: Gutmann's numbers . .
 - 10.2.1.2.6 Spectroscopic measurements: Fowkes' approach
 - 10.2.2 Effect of polymer/solvent interactions on aggregation of stereoregular PMMA
 - 10.2.2.1 Aggregation of stereoregular PMMA
 - 10.2.2.2 Relation between the complexing power of solvents and their acid-base properties
 - 10.2.3 Influence of the nature of the solvent on the α and β -relaxations of conventional PMMA
 - 10.2.3.1 Introduction
 - 10.2.3.2 Dielectric spectroscopy results
 - 10.2.4 Concluding remarks
- 10.3 Solvent effects based on pure solvent scales
 - Introduction
 - 10.3.1 The solvent effect and its dissection into general and specific contributions
 - 10.3.2 Characterization of a molecular environment with the aid of the probe/homomorph model
 - 10.3.3 Single-parameter solvent scales
 - 10.3.3.1 The solvent ionizing power scale or Y scale
 - 10.3.3.2 The G values of Allerhand and Schleyer
 - 10.3.3.3 The ET(30) scale of Dimroth and Reichardt
 - 10.3.3.4 The Py scale of Dong and Winnick
 - 10.3.3.5 The Z scale of Kosower
 - 10.3.3.6 The XR scale of Brooker
 - 10.3.3.7 The scale of Dubois and Bienvenü
 - 10.3.3.8 The S' scale of Drago
 - 10.3.4 Solvent polarity: the SPP scale
 - 10.3.5 Solvent basicity: the SB scale
 - 10.3.6 Solvent acidity: the SA scale
 - 10.3.7 Applications of the pure SPP, SA and SB scales
 - 10.3.7.1 Other reported solvents scales
 - 10.3.7.2 Treatment of the solvent effect in:
 - 10.3.7.2.1 Spectroscopy
 - 10.3.7.2.2 Kinetics
 - 10.3.7.2.3 Electrochemistry .
 - 10.3.7.2.4 Thermodynamics
 - 10.3.7.3 Mixtures of solvents. Understanding the preferential solvation model
- 10.4 Acid-base equilibria in ionic solvents (ionic melts)
 - 10.4.1 Acid-base definitions used for the description of donor-acceptor interactions in ionic media
 - 10.4.1.1 The Lewis definition
 - 10.4.1.2 The Lux-Flood definition
 - 10.4.2 The features of ionic melts as media for acid-base interactions
 - 10.4.2.1 Oxygen-less media
 - 10.4.2.2 Oxygen-containing melts
 - 10.4.2.3 The effect of the ionic solvent composition on acid-base equilibria
 - 10.4.3 Methods for estimations of acidities of solutions based on ionic melts
 - 10.4.4 On studies of the homogeneous acid-base reactions in ionic melts

- 10.4.4.1 Nitrate melts
- 10.4.4.2 Sulphate melts
- 10.4.4.3 Silicate melts
- 10.4.4.4 The equimolar mixture KCl-NaCl
- 10.4.4.5 Other alkaline halide melts
- 10.4.5 Reactions of melts with gaseous acids and bases
- 10.4.5.1 High-temperature hydrolysis of molten halides
- 10.4.5.2 The processes of removal of oxide admixtures from melts

11 ELECTRONIC AND ELECTRICAL EFFECTS OF SOLVENTS

- 11.1 Theoretical treatment of solvent effects on electronic and vibrational spectra of compounds in condensed media
 - 11.1.1 Introduction
 - 11.1.2 Theoretical treatment of solvent cavity effects on electronic-vibrational spectra of molecules
 - 11.1.3 Theoretical treatment of solvent electrostatic polarization on electronic-vibrational spectra of molecules
 - 11.1.4 Theoretical treatment of solvent dispersion effects on electronic-vibrational spectra of molecules
 - 11.1.5 Supermolecule approach to the intermolecular interactions in condensed media
- 11.2 Dielectric solvent effects on the intensity of light absorption and the radiative rate constant
 - 11.2.1 The Chako formula or the Lorentz-Lorenz correction
 - 11.2.2 The generalized local-field factor for the ellipsoidal cavity
 - 11.2.3 Dielectric solvent effect on the radiative rate constant

12 OTHER PROPERTIES OF SOLVENTS, SOLUTIONS, AND PRODUCTS OBTAINED FROM SOLUTIONS

- 12.1 Rheological properties, aggregation, permeability, molecular structure, crystallinity, and other properties affected by solvents
 - 12.1.1 Rheological properties
 - 12.1.2 Aggregation
 - 12.1.3 Permeability
 - 12.1.4 Molecular structure and crystallinity
 - 12.1.5 Other properties affected by solvents
- 12.2 Chain conformations of polysaccharides in different solvents
 - 12.2.1 Introduction
 - 12.2.2 Structure and conformation of polysaccharides in solution
 - 12.2.2.1 Chemical structure
 - 12.2.2.2 Solution chain conformation
 - 12.2.3 Experimental evidence of solvent effect on oligosaccharide conformational equilibria
 - 12.2.4 Theoretical evaluation of solvent effect on conformational equilibria of sugars
 - 12.2.4.1 Classical molecular mechanics methods
 - 12.2.4.2 Molecular dynamic methods
 - 12.2.5 Solvent effect on chain dimensions and conformations of polysaccharides.
 - 12.2.6 Solvent effect on charged polysaccharides and the polyelectrolyte model
 - 12.2.6.1 Experimental behavior of polysaccharides polyelectrolytes
 - 12.2.6.2 The Haug and Smidsrød parameter: description of the salt effect on the chain dimension
 - 12.2.6.3 The statistical thermodynamic counterion-condensation theory of Manning
 - 12.2.6.4 Conformational calculations of charged polysaccharides
 - 12.2.7 Conclusions

13. EFFECT OF SOLVENT ON CHEMICAL REACTIONS AND REACTIVITY

- 13.1 Solvent effects on chemical reactivity
 - 13.1.1 Introduction
 - 13.1.2 The dielectric approach
 - 13.1.3 The chemical approach
 - 13.1.4 Dielectric vs. chemical approach
 - 13.1.5 Conceptual problems with empirical solvent parameters
 - 13.1.6 The physical approach
 - 13.1.7 Some highlights of recent investigations
 - The like dissolves like rule
 - Water's anomalies
 - The hydrophobic effect
 - The structure of liquids
 - Solvent reorganization energy in ET
 - The solution ionic radius
 - 13.1.8 The future of the phenomenological approach
- 13.2 Solvent effects on free radical polymerization

- 13.2.1|Introduction
- 13.2.2|Homopolymerization
 - 13.2.2.1|Initiation
 - 13.2.2.2|Propagation
 - 13.2.2.3|Transfer
 - 13.2.2.4|Termination
- 13.2.3|Copolymerization
 - 13.2.3.1|Polarity effect
 - 13.2.3.1.1|Basic mechanism
 - 13.2.3.1.2|Copolymerization model
 - 13.2.3.1.3|Evidence for polarity effects in propagation reactions
 - 13.2.3.2|Radical-solvent complexes
 - 13.2.3.2.1|Basic mechanism
 - 13.2.3.2.2|Copolymerization model
 - 13.2.3.2.3|Experimental evidence
 - 13.2.3.3|Monomer-solvent complexes
 - 13.2.3.3.1|Introduction
 - 13.2.3.3.2|Monomer-monomer complex participation model
 - 13.2.3.3.3|Monomer-monomer complex dissociation model
 - 13.2.3.3.4|Specific solvent effects
 - 13.2.3.4|Bootstrap model
 - 13.2.3.4.1|Basic mechanism
 - 13.2.3.4.2|Copolymerization model
 - 13.2.3.4.3|Experimental evidence
- 13.2.4|Concluding remarks
- 13.3|Effects of organic solvents on phase-transfer catalysis
 - 13.3.1|Two-phase phase-transfer catalytic reactions
 - 13.3.1.1|Theoretical analysis of the polarity of the organic solvents and the reactions.
 - 13.3.1.2|Effect of organic solvent on the reaction in various reaction systems
 - 13.3.1.3|Effects of the organic solvents on the reactions in other catalysts
 - 13.3.1.4|Effect of the volume of organic solvent and water on the reactions in various reaction systems
 - 13.3.1.5|Effects of organic solvents on other phase-transfer catalytic reactions .
 - 13.3.1.6|Other effects on the phase-transfer catalytic reactions
 - 13.3.2|Three-phase reactions (triphase catalysis)
 - 13.3.2.1|The interaction between solid polymer (hydrophilicity) and the organic solvents
 - 13.3.2.2|Effect of solvents on the reaction in triphase catalysis
 - 13.3.2.3|Effect of volume of organic solvent and water on the reactions in triphase catalysis
- 13.4|Effect of polymerization solvent on the chemical structure and curing of aromatic poly(amideimide)
 - 13.4.1|Introduction
 - 13.4.2|Effect of solvent on the chemical structure of PAL
 - 13.4.2.1|Imide and amide bond content of PAI
 - 13.4.2.2|Intrinsic viscosity and carboxyl group content
 - 13.4.3|Effect of solvent on the curing of PAL by heat treatment
 - 13.4.3.1|Chemical structure of PAI after heat treatment
 - 13.4.3.2|Curing PAI by post-heating
 - 13.4.4|Conclusions
- 14|SOLVENT USE IN VARIOUS INDUSTRIES
 - 14.1|Adhesives and sealants
 - 14.2|Aerospace
 - 14.3|Asphalt compounding
 - 14.4|Biotechnology
 - 14.4.1|Organic solvents in microbial production processes
 - 14.4.1.1|Introduction
 - 14.4.1.2|Toxicity of organic solvents
 - 14.4.1.3|Solvent-tolerant bacteria
 - 14.4.1.4|Biotransformation using solvent-tolerant microorganisms
 - 14.4.2|Solvent-resistant microorganisms
 - 14.4.2.1|Introduction
 - 14.4.2.2|Toxicity of solvents for microorganisms
 - 14.4.2.2.1|Spectrum of microorganisms and solvents
 - 14.4.2.2.2|Mechanisms of solvent toxicity for microorganisms
 - 14.4.2.3|Adaption of microorganisms to solvents - solvent-resistant microorganisms
 - 14.4.2.3.1|Spectrum of solvent-resistant microorganisms

- 14.4.2.3.2:Adaption mechanisms of microorganisms to solvents
- 14.4.2.4 Solvents and microorganisms in the environment and industry - examples.
- 14.4.2.4.1:Examples
- 14.4.3:Choice of solvent for enzymatic reaction in organic solvent
- 14.4.3.1:Introduction
- 14.4.3.2:Classification of organic solvents
- 14.4.3.3:Influence of solvent parameters on nature of enzymatic reactions in organic media
- 14.4.3.4:Properties of enzymes affected by organic solvents
- 14.4.3.5:Concluding remarks
- 14.5:Coil coating
- 14.6:Cosmetics and personal care products
- 14.7:Dry cleaning - treatment of textiles in solvents
- 14.7.1:Dry cleaning
- 14.7.1.1:History of dry cleaning
- 14.7.1.2:Basis of dry cleaning
- 14.7.1.3:Behavior of textiles in solvents and water
- 14.7.1.4:Removal of soiling in dry cleaning
- 14.7.1.5:Activity of detergents in dry cleaning
- 14.7.1.6:Dry cleaning processes
- 14.7.1.7:Recycling of solvents in dry cleaning
- 14.7.2:Spotting
- 14.7.2.1:Spotting in dry cleaning
- 14.7.2.2:Spotting agents
- 14.7.2.3:Spotting procedure
- 14.7.3:Textile finishing
- 14.7.3.1:Waterproofing
- 14.7.3.2:Milling
- 14.7.3.3:Antistatic finishing
- 14.8:Electronic industry - CFC-free alternatives for cleaning in electronic industry
- 14.8.1:Cleaning requirements in the electronic industry
- 14.8.2:Available alternatives
- 14.8.2.1:Water based systems; advantages and disadvantages
- 14.8.2.1.1:Cleaning with DI - water
- 14.8.2.1.2:Cleaning with alkaline water-based media
- 14.8.2.1.3:Aqueous-based cleaning agents containing water soluble organic components
- 14.8.2.1.4:Water-based cleaning agents based on MPC® Technology (MPC = Micro Phase Cleaning)
- 14.8.2.1.5:Advantages and disadvantages of aqueous cleaning media
- 14.8.2.2:Semi-aqueous cleaners based on halogen-free solvents, advantages and disadvantages
- 14.8.2.2.1:Water insoluble cleaning fluids
- 14.8.2.2.2:Water-soluble, water-based cleaning agents
- 14.8.2.2.3:Comparison of the advantages (+) and disadvantages (-) of semi-aqueous cleaning fluids
- 14.8.2.3:Other solvent based cleaning systems
- 14.8.3:Cleaning of tools and auxiliaries
- 14.8.3.1:Cleaning substrates and contamination
- 14.8.3.2:Compatibility of stencil and cleaning agent
- 14.8.3.3:Different cleaning media
- 14.8.3.4:Comparison of manual cleaning vs. automated cleaning
- 14.8.3.5:Cleaning equipment for stencil cleaning applications
- 14.8.3.6:Stencil cleaning in screen printing machines
- 14.8.3.7:Summary
- 14.8.4:Cleaning agents and process technology available for cleaning PCB
- 14.8.4.1:Flux remove and aqueous process
- 14.8.4.1.1 The limits of a no-clean process
- 14.8.4.1.2 Different cleaning media and cleaning processes
- 14.8.4.1.3 Semi-aqueous cleaning
- 14.8.4.1.4 Aqueous cleaning in spray in air cleaning equipment
- 14.8.4.2 Flux removal from printed circuit boards - water-free cleaning processes
- 14.8.4.2.1 Water-free cleaning processes using HFE (hydrofluoroethers) in combination with a cosolvent
- 14.8.4.2.2 Water-free cleaning processes in closed, one-chamber vapor defluxing systems
- 14.8.5 Criteria for assessment and evaluation of cleaning results
- 14.8.6 Cost comparison of different cleaning processes
- 14.9 Fabricated metal products
- 14.10 Food industry - solvents for extracting vegetable oils
- 14.10.1 Introduction

- 14.10.2 Regulatory concerns
 - 14.10.2.1 Workplace regulations
 - 14.10.2.1.1 Air Contaminants Standard (29 CFR 1910.1000)
 - 14.10.2.1.2 Hazard Communication Standard (HCS) (29 CFR 1910.1200)
 - 14.10.2.1.3 Process Safety Management (PSM) Standard (29 CFR 1910.119)
 - 14.10.2.2 Environmental regulations
 - 14.10.2.2.1 Clean Air Act (CAA; 42 U.S. Code 7401 et seq.)
 - 14.10.2.2.2 Clean Water Act (CWA; 33 U.S. Code 1251 et seq.)
 - 14.10.2.2.3 Resource Conservation and Recovery Act (RCRA; 42 U.S. Code 6901 et seq.)
 - 14.10.2.2.4 Emergency Planning and Community Right-to-Know Act (EPCRA; 42 U.S. Code 11001 et seq.)
 - 14.10.2.2.5 Toxic Substances Control Act (TSCA; 15 U.S. Code 2601 et seq.)
 - 14.10.2.3 Food safety
- 14.10.3 The solvent extraction process
 - 14.10.3.1 Preparation for extraction
 - 14.10.3.2 Oil extraction
 - 14.10.3.3 Processing crude oil
- 14.10.4 Review of solvents studied for extraction efficiency
 - 14.10.4.1 Hydrocarbon solvents
 - 14.10.4.1.1 Nomenclature, structure, composition and properties of hydrocarbons . .
 - 14.10.4.1.2 Performance of selected hydrocarbon solvents
 - 14.10.5 Future trends
- 14.11 Ground transportation
- 14.12 Inorganic chemical industry
- 14.13 Iron and steel industry
- 14.14 Lumber and wood products - Wood preservation treatment: significance of solvents
 - 14.14.1 General aspects
 - 14.14.2 Role of solvents
 - 14.14.2.1 Occurrence
 - 14.14.2.2 Technical and environmental aspects
- 14.15 Medical applications
- 14.16 Metal casting
- 14.17 Motor vehicle assembly
- 14.18 Organic chemical industry
- 14.19 Paints and coatings
 - 14.19.1 Architectural surface coatings and solvents
 - 14.19.1.1 General aspects .
 - 14.19.1.2 Technical aspects and properties of coating materials
 - 14.19.2 Recent advances in coalescing solvents for waterborne coatings
 - 14.19.2.1 Introduction
 - 14.19.2.2 Water based coatings
 - 14.19.2.3 Emulsion polymers
 - 14.19.2.4 Role of a coalescing solvent
 - 14.19.2.5 Properties of coalescing agents
 - 14.19.2.5.1 Hydrolytic stability
 - 14.19.2.5.2 Water solubility
 - 14.19.2.5.3 Freezing point
 - 14.19.2.5.4 Evaporation rate
 - 14.19.2.5.5 Odor
 - 14.19.2.5.6 Color
 - 14.19.2.5.7 Coalescing efficiency
 - 14.19.2.5.8 Incorporation
 - 14.19.2.5.9 Improvement of physical properties
 - 14.19.2.5.10 Biodegradability
 - 14.19.2.5.11 Safety
 - 14.19.2.6 Comparison of coalescing solvents
 - 14.19.2.7 Recent advances in diester coalescing solvents
 - 14.19.2.8 Appendix - Classification of coalescing solvents
- 14.20 Petroleum refining industry
 - 14.2 1 Pharmaceutical industry
 - 14.21.1 Use of solvents in the manufacture of drug substances (DS) and drug products (DP)
 - 14.21.1.1 Introduction
 - 14.2 1.1.2 Where are solvents used in the manufacture of pharmaceutical drugs
 - 14.21.1.2.1 Intermediates of synthesis, DS and excipients
 - 14.21.1.2.2 Drug products

- 14.2 1.1.3 Impacts of the nature of solvents and their quality on the physicochemical characteristics of raw materials and DP
 - 14.21.1.3.1 Raw materials (intermediates, DS, excipients)
 - 14.21.1.3.2 Drug product
 - 14.21.1.3.3 Conclusions
 - 14.21.1.4 Setting specifications for solvents
 - 14.21.1.4.1 Solvents used for the raw material manufacture
 - 14.2 1.1.4.2 Solvents used for the DP manufacture
 - 14.2 1.1.5 Quality of solvents and analysis
 - 14.21.1.5.1 Quality of solvents used in spectroscopy
 - 14.21.1.5.2 Quality of solvents used in chromatography
 - 14.2 1.1.5.3 Quality of solvents used in titrimetry
 - 14.21.1.6 Conclusions
 - 14.2 1.2 Predicting cosolvency for pharmaceutical and environmental applications
 - 14.21.2.1 Introduction
 - 14.2 1.2.2 Applications of cosolvency in pharmaceutical sciences and industry
 - 14.2 1.2.3 Applications of cosolvency in environmental sciences and engineering
 - 14.21.2.4 Experimental observations
 - 14.2 1.2.5 Predicting cosolvency in homogeneous liquid systems
 - 14.21.2.6 Predicting cosolvency in non-ideal liquid mixtures
 - 14.21.2.7 Summary .
 - 14.22 Polymers and man-made fibers
 - 14.23 Printing industry .
 - 14.24 Pulp and paper
 - 14.25 Rubber and plastics
 - 14.26 Use of solvents in the shipbuilding and ship repair industry.
 - 14.26.1 Introduction
 - 14.26.2 Shipbuilding and ship repair operations
 - 14.26.3 Coating operations
 - 14.26.4 Cleaning operations using organic solvents
 - 14.26.4.1 Surface preparation and initial corrosion protection
 - 14.26.4.2 Cleaning operations after coatings are applied
 - 14.26.4.3 Maintenance cleaning of equipment items and components.
 - 14.26.5 Marine coatings
 - 14.26.6 Thinning of marine coatings
 - 14.26.7 Solvent emissions
 - 14.26.8 Solvent waste
 - 14.26.9 Reducing solvent usage, emissions, and waste
 - 14.26.10 Regulations and guidelines for cleaning solvents
 - 14.27 Stone, clay, glass, and concrete
 - 14.28 Textile industry
 - 14.29 Transportation equipment cleaning
 - 14.30 Water transportation
 - 14.31 Wood furniture
 - 14.32 Summary
- 15 METHODS OF SOLVENT DETECTION AND TESTING.
- 15.1 Standard methods of solvent analysis
 - 15.1.1 Alkalinity and acidity
 - 15.1.2 Autoignition temperature
 - 15.1.3 Biodegradation potential
 - 15.1.4 Boiling point
 - 15.1.5 Bromine index
 - 15.1.6 Calorific value
 - 15.1.7 Cleaning solvents
 - 15.1.8 Color
 - 15.1.9 Corrosion (effect of solvents)
 - 15.1.10 Density
 - 15.1.11 Dilution ratio
 - 15.1.12 Dissolving and extraction
 - 15.1.13 Electric properties
 - 15.1.14 Environmental stress crazing
 - 15.1.15 Evaporation rate
 - 15.1.16 Flammability limits

- 15.1.17 Flash point
- 15.1.18 Freezingpoint
- 15.1.19 Free halogens in halogenated solvents
- 15.1.20 Gas chromatography
- 15.1.21 Labeling
- 15.1.22 Odor
- 15.1.23 Paints standards related to solvents
- 15.1.24 pH
- 15.1.25 Purity
- 15.1.26 Refractive index
- 15.1.27 Residual solvents
- 15.1.28 Solubility
- 15.1.29 Solvent partitioning in soils . .
- 15.1.30 Solvent extraction
- 15.1.31 Specifications
- 15.1.32 Sustained burning
- 15.1.33 Vaporpressure
- 15.1.34 Viscosity
- 15.1.35 Volatile organic compound content, VOC
- 15.2 Special methods of solvent analysis
- 15.2.1 Use of breath monitoring to assess exposures to volatile organic solvents
- 15.2.1.1 Principles of breath monitoring
- 15.2.1.2 Types of samples used for biological monitoring
- 15.2.1.3 Fundamentals of respiratory physiology
- 15.2.1.3.1 Ventilation
- 15.2.1.3.2 Partition coefficients
- 15.2.1.3.3 Gas exchange
- 15.2.1.4 Types of exhaled air samples
- 15.2.1.5 Breath sampling methodology
- 15.2.1.6 When is breath monitoring appropriate
- 15.2.1.7 Examples of breath monitoring
- 15.2.2 A simple test to determine toxicity using bacteria
- 15.2.2.1 Introduction
- 15.2.2.2 Toxicity defined
- 15.2.2.3 An alternative
- 15.2.2.4 Chemicals tested
- 15.2.2.5 Comparisons with other tests
- 15.2.2.6 Toxic herbicides
- 15.2.2.7 Toxicity of divalent cations
- 15.2.2.8 Toxicity of organics in the presence of EDTA
- 15.2.2.9 Mechanism for reduction of the dye
- 15.2.2.10 Summary
- 15.2.3 Description of an innovative GC method to assess the influence of crystal texture and drying conditions on residual solvent content in pharmaceutical products
- 15.2.3.1 Description of the RS determination method
- 15.2.3.2 Application: Influence of crystal texture and drying conditions on RS content.
- 15.2.3.2.1 First example: monocrystalline particles of paracetamol
- 15.2.3.2.2 Second example: polycrystalline particles of meprobamate and ibuprofen
- 15.2.3.2.3 Third example: polycrystalline particles of paracetamol
- 16 RESIDUAL SOLVENTS IN PRODUCTS
- 16.1 Residual solvents in various products
- 16.2 Residual solvents in pharmaceutical substances
- 16.2.1 Introduction
- 16.2.2 Why should we look for RS
- 16.2.2.1 Modifying the acceptability of the drug product
- 16.2.2.2 Modifying the physico-chemical properties of drug substances (DS) and drug products (DP) .
- 16.2.2.3 Implications of possible drug/container interactions
- 16.2.2.4 As a tool for forensic applications
- 16.2.2.5 As a source of toxicity
- 16.2.2.5.1 Generalpoints
- 16.2.2.5.2 Brief overview of the toxicology of solvents
- 16.2.3 How to identify and control RS in pharmaceutical substances
- 16.2.3.1 Loss of weight

- 16.2.3.2 Miscellaneous methods
- 16.2.3.3 Gas chromatography (GC)
 - 16.2.3.3.1 Generalpoints
 - 16.2.3.3.2 Review of methods
 - 16.2.3.3.3 Official GC methods for RS determination
- 16.2.4 How to set specifications? Examination of the ICH guidelines for residual solvents
 - 16.2.4.1 Introduction
 - 16.2.4.2 Classification of residual solvents by risk assessment
 - 16.2.4.3 Definition of PDE. Method for establishing exposure limits
 - 16.2.4.4 Limits for residual solvents
 - 16.2.4.5 Analytical procedures
 - 16.2.4.6 Conclusions regarding the ICH guideline
- 16.2.5 Conclusions

17 ENVIRONMENTAL IMPACT OF SOLVENTS

- 17.1 The environmental fate and movement of organic solvents in water, soil, and air
 - 17.1.1 Introduction
 - 17.1.2 Water
 - 17.1.2.1 Solubility
 - 17.1.2.2 Volatilization
 - 17.1.2.3 Degradation
 - 17.1.2.4 Adsorption
 - 17.1.3 Soil
 - 17.1.3.1 Volatilization
 - 17.1.3.2 Adsorption
 - 17.1.3.3 Degradation
 - 17.1.4 Air
 - 17.1.4.1 Degradation
 - 17.1.4.2 Atmospheric residence time
 - 17.1.5 The 31 solvents in water
 - 17.1.5.1 Solubility
 - 17.1.5.2 Volatilization from water
 - 17.1.5.3 Degradation in water
 - 17.1.6 Soil
 - 17.1.6.1 Volatilization
 - 17.1.6.2 Adsorption
 - 17.1.6.3 Degradation
 - 17.1.7 Air
 - 17.2 Fate-based management of organic solvent-containing wastes
 - 17.2.1 Introduction
 - 17.2.1.1 The waste disposal site
 - 17.2.1.2 The advection-dispersion model and the required input
 - 17.2.1.3 Maximum permissible concentrations
 - 17.2.1.4 Distribution of organic compounds in leachate
 - 17.2.2 Movement of solvents in groundwater
 - 17.2.3 Mass limitations
 - 17.3 Environmental fate and ecotoxicological effects of glycol ethers
 - 17.3.1 Introduction
 - 17.3.2 Occurrence
 - 17.3.3 Environmental behavior
 - 17.3.4 Ecotoxicity
 - 17.3.4.1 Survival and growth
 - 17.3.4.2 Reproduction and development
 - 17.3.5 Conclusion
 - 17.4 Organic solvent impacts on tropospheric air pollution.
 - 17.4.1 Sources and impacts of volatile solvents
 - 17.4.2 Modes and scales of impact
 - 17.4.2.1 Direct exposure
 - 17.4.2.2 Formation of secondary compounds
 - 17.4.2.3 Spatial scales of secondary effects
 - 17.4.2.3.1 Global impacts
 - 17.4.2.3.2 Stratospheric ozone depletion
 - 17.4.2.3 Global climate forcing
 - 17.4.2.4 Urban and regional scales

- 17.4.3 Tropospheric ozone
 - 17.4.3.1 Effects
 - 17.4.3.2 Tropospheric photochemistry and ozone formation
 - 17.4.3.3 Assessing solvent impacts on ozone and VOC reactivity
 - 17.4.3.3.1 Quantification of solvent emissions on ozone formation
- 17.4.4 Regulatory approaches to ozone control and solvents
- 17.4.5 Summary

- 18 CONCENTRATION OF SOLVENTS IN VARIOUS INDUSTRIAL ENVIRONMENTS
 - 18.1 Measurement and estimation of solvents emission and odor
 - 18.1.1 Definition "solvent" and "volatile organic compounds" (VOC)
 - 18.1.2 Review of sources of solvent emissions
 - 18.1.2.1 Causes for emissions
 - 18.1.2.2 Emissions of VOCs from varnishes and paints
 - 18.1.2.3 VOC emissions from emulsion paints
 - 18.1.3 Measuring of VOC-content in paints and varnishes
 - 18.1.3.1 Definition of low-emissive coating materials
 - 18.1.3.2 Determination of the VOC content according to ASTM D 3960-1
 - 18.1.3.3 Determination of the VOC content according to ISO/DIS 11 890/1 and 2
 - 18.1.3.3.1 VOC content > 15%
 - 18.1.3.3.2 VOC content > 0.1 and < 15 %
 - 18.1.3.4 Determination of VOC-content in water-thinnable emulsion paints (in-can VOC)
 - 18.1.4 Measurement of solvent emissions in industrial plants
 - 18.1.4.1 Plant requirements
 - 18.1.4.2 The determination of the total carbon content in mg C/Nm
 - 18.1.4.2.1 Flame ionization detector (FID)
 - 18.1.4.2.2 Silica gel approach
 - 18.1.4.3 Qualitative and quantitative assessment of individual components in the exhaust-gas
 - 18.1.4.3.1 Indicator tubes
 - 18.1.4.3.2 Quantitative solvent determination in exhaust gas of plants by means of gas-chromatography
 - 18.1.5 "Odor" definition
 - 18.1.6 Measurement of odor in materials and industrial plants
 - 18.1.6.1 Introduction
 - 18.1.6.2 Odor determination by means of the "electronic nose"
 - 18.1.6.3 Odor determination by means of the olfactometer
 - 18.1.6.4 Example for odor determination for selected materials: Determination of odorant concentration in varnished furniture surfaces
 - 18.1.6.5 Example of odor determination in industrial plants: Odor measurement in an industrial varnishing plant
 - 18.2 Prediction of organic solvents emission during technological processes
 - 18.2.1 Introduction
 - 18.2.2 Methods of degreasing
 - 18.2.3 Solvents
 - 18.2.4 Identification of the emitted compounds
 - 18.2.5 Emission of organic solvents during technological processes
 - 18.2.6 Verification of the method
 - 18.2.7 Relationships between emission and technological parameters
 - 18.2.7.1 Laboratory test stand
 - 18.2.7.2 The influence of temperature on emission
 - 18.2.7.3 The influence of air velocity on emission
 - 18.2.7.4 The relationship between the mass of solvent on wet parts and emissions
 - 18.2.8 Emission of solvents
 - 18.2.9 Verification in industrial conditions
 - 18.3 Indoor air pollution by solvents contained in paints and varnishes
 - 18.3.1 Composition - solvents in paints and varnishes. Theoretical aspects .
 - 18.3.2 Occurrence of solvents in paints and varnishes
 - 18.3.2.1 Solvents in products
 - 18.3.2.2 Paints and varnishes
 - 18.3.3 Emission of solvents
 - 18.3.3.1 Emission
 - 18.3.3.2 Immission
 - 18.3.4 Effects on health of solvents from paints and varnishes
 - 18.3.4.1 Exposure
 - 18.3.4.2 Health effects
 - 18.3.4.2.1 Toxic responses of skin and mucose membranes

- 18.3.4.2.2 Neurological disorders
- 18.3.4.2.3 Carcinogenic effects
- 18.3.4.2.4 Respiratory effects
- 18.3.4.2.5 Toxic responses of blood
- 18.3.4.2.6 Toxic responses of the reproductive system
- 18.3.4.2.7 Toxic responses of other organ systems
- 18.3.5 Methods for the examination of solvents in paints and varnishes
- 18.3.5.1 Environmental monitoring
- 18.3.5.1.1 Solvents in products
- 18.3.5.1.2 Emission of solvents
- 18.3.5.2 Biological monitoring of solvents in human body fluids
- 18.3.5.2.1 Solvents and metabolites in human body fluids and tissues
- 18.3.5.2.2 Biomarkers
- 18.4 Solvent uses with exposure risks
- 18.4.1 Introduction
- 18.4.2 Exposure assessment
- 18.4.3 Production of paints and printing inks
- 18.4.4 Painting
- 18.4.5 Printing
- 18.4.6 Degreasing, press cleaning and paint removal
- 18.4.7 Dry cleaning
- 18.4.8 Reinforced plastics industry
- 18.4.9 Gluing .
- 18.4.10 Other
- 18.4.11 Summary

- 19 REGULATIONS
- 19.1 Introduction
- 19.2 Air laws and regulations
- 19.2.1 Clean Air Act Amendments of 1990
- 19.2.1.1 Background
- 19.2.1.2 Title I - Provisions for Attainment and Maintenance of National Ambient Air Quality Standards
- 19.2.1.3 Title III - Hazardous Air Pollutants
- 19.2.1.4 Title V - Permits
- 19.2.1.5 Title VI - Stratospheric Ozone Protection
- 19.3 Water laws and regulations
- 19.3.1 Clean Water Act
- 19.3.1.1 Background
- 19.3.1.2 Effluent Limitations
- 19.3.1.3 Permit Program
- 19.3.2 Safe Drinking Water Act
- 19.3.2.1 Background
- 19.3.2.2 National Primary Drinking Water Regulations
- 19.4 Land laws & regulations
- 19.4.1 Resource Conservation and Recovery Act (RCRA)
- 19.4.1.1 Background
- 19.4.1.2 RCRA, Subtitle C - Hazardous Waste
- 19.5 Multimedia laws and regulations
- 19.5.1 Pollution Prevention Act of 1990
- 19.5.1.1 Background
- 19.5.1.2 Source Reduction Provisions
- 19.5.2 Toxic Substances Control Act
- 19.5.2.1 Background
- 19.5.2.2 Controlling toxic substances
- 19.6 Occupational laws and regulations
- 19.6.1 Occupational Safety and Health Act
- 19.6.1.1 Background
- 19.6.1.2 Air contaminants exposure limits
- 19.6.1.3 Hazard Communication Standard
- 19.7 International perspective
- 19.7.1 Canada
- 19.7.2 European Union
- 19.8 Tools and resources for solvents
- 19.9 Summary

- 19.10 Regulations in Europe
 - 19.10.1 EEC regulations
 - 19.10.2 German regulations
- 20 TOXIC EFFECTS OF SOLVENT EXPOSURE.
 - 20.1 Toxicokinetics, toxicodynamics, and toxicology
 - 20.1.1 Toxicokinetics and toxicodynamics
 - 20.1.1.1 Exposure
 - 20.1.1.2 Uptake
 - 20.1.1.2.1 Inhalation
 - 20.1.1.2.2 Dermaluptake
 - 20.1.1.2 Metabolism, distribution, excretion
 - 20.1.1.3 Modeling of toxicokinetics and modif factors
 - 20.1.2 Toxicology .
 - 20.1.2.1 General effects
 - 20.1.2.2 Specific non-immunological effects
 - 20.1.2.3 Immunological effects
 - 20.1.2.4 Toxic effects of solvents on other organisms
 - 20.1.2.5 Carcinogenicity
 - 20.1.2.6 Risk assessment
 - 20.1.3 Conclusions
 - 20.2 Cognitive and psychosocial outcome of chronic occupational solvent neurotoxicity
 - 20.2.1 Introduction
 - 20.2.2 Acute symptoms of solvent neurotoxicity
 - 20.2.3 Categorization of OSN
 - 20.2.4 Assessment of OSN
 - 20.2.5 Do the symptoms of Type 2 OSN resolve
 - 20.2.6 Individual differences in susceptibility to OSN
 - 20.2.7 Psychosocial consequences of OSN, and rehabilitation
 - 20.3 Pregnancy outcome following maternal organic solvent exposure. .
 - 20.3.1 Introduction
 - 20.3.2 Animal studies
 - 20.3.3 Pregnancy outcome following maternal organic solvent exposure: a meta-analysis of epidemiologic studies
 - 20.3.4 Pregnancy outcome following gestational exposure to organic solvents: a prospective controlled study
 - 20.3.5 A proactive approach for the evaluation of fetal safety in chemical industries
 - 20.3.6 Overall conclusion
 - 20.4 Industrial solvents and kidney disease
 - 20.4.1 Introduction
 - 20.4.2 Experimental animal studies
 - 20.4.3 Case reports
 - 20.4.4 Case control studies
 - 20.4.5 Epidemiological assessment
 - 20.4.6 Mechanism
 - 20.5 Lymphohematopoietic study of workers exposed to benzene including multiple myeloma, lymphoma and chronic lymphatic leukemia
 - 20.5.1 Introduction
 - 20.5.2 Routes of exposure
 - 20.5.3 Hematopoietic effects of benzene
 - 20.5.4 Carcinogenic effects of benzene
 - 20.5.5 Risk assessment estimates
 - 20.5.6 Levels of exposure
 - 20.5.7 Cell types: hematolymphoproliferative effects of benzene
 - 20.5.8 Epidemiological studies
 - 20.5.9 Solvents and benzene
 - 20.5.10 Genetic fingerprint theory
 - 20.6 Chromosomal aberrations and sister chromatoid exchanges
 - 20.7 Hepatotoxicity
 - 20.7.1 Introduction
 - 20.7.2 Individual variability and hepatotoxicity of solvents
 - 20.7.3 Non-halogenated solvents .
 - 20.7.4 Solvent mixtures
 - 20.7.5 Trichloroethylene
 - 20.7.6 Tetrachloroethylene
 - 20.7.7 Toluene

- 20.7.8 Dichloromethane
- 20.7.9 Stoddard solvent
- 20.7.10 1,1,1-Trichloroethane
- 20.7.11 Summai
- 20.8 Solvents and the liver
 - 20.8.1 Normal anatomic and physiologic function of the liver
 - 20.8.1.1 Factors influencing solvent hepatotoxicity
 - 20.8.1.2 Microscopic, biochemical and clinical findings associated with liver injury due to solvents
 - 20.8.2 Hepatotoxicity associated with specific solvents
 - 20.8.2.1 Haloalkanes and haloalkenes
 - 20.8.2.2 Carbon tetrachloride
 - 20.8.2.3 Chloroform
 - 20.8.2.4 Dichloromethane
 - 20.8.2.5 Trichloroethanes
 - 20.8.2.6 1,1,2,2-Tetrachloroethane
 - 20.8.2.7 Tetrachloroethylene and trichloroethylene
 - 20.8.2.8 Other halogenated hydrocarbons
 - 20.8.2.9 Styrene and aromatic hydrocarbons
 - 20.8.2.10 N-substituted amides
 - 20.8.2.11 Nitroparaffins
 - 20.8.2.12 Other solvents and mixed solvents
- 20.9 Toxicity of environmental solvent exposure for brain, lung and heart.

21. SUBSTITUTION OF SOLVENTS BY SAFER PRODUCTS AND PROCESSES

- 21.1 Supercritical solvents
 - 21.1.1 Introduction
 - 21.1.1.1 A promising path to green chemistry
 - 21.1.1.2 Unique and tunable physico-chemical properties
 - 21.1.1.3 Sustainable applications in many different areas
 - 21.1.2 Fundamentals
 - 21.1.2.1 Phase behavior with supercritical solvents
 - 21.1.2.1.1 Experimental methods
 - 21.1.2.1.2 Computational aspects
 - 21.1.2.1.3 Modeling
 - 21.1.2.2 Transport properties of supercritical solvents
 - 21.1.2.2.1 Viscosity
 - 21.1.2.2.2 Diffusivity
 - 21.1.2.2.3 Thermal conductivity
 - 21.1.2.2.4 Surface tension
 - 21.1.2.3 Entrainer (co-solvent effects) of supercritical solvents
 - 21.1.2.4 Reaction rate implication in supercritical solvents
 - 21.1.2.5 Sorption behavior of supercritical solvents
 - 21.1.2.6 Swelling with supercritical solvents
 - 21.1.2.7 Surfactants and micro-emulsions
 - 21.1.3 Separation with supercritical solvents
 - 21.1.3.1 Leaching - generic application
 - 21.1.3.2 Extraction - generic applications
 - 21.1.3.3 Crystallization - generic applications
 - 21.1.3.4 Sorption - generic applications
 - 21.1.4 Reactions in supercritical solvents
 - 21.1.4.1 Homogenous reactions in supercritical solvents - examples
 - 21.1.4.1.1 Homogeneous reactions catalyzed by organometallic compounds
 - 21.1.4.1.2 Homogeneous reactions of supercritical water
 - 21.1.4.1.3 Homogeneous non-catalytic reactions in supercritical solvents
 - 21.1.4.2 Heterogeneous reactions in supercritical solvents - examples
 - 21.1.4.2.1 Heterogeneous catalytic reactions in supercritical solvents
 - 21.1.4.2.2 Heterogeneous non-catalytic reactions in supercritical solvents
 - 21.1.4.3 Biochemical reactions - examples
 - 21.1.4.4 Polymerization reactions - examples
 - 21.1.4.5 Materials processing with supercritical solvents
 - 21.1.4.6 Particle synthesis - generic application
 - 21.1.4.7 Encapsulation - generic application
 - 21.1.4.8 Spraying and coating - generic application
 - 21.1.4.9 Extrusion - generic application

- 21.1.4.10 Perfusion (impregnation) - generic application
- 21.1.4.11 Parts cleaning - generic application
- 21.1.4.12 Drying - generic application
- 21.2 Ionic liquids
- 21.2.1 Introduction
- 21.2.2 Fundamental principles of the formation of room
- 21.2.2.1 Development of ionic liquids
- 21.2.2.2 Binary ionic liquid systems
- 21.2.3 Catalysis in ionic liquids
- 21.2.3.1 Reactions involving first generation chloroaluminate(III)
- 21.2.3.2 Reactions in neutral or second generation ionic liquids.
- 21.2.4 Electrochemical applications
- 21.2.4.1 Electrosynthesis
- 21.2.5 Physical characterization
- 21.2.5.1 Viscosity
- 21.2.5.2 Density
- 21.2.6 Summary
- 21.3 Oxide solubilities in ionic melts
- 21.3.1 Methods used for solubility estimations in ionic melts
- 21.3.1.1 Isothermal saturation method
- 21.3.1.2 Potentiometric titration method
- 21.3.2 Oxygen-containing melts
- 21.3.3 Halide melts
- 21.3.3.1 The eutectic mixture KCl-LiCl(0.41:0.59)
- 21.3.3.2 Molten KCl-NaCl (0.50:0.50)
- 21.3.3.3 Other chloride-based melts
- 21.3.3.4 Other alkaline halides
- 21.3.4 On the possibility to predict oxide solubilities
- 21.3.4.1 The estimation of effect of anion
- 21.3.4.2 The estimation of effect of melt acidity
- 21.3.4.3 The estimation of effect of temperature
- 21.3.5 Conclusions
- 21.4 Alternative cleaning technologies/drycleaning installations
- 21.4.1 Drycleaning with liquid carbon dioxide (LCD)
- 21.4.1.1 Basics
- 21.4.1.2 State of the art
- 21.4.1.3 Process technology.
- 21.4.1.4 Risks
- 21.4.1.5 Competition .
- 21.4.2 Wet cleaning
- 21.4.2.1 Kreussler textile cleaning system
- 21.4.2.2 Possibilities
- 21.4.2.3 Limitations
- 21.4.2.4 Adapting to working practices
- 21.4.3 Future

- 22 SOLVENT RECYCLING; REMOVAL, AND DEGRADATION...
- 22.1 Absorptive solvent recovery
- 22.1.1 Introduction
- 22.1.2 Basic principles
- 22.1.2.1 Fundamentals of adsorption
- 22.1.2.2 Adsorption capacity
- 22.1.2.3 Dynamic adsorption in adsorber beds
- 22.1.2.4 Regeneration of the loaded adsorbents
- 22.1.3 Commercially available adsorbents
- 22.1.3.1 Activated carbon
- 22.1.3.2 Molecular sieve zeolites
- 22.1.3.3 Polymeric adsorbents
- 22.1.4 Adsorptive solvent recovery systems
- 22.1.4.1 Basic arrangement of adsorptive solvent recovery with steam desorption.
- 22.1.4.2 Designing solvent recovery systems
- 22.1.4.2.1 Design basis
- 22.1.4.2.2 Adsorber types
- 22.1.4.2.3 Regeneration

- 22.1.4.2.4 Safety requirements
- 22.1.4.3 Special process conditions
 - 22.1.4.3.1 Selection of the adsorbent
 - 22.1.4.3.2 Air velocity and pressure drop
 - 22.1.4.3.3 Effects of solvent-concentration, adsorption temperature and pressure
 - 22.1.4.3.4 Influence of humidity
 - 22.1.4.3.5 Interactions between solvents and activated carbon
 - 22.1.4.3.6 Activated carbon service life
- 22.1.5 Examples from different industries
 - 22.1.5.1 Rotogravure printing shops
 - 22.1.5.2 Packaging printing industry
 - 22.1.5.2.1 Fixed bed adsorption with circulating hot gas desorption
 - 22.1.5.2.2 Solvent recovery with adsorption wheels
 - 22.1.5.3 Viscose industry
 - 22.1.5.4 Refrigerator recycling
 - 22.1.5.5 Petrochemical industry and tank farms
 - 22.1.5.6 Chemical industry
- 22.2 Solvent recovery
 - 22.2.1 Activated carbon in fluidized bed adsorption method
 - 22.2.2 Application of molecular sieves
 - 22.2.3 Continuous process for air cleaning using macroporous particles as adsorption agents
 - 22.2.4 Solvent recovery from hazardous wastes
 - 22.2.5 Halogenated solvent recovery
 - 22.2.5.1 Coating process
 - 22.2.5.2 Tableting process of pharmaceutical products
 - 22.2.6 Energy recovery from waste solvent
- 22.3 Solvent treatment in a paints and coating plant
- 22.4 Application of solar photocatalytic oxidation to VOC-containing airstreams.
 - 22.4.1 Solvent degradation by photocatalytic oxidation
 - 22.4.2 PCO pilot scale systems
 - 22.4.2.1 Air stripper application
 - 22.4.2.2 Paint booth application
 - 22.4.3 Field test results
 - 22.4.3.1 Air stripper application
 - 22.4.3.2 Paint booth application
 - 22.4.4 Comparison with other treatment systems

23 CONTAMINATION CLEANUP: NATURAL ATTENUATION AND ADVANCED REMEDIATION TECHNOLOGIES

- 23.1 Natural attenuation of chlorinated solvents in ground water
 - 23.1.1 Introduction
 - 23.1.2 Natural attenuation processes affecting chlorinated solvent plumes
 - 23.1.2.1 Advection
 - 23.1.2.2 Dispersion
 - 23.1.2.3 Sorption
 - 23.1.2.4 One-dimensional advection-dispersion equation with retardation
 - 23.1.2.5 Dilution (recharge)
 - 23.1.2.6 Volatilization
 - 23.1.2.7 Hydrolysis and dehydrohalogenation
 - 23.1.2.8 Reduction reactions
 - 23.1.3 Biodegradation of chlorinated solvents
 - 23.1.3.1 Halorespiration or reductive dechlorination using hydrogen
 - 23.1.3.1.1 Stoichiometry of reductive dechlorination
 - 23.1.3.1.2 Chlorinated solvents that are amenable to halorespiration
 - 23.1.3.2 Oxidation of chlorinated solvents
 - 23.1.3.2.1 Direct aerobic oxidation of chlorinated compounds
 - 23.1.3.2.2 Aerobic cometabolism of chlorinated compounds
 - 23.1.3.2.3 Anaerobic oxidation of chlorinated compounds
 - 23.1.4 Biodegradation rates for chlorinated solvents
 - 23.1.4.1 Michaelis-Menten rates
 - 23.1.4.2 Zero-order rates
 - 23.1.4.3 First-order rate constants
 - 23.1.5 Geochemical evidence of natural bioremediation at chlorinated solvent sites.
 - 23.1.5.1 Assessing reductive dechlorination at field sites
 - 23.1.5.2 Plume classification schemes

- 23.1.5.2.1 Type 1
- 23.1.5.2.2 Type 2
- 23.1.5.2.3 Type 3
- 23.1.5.2.4 Mixed environments
- 23.1.6 Chlorinated solvent plumes - case studies of natural attenuation
- 23.1.6.1 Plume databases
- 23.1.6.2 Modeling chlorinated solvent plumes
- 23.1.6.2.1 BIOCHLOR natural attenuation model
- 23.1.6.3 RT3D numerical model
- 23.1.6.4 CS case study - The Plattsburgh Air Force Base
- 23.2 Remediation technologies and approaches for managing sites impacted by hydrocarbons
- 23.2.1 Introduction
- 23.2.1.1 Understanding HC and CHC in the environment
- 23.2.1.2 Sources of HC in the environment
- 23.2.1.3 Sources of CHC in the environment
- 23.2.2 In situ biotreatment
- 23.2.2.1 Microbial-enhanced natural attenuation/bioremediation
- 23.2.2.1.1 Case study - Cooper River Watershed, Charleston, SC, USA
- 23.2.2.2 Phytoremediation
- 23.2.2.2.1 Case study - phytoremediation for CHCs in groundwater at a chemical plant in Louisiana
- 23.2.3 In situ treatment technologies
- 23.2.3.1 Product recovery via GCW technology
- 23.2.3.1.1 Case study - GCW recovery of creosote, Cabot/Kopper's Superfund Site, Gainesville, FL
- 23.2.3.2 Surfactant enhanced product recovery
- 23.2.3.2.1 Case study - Surfactant-aided chlorinated HC DNAPL recovery, Hill Air Force Base, Ogden, Utah
- 23.2.3.3 Foam-enhanced product recovery
- 23.2.3.4 Thermal desorption - Six Phase Heating
- 23.2.3.4.1 Case study - Six-Phase Heating removal of CHC at a manufacturing facility near Chicago, IL
- 23.2.3.5 In situ steam enhanced extraction (Dynamic Underground Stripping)
- 23.2.3.6 In situ permeable reactive barriers (funnel and gate)
- 23.2.3.6.1 Case study - CHC remediation using an in situ permeable reactive barrier at Naval Air Station Moffett Field, CA
- 23.2.4 Conclusions
- 24 PROTECTION
- 24.1 Gloves
- 24.2 Suit materials
- 24.3 Respiratory protection
- 25 NEW TRENDS BASED ON PATENT LITERATURE
- 25.1 New solvents
- 25.2 Adhesives
- 25.3 Aerospace
- 25.4 Agriculture
- 25.5 Asphalt
- 25.6 Automotive applications
- 25.7 Coil coating
- 25.8 Composites and laminates
- 25.9 Cosmetics
- 25.10 Cleaning
- 25.11 Fibers
- 25.12 Furniture and wood coatings
- 25.13 Paper
- 25.14 Printing
- 25.15 Stone and concrete
- 25.16 Wax
- 25.17 Summary
- ACKNOWLEDGMENTS
- INDEX

Reviews - Synopsis - Dust Jacket

This comprehensive handbook provides a textual analysis of the principles of solvent selection and use. It offers a balanced presentation of solvent performance, processing, characteristics, and environmental issues. It explains solvent

formulation principles for 33 major industries, identifies the risks and benefits of specific solvents and classes of solvents, and discusses the newest water-based technologies.

This book was written by a group of experts on various subjects of solvents' use, the fundamental principles governing their application, effect on health and environment, residual solvents in products, their concentration in industrial environments, current regulations, safer substitutes, non-emitting technologies of use, contamination cleanup, personal protection, and the most modern trends in future technology. The authors, who are the members of prestigious universities and industries from around the world, altogether have previously written 47 books and hundreds of papers on the subject and here they give a synthesis of their experiences and opinions on how best to change the global use of solvents in order to obtain benefits of technology and at the same time limit risk and health effects, and more.

All 25 chapters of this book were written between summer of 1999 and spring of 2000 and contain over 5000 references to source literature, enabling the user to find specific information on any subject related to solvents. The text is illustrated by figures and tables which compare in number with multi-volume encyclopedias.

The book contains a synthesis of a large sample of data and information to reveal fundamental principles which data helped to discover. The actual data on 1141 solvents are in the form of a searchable database on CD-ROM (see separate information on Database of Solvents, ISBN 1985198259). The database contains 110 categories of data (fields) and almost 40,000 single data entries, making it the largest extant database on solvents.

PREFACE:

Although the chemical industry can trace its roots into antiquity, it was during the industrial revolution that it started to become an actual industry and began to use the increased knowledge of chemistry as a science and technology to produce products that were needed by companion industries and consumers. These commercial efforts resulted in the synthesis of many new chemicals. Quite quickly, in these early days, previously unknown materials or materials that had been present only in low concentrations, were now in contact with people in highly concentrated forms and in large quantities. The people had little or no knowledge of the effects of these materials on their bodies and the natural biological and physical processes in the rivers and oceans, the atmosphere, and in the ground.

Until the end of the nineteenth century these problems were not addressed by the chemical industry and it is only recently that the industry began to respond to public criticism and political efforts. Legal restrictions aimed at preserving the quality of life have been directed at health, safety and longevity issues and the environment. Solvents have always been mainstays of the chemical industry and because of their widespread use and their high volume of production they have been specifically targeted by legislators throughout the world. The restrictions range from total prohibition of production and use, to limits placed on vapor concentrations in the air. As with any arbitrary measures some solvents have been damned unfairly. However, there is no question that it is best to err on the side of safety if the risks are not fully understood. It is also true that solvents should be differentiated based on their individual properties.

This book is intended to provide a better understanding of the principles involved in solvent selection and use. It strives to provide information that will help to identify the risks and benefits associated with specific solvents and classes of solvents. The book is intended to help the formulator select the ideal solvent, the safety coordinator to safeguard his or her coworkers, the legislator to impose appropriate and technically correct restrictions and the student to appreciate the amazing variety of properties, applications and risks associated with the more than one thousand solvents that are available today.

By their very nature, handbooks are intended to provide exhaustive information on the subject. While we agree that this is the goal here, we have attempted to temper the impact of information, which may be too narrow to make decision.

Many excellent books on solvents have been published in the past and most of these are referenced in this book. But of all these books none has given a comprehensive overview of all aspects of solvent use. Access to comprehensive data is an essential part of solvent evaluation and it has been a hallmark of such books to provide tables filled with data to the point at which 50 to 95% of the book is data. This approach seems to neglect a fundamental requirement of a handbook - to provide the background, explanations and clarifications that are needed to convert data to information and assist the reader in gaining the knowledge to make a decision on selecting a process or a solvent. Unfortunately, to meet the goal of providing both the data and the fundamental explanations that are needed, a book of 4,000 to 5,000 pages might be required. Even if this was possible, much of the data would fall out of date quite quickly. For example, a factor that defines solvent safety such as threshold limit values (TLVs) for worker exposure or some single toxicity determinants may change frequently. This book would be huge and it would have to be updated frequently to continue to claim that it is current.

What we have attempted to do here is to give you a book with a comprehensive and extensive analysis of all current information on solvents then use other media to present the supporting data on individual solvents. These data are provided on a CD-ROM as a searchable database. Data are provided on more than 1140 solvents in 110 fields of data.

The medium permits frequent updates. If the same data were presented in book form, more than 2,000 pages would be needed which exceeds the size of any data in handbook form offered to date.

The best approach in presenting an authoritative text for such a book is to have it written by experts in their fields. This book attracted well-known experts who have written jointly 47 books and authored or coauthored hundreds of papers on their areas of expertise. The authors have made their contributions to this book in late 1999 and early 2000 providing the most current picture of the technology. Their extreme familiarity with their subjects enables them to present information in depth and detail, which is essential to the reader's full understanding of the subject.

The authors were aware of the diversity of potential readers at the outset and one of their objectives was to provide information to various disciplines expressed in a way that all would understand and which would deal with all aspects of solvent applications. We expect professionals and students from a wide range of businesses, all levels of governments and academe to be interested readers. The list includes solvent manufacturers, formulators of solvent containing products, industrial engineers, analytical chemists, government legislators and their staffs, medical professionals involved in assessing the impact on health of solvents, biologists who are evaluating the interactions of solvents with soil and water, environmental engineers, industrial hygienists who are determining protective measures against solvent exposure, civil engineers who design waste disposal sites and remediation measures, people in industries where there are processes which use solvents and require their recovery and, perhaps most important, because understanding brings improvements, those who teach and learn in our universities, colleges and schools.

A growing spirit of cooperation is evident between these groups and this can be fostered by providing avenues of understanding based on sharing data and information on common problems. We hope to provide one such avenue with this book. We have tried to present a balanced picture of solvent performance by dealing not only with product performance and ease of processing but also by giving environmental and health issues full consideration.

Data and information on known products and processes should be cornerstones of the understanding of a technology but there is another aspect of technology, which could lead to advances and improvements in utility, safety and in safeguarding the environment. This must come from you, the reader. It is your ideas and creative thinking that will bring these improvements. The authors have crammed their ideas into the book and we hope these will stimulate responsible and effective applications of solvents. Francis Bacon wrote, "The end of our foundation is the knowledge of causes, and the secret motion of things, and the enlarging of the bound of human Empire, to the effecting of all things possible."

Today there are few technical activities that do not employ solvents. Almost all industries, almost all consumer products, almost everything we use can, if analyzed, be shown to contain or to have used in its processing, a solvent. Solvent elimination need never be a technical objective. Rather, we need to use our increasing understanding and knowledge to find the safest and the most effective means of meeting our goals.

I would like to thank the authors for their relentless efforts to explain the difficult in an interesting way. In advance, I would like to thank the reader for choosing this book and encourage her or him to apply the knowledge to make our world a better, more livable place.

INTRODUCTION:

Chemical transformations can be performed in a gas, liquid, or solid phase, but, with good reasons, the majority of such reactions is carried out in the liquid phase in solution. At the macroscopic level, a liquid is the ideal medium to transport heat to and from exo- and endothermic reactions. From the molecular-microscopic point of view, solvents break the crystal lattice of solid reactants, dissolve gaseous or liquid reactants, and they may exert a considerable influence over reaction rates and the positions of chemical equilibria. Because of nonspecific and specific intermolecular forces acting between the ions or molecules of dissolved reactants, activated complexes as well as products and solvent molecules (leading to differential solvation of all solutes), the rates, equilibria, and the selectivity of chemical reactions can be strongly influenced by the solvent. Other than the fact that the liquid medium should dissolve the reactants and should be easily separated from the reaction products afterwards, the solvent can have a decisive influence on the outcome (i.e., yield and product distribution) of the chemical reaction under study. Therefore, whenever a chemist wishes to perform a certain chemical reaction, she/he has to take into account not only suitable reaction partners and their concentrations, the proper reaction vessel, the appropriate reaction temperature, and, if necessary, the selection of the right reaction catalyst but also, if the planned reaction is to be successful, the selection of an appropriate solvent or solvent mixture.

Solvent effects on chemical reactivity have been studied for more than a century, beginning with the pioneering work of Berthelot and Saint Gilles in Paris in 1862 on esterification reactions and with that of Menschutkin in St. Petersburg in 1880 on the quaternization of tertiary amines by haloalkanes. At this time Menschutkin remarked that "a reaction cannot be separated from the medium in which it is performed... Experience shows that solvents exert considerable influence on reaction rates." Today, we can suggest a striking example to reinforce his remark, the rate of the unimolecular heterolysis of 2-chloro-2-methylpropane observed in water and benzene increases by a factor of approximately 10^{+11} when the nonpolar benzene is replaced by water. The influence of solvents on the position of chemical equilibria was

discovered in 1896 by Claisen in Aachen, Knorr in Jena, Wislicenus in Wurzburg, and Hantzsch in Wurzburg. They investigated almost simultaneous but independent of one another the keto-enol tautomerism of 1,3-dicarbonyl compounds and the nitro-isonitro tautomerism of primary and secondary aliphatic nitro compounds. With this example, the enol content of acetylacetone increases from 62 to 95 % when acetonitrile is substituted with n-hexane.

The proper solvent and solvent mixture selection is not only important for chemical but also for physical processes such as recrystallization, all extraction processes, partitioning, chromatographic separations, phase-transfer catalytic reactions, etc. Of particular interest in this context is the influence of solvents on all types of light absorption processes, e.g., on UV/Vis, IR, ESR, and NMR spectra, caused by differential solvation of the ground and excited states of the absorbing species. In 1878, Kundt in Zurich proposed the rule that increasing dispersion interactions between the absorbing solute and the solvent lead in general to a bathochromic shift of an UV/Vis absorption band. Later, in 1922, Hantzsch termed the solvent-dependence of UV/Vis absorption spectra "solvatochromism". UV/Vis absorption of solute molecules can be influenced not only by the surrounding solvent sphere, but also by other entities in the surroundings such as solids, polymers, glasses, and surfaces. In order to emphasize this influence, the use of the more general term "perichromism" (from Greek peri = around) has been recommended. A typical, more recent, example of extraordinary solvatochromism is the intramolecular charge-transfer Vis-absorption of 2,6-diphenyl-4-(2,4,6-triphenyl-1-pyridinio)phenolate, a zwitterionic betaine dye: its corresponding absorption band is shifted from $\lambda_{\text{max}} = 810 \text{ nm}$ to $\lambda_{\text{max}} = 453 \text{ nm}$ ($\Delta\lambda = 357 \text{ nm}$) when diphenyl ether is replaced by water as solvent. Such solvatochromic dyes can be used as empirical solvent polarity indicators.

The number of solvents generally available to chemists working in research and industrial laboratories is between 250 and 300 (there is an infinite number of solvent mixtures), and this number is increasing. More recently and for obvious reasons, the search for new solvents has been intensified: peroxide-forming solvents are being substituted by solvents which are more stable against oxidation (e.g., diethyl ether by t-butyl methyl ether or by formaldehyde dialkyl acetals), toxic solvents are being replaced by nontoxic ones (e.g., the cancerogenic hexamethylphosphoric triamide, HMPT, by N,N'-dimethylpropyleneurea, DMPU) and environmentally dangerous solvents by benign ones (e.g., tetrachloromethane by perfluorohexane). The development of modern solvents for organic syntheses is the subject of much current research. Amongst these modern solvents, also called "neoteric solvents" (neoteric = recent, new, modern) in contrast to the classical ones, are ionic liquids (i.e., room-temperature liquid salts such as 1-ethyl-3-methylimidazolium tetra-chloroaluminates) supercritical-fluid solvents, SCF, (such as SCF carbon dioxide) and perfluorinated solvents (e.g., partially or perfluorinated hydrocarbons as used in so-called "fluorous biphasic catalysis reactions", making possible mono-phase reactions and a two-phase separation of catalyst and reaction products). Even plain water has found a magnificent renaissance as a solvent for organic reactions. These efforts have also recently strengthened the search for completely solvent-free reactions, thus avoiding the use of expensive, toxic, and environmentally problematic solvents.

With respect to the large and still increasing number of valuable solvents useful for organic syntheses, a chemist needs, in addition to his experience and intuition, to have general rules, objective criteria, and the latest information about the solvents' physical, chemical, and toxicological properties for the selection of the proper solvent or solvent mixture for a planned reaction or a technological process. To make this often cumbersome and time-consuming task easier, this "Handbook of Solvents" with its twenty-five chapters is designed to provide a comprehensive source of information on solvents over a broad range of applications. It is directed not only to chemists working in research laboratories, but also to all industries using solvents for various purposes. A particular advantage is that the printed handbook is accompanied by a compact-disc (CD-ROM) containing additional solvent databases with hundred ten fields for over eleven hundred solvents. This makes large data sets easily available for quick search and retrieval and frees the book text from bulky tables, thus giving more room for a thorough description of the underlying theoretical and practical fundamental subjects.

Fundamental principles governing the use of solvents (i.e., chemical structure, molecular design as well as physical and chemical properties of solvents) are given in Chapter 2. Solvent classification, methods of solvent manufacture together with properties and typical applications of various solvents are provided in Chapter 3. Chapters 4, 5 and 6 deal with all aspects of the dissolution of materials in solvents as well as with the solubility of selected systems (e.g., polymers and elastomers) and the influence of the solute's molecular structure on its solubility behavior. In particular, the valuable solubility-parameter concept is extensively treated in these chapters. All aspects of solvent transport within polymeric system and the drying of such polymeric systems, including coated films, are described in Chapter 7. The fundamentals of the interaction forces acting between ions or molecules of the solvents themselves and between solutes and solvents in solutions are presented in Chapter 8. Chapter 9 deals with the corresponding properties of solvent mixtures. Specific solute/solvent interactions, particularly Lewis acid/base interactions between electron-pair donors (EPD) and electron-pair acceptors (EPA), are reviewed in Chapter 10, together with the development of empirical scales of solvent polarity and Lewis acidity/basicity, based on suitable solvent-dependent reference processes, and their application for the treatment of solvent effects. The theory for solvent effects on electronic properties is provided in Chapter 11 and extended to solvent-dependent properties of solutes such as fluorescence spectra, ORD and CD spectra. Aggregation, swelling of polymers, their conformations, the viscosity of solutions and other solvent-related properties are treated in Chapter 12. A review concerning solvent effects on various types of chemical reactivity is given in Chapter 13, along with a discussion of the effects of solvent on free-radical polymerization and phase-transfer catalysis reactions.

The second part of this handbook (Chapters 14-25) is devoted more to the industrial use of solvents. Formulating with solvents applied in a broad range of industrial areas such as biotechnology, dry cleaning, electronic industry, food industry, paints and coatings, petroleum refining industry, pharmaceutical industry, textile industry, to mention only a few, is extensively described in Chapter 14. Standard and special methods of solvent detection and solvent analysis as well as the problem of residual solvents in various products, particularly in pharmaceutical ones, are the topics of Chapters 15 and 16.

At present, large-scale chemical manufacturing is facing serious solvent problems with respect to environmental concerns. National and international regulations for the proper use of hazardous solvents are becoming increasingly stringent and this requires the use of environmentally more benign but nevertheless economical liquid reaction media. This has enormously stimulated the search for such new solvent systems within the frame work of so-called green chemistry. Supercritical fluids, SCF, and ionic liquids (room temperature liquid salts) have been known and have been the subject of scientific interest for a long time. It is only recently, however, that the potential benefits of these materials in solvent applications have been realized. This handbook includes in Chapters 17-25 all the knowledge necessary for a safe handling of solvents in research laboratories and in large-scale manufacturing, beginning with the environmental impact of solvents on water, soil, and air in Chapter 17, followed by considerations about safe solvent concentrations and the risks of solvent exposure in various industrial environments in Chapter 18. Chapter 19 summarizes the corresponding legal regulations, valid for North America and Europe, and Chapter 20 describes in detail the toxic effects of solvent exposure to human beings. Authors specializing in different fields of solvent toxicity give the most current information on the effect of solvent exposure from the point of view of neurotoxicity, reproductive and maternal effects, nephrotoxicity, cancerogenicity, hepatotoxicity, chromosomal aberrations, and toxicity to brain, lungs, and heart. This information brings both the results of documented studies and an evaluation of risk in different industrial environments in a comprehensive but easy to understand form to engineers and decision-makers in industry. Chapter 21 is focused on the substitution of harmful solvents by safer ones and on the development of corresponding new technological processes. Chapter 22 describes modern methods of solvent recovery, solvent recycling. When recycling is not possible, then solvents have to be destroyed by incineration or other methods of oxidation, as outlined in Chapter 22. Chapter 23 describes natural attenuation of solvents in groundwater and advanced remediation technologies as well as management strategies for sites impacted by solvent contamination. Protection from contact with solvents and their vapors is discussed in Chapter 24. Finally, new trends in solvent chemistry and applications based on the recent patent literature are discussed in Chapter 25.

In most cases, the intelligent choice of the proper solvent or solvent mixture is essential for the realization of certain chemical transformations and physical processes. This handbook tries to cover all theoretical and practical information necessary for this often difficult task for both academic and industrial applications. It should be used not only by chemists, but also by physicists, chemical engineers, and technologists as well as environmental scientists in academic and industrial institutions. It is to be hoped that the present compilation of all relevant aspects connected with the use of solvents will also stimulate further basic and applied research in the still topical field of the physics and chemistry of liquid media.

Title	Location	Edition / Series / Misc.
68 Hansen Solubility Parameters: A User's Handbook		Edition:
Author: Hansen, Charles M.	Dynix: 89761	Series:
Publish.: CRC (Chemical Rubber Company) Press	Call No.: 547.7 Ha	
- place: Boca Raton, FL	ISBN: 0849315255	
- date: ©2000	Shelf Adult Non-Fiction	Year: 2000
Subject: Solution (Chemistry)		Price: \$108.50
Desc: 208 p., illus., 26 cm.		

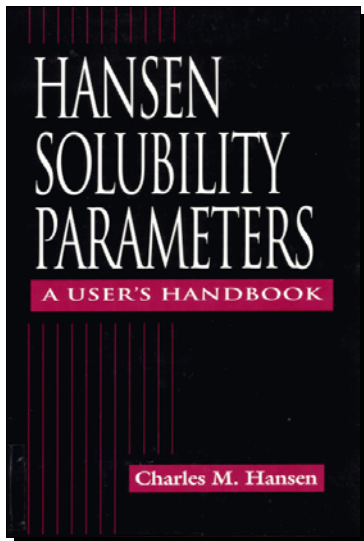


Table of Contents

1. Solubility Parameters --- An Introduction
 2. Theory --- The Prigogine Corresponding States Theory, the X12 Interaction Parameter, and the Hansen Solubility Parameters
 3. Methods of Characterization --- Polymers
 4. Methods of Characterization --- Surfaces
 5. Methods of Characterization for Pigments, Fillers, and Fibers
 6. Applications --- Coatings and Other Filled Polymer Systems
 7. Applications --- Chemical Resistance
 8. Applications --- Barrier Polymers
 9. Hansen Solubility Parameters --- Biological Materials
 10. Applications --- Safety and Environment
 11. The Future
- Appendix
Index

Reviews - Synopsis - Dust Jacket

From Book News, Inc.
Hansen (Senior Scientist at FORCE Institute in Broendby Denmark) describes the techniques that he developed that allow correlations and systemic comparisons in the science of polymer solvents. These techniques are used in comparisons in polymer solubility, swelling, permeation, surface wetting, and dewetting, solubility of organic salts, and biological applications. The approach not only quantitatively describes hydrogen bonding and polar bonding in many types of systems, but in fact agrees with and extends the very general Prigogine theory. Book News, Inc.®, Portland, OR

Subjects

329 .	Solution (Chemistry)
406 .	Polymers -- Solubility
464 .	Thin films

Book Description
Authored by the father of the concept, Hansen Solubility Parameters provides new tables of previously unpublished correlations and parameters. The author illuminates his text with practical examples relating to coatings, biological systems, pigments, and fibers, and takes a general approach that makes this reference ideal for predicting compatibility, adsorption on surfaces, orientation toward materials of similar affinities (self-assembly), and other phenomena associated with solubility and affinity.

BOOK JACKET:

Charles M. Hansen began his work with solvents in 1962, and almost immediately began producing new and groundbreaking results. Since then, his Hansen Solubility Parameters have been extensively used and proven valuable to a variety of industries. They allow correlations and systematic comparisons previously not possible, such as polymer solubility, swelling, permeation, surface wetting and dewetting, solubility of organic salts, and many biological applications. Until now, however, their seemingly universal ability to predict molecular affinities has been generally taken as semiempirical.

Hansen Solubility Parameters provides new tables of previously unpublished correlations and parameters. The author illuminates the text with practical examples relating to coatings, biological systems, pigments and fibers, and takes a general approach that makes this reference ideal for predicting compatibility, adsorption on surfaces, orientation toward materials of similar affinities (self-assembly), and other phenomena associated with solubility and affinity.

Chemical engineers, chemists, and biochemists will find this book - the collected work and experience of the father of its concept - intriguing for its theory and invaluable for its data.

Title	Location	Edition / Series / Misc.
69 Hazardous and Toxic Materials: Safe Handling and Disposal Author: Fawcett, Howard H. Publish.: John Wiley & Sons - place: New York, NY - date: ©1984 Subject: Hazardous wastes -- United States -- Safety measures Desc: xi, 296 p., illus., 24 cm.	Dynix: 02760 Call No.: 615.902 Fa ISBN: 0471804835 Shelf Adult Non-Fiction	Edition: Series: Year: 1984 Price: \$25.00

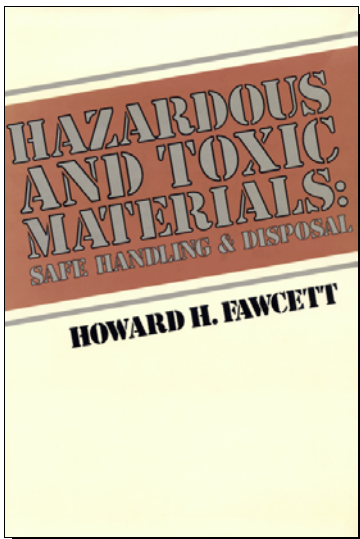


Table of Contents

1. The Laboratory in the Beginning -- the Edge of the Atom
2. Toxicity-Part I
3. Toxicity-Part II, Toxicity versus Hazard
4. Fires and Explosions
5. Personal Protective Equipment
6. Respiratory Protective Equipment
7. RCRA, SUPERFUND, and Guides to Their Implementation
8. Dioxin (TCDD), Dibenzofurans, and Related Compounds
9. Medical Care and Surveillance Program for Hazardous Waste Workers

Appendixes

1. National Priorities List by EPA Regions
2. National Priority List Additions Grouped with Similar Hazard Rating System Scores
3. Legal Interest in Hazardous Wastes

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The widespread media interest in hazardous and toxic chemicals -- especially the extensive coverage of improper or inadequate disposal practices -- has seriously damaged the public image of the chemical and engineering profession and caused a considerable financial drain on the industry. The term "toxic chemical" has almost become one word.

This book offers a balanced, unbiased view of the latest scientific information about hazardous and toxic materials, their containment, and their availability to man, animals and plants. First, Hazardous and Toxic Materials takes a close look at the laboratory where most of these materials originate and then proceeds into fire and explosion hazards and their detection. Avoiding excessive "horror stories" it details the personal protection for the body, head, feet, and respiratory system that's necessary in the waste site investigation and clean-up environments. The legal applications of RCRA and SUPERFUND -- the enforcement laws and financial base -- are discussed at length. There's also an updated analysis of the most widely misunderstood chemical of all time, dioxin. A special Appendix lists 546 "National Priority Sites" which are broken down geographically.

Health and environmental officials, local action groups, chemists, engineers, technical advisors, laboratory workers, students, and anyone concerned with this topical issue will find here the scientific facts behind the newspaper headlines. Assuming a positive, problem-solving approach, Hazardous and Toxic Materials emphasizes the importance of alternative disposal methods and shows how to control and prevent future environmental disasters.

PREFACE:

When any aspect of science or technology becomes an item of public concern or when the benefits of chemistry and chemical engineering are overneutralized by statements in the mass media which border on hysteria, the time has come for some sober and reflective action on the parts of all concerned-government, industry, and academe-as well as legal and socioeconomic students. Constructive action is in order to restore the sciences to their proper and absolutely essential place in our society's judgment.

This book is dedicated to the idea that sober persons, acting in their own best interests, will actively pursue the course of actions that will make Love Canals, Times Beaches, Stringfellow Acid Pits, Valley of the Drums, and other horror stories historical artifacts of the learning experiences based on the informed responsible actions of all concerned. We would turn around the figure reported in Chemical & Engineering News of the Cambridge Reports study, that 60% of the public believe there is no safe way and there never will be a safe way of disposing of chemical waste. In this book we outline such ways. The initiative of government, industry, and academe to move constructively and in concert is long overdue.

The widespread media interest in chemical and toxic (hazardous) chemicals, especially in the context of improper or inadequate disposal practices in the past, has seriously damaged the professions of chemistry and engineering, and has been a financial and public relations drain on all industry (since chemicals are used by all industry). This has spawned a

Subjects

270 . Hazardous wastes -- United States -- Safety measures

"counterculture" movement to demote the science of chemistry from its prior image as a true and faithful servant of mankind, to a villain, lurking behind every drum and tank car with hidden dangers to the human race.

Phil J. Wingate, writing in *The Colorful DuPont Company* (Serendipity Press, Wilmington, Delaware, 1981, pages 7 and 8), has expressed it well: "Chemicals are no longer thought of as magic bullets which would cure the ills of the world, but as poisons which are about to kill off all forms of life on earth. The term 'toxic chemical' has become almost one word, much like 'German dye' before WWI and 'damn Yankee' after the Civil War. Chemistry had ridden the roller coaster of public opinion from the heights of esteem to the depth of distrust."

It is not the purpose of this author to criticize or to apologize. Certainly errors have been made in the past at all levels -- industry, government, and academe. We appreciate the confusion in managements' and administrators' minds in accessing priorities, by the evolving political, legal, risk-benefit, and toxic tort threat proceedings, combined with the recent "recession" and the viewpoint which someone has labeled "short-term profit mentality" and the continuous progression of newer, less experienced personnel.

The subject of this book, hazardous and toxic wastes, is but one facet of the changing complex relationship between humans and science and technology. It has been noted by Samuel Florman in *Blaming Technology: The Irrational Search for Scapegoats* (St. Martins Press, New York, 1982) that technology is not the reason for the changes, but the hope of the future. In *The Two Faces of Chemistry*, by Luciano Caglioti (MIT Press, Cambridge, Mass., 1983), the background for much of the misunderstanding regarding chemicals and their place in the world are reviewed. He concludes that we cannot go back, unless we are willing to accept loss of life in unthinkable proportions. Going back to the beginning means reopening the door to epidemics and high infant mortality, giving up the use of herbicides and chemical fertilizers, and condemning to starvation hundreds of millions. people in addition to the many who are already starving. What he recommends not to continue to advance indiscriminately nor stop or retreat on all fronts. We must face one problem at a time with honesty, intelligence, and humility. Certain the hazardous wastes and related problems are candidates for this approach.

Although we are focusing on hazardous wastes, we are admitting our incomplete understanding of the whole process of manufacture, processing, transporting, and ultimate disposal of wastes. We do live in a chemical world, in which our lives are continually affected and nourished by chemicals in foods, drinks, transportation housing, medicines, as well as in the water we drink and in the air we breath. Most of these chemical substances and products are beneficial to our well-being. Unfortunately, as in all science, our knowledge base of hazards is never complete, what we know is poorly or incompletely disseminated, and occasionally we learn to our regret that some substances, both natural and manmade, must be given special attention and control. Wastes can be managed, reduced in volume, recycled, made less hazardous, and engineered to be assets instead of liabilities if we have the determination, as well as the legal and economic motivation to direct our attention to the task required.

Title	Location	Edition / Series / Misc.
920 Hazardous Chemicals Desk Reference Author: Lewis, Richard J., Sr. (editor) Publish.: John Wiley & Sons - place: New York, NY - date: ©2002 Subject: Hazardous substances Desc: xx, 1695 p., 26 cm.	Dynix: 105718 Call No.: 604.7 Le ISBN: 0471441651 Shelf Reference	Edition: 5th edition Series: Wiley-Interscience Publication Year: 2002 Price: \$165.00

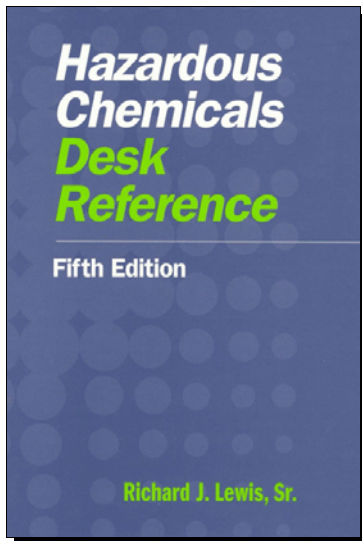


Table of Contents

Preface
 Introduction
 Key to Abbreviations
 General Chemical Entries
 CAS Number Cross-Index
 Synonym Cross-Index
 DOT Guide Number Cross-Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

"The authoritative guide to hazardous chemicals, completely revised and updated"

The Fifth Edition of "Hazardous Chemicals Desk Reference" contains Safety Profiles, synonyms, physical properties, standards, and recommendations of government agencies for approximately 5,000 chemicals deemed both important and potentially hazardous by the international scientific community. Substances were chosen on the basis of meeting a variety of criteria, including:

- Having an OSHA standard
- Having an ACGIH TLV
- Listed by the International Agency for Research on Cancer Groups 1 through 4 assessments
- Listed on the NIP Ninth Report on Carcinogens
- Having a German Research Society's MAK or BAT listing
- Having especially dangerous toxic, reactive, or fire properties

Subjects

266 .	Hazardous substances
336 .	Toxicology

The data for each entry is taken from the master file of DPIM. The Fifth Edition distinguishes itself from its predecessors by including the very latest information from a variety of international databases and organizations, while deleting entries that have proven to be the least pertinent to practitioners. As with previous incarnations, the organization of contents places a premium on providing a quick reference for individuals seeking a concise summary of a chemical's hazards. The Desk Reference remains the premier resource on hazardous chemicals for students, professors, scientists, engineers, and all professionals whose work involves managing these materials.

Richard J. Lewis, Sr., is a chemist with extensive experience in air and industrial pollution measurement, industrial hygiene research, and toxicological and chemical information systems. Formerly Manager of Information Systems for the National Institute for Occupational Health and Safety, Lewis is the author or coauthor of a number of widely used references, including Sax's Dangerous Properties of Industrial Materials (Eighth and Ninth Editions), Rapid Guide to Hazardous Chemicals in the Workplace (Second and Third Editions), Reproductively Active Chemicals, and Hawley's Condensed Chemical Dictionary, Fourteenth Edition, all published by John Wiley and Sons.

PREFACE:

This fifth edition of "Hazardous Chemicals Desk Reference" again fills the need for a reference work of moderate size that serves the information needs of those who work with hazardous chemicals.

Over 5,000 entries are included. Over 350 new entries were added. Some entries present in previous editions were removed to make room for more relevant substances and maintain the book at a reasonable size. Two-thirds of the entries have been revised for this edition. Most of the new entries were selected because they are on the EPA TSCA Inventory. These are reported to be used in commerce in the United States. Emphasis was placed on adding and updating physical properties, updating all DOT Classifications.

The information was extracted from Dangerous Properties of Industrial Materials, Tenth Edition. Citation to toxicity data and other less relevant information will be found in the above cited work. When cross-references to entries are not found

in this book, they can be found in *Dangerous Properties of Industrial Materials*, Tenth Edition.

Numerous synonyms have been added to assist in locating the many materials that are known under a variety of systematic and common names. The synonym cross-index contains the entry name as well as each synonym. This index should be consulted first to locate a material by name. Synonyms are given in English and also in other major languages such as French, German, Dutch, Polish, Japanese, and Italian.

Many additional physical and chemical properties have been added. Whenever available, physical descriptions, formulas, molecular weights, melting points, boiling points, explosion limits, flash points, densities, autoignition temperatures, and the like have been supplied.

A court order has vacated the OSHA Air Standards set in 1989 and contained in 29CFR 1910.1000. OSHA has decided to enforce only pre-1989 air standards. We have elected to include both the Transitional Limits that went into effect on December 31, 1992, and the Final Rule limits that went into effect September 1, 1989. These represent the current best judgment as to appropriate workplace air levels. While they may not be enforceable by OSI-JA, they are better guides than the OSHA Air Standards adopted in 1969.

The following classes of data are new or have been updated for all entries for which they apply.

1. ACGIH TLVs and BEIs reflect the latest recommendations and now include intended changes.
2. German MAK and BAT reflect the latest recommendations.
3. NTP 9th Annual Report On Carcinogens entries are identified.
4. DOT classifications were updated reflecting the HM-181 rule making.
5. CAS numbers are provided for additional entries.

Each entry concludes with a Safety Profile, a textual summary of the hazards presented by the entry. The discussion of human exposures includes target organs and specific effects reported. Carcinogenic and reproductive assessments have been completely revised for this edition.

Fire and explosion hazards are briefly summarized in terms of conditions of flammable or reactive hazard. Where feasible, firefighting materials and methods are discussed. Materials that are known to be incompatible with an entry are listed here.

Also included in the Safety Profile are comments on disaster hazards that serve to alert users of materials to the dangers that may be encountered on entering storage premises during a fire or other emergency. Although the presence of water, steam, acid fumes, or powerful vibrations can cause the decomposition of many materials into dangerous compounds, of particular concern are high temperatures (such as those resulting from a fire) because these can cause many otherwise mild chemicals to emit highly toxic gases or vapors such as NO_x, SO_x, acids, and so forth, or to evolve vapors of antimony, arsenic, mercury, and the like.

Every effort has been made to include the most current and complete information. The author welcomes comments or corrections to the data presented.

INTRODUCTION:

This condensation of information on potentially hazardous materials includes drugs, food additives, preservatives, ores, pesticides, dyes, detergents, lubricants, soaps, plastics, extracts from plant and animal sources, plants and animals that are toxic by contact or consumption, and industrial intermediates and waste products from production processes. Some of the information refers to materials of undefined composition. The chemicals included are assumed to exhibit the reported toxic effect in their pure state unless otherwise noted. However, even in the case of a supposedly "pure" chemical, there is usually some degree of uncertainty as to its exact composition and the impurities that may be present. This possibility must be considered in attempting to interpret the data presented because the toxic effects observed could in some cases be caused by a contaminant. Some radioactive materials are included but the effect reported is the chemically produced effect rather than the radiation effect.

For each entry the following data are provided when available: the DPIM code, hazard rating, entry name, GAS number, DOT number, molecular formula, molecular weight, description of the material and physical properties, and synonyms. The Consensus Reports section contains, where available, NTP 9th Annual Report on Carcinogens notation, IARC reviews, NIP Carcinogenesis Testing Program results, EPA Extremely Hazardous Substances List, the EPA Genetic Toxicology Program, and the Community Right-To-Know List. We also indicate the presence of the material on the update of the EPA TSCA inventory of chemicals in use in the United States. The next grouping consists of the U.S. Occupational Safety and Health Administration's (OSHA) permissible exposure levels, the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLVs), German Research Society's (MAK) values, National Institute for Occupational Safety and Health (NIOSH) recommended exposure levels, and U.S. Department of Transportation (DOT) classifications. Each entry concludes with a Safety Profile that discusses the toxic and other

hazards of the entry. The Safety Profile concludes with the OSI-IA and NIOSH occupational analytical method, referenced by method name or number.

1. DPIM Entry Code identifies each entry by a unique code consisting of three letters and three numbers, for example, AAA123. The first letter of the entry code indicates the alphabetical position of the entry. Codes beginning with "A" are assigned to entries indexed with the A's. Each listing in the cross-indexes is referenced to its appropriate entry by the DPIM entry code.

2. Entry Name is the name of each material, selected, where possible, to be a commonly used designation.

3. Hazard Rating (HR:) is assigned to each material in the form of a number (1, 2, or 3) that briefly identifies the level of the toxicity or hazard. The letter "D" is used where the data available are insufficient to indicate a relative rating. In most cases a "D" rating is assigned when only in-vitro mutagenic or experimental reproductive data are available. Ratings are assigned on the basis of low (1), medium (2), or high (3) toxic, fire, explosive, or reactivity hazard.

The number "3" indicates an LD50 below 400 mg/kg or an LC50 below 100 ppm; or that the material is explosive, highly flammable, or highly reactive.

The number "2" indicates an LD50 of 400-4,000 mg/kg or an LC50 of 100-500 ppm; or that the material is flammable or reactive.

The number "1" indicates an LD50 of 4,000-40,000 mg/kg or an LC50 of 500-5,000 ppm; or that the material is combustible or has some reactivity hazard.

4. Chemical Abstracts Service Registry Number (CAS) is a numeric designation assigned by the American Chemical Society's Chemical Abstracts Service and uniquely identifies a specific chemical compound. This entry allows one to conclusively identify a material regardless of the name or naming system used.

5. DOT: indicates a four-digit hazard code assigned by the U.S. Department of Transportation. This code is recognized internationally and is in agreement with the United Nations coding system. The code is used on transport documents, labels, and placards. It is also used to determine the regulations for shipping the material.

6. Molecular Formula (mf:) or Atomic Formula (af:) designates the elemental composition of the material and is structured according to the Hill System (see Journal of the American Chemical Society, 22(8): 478-494, 1900), in which carbon and hydrogen (if present) are listed first, followed by the other elemental symbols in alphabetical order. The formulas for compounds that do not contain carbon are ordered strictly alphabetically by element symbol. Compounds such as salts or those containing waters of hydration have molecular formulas incorporating the CAS dot-disconnect convention. In this convention, the components are listed individually and separated by a raised period. The individual components of the formula are given in order of decreasing carbon atom count, and the component ratios given. A lowercase "x" indicates that the ratio is unknown. A lower case "n" indicates a repeating, polymer-like structure. The formula is obtained from one of the cited references or a chemical reference text, or derived from the name of the material.

7. Molecular Weight (mw:) or Atomic Weight (aw:) is calculated from the molecular formula, using standard elemental molecular weights (carbon = 12.01).

8. Properties (PROP:) are selected to be useful in evaluating the hazard of a material and designing its proper storage and use procedures. A definition of the material is included where necessary. The physical description of the material may refer to the form, color, and odor to aid in positive identification. When available, the boiling point, melting point, density, vapor pressure, vapor density, and refractive index are given. The flash point, autoignition temperature, and lower and upper explosive limits are included to aid in fire protection and control. An indication is given of the solubility or miscibility of the material in water and common solvents. Unless otherwise indicated temperature is given in Celsius, pressure in millimeters of mercury.

9. Synonyms for the entry name are listed alphabetically. Synonyms include other chemical names, common or generic names, foreign names (with the language in parentheses), or codes. Some synonyms consist in whole or in part of registered trademarks. These trademarks are not identified as such. The reader is cautioned that some synonyms, particularly common names, may be ambiguous and refer to more than one material.

10. Consensus Reports lines supply additional information to enable the reader to make knowledgeable evaluations of potential chemical hazards. Two types of reviews are listed: (a) International Agency for Research on Cancer (IARC) monograph reviews, which are published by the United Nations World Health Organization (WHO); and (b) the National Toxicology Program (NTP).

a. Cancer Reviews. In the U.N. International Agency for Research on Cancer (IARC) monographs, information on suspected environmental carcinogens is examined, and summaries of available data with appropriate references are presented. Included in these reviews are synonyms, physical and chemical properties, uses and occurrence, and biological data relevant to the evaluation of carcinogenic risk to humans. The monographs in the series contain an evaluation of approximately 1,200 materials. Single copies of the individual monographs (specify volume number) can be ordered from WHO Publications Centre USA, 49 Sheridan Avenue, Albany, NY 12210, telephone (518) 436-9686.

The format of the IARC data line is as follows. The entry 'IARC Cancer Review:' indicates that the carcinogenicity data pertaining to a compound have been reviewed by the IARC committee. The committee's conclusions are summarized in three words. The first word indicates whether the data pertain to humans or to animals. The next two words indicate the degree of carcinogenic risk as defined by IARC.

For experimental animals the evidence of carcinogenicity is assessed by IARC and judged to fall into one of four groups defined as follows.

(1) Sufficient Evidence of carcinogenicity is provided when there is an increased incidence of malignant tumors: (a) in multiple species or strains; (b) in multiple experiments (preferably with different routes of administration or using different dose levels); or (c) to an unusual degree with regard to the incidence, site, or type of tumor, or age at onset. Additional evidence may be provided by data on dose-response effects.

(2) Limited Evidence of carcinogenicity is available when the data suggest a carcinogenic effect but are limited because: (a) the studies involve a single species, strain, or experiment; (b) the experiments are restricted by inadequate dosage levels, inadequate duration of exposure to the agent, inadequate period of follow-up, poor survival, the use of too few animals, or inadequate reporting; or (c) the neoplasms produced often occur spontaneously and, in the past, have been difficult to classify as malignant by histological criteria alone (for example, lung adenomas and adenocarcinomas, and liver tumors in certain strains of mice).

(3) Inadequate Evidence is available when, because of major qualitative or quantitative limitations, the studies cannot be interpreted as showing either the presence or absence of a carcinogenic effect.

(4) No Evidence applies when several adequate studies are available that show that within the limitations of the tests used, the chemical is not carcinogenic.

It should be noted that the categories Sufficient Evidence and Limited Evidence refer only to the strength of the experimental evidence that these chemicals are carcinogenic and not to the extent of their carcinogenic activity nor to the mechanism involved. The classification of any chemical may change as new information becomes available.

The evidence for carcinogenicity from studies in humans is assessed by the IARC committees and judged to fall into one of four groups defined as follows:

(1) Sufficient Evidence of carcinogenicity indicates that there is a causal relationship between the exposure and human cancer.

(2) Limited Evidence of carcinogenicity indicates that a causal relationship is credible, but that alternative explanations, such as chance, bias, or confounding, could not adequately be excluded.

(3) Inadequate Evidence, which applies to both positive and negative evidence, indicates that one of two conditions prevailed: (a) there are few pertinent data; or (b) the available studies, while showing evidence of association, do not exclude chance, bias, or confounding.

(4) No Evidence applies when several adequate studies are available that do not show evidence of carcinogenicity.

This cancer review reflects only the conclusion of the IARC committee based on the data available for the committee's evaluation. Also, some substances previously reviewed by IARC may be reexamined as additional data become available. These substances will contain multiple IARC review lines, each of which is referenced to the applicable IARC monograph volume.

An IARC entry indicates that some carcinogenicity data pertaining to a compound have been reviewed by the IARC committee. It indicates whether the data pertain to humans or to animals and whether the results of the determination are positive, suspected, indefinite, or negative, or whether there are no data.

This cancer review reflects only the conclusion of the IARC committee based on the data available at the time of the committee's evaluation. Hence, for some materials there may be disagreement between the IARC determination and the tumorigenicity information in the toxicity data lines.

b. NTP Status. The notation "NTP 9th Annual Report On Carcinogens" indicates that the entry is listed on the seventh report made to the U.S. Congress by the National Toxicology Program (NTP) as required by law. This listing implies that

the entry is assumed to be a human carcinogen.

Another NTP notation indicates that the material has been tested by the NTP under its Carcinogenesis Testing Program. These entries are also identified as being conducted by the National Cancer Institute (NCI), which reported the studies before the NCI Carcinogenesis Testing Program was absorbed by NTP. To obtain additional information about NTP, the Carcinogenesis Testing Program, or the status of a particular material under test, contact the Toxicology Information and Scientific Evaluation Group, NTP/TRTP/NIEHS, Mail Drop 18-01, P.O. Box 12233, Research Triangle Park, NC 27709.

c. EPA Extremely hazardous Substances List. This list was developed by the U.S. Environmental Protection Agency (EPA) as required by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Title III Section 304 requires notification by facilities of a release of certain extremely hazardous substances. These 402 substances were listed by EPA in the Federal Register of November 17, 1986.

d. Community Right-to-Know List. This list was developed by the EPA as required by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Title III Sections 311-312 require manufacturing facilities to prepare Material Safety Data Sheets and notify local authorities of the presence of listed chemicals. Both specific chemicals and classes of chemicals are covered by these sections.

e. EPA Genetic Toxicology Program (This status line indicates that the material has had genetic effects reported in the literature during the period 1969-1979. The test protocol in the literature is evaluated by an EPA expert panel on mutations, and the positive or negative genetic effect of the substance is reported. To obtain additional information about this program, contact GENE-TOX Program, USEPA, 401 M Street, SW, TS796, Washington, DC 20460, telephone (202) 260-1513.

f. EPA TSCA Status Line. This line indicates that the material appears on the chemical inventory prepared by the Environmental Protection Agency in accordance with provisions of the Toxic Substances Control Act (TSCA). Materials reported in the inventory include those that are produced commercially in or are imported into this country. The reader should note, however, that materials already regulated by EPA under FIFRA and by the Food and Drug Administration under the Food, Drug, and Cosmetic Act, as amended, are not included in the TSCA inventory. Similarly, alcohol, tobacco, and explosive materials are not regulated under TSCA. TSCA regulations should be consulted for an exact definition of reporting requirements. For additional information about TSCA, contact EPA, Office of Toxic Substances, Washington, DC 20402. Specific questions about the inventory can be directed to the EPA Office of Industry Assistance, telephone (800) 424-9065.

11. Standards and Recommendations section contains regulations by agencies of the U.S. government or recommendations by expert groups. "OSHA" refers to standards promulgated under Section 6 of the Occupational Safety and Health Act of 1970. "DOT" refers to materials regulated for shipment by the Department of Transportation. Because of frequent changes to and litigation of federal regulations, it is recommended that the reader contact the applicable agency for information about the current standards for a particular material. Omission of a material or regulatory notation from this edition does not imply any relief from regulatory responsibility.

a. OSHA Air Contaminant Standards. The values given are for the revised standards that were published on January 13, 1989, and were scheduled to take effect from September 1, 1989, through December 31, 1992. These are noted with the entry "OSHA PEL:" followed by "TWA" or "CL," meaning either time-weighted average or ceiling value, respectively, to which workers can be exposed for a normal 8-hour day, 40-hour work week without ill effects. For some materials, TWA, CL, and Pk (peak) values are given in the standard. In those cases, all three are listed. Finally, some entries may be followed by the designation "(skin)." This designation indicates that the compound may be absorbed by the skin and that, even though the air concentration may be below the standard, significant additional exposure through the skin may be possible.

b. ACGIH Threshold Limit Values. The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values are noted with the entry "ACGIH TLV:" followed by "TWA" or "CL," meaning either time-weighted average or ceiling value, respectively, to which workers can be exposed for a normal 8-hour day, 40-hour work week without ill effects. The notation "CL" indicates a ceiling limit that must not be exceeded. The notation "skin" indicates that the material penetrates intact skin, and skin contact should be avoided even though the TLV concentration is not exceeded. STEL indicates a short-term exposure limit, usually a 15-minute time-weighted average, which should not be exceeded. Biological Exposure Indices (BEI) are, according to the ACGIH, set to provide a warning level "... of biological response to the chemical, or warning levels of that chemical or its metabolic product(s) in tissues, fluids, or exhaled air of exposed workers. ...

The latest annual TLV list is contained in the publication Threshold Limit Values and Biological Exposure Indices. This publication should be consulted for future trends in recommendations. The ACGIH TLVs are adopted in whole or in part by many countries and local administrative agencies throughout the world. As a result, these recommendations have a major effect on the control of workplace contaminant concentrations. The ACGIH may be contacted for additional

information at Kemper Woods Center, 1330 Kemper Meadow Drive, Cincinnati, OH 45240.

c. DFG MAK These lines contain the German Research Society's Maximum Allowable Concentration values. Those materials that are classified as to workplace hazard potential by the German Research Society are noted on this line. The MAK values are also revised annually, and discussions of materials under consideration for MAK assignment are included in the annual publication together with the current values. BAT: indicates Biological Tolerance Value for a Working Material which is defined as, "...the maximum permissible quantity of a chemical compound, its metabolites, or any deviation from the norm of biological parameters induced by these substances in exposed humans." TRK: values are Technical Guiding Concentrations for workplace control of carcinogens. For additional information, write to Deutsche Forschungsgemeinschaft (German Research Society), Kennedyallee 40, D-5300 Bonn 2, Federal Republic of Germany. The publication Maximum Concentrations at the Workplace and Biological Tolerance Values for Working Materials Report No. 29 can be obtained from VCH Publishers, Inc., 303 N.W. 12th Ave., Deerfield Beach, FL 33442- 1788 or Verlag Chemie GmbH, Buchauslieferung, P.O. Box 1260/1280, D-6940 Weinheim, Federal Republic of Germany.

d. NIOSH REL. This line indicates that a NIOSH criteria document recommending a certain occupational exposure has been published for this compound or for a class of compounds to which this material belongs. These documents contain extensive data, analysis, and references. The more recent publications can be obtained from the National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, 4676 Columbia Pkwy., Cincinnati, OH 45226.

e. DOT Classification. This is the hazard classification according to the U.S. Department of Transportation (DOT) or the International Maritime Organization (IMO). This classification gives an indication of the hazards expected in transportation, and serves as a guide to the development of proper labels, placards, and shipping instructions. The basic hazard classes include compressed gases, flammables, oxidizers, corrosives, explosives, radioactive materials, and poisons. Although a material may be designated by only one hazard class, additional hazards may be indicated by adding labels or by using other means as directed by DOT. Many materials are regulated under general headings such as "pesticides" or "combustible liquids" as defined in the regulations. These are not noted here, as their specific concentrations or properties must be known for proper classification. Special regulations may govern shipment by air. This information should serve only as a guide, because the regulation of transported materials is carefully controlled in most countries by federal and local agencies. Because there are frequent changes to regulations, it is recommended that the reader contact the applicable agency for information about the current standards for a particular material. United States transportation regulations are found in 40 CFR, Parts 100 to 189. Contact the U.S. Department of Transportation, Materials Transportation Bureau, Washington, DC 20590.

12. Safety Profiles are text summaries of the reported hazards of the entry. The word "experimental" indicates that the reported effects resulted from a controlled exposure of laboratory animals to the substance. Toxic effects reported include carcinogenic, reproductive, acute lethal, and human nonlethal effects, skin and eye irritation, and positive mutation study results.

Human effects are identified either by human or more specifically by man, woman, child, or infant. Specific symptoms or organ systems effects are reported when available.

Carcinogenicity potential is denoted by the words "confirmed," "suspected," or "questionable." The substance entries are grouped into three classes based on experimental evidence and the opinion of expert review groups. The OSHA, JARC, ACGIH, and DFG MAK decision schedules are not related or synchronized. Thus, an entry may have had a recent review by only one group. The most stringent classification of any regulation or expert group is taken as governing.

Class I—Confirmed Carcinogens

These substances are capable of causing cancer in exposed humans. An entry was assigned to this class if it had one or more of the following data items present.

- a. An OSHA regulated carcinogen
- b. An ACGIH assignment as a human or animal carcinogen
- c. A DFG MAK assignment as a confirmed human or animal carcinogen
- d. An IARC assignment of human or animal sufficient evidence of carcinogenicity, or higher
- e. A listing in the NTP 9th Annual Report On Carcinogens

Class II—Suspected Carcinogens

These substances may be capable of causing cancer in exposed humans. The evidence is suggestive, but not sufficient to convince expert review committees. Some entries have not yet had expert review, but contain experimental reports of carcinogenic activity. In particular, an entry is included if it has positive reports of carcinogenic endpoint in two species. As more studies are published, many Class II carcinogens will have their carcinogenicity confirmed. On the other hand, some will be judged noncarcinogenic in the future. An entry was assigned to this class if it had one or more of the following data items present.

- a. An ACGIH assignment of suspected carcinogen
- b. A DFG MAK assignment of suspected carcinogen
- c. An IARC assignment of human or animal limited evidence
- d. Two animal studies reporting positive carcinogenic endpoint in different species

Class III—Questionable Carcinogens

For these entries there is minimal published evidence of possible Carcinogenic activity. The reported endpoint is often neoplastic growth with no spread or invasion characteristic of carcinogenic pathology. An even weaker endpoint is that of equivocal tumorigenic agent (ETA). Reports are assigned this designation when the study was defective. The study may have lacked control animals, may have used a very small sample size, often lack complete pathology reporting, or suffer many other study design defects. Many of these studies were designed for other than carcinogenic evaluation, and the reported carcinogenic effect is a by-product of the study, not the goal. The data are presented because some of the substances studied may be carcinogens. There are insufficient data to affirm or deny the possibility. An entry was assigned to this class if it had one or more of the following data items present.

- a. An IARC assignment of inadequate or no evidence
- b. A single human report of carcinogenicity
- c. A single experimental carcinogenic report, or duplicate reports in the same species
- d. One or more experimental neoplastic or equivocal tumorigenic agent report

Fire and explosion hazards are briefly summarized in terms of conditions of flammable or reactive hazard. Materials that are incompatible with the entry are listed here. Fire-fighting materials and methods are discussed where feasible. A material with a flash point of 100°F or less is considered dangerous; if the flash point is from 100 to 200°F, the flammability is considered moderate; if it is above 200°F, the flammability is considered low (the material is considered combustible).

Also included in the safety profile are disaster hazards comments, which serve to alert users of materials, safety professionals, researchers, supervisors, and firefighters to the dangers that may be encountered on entering storage premises during a fire or other emergency. Although the presence of water, steam, acid fumes, or powerful vibrations can cause many materials to decompose into dangerous compounds, we are particularly concerned with high temperatures (such as those resulting from a fire) because these can cause many otherwise inert chemicals to emit highly toxic gases or vapors such as NOx, SOx, acids, and so forth, or to evolve vapors of antimony, arsenic, mercury, and the like.

Title	Location	Edition / Series / Misc.
70 Hazardous Materials Transport Guide <i>Author:</i> BNA (Bureau of National Affairs) Staff <i>Publish.:</i> Bureau of National Affairs, Inc. <i>- place:</i> Washington, DC <i>- date:</i> ©1984 <i>Subject:</i> Hazardous substances <i>Desc:</i> x, 366 p., 23 cm.	<i>Dynix:</i> 30113 <i>Call No.:</i> 344.73 Ha <i>ISBN:</i> 0871794624 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1984 <i>Price:</i> \$25.00

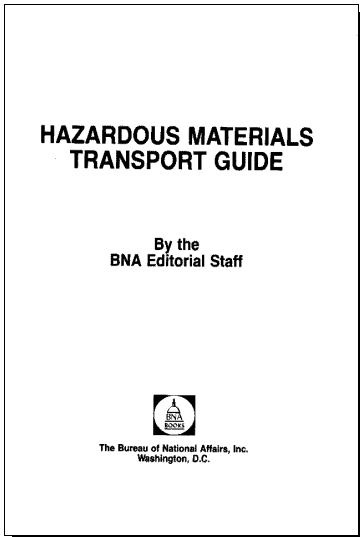


Table of Contents

Preface

Part I. Hazardous Materials Transport Rules
Introduction

A. Identifying Materials For Transport
Shipping Papers
Labeling
Placarding
Incident Reports

B. Preparation For Shipment
Classifying Hazardous Materials
Packaging
Tank Cars
Cylinders

C. Hazard Classes
Explosives
Class A Explosives
Class B Explosives
Class C Explosives
Flammable Liquids
Specifically Regulated Flammable Liquids
Flammable Solids
Corrosive Materials: Shipping Preparation
Corrosive Materials: Specific Substances
Compressed Gases
Poison A Materials
Poison B Materials
Irritating Materials
Etiologic Agents
Other Regulated Material (ORM):Shipping Preparation

Part II. Handling Emergencies
Introduction
National Contingency Plan
Chemtrec
Handling Hazardous Materials Spills
Emergency Response Guide
Alphabetical Listing
Numbered Guides
Introduction to Evacuation Tables
Table of Placards
Example of Shipping Paper

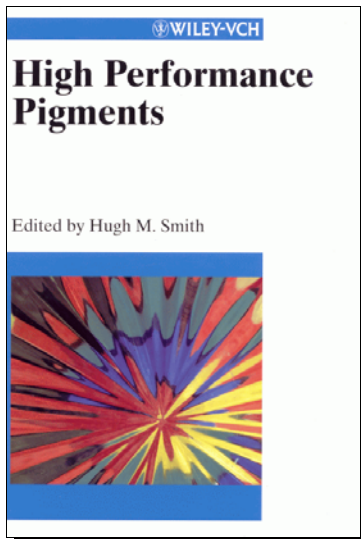
Appendix
U.S. Hazardous Materials Table and Optional Hazardous Materials Table
Sample Page From Hazardous Materials Table

Subjects

266 . Hazardous substances

Reviews - Synopsis - Dust Jacket

Title	Location	Edition / Series / Misc.
<p>814 High Performance Pigments</p> <p>Author: Smith, Hugh MacDonald (editor)</p> <p>Publish.: Wiley - VCH</p> <p>- place: Weinheim, Germany</p> <p>- date: ©2002</p> <p>Subject: Pigments</p> <p>Desc: xv, 435 p., illus. (some color), 25 cm.</p>	<p>Dynix: 99417</p> <p>Call No.: 667.29 Hi</p> <p>ISBN: 3527302042</p> <p>Shelf Adult Non-Fiction</p>	<p>Edition:</p> <p>Series:</p> <p>Year: 2002</p> <p>Price: \$93.50</p>



Subjects

293 . Pigments

Table of Contents

Preface

PART I

1. Introduction to Inorganic High Performance Pigments
2. Bismuth Vanadates
3. Cadmium Pigments
4. Cerium Pigments
5. Complex Inorganic Color Pigments: An Overview
6. Titanate Pigments: Colored Rutile, Priderite, and Pseudobrookite Structured Pigments

PART II

7. Special Effect Pigments
8. Crystal Design of High Performance Pigments

PART III

9. The Global Market for Organic High Performance Pigments
10. Benzimidazolone Pigments and Related Structures
11. Diketopyrrolopyrrole (DPP) Pigments
12. Dioxazine Violet Pigments
13. Disazocondensation Pigments
14. Isoindoline Pigments
15. Isoindolinone Pigments
16. Perylene Pigments
17. Phthalocyanines — High Performance Pigments with New Applications
18. Quinacridone Pigments
19. Quinophthalone Pigments
20. Thiazines, Oxazines and Other Novel High-Performance Pigments

PART IV

21. Chemical and Physical Characterization of High Performance Organic Pigments
22. Regulatory Affairs for High Performance Pigments: North America
23. Regulatory and Legislative Aspects of Relevance to High Performance Pigments: Europe
24. Toxicology and Ecotoxicology Issues with High Performance Pigments

Appendix

Index

Reviews - Synopsis - Dust Jacket

The manufacture of high performance pigments has become a global industry, with a growth rate well in advance of the more classical types of pigments. This volume offers both producers and users of these materials the opportunity to review and update their understanding of the latest technologies and market issues affecting both organic and inorganic high performance pigments. The book includes chapters on European and North American regulatory and legislative issues as well.

Book Description

This volume is the ideal companion to Wiley's trilogy: The Pigments Handbook (1988), Industrial Organic Pigments (1997), and Industrial Inorganic Pigments (1998). High Performance Pigments have become increasingly important in recent years, with a growth rate well in advance of the more classical types of pigments. The book offers both producers and users of High Performance Pigments the opportunity to review and update their understanding of latest technologies and market issues impacting both inorganic and organic High Performance Pigments, together with assessing key regulatory affairs, in this specialty niche of the chemical industry. The manufacture of High Performance Pigments is

today a global industry. This is reflected in the multinational expertise of the over twenty experts, drawn from Europe, North America and Asia, who have authored chapters in this book. No professional today can afford to waste time on unfocussed research. This book will effectively help chemists, physicists, engineers, applications and regulatory specialists, and materials scientists to stay ahead in this fast-changing field.

PREFACE:

In releasing another volume of pigments technology to readers around the world, it is appropriate first to answer the question as to why such a work is needed, in light of the monumental works already written on Organic Pigments by Willi Herbst and Klaus Hunger, and Inorganic Pigments, edited by Gunter Buxbaum, together with the earlier Pigment Handbook edited by my colleague, Peter Lewis.

Perhaps the following sixfold explanation will suffice:

1. In the light of several recent international conferences, in Chicago, Miami Beach and Barcelona, each dealing with High Performance Pigments, there seems to be a resurgence of interest in this topic, coupled with some confusion as to what the word "high performance pigment", (often abbreviated to "HPP") really means.

Compilation of what is essentially the first book devoted to this topic thus appears overdue.

2. Once the concept of "high performance" is understood, it appears quite appropriate to assemble a collection of Chapters dealing with both organic as well as inorganic pigment topics, each written by experts in their respective fields of science and technology.
3. So as to gain an understanding of the changing role of high performance pigments in today's global marketplace, it is also helpful to view the field from the viewpoint of a businessman who also understands the language of pigment technology, and this we have done with Fritz Brenzikofer's Chapter.
4. With a seemingly never-ending change in the regulatory "drivers" for successful manufacture, importation and marketing of high performance pigments around the world, we have included two Chapters dealing with this topic, drawn from the somewhat different perspectives of Europe and the United States. No longer can we conclude that "mere" technical supremacy, coupled with apparently good profitability, is sufficient to launch or maintain a particular high performance pigment, when new regulatory requirements, focusing on some impurity inadvertently produced in minute quantities during the course of the production process or released from trace breakdown of the pigment in some demanding application, transform the investment needed to a much higher level than was originally considered, and may change a previously good level of profitability into a questionable one. Gaining expertise in this area is thus essential to the pursuit of business in today's marketplace.
5. In recent years, production of what is called by some "classical" and by others "commodity" pigments has begun to migrate out of Europe, the United States and Canada into Third World Countries, where labor wages are much lower but adequate production facilities, together with some technical "know how", are available. In the light of this paradigm shift, the largest colored pigment manufacturers have refocused their attention on High Performance Pigments because of the greater return still possible with such products.
6. Since the publication of Hunger and Buxbaum's excellent monographs on Organic and Inorganic Pigments, a number of technical developments have surfaced, which are of significance to an understanding of high performance pigments. Consequently, we have introduced for the first time in one volume, for example, chapters on the technology of cerium pigments, crystal engineering, the growing family of special effect pigments, and the new "quinox" family of azo pigments, to extend our knowledge of the frontiers of successful HPP research.

Unlike the original "Pigment Handbook", which presented a uniform pattern of information on each pigment class identified, each author in this volume has been encouraged to produce a manuscript truly reflective of their own personality, motivation and insight. For example, the Chapter written by Paul Dunning of Johnson Matthey on the old and well established cadmium pigment family includes useful historical data, together with much process information, and ends with a plea for objective assessment of this pigment, still considered suspect by some countries but now reassessed in the EU as without significant risk to human health or the environment.

Conversely, Jean-Noel Berte of Rhodia, writing on the commercial launch of the family of cerium pigments, provides a host of technical information, establishing this new class as High Performance Pigments in their own right and not "merely" as substitutes for cadmiums.

Again, Masao Tanaka of Dainippon, author of a past Japanese booklet on the chemistry of the phthalocyanine family, in dealing with this class of colorants, has chosen to explore the universe of functional derivatives of phthalocyanines and leave the traditional pigment technology of phthalocyanines to the excellent text of Herbst/ Hunger.

Throughout each chapter, pigments are identified according to the system set forth by the Colour Index International, which is produced by the Society of Dyers and Colourists in Bradford, England. For accuracy of terminology, while it is understood that the full and correct name for a pigment might be, for example, C.I. Pigment Red xyz, etc., most authors will eliminate the "C.I." prefix, and some abbreviate the "Pigment Red" to P.R. xyz etc.

At this point, some comment on definition is overdue. Entry of the phrase "high performance" into the pigment literature appears to date from the mid 1960s, when it was applied to certain high value vat pigments possessing excellence of fastness as well as good tinctorial properties. But an actual definition was never proposed. Later, the author, at an Intertech Conference in 1998, suggested adoption of the following phrase: "A high performance pigment is a colored, black, white, pearlescent, luminescent or fluorescent particulate organic or inorganic pigment that demonstrates high performance properties in its end use application".

Since that time, realizing that the above definition was proposed from a strictly technical basis, Fritz Brenzikofer of Clariant, has offered the following definition from a "business" perspective: "A high performance pigment is the right pigment selected for a specific use, with well defined quality criteria, at an optimized pigment cost".

Regardless of which definition is favored, another issue has to be considered, in that the high performance pigment of yesteryear may eventually become the "classical" or "commodity" pigment of tomorrow because of shift in acceptable standards of performance. A masterly presentation on this topic was given by Klaus Hunger in Berlin during Intertech's High Performance Pigments 2000 Conference.

In realizing that no definition of high performance pigments will ever be a static one or fully agreed to by all, I would further propose that the four essential elements of such products should include:

- > Excellence of performance .
- > Applicational permanence
- > Compatibility with health, safety and environmental issues
- > Good profitability in value-in-use to the consumer and return of investment to the producer

In presenting the many work products in this volume, it was thought appropriate to divide up the contents into four separate sections, dealing successively with

1. inorganic HPPs in Chapters 1 through 6,
2. topics that include both organic and inorganic products, such as crystal engineering and special effect pigments in Chapters 7 and 8,
3. organic HPPs in Chapters 9 through 20, and
4. analytical chemistry of HPPs and regulatory, legislative and product safety issues impacting high performance pigments in Chapters 21 through 24. We are particularly grateful to all authors for their hard work and insight, and congratulate them on a job well done.

In this field of rapid technological and/or environmental change, it is inevitable that some of the information provided in this volume may soon become less significant in the light of future discoveries. For example, the application of molecular recognition in design chemistry to providing additives capable of quantum enhancement of pigmentation in thermoplastic resins is an exciting new chemistry pioneered by Clariant Corporation, and should open new doors to progress in high performance pigments. It would therefore appear that any future publication in this field should not only deal with high performance pigments per se, but also with the various additives, synergists, and functional derivatives that enable pigments to do their work better. Again, the inevitable search for the regulatory "needles in hay- stacks" may render some pigments less desirable because of the continued fostering of chemophobia on the part of some NGO organizations, producing a misperception that some trace impurity (at present unknown), measured at parts per billion or trillion, contained in the pigment, may be prejudicial to the pigment consuming public, thus triggering an urgent search by the pigment producers to come up with a replacement product.

Title	Location	Edition / Series / Misc.
71 Hot Melt Adhesives Author: Bateman, D. L. Publish.: Noyes Data Corporation - place: Park Ridge, NJ - date: ©1978 Subject: Adhesives, Hot melt Desc: xiv, 494 p., illus., 25 cm.	Dynix: 13017 Call No.: 668.3 Ba ISBN: 0815507046 Shelf Adult Non-Fiction	Edition: 3rd edition Series: Chemical Technology Review: No. 109 Year: 1978 Price: \$25.00

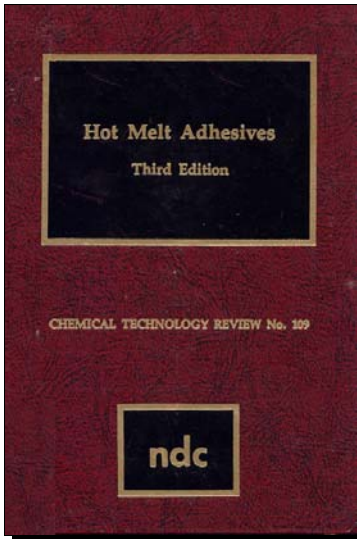


Table of Contents

INTRODUCTION

BONDING PAPER

- Water-Remoistenable Adhesives
- Vinyl Pyrrolidone/Vinyl Acetate Copolymer-Plasticizer-Wax
- PVP/IVA Copolymer-Propylene Glycol-Hydrogenated Castor Oil
- Acid Hydrolyzed PVA-Water Soluble Polymers
- Acid Hydrolyzed Polyvinyl Acetate
- Polyvinyl Alcohol of Controlled Hydrolysis Value with Solid Glycol and Liquid Plasticizer
- Polyvinyl Alcohol Plasticized with Propylene Glycol
- Cure Resistant Polyvinyl Alcohol-Polyvinyl Acetate Adhesive
- Synthetic Organic Resin-Plasticizer Compositions with Good Wet Tack
- Corrugated Paperboard
- Atactic and Isotactic Polypropylenes plus Formolite Resin
- Atactic Polypropylene-EVA-Terpene Resin
- Atactic Polypropylene-Polyethylene
- Critical Viscosity of 15,000 to 58,000 cp for Corrugated Paperboard Application
- Synthetic Rubber-Formolite Resin
- Ethylene Vinyl Acetate-Formolite Resin
- Addition of Wax to EVA-Formolite Adhesives to Improve Creep Properties
- Addition of Polyhydroxy Crystalline Compound to EVA-Formolite Adhesive to Improve Repulpability
- Heated Liner Applied to Cooled Adhesive on First Face
- Cardboard Case Sealing
- Use of Branched Elastomeric Ethylene-Propylene Terpolymers
- Addition of Boric Additive plus Phenolic Antioxidant to Improve Melt Viscosity Stability of Branched and Linear Copolymers
- DAR-B-Resin for Use with Polyolefins
- Heat Sealable Containers
- Polyethylene and Ethylene-Ethyl Acrylate Copolymer Composition— Inert to Food
- Ternary Blend of High and Low Density Polyethylenes with Superior Hot Tack
- Laminates
- Trilayer Laminate Using Dispersion of Thermoplastic Polymer in Wax
- Amorphous Polypropylene-Olefin Copolymer-Polyterpene Tackifier
- Resinous Crystalline Polypropylene-Resin Tackifier-Wax
- Sulfur-Dicyclopentadiene-Glass Fibers-Talc
- Crystalline Polyester of Terephthalic Acid, Sebacic Acid and Tetra methylene Glycol
- Lamination of Paper Tissue
- Book Binding
- Perfect Book Binding: ABA Block Polymer-Tackifier-Stabilizer-Wax.
- Hard Cover Bookbinding: Isotactic Polybutylene-Tackifier-Wax
- Dot Binding of Paper Sheets into Cover
- Terpolymer of Vinyl Acetate, Crotonic Acid and Vinyl Stearate
- Pick-Up Adhesives
- Polyethylene Oxide-Polyalkylene Oxide Blend
- Hydantoin-Formaldehyde Resin in Polyoxyalkylated Alkyl Phenol
- Improving Specific Property of Adhesives
- Addition of Acetylated Monoglyceride to Eliminate Surface Tack
- Dusting with Plasticizer for Nontacky Film
- Addition of Polyethylene as Antiblocking Agent
- Maleated Polyethylene-Polyethylene Coatings
- Terpene Modified Urethane Resin in EVA-Wax Compositions

Subjects

219 .	Adhesives, Hot melt
290 .	Patents -- United States
345 .	Adhesives, Hot melt -- Patents

Polypropylene Based Adhesives for Disposable Diapers
 Direct Through-Feed Dispensing
 Adhesive with Fire Extinguishing Properties
 - Styrene Resin Modifiers for EVA-Wax
 Dimethyl-Alpha-Methylstyrene Resin
 Dimethyl-Alpha-Methylstyrene/Alpha-Methylstyrene Copolymer
 Terpolymers of Dimethyl-Alpha-Methylstyrene, Alpha-Methylstyrene, and Styrene
 Terpolymers of Alpha-Methylstyrene, Tertiary Butylstyrene and Olefin
 - Adhesives for Use on Repulpable Paper Products
 Graft Polymer of Vinyl Monomer and Polyalkylene Oxide Polymer
 Half Ester Reaction Products of Maleated α -Olefins and Monohydric Alcohols
 Carbonylated Polyolefin Esterified with Ethoxylated Alcohols
 Natural Resins-Polyethylene Oxide Adduct
 Alkali Metal Sulfonate Group with Dicarboxylic Acid Components
 - Paper-Plastic Bonding
 Reusable Polyolefin-Paper Laminate
 Dicarboxylic Acid Modified Polyolefin
 - Paper-Glass Bonding
 Improving Resistance to Humidity by Addition of Silane Compound
 Condensation Product of Glycol or Monoalkylol Amine with Dibasic Acid

SHOE MANUFACTURING

- Attachment of Shoe Uppers to Soles
 Use of Radiant Heat to Soften Polyester Adhesive
 High Melting Polyester-Low Melting Thermosetting Resin
 Polyester from Dicarboxylic Acid Mixture and Butanediol Applied to Sole
 Modified Polyethylene Terephthalate Adhesive
 Polyester Adhesive from 1,4-Butanediol plus Mixture of Terephthalic, Isophthalic and Hexahydroisophthalic Acids
 Copolyester of Mixed Phthalic Acids, Aliphatic Dicarboxylic Acids and Tetramethylene Glycol
 Application of Viscous Hot Melt at Elevated Temperatures
 - Toe Lasting
 High Melting Thermoplastic Resin-Low Melting Thermosetting Resin in Stream of Heated Gas
 Adhesive Containing an Indicator
 Use of Rod of Polyester Adhesive Under Special Temperature Conditions
 - Adhesives for Other Shoe Manufacturing Operations
 Cellulosic Side-Lasting Adhesive for Temporary Bonds
 End Lasting Using Ribbon of Thermoplastic Adhesive
 Linear Terpolyester Adhesive for Bond Between Insole Rib and Insole
 PVC Shoe Stiffener Blank Coated with Heat Activatable Adhesive
 - Other Adhesives for Use in Shoemaking or Leather Bonding
 Addition of Wax to Polyester Adhesives to Shorten Setting Time
 Linear Polyesters from Dicarboxylic Acids and 1,4-Butanediol
 Thermoplastic Ester-Amide Heterophase Copolymer Resin
 Polyalkylene Glycol Modified Polypropylene or Cellulosic Resinous Composition

CARPET MANUFACTURING

- Carpet Backsizing
 EVA- Rosin-Polyhydric Alcohol Resin/Polyhydric Alcohol Trimer of Fatty Acid
 EVA-Atactic Polypropylene-Vulcanized Rubber
 Laminating Primary to Secondary Backing with Sheet of Hot Melt Polymer
 Tuft Bonding Compositions
 - Backsizing Carpets with EVA-Wax Blends
 EVA-Wax-Rosin Derivatives
 Use of Resin Extender Blend of Base Resin plus Modifying Resin
 Application of Specified Pressure with Hold-Down Roll
 High Filler Content Composition
 Use of Low Viscosity Precoat Adhesive Prior to Backsizing Compound
 Addition of LMW/HD Polyethylene and Dicyclopentadiene Alkylation Polymer to Increase R&B Point
 Addition of LMW Ethylene Homopolymer to Improve Tuft Bind
 - Other Uses
 Laminate Structure Suitable for Carpets
 Thermoadhesive Carpet Sealing Tape

TEXTILE BONDING

- Laminating Fabrics with Lactam Polyamides
- Copolyamide from ϵ -Caprolactam, Diamines and Dicarboxylic Acids
- Polyamide Comprising Dimerized Fatty Acid, Monocarboxylic Acid, Codicarboxylic Acid, Diprimary Diamine and Caprolactam
- Copolyamides Containing Caprolactam, Lauric lactam and 11-Amino-undecanoic Acid
- Copolyamides from ϵ -Caprolactam, Diamine Salts of Adipic Acid and Alkylene Dicarboxylic Acid Salts of Polyether Diamine
- Polyamide from Lactam, Mixture of Aliphatic Dicarboxylic Acids and Diamine
- Anionic Terpolyamide of 8-Octanolactam and Two Other Lactams
- Lactam Copolyamides Containing Adhered Organic and Inorganic Compounds
- Other Polyamide Adhesives
- Bonding Linen Using Polyamides Based on Branched Diamines
- Additive for Improving Adhesion by Copolyamide Adhesives
- Polyurethanes for Heat Sealing Textile Sheets
- Polyurethane from Hexane-1,6-Diisocyanate, Specific Glycol Mixture and Polyester
- Thermoplastic Polyurethane from Prepolymer and Polyester
- Sewing with Adhesive Threads
- Synthetic Resin Fiber Thread as Binder in Lapel Tailoring
- Thermoplastic Coated Rayon Yarn for Upholstery Boxing
- Monofilament Adhesives
- Use of High Frequency Electrical Field for Hot Melt Bonded Seams
- Joining Fabric with Dry Monofilament Adhesive and Radio Frequency Heat Energy
- Other Textile Adhesives
- Protective Laminate Using Charcoal-Polyamide Resin-Microfine Polyethylene
- Polyacetal Adhesives Resistant to Alkali and Solvents
- Copolyester from Adipic plus Terephthalic Acids and Ethylene Glycol plus 1,6-Hexanediol
- Fusible Interlining Containing Styrene-Acrylonitrile-Alkyl Acrylate Terpolymers as Adhesive
- Method of Bonding Polyester-Polyurethane Foam to Textiles with Polyethylene Film
- Laminating Techniques Which Can Be Used with a Variety of Adhesives
- Compacted Composite Fabrics
- Stitch-Bonded Backing Laminated to Facing
- Apparatus for Bonding Fabric

BONDING PLASTICS

- Bonding Polyethylene to Itself
- ABA Block Polymer-Zinc Salt of Rosin-Microcrystalline Wax
- ABA Block Polymer-Isoprene/Piperylene Copolymer-Zinc Salt of Rosin-Wax
- Two EVA Copolymers-Atactic Polypropylene-Two Tackifiers
- Addition of Inorganic Filler to EVA-Wax-Tackifier Composition to Improve Adhesiveness at High Temperature
- Plastic Bottles with Plastic Labels
- Polyethylene-Polybutylene-Polyterpene Resin Rod Adhesive for Direct Through-Feed Dispensing
- Plastic-Plastic Bonding
- Plasticized Cellulose Caprate Optical Cement
- Polymeric Fatty Acid Polyamide-Aromatic Compound
- Asphalt-EVA Blend for Polyolefin Laminates
- Polymeric Linear Terephthalate Ester Film
- Bonding Plastic to Other Substrates
- Plastic-Glass
- Plastic-Lined Burlap Bag
- Plastic-Cellulose Material
- Plastic-Wood
- Adhesive for Blister Packs
- Polyolefin-Metal
- Polypropylene-Lead
- Polyethylene-Lead for Cable Insulation
- Polyethylene-Lead for Encapsulation and Termination of Electrical Conductors

BONDING METALS

- Bonding Seams in Container Bodies with Polyester Adhesives
- Use of Terephthalate Copolyester Adhesive
- Addition of Polyoxyalkylene Glycol
- Addition of Amorphous Phenoxy Resin
- Dimer Acid Modified Polyester Adhesives
- Dimer Acid Modified Polyester-Polystyrene

Dimer Acid Modified Polyester-Aliphatic Hydrocarbon-Polystyrene
 - Polyesteramide Adhesives
 Polyesteramide Block Copolymer Resistant to Flow at 150°C
 Use of Methoxymethylmelamine to Improve Adhesion of Filled Copolyesteramides to Metal Substrates
 Block Polyesteramide-Polystyrene Blend
 - Hot Melts Containing Olefinic Components
 Terpolymer of Ethylene-Acrylic Acid-tert-Butyl Acrylate
 Use of Acrylic Acid Grafted Polyolefins to Replace Part of the Olefinic Components
 Polyolefin- or Polyamide-Oxime Adhesives for Metal or Glass
 - Polyamide Adhesives
 Polyamide from Polymerization of Bis(4-Aminocyclohexyl)Methane and Polycarboxylic Acid
 Attaching Metallic End Closures to Container Bodies
 - Use of Other Adhesives for Metals
 Use of Inorganic Mineral Powder as Setting Promoter
 Thin Metal Laminates Useful as Household Foils
 Polyester-Urethane Sealant
 Radiation Grafting of Butadiene to EVA
 - Rod Adhesives for Direct Through-Feed Dispensing
 Polyepoxide Resin in Thermoplastic Carrier
 Polyepoxide, Polyamide and Phenol in Thermoplastic Carrier
 - Bonding of Metals to Other Substrates
 Metal to Glass
 Windshield Installation
 Metal to Rubber Vulcanizate

PRESSURE SENSITIVE HOT MELT COMPOSITIONS

- Floor and Tile Adhesives
 Rubbery Block Copolymer-Extending Oil-Resin-Atactic Polypropylene.
 EVA-Rubbery Block Copolymer-Resin
 Atactic Polypropylene-Rubbery Block Copolymer-Resin
 Rosin-Rubbery Block Copolymer-Polyterpene Resin
 - Rubber-Metal Bonding in Automobiles
 Six-Component Blend
 Four-Component Blend
 - Compositions Based on Block Copolymers
 A-B-A Block Copolymer- Liquid and Solid Tackifiers
 Improving Stability of Block Copolymer
 Partially Hydrogenated Block Polymer
 Use of Naphthenic Plasticizer Oil with A-B-A Block Copolymer Composition
 Addition of Copolymers of -Methylstyrene and Styrene to Impart Tack
 - Compositions Based on Styrene-Isobutylene Copolymers
 Styrene-Isobutylene Copolymer plus Secondary Ethylene Polymer
 Styrene-Isobutylene Copolymer-Wax-Primary Resin
 - Acrylic Based Copolymers
 Addition of Photoinitiators into Backbone of Acrylic Based Copolymer
 Acrylic Based Copolymer Containing Tertiary Amine Monomer plus Organic Metallic Salt
 Blends of Acrylate Copolymers of Different Tg
 - Other Pressure Sensitive Compositions
 High Acid Number Polyamide-or Polyesteramide Tack Retainers
 Adhesive Containing Tacky Elastomeric Copolymer Microspheres
 Subjecting Hot-Melt Compositions to Ionizing Radiation
 Adhesive Based on Solid Polybutadiene

EVA ADHESIVES WITH A WIDE RANGE OF APPLICATIONS

- EVA-Containing Adhesives
 Improving Softening Temperature of EVA-Additive Compositions
 Prevention of Crust Formation
 EVA-Chlorinated Polyethylene-Unsaturated Acid-Organic Peroxide
 EVA-Reactive Urethane Prepolymer-Tackifier
 Compositions Containing Irradiated Concentrate of Wax and EVA or EEA Copolymers
 EVA-Wax-Rosin Polyester
 EVA-Polyamide Composition
 - Resins from Petroleum By-Products
 Hydrogenated, Polymerized Petroleum Fraction \

C4-C5 Fraction Copolymerized with Vinyl Aromatic Hydrocarbons Containing Isopropenyltoluene
 Low Boiling C4-C5 Fraction in Combination with Unsaturated Aromatic Hydrocarbons
 - Other Resins for Thermoplastic Polymers
 Synthetic Hydrocarbon Resin Tackifier
 Ethylene Copolymer-Thermoplastic Resin
 Limonene-Phenol Condensation Product
 Zinc Resinates of Disproportionated Rosin
 EVA-Phenolic Modified Terpene Resin

MULTIPURPOSE ADHESIVES

- Elastomeric Polymer Compositions
 Polymerized Urethane Elastomeric Compound
 Polymerized Elastomeric Butyl Rubber Compound
 Polymerized Elastomeric Polysulfide Compound
 - Adhesives Containing Coal Tar Pitch
 Coal Tar Pitch-Ethylene/Acrylic Acid Copolymer
 Coal Tar Pitch-EVA and EAA Cross Linked with Dicumyl Peroxide
 - Segmented Copolyester Adhesives
 Preparation of Segmented Copolyester Adhesives
 Use on a Variety of Substrates
 Use in Manufacture of Reinforced Flexible Hose
 Cellulose or Fiberglass Reinforced Polyester Substrates
 Bonding Ethylene Copolymer to Primed Metal
 Stabilization by CaO and Carboxylic Compound
 Stabilization by Addition of CaO, Polycarbodiimide and Additional Compounds
 - Polyester Adhesives
 Noncrystallizing Ethylene Glycol-Neopentyl Glycol-Terephthalate Sebacate Copolyester
 Polyester from 1,4-Butanediol and trans-1,4-Cyclohexanedicarboxylic Acid
 Mixtures of Dicarboxylic Acid Modified Phthalic Acid Polyesters
 - Adhesives Containing Polyamides
 Addition of PVA to Nonadhesive Polymer
 Polyamide-Glycerol Ester of Fumaric Modified Rosin-Wax
 Ethylenediamine and Mixture of Dimerized Fatty Acids and Heptadecanedicarboxylic Acid
 Polyamide-Polyepoxy Rod for Direct Through-Feed Dispensing
 - Copolymers of Esters of Unsaturated Acids
 Copolymers of Acrylonitrile, Acrylamide, 2-Ethylhexyl Acrylate and Methyl Methacrylate Containing Formaldehyde
 Reaction Product with Polyepoxide Compounds
 - Adhesives Containing Olefins
 Terpolymer of Ethylene-Acrylamide-Acrylic Acid
 Olefin-Acrylic Ester Copolymer
 Asphalt-Reject Polypropylene
 Atactic Polypropylene-Aliphatic Petroleum Hydrocarbon Resin Tackifier
 - Polyester-Polystyrene Blends
 Polytetramethylene Terephthalate-Polystyrene
 Poly(1,4-Cyclohexylene Dimethylene Terephthalate)-Polystyrene
 - Block Polymers
 Preventing Viscosity Increase in Heat Aging
 Polyalkene Tackifier Modifier
 Use of Liquid Polyakadiene as Extender Plasticizer
 Block Copolymer-Tackifying Resin-Extender Oil
 - Other Polymeric Adhesives
 Cyclic Ester Polymer-Vinyl Alkyl Ethers Composition
 PVA-Plasticizer-Hydrogenated Pine Gum
 Styrene-Isobutylene-b-Terpolymer
 Styrene-Acrylic Ester Graft Copolymers
 Resinous Graft Polymer of α -Alkoxy styrene-Acrylonitrile-Synthetic Rubber
 Polyvinyl Methyl Ether plus Rosin Modifier
 In Situ Formation of Solid Elastomeric Polymer

ADDITIONAL HOT MELT PROCESSES

- Packageable Forms of Hot Melts
 Hot Melt Adhesive Sticks for Hot Melt Applicators
 Forming Hot Melt Adhesives into Readily Packageable Forms
 - Dispensing Hot Melt Adhesives

Hot Melt Dispenser Body
Gravity Fed Glue Dispensing Apparatus
Apparatus for Feeding Glue to a Hot Melt Dispensing Appliance
Transfer Method of Applying Hot Melt Glue
Electrostatic Deposition of Adhesive onto an Apertured Substrate
- Hot Melt Thermoplastic Adhesive Foam Systems
Pressurized Liquid Adhesive-Inert Gas Mixture
Molten Mixtures of Solid Adhesive and Powdered Blowing Agent
- Special Uses for Hot Melts
Component of Gems Set in Fusion Adhesive Foil
Molten Sulfur Adhesive for Wood and Leather
Reaction Product of Methylolurea with C12 to C20 Fatty Acid for Matrix Fixturing
Inhibiting Shrinkage of a Vinyl Substrate by Using a Thermoplastic Copolyester
Polyester Resin Impregnated Paper Coated with EVA
Attachment System for Decorative Trim Strips
Decorative Laminates

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket**FOREWORD**

The detailed, descriptive information in this book is based on U.S. patents. Hot Melt Adhesives, Third Edition, covers complete technology of this subject, production of which was initiated on a large commercial scale in the early 1950s. The book contains patents issued since mid-May 1954 and includes approximately 100+ patents issued since the second edition (March 1974).

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of hot melt adhesives.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION:

Hot melt adhesives have found acceptance and usefulness in many industrial applications. Hot melt adhesives are bonding materials which are solid at room temperature, but soft and fluid at elevated temperatures. The adhesives are readily applied in a molten state to the substrate to be bonded. A strong adhesive bond is rapidly formed on cooling and hardening. Unlike thermosetting adhesives, no curing time is required.

Hot melt adhesive systems offer increased production speeds and lower costs than solvent or waterborne adhesive systems. These basically solid adhesives can be prepared in bulk or pellet form for easy handling. Because they are solventless, they are less costly to prepare; shipping costs are lower. The hazards entailed in using toxic and flammable solvents are eliminated. Drying equipment to remove solvent is unnecessary. In addition there is no danger of freezing.

In the past, a large number of synthetic and natural waxes and resins were the principal constituents of hot melts. Present day adhesives are mixtures of resins, tackifying resins, polymeric materials (including thermoplastic and rubber polymers), waxes, plasticizers, pigments, as well as other additives for improving properties for specific application (film formation, tack, flexibility, gloss, etc.).

Hot melts can be made to have high bond strength and good environmental resistance. They can be designed to meet specific application requirements, for example, to be relatively hard and free of tack, or relatively soft and permanently tacky at room temperature for pressure sensitive adhesives. They can be specially compounded, so as not to interfere in paper recycling operations.

Because hot melts offer such distinct advantages, there is a growing need for new and additional hot melt compositions offering equal or better properties at still lower cost. This book describes a wide range of hot melt formulations. Some are designed for specific industrial applications (plastics, textile, paper products, shoes, metals, etc.). Others are suitable for bonding a variety of similar or dissimilar substrates.

Title	Location	Edition / Series / Misc.
72 Household, Automotive and Industrial Chemical Formulations		Edition: 2nd edition
Author: Flick, Ernest W.	Dynix: 01020	Series:
Publish.: Noyes Publications	Call No.: 660.272 FI	
- place: Park Ridge, NJ	ISBN: 0815509707	Year: 1984
- date: ©1984	Shelf Reference	Price: \$50.00
Subject: Chemicals		
Desc: xxii, 360 p., 25 cm.		

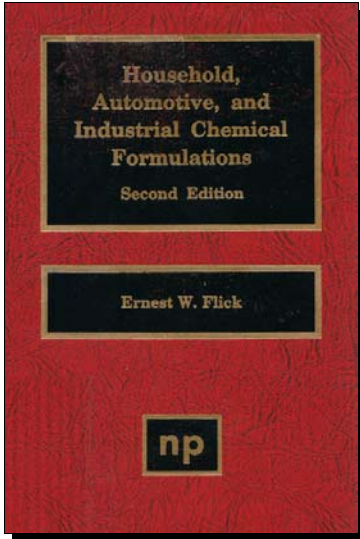


Table of Contents

Introduction

Section I: Household/Industrial Chemical Specialties

- Aluminum Brighteners And Cleaners
- Bottle Washing Compounds
- Corrosion Inhibitors
- Dairy Cleaners
- Degreasers
- Detergent Rinse Aids
- Dishwashing Detergents—Liquid
- Dishwashing Detergents—Machine
- Disinfectants, Germicides And Sanitizers
- Emulsion Systems
- Fabric Softeners
- Floor Polishes
- Floor Polish Es—Buf Fable .
- Floor Polishes—Nonbuffable
- Floor Polishes—Semibuffable
- Floor, Wall And Tile Cleaners
- Furniture Polishes And Cleaners
- General Purpose Cleaners
- General Purpose Detergents
- General Purpose Hard Surface Cleaners
- Glass And Window Cleaners
- Graffiti Removers
- Hand Cleaners
- Leather, Vinyl And Plastic Cleaners
- Metal Cleaners And Polishes
- Oven Cleaners
- Pet Shampoos
- Rug Cleaners .
- Rug And Upholstery Shampoos
- Rust And Paint Removers
- Shoe Polishes
- Spot Removers
- Steam Cleaners
- Toilet Bowl Cleaners
- Wax Strippers
- Wool Washes
- Miscellaneous Specialties

Section II: Automotive Chemical Specialties

- Auto Body Cleaners, Polishes And Waxes
- Auto Engine Block Cleaners And Degreasers
- Car Wash Compounds And Shampoos
- Car Wash Waxes
- Convertible Tops And Vinyl Cleaners And Polishes
- Heavy Duty Washing And Cleaning Compounds
- Whitewall Tire Cleaners
- Windshield Washer Cleaners And Solutions

Subjects

227 .	Chemicals
381 .	Household supplies
428 .	Automobiles -- Equipment and supplies

Section III: Trademarked Raw Materials

Section IV: Suppliers' Addresses

Reviews - Synopsis - Dust Jacket

PREFACE:

This second edition includes 612 up-to-date household, automotive, and industrial specialty chemical formulations that have been compiled for the chemical specialty industries. It consists of entirely new formulations than those found in the previous edition. It will be of value to technical and managerial personnel in chemical specialty manufacturing companies and companies which supply raw materials or services to those companies. The book will be useful to both those with extensive experience as well as those who are novices in the field.

The data consist of selections of manufacturers' formulations made at no cost to, nor influence from, the makers or distributors of these materials.

Only the most recent data have been included. Solvent-based compositions are at a minimum, which fact will be valuable to those readers who must concern themselves with EPA and OSHA restrictions. Alternate nonsolvent formulas are included for most of the solvent-based formulations.

The table of contents is organized in such a way as to serve as a subject index.

My fullest appreciation is expressed to the companies and organizations who supplied the original starting formulations included in this book. I also thank the suppliers of the raw materials included in these formulations, who furnished information describing their trademarked raw materials. All companies are listed in Section IV.

INTRODUCTION:

This is a collection of 522 up-to-date household/industrial chemical specialty and 90 automotive chemical specialty formulations. It is the result of information received from numerous industrial companies and other organizations. The data represent selections from manufacturers' descriptions made at no cost to, nor influence from, the makers or distributors of these materials. Only the most recent formulas have been included. I believe that all of the trade marked raw materials listed here are currently available, which will be of utmost concern to readers with the raw material shortages and discontinuances of recent years.

Very few solvent-based formulas are included, in consideration of the United State's EPA and OSHA regulations, which fact will be of interest to readers concerned with these restrictions. Non-solvent-based formulations are included as alternates to these solvent-based formulas, in most cases.

The formulations in this book are divided into the following two sections:

Section I: Household/Industrial Chemical Specialty Formulas.

Section II: Automotive Chemical Specialty Formulas.

Each formula is indexed in the section which is most applicable. The reader, if he is seeking a formula for a specific end use, should check each section which could possibly apply.

In addition to the above, there are two other sections which will be helpful to the reader:

Section III: A chemical trademark section where each tradenamed raw material included in the book is listed with a chemical description and the supplier's name. The specifications which each raw material meets are included, if applicable.

Section IV: Main office addresses of the suppliers of trademarked raw materials, some of which are not available in the usual reference books.

Each formulation in this book lists the following information, which has been standardized as much as possible:

- (1) Description of end use and most outstanding properties.
- (2) Base chemical and modifier(s) in the heading. The first chemical listed is the base. The chemical listed after the first slash is the major modifier in the formula. Another slash is used to indicate a secondary modifier if applicable. Subsequent modifiers are listed in order of decreasing percentage in the formula.
- (3) The formulas include the following:
 - (A) A listing of each raw material contained.
 - (B) A capsule description of each trademarked raw material or the name of any common chemical.
 - (C) The percent by weight or volume of each raw material included in the formula, rounded to a decimal figure.
 - (D) In some cases, the parts by weight or by volume are included.
 - (E) Formulation notes which list formula modification or improvements which may be made and any other

- formula suggestions.
- (F) Physical constants of the finished formulation. These list the test results obtained on the formula, whenever available.
 - (G) Key properties of the formula, which are the features that the source considers to be more outstanding than other formulations of the same type.
 - (H) The formula source, which is the company or organization, that supplied the formula. The secondary source may be the originating company and/or the primary source's publication title, or both. A formula number is included, if applicable.

Title	Location	Edition / Series / Misc.
73 How to Make Patent Drawings Yourself Author: Lo, Jack and David Pressman Publish.: Nolo Press - place: Berkeley, CA - date: ©1999 Subject: Patents -- United States Desc: 1 v. (various pagings) illus., 28 cm.	Dynix: 89754 Call No.: 608.022 Lo ISBN: 0873374916 Shelf Adult Non-Fiction	Edition: 2nd edition Series: Year: 1999 Price: \$18.50

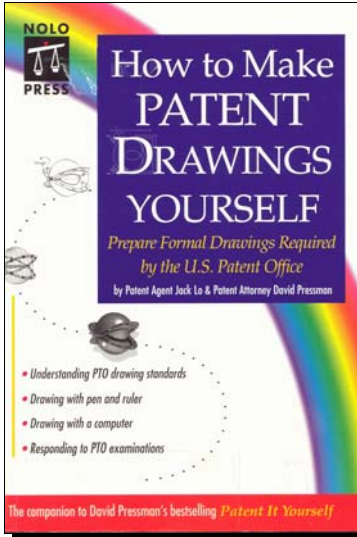


Table of Contents

- Introduction
- 1. General Introduction to Drawing
- 2. Drawing With Pen and Rulers
- 3. Drawing With a Computer
- 4. "Drawing" With a Camera
- 5. Patent Drawings in General
- 6. Utility Patent Drawings
- 7. Designing Patent Drawings
- 8. General Standards
- 9. Responding to Office Actions
- Appendix (Tear-Out Forms)
- Index

Reviews - Synopsis - Dust Jacket

This essential guide for inventors illustrates how to complete a crucial step in the patenting process -- creating formal patent drawings that comply with the strict rules of the U.S. Patent Office. Professional patent drafters charge \$75 to \$100 per sheet to prepare patent drawings. Now, with How to Make Patent Drawings Yourself, you can do your own drawings and save yourself hundreds or even thousands of dollars.

Subjects

290 . Patents -- United States

Written by two experts in the patent field, this essential book shows how to:

- understand Patent Office drawing standards
- make formal drawings using a pen and ruler, computer or camera
- respond to Patent Office examinations

Most importantly, you can have the satisfaction of properly completing the entire patent application yourself -- an impressive accomplishment for an inventor.

The perfect companion to David Pressman's Patent It Yourself!

- Fill In Forms:
- Petition for Submitting Black-and-White Photographs
 - Petition for Submitting Color Photographs or Drawings
 - Request for Entry of Drawing Amendment

- Samples:
- Petition for Submitting Black-and-White Photographs
 - Petition for Submitting Color Photographs or Drawings
 - Form PTO 948 -- Notice of Draftsperson's Patent Drawing Review

Midwest Book Review

Professional patent drafters charge hundreds of dollars to prepare patent drawings. The Patent Drawing Book shows how to complete a crucial step in the patenting process -- the creation of formal patent drawings that comply with the strict rules of the U. S. Patent and Trademark Office. You can also use the drawings to market and promote your product to prospective manufacturers and customers. This invaluable book also teaches the basics of technical drafting using pen and ruler, computer automated drawing programs, and photographic techniques. Most importantly, you can have the satisfaction of properly completing the entire patent application yourself. An impressive legal accomplishment for an inventor that will protect the value of his or her intellectual property and provide peace of mind regarding protections against patent infringements and misuse by others. --This text refers to an out of print or unavailable edition of this title.

Ingram

A companion to David Pressman's bestselling Patent It Yourself, this book shows inventors how to complete a crucial step in the patenting process--creating formal patent drawings that comply with the strict rules of the U.S. Patent Office. -- This text refers to an out of print or unavailable edition of this title.

Even if you hire a patent attorney, this book is worth reading, as it can help minimize the \$200-per-hour consulting time you'll need with your attorney.

---Entrepreneur Magazine

The Patent Drawing Book by Jack Lo and David Pressman, (author of Patent It Yourself) leads you step by step through preparing your own. Even if you haven't taken a course in school, you can make your own patent drawings by following these simple examples.

Jack Lander

---The Inventor's Bookshelf

The authors, a patent agent and a patent attorney, illustrate how to create formal patent drawings that comply with the rules of the U.S. Patent Office, a crucial and sometimes expensive step in the patenting process.

---Mechanical Engineering

Using this book, inventors will learn how to complete this crucial step in receiving a patent.

---Poptronics

Hydrophile-Lipophile Balance of Surfactants and Solid Particles: Physicochemical Aspects and Applications

LASCT Holdings -
maximum detail by Title

H

Title	Location	Edition / Series / Misc.
921 Hydrophile-Lipophile Balance of Surfactants and Solid Particles: Physicochemical Aspects and Appl		Edition: 1st edition
Author: Kruglyakov, Pyotr M. (Maksimovich)	Dynix: 105712	Series: Studies in Interface Science Vol. 9
Publish.: Elsevier Science B.V.	Call No.: 541.3 Kr	
- place: Amsterdam, The Netherlands	ISBN: 0444502572	
- date: ©2000	Shelf Adult Non-Fiction	Year: 2000
Subject: Hydrophile-lipophile balance		Price: \$165.00
Desc: xii, 391 p., illus., 25 cm.		

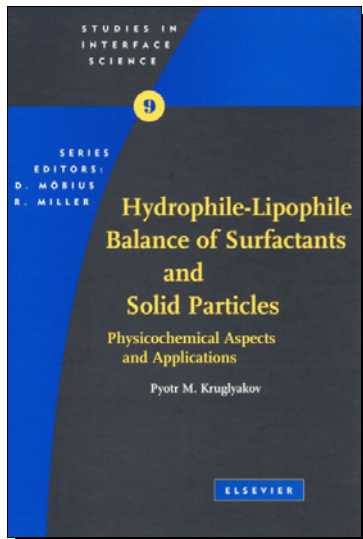


Table of Contents

Preface
List of contents
Introduction

Chapter 1: Physicochemical properties of surfactants used in the definition of hydrophile-lipophile balance

- 1.1. Classification of surfactants with respect to structure and chemical nature
- 1.2. Surface-related properties of surfactants
 - 1.2.1. Interfacial tension
 - 1.2.2. Adsorption at liquid/liquid or liquid/gas interface and the structure of the interface region
 - 1.2.3. Structure and properties of adsorption layers
 - 1.2.4. Work of adsorption
 - 1.2.5. Surface activity
- 1.3. Bulk Properties of Surfactants
 - 1.3.1. Solubility of Surfactants
 - 1.3.2. Distribution of matter between two non-mixing liquids
 - 1.3.3. Micellisation and solubilisation
 - 1.3.4. Formation of micellar (microemulsion) systems
- 1.4. The contributions to Gibbs' energy corresponding to the transfer of surfactant molecules from bulk phases to interfaces as compared to the transfer to other bulk phases. The interpretation of Traube's rule
- 1.5. Brief Review of Surfactant Chromatography
- 1.6. References

Chapter 2: Stabilising ability of surfactants in emulsification and foam formation

- 2.1. Physicochemical properties of emulsion films
 - 2.1.1. Kinetics of emulsion films thinning
 - 2.1.2. Molecular, electrostatic and steric interactions in the emulsion films
 - 2.1.3. Concentration of black spots formation
- 2.2. Kinetics of flocculation and coalescence
- 2.3. Phase inversion in emulsions
- 2.4. Effect of temperature on emulsion stability-phase inversion temperature PIT
- 2.5. Relation between foam stability and hydrophile-lipophile balance
- 2.6. References

Chapter 3: Hydrophile-lipophile balance of surfactants

- 3.1. Griffin's system of HLB numbers
 - 3.1.1. Definition of HLB numbers based on the comprehensive estimation of the surfactant properties. Required HLB numbers of oils
 - 3.1.2. Determination of HLB numbers from the molecular composition of the surfactant
 - 3.1.3. Interrelation between HLB numbers and various properties of surfactants
- 3.2. Kinetic and thermodynamic rationalisation of HLB numbers - Davies' HLBd number
- 3.3. Critical micellisation concentration and I-HLB numbers
- 3.4. Phase inversion temperature in emulsion — measure of hydrophile-lipophile balance
- 3.5. Hydrophile-lipophile balance and chromatographic characteristics of surfactants
- 3.6. Comparative analysis of Griffin's and Davies' HLB numbers, consideration of the influence of the medium and the surfactant structure on the HLB number systems

3 Thermodynamic approaches to the determination of hydrophile-lipophile balance

- 3.7.1. Determination of hydrophile-lipophile balance from the distribution coefficients of the surfactant
- 3.7.2. Determination of hydrophile-lipophile balance from the work of transfer of polar and apolar parts of a surfactant molecule
- 3.7.3. Hydrophile-oleophile ratio determined from the adsorption works
- 3.7.4. Hydrophilic-oleophilic ratio for the mixture of surfactants

Subjects

332 . Surface active agents

575 . Hydrophile-lipophile balance

- 3.7.5. Hydrophile-oleophile ratio determined from the micellisation energy
- 3.8. Hydrophile-lipophile balance and phase inversion of emulsions
 - 3.8.1. Studies of phase inversion in emulsions using the black spot formation concentration
- 3.9. Hydrophilic-oleophilic ratio and the formation of micellar systems (surfactant phases)
- 3.10. References

Chapter 4: Hydrophile-lipophile balance of solid particles

- 4.1. Behaviour of drops at solid surfaces, and solid spherical particles at liquid/liquid interface
- 4.2. Stabilisation of emulsions by solid particles
- 4.3. Work of wetting and determination of the hydrophile-lipophile balance for solid particles
- 4.4. Calculation of the hydrophile-lipophile balance for highly disperse solid emulsifiers
- 4.5. The dependence of emulsion stability on the work of wetting of emulsifier particles. HLB used as criterion of phase inversion in emulsions stabilised by solid particles
- 4.6. References

Chapter 5: Examples of the implementation of hydrophilicity-lipophilicity concepts in the development of the formulations of surfactants and selection of solid particles for certain purposes

- 5.1. Physicochemical properties of microemulsion systems
- 5.2. Emulsion systems and emulsion technologies
 - 5.2.1. Specificities of the preparation of highly concentrated emulsions
 - 5.2.2. Preparation of multiple emulsions
- 5.3. Use of microemulsion systems for enhanced oil recovery from reservoirs
- 5.4. Breakdown of dilute emulsions
- 5.5. Hydrophile-lipophile balance and foaming properties of microemulsions
- 5.6. Hydrophile-lipophile balance and selection of reagents in the processes of surface (foam) separation of dissolved substances, colloid particles and oil drops
- 5.7. Hydrophile-lipophile balance and sanitary-technical characteristics of surfactants
- 5.8. 1-hydrophile-lipophile balance and protein structure
- 5.9. Use of the hydrophile-lipophile balance concept for the characterisation of solid surfaces with respect to its application
- 5.10. References

List of Symbols

Abbreviations of surfactants and surfactant mixtures

Acronyms

Subject Index

Reviews - Synopsis - Dust Jacket

PREFACE:

The amphiphilicity is a fundamental characteristic of any surfactant, which becomes evident in various surface and bulk properties, for example, adsorption, micelle formation, formation of stable liquid films in foams and emulsions, wetting films, lipid membranes, formation of vesicles (liposomes), in the distribution of matter between heteropolar phases, in the operation of various biologic systems, etc.

To access the quantitative measure of the amphiphilicity, the so-called hydrophile-lipophile balance is widely used, which in a certain way reflects the relative efficiency of the heteropolar parts of the surfactants.

The most commonly used characteristics of the hydrophile-lipophile balance with respect to the application of surfactants are Griffin's HLB numbers and Davies' HLB numbers. These numbers were introduced in response to technological needs, where a quantitative characterisation of a surfactant was required to facilitate the choice and selection of the particular compound in a specific application (the development of a detergent compositions and solubilisers, stabilisation of foams and emulsions, etc.)

The studies dealing with the concept of the hydrophile-lipophile balance were mainly concerned with establishing correlations between Griffin's or Davies' HLB numbers and various properties of surfactants, the substantiation or criticism of the Griffin's HLB system, the refinement of various methodological details of experimental measurements or theoretical calculations of HLB numbers, and with the proper account for various factors (molecular structure, medium, temperature etc.) which have been ignored in the HLB numbers system. It should be noted that the applicability of the system of HLB numbers is often overestimated. Clearly, any complex phenomena, and, in particular, the stabilisation of emulsions or detergency, cannot be characterised by a single parameter of a surfactant irrespective of the temperature and ambient medium.

It should also be noted that, following Davies, many authors considered the calculated Davies' and Griffin's HLB numbers as the same quantities. This point of view cannot, however, be shared. Generally speaking, these two

systems of numbers represent different hydrophilicity scales.

From the viewpoint of the physical chemistry of surfactants, it appears that the problem of the search, establishing and study of the practically important characteristics of the hydrophile-lipophile balance which, as applied to surfactants, possess a simple and unambiguous physical meaning, and are applicable to all types of surfactants (micellar and non-micellar, ionic and non-ionic) is much more important.

It was stressed by P.A. Rebinder that "...the development of a quantitative theory of hydrophile-lipophile balance... should be considered as the most important goal of the physical chemistry of surfactants. The solution of this problem should lead to the scientific foundations for the estimation of the efficiency of the developed application of surfactants". Here two aspects of the problem should be kept in mind: the choice of a general and physically meaningful characteristic which employs both the balance of the heteropolar parts of a surfactant and the amount (force) of the "lever arm" of the balance, and the application of the constituents of this balance and the hydrophile-lipophile balance value to give an explanation for various surface and bulk properties (with respect to micelle formation or adsorption) and more complicated phenomena, for example the formation of vesicles, microemulsions, emulsions, foams etc.

The energetic treatment of the hydrophile-lipophile balance can possibly be the most general and useful concept, because all colloid and surface phenomena are closely related with the energetic characteristics of surfactants. This approach, however not consequently, was adopted already in the concept of Davies' numbers for functional groups of surfactants.

In his studies, Davies introduced the energetic treatment of the hydrophile-lipophile balance when comparing the empirical group numbers corresponding to the functional groups of surfactants, and the activation barrier for the breaking of emulsion films.

In recent years, a quite extensive scope of knowledge was accumulated in the area of the energetic characteristics of surfactant molecules and their particular parts with respect to adsorption, micelle formation, distribution between bulk phases etc. However, the hydrophile-lipophile balance concept based on these characteristics by no means became widespread.

The main idea of the proposed book is the energetic concept of hydrophile-lipophile balance as applied to surfactants and solid particles (acting mainly as stabilisers of emulsions). At the same time, the monograph systematises a number of other branches of studies regarding the hydrophile-lipophile balance.

The first chapter summarises the known surface and bulk properties of surfactants which are directly related to the hydrophile-lipophile balance concept and are used either to determine the HLB numbers or to provide an independent measure of the hydrophile-lipophile balance. Along with the systematic exposition of known properties of surfactants, this chapter contains new theoretic data concerning the calculation of interfacial tension, determination of the adsorption of surface-active electrolytes, estimation of the energy of adsorption, and also summarises the studies performed by the author in relation with the Antonov's rule, Traube's rule and the comparison of the contribution to Gibbs' energy for various structural groups of surfactant molecules as applied to their transfer from bulk phases through the dividing surface to micelles and other bulk phases.

The second chapter systematises the most important properties of emulsions (properties of films, phase inversion, and the kinetics of flocculation and coalescence) which are directly related to the stability of emulsions, to the formulation of HLB numbers by Davies, and to the concept of the HLB temperature (phase inversion temperature, PIT) introduced by Shinoda.

The third chapter presents a comprehensive analysis of the systems of Griffin's and Davies' HLB numbers (experimental evaluation and calculation of HLB numbers and a comparative analysis of the original systems and modifications proposed by various authors), the determination of the characteristics of the hydrophile-lipophile balance based on the energetic properties of surfactants (distribution coefficients, work of adsorption and energy of micelle formation).

In the fourth chapter, the methods are described which are used to express hydrophile-lipophile balance for solid particles of various nature and dispersity (macroscopic, gel-like or colloid disperse) employed as emulsifying agents or foam stabilisers, and the properties of emulsions stabilised by solid particles.

The fifth chapter briefly summarises some practical applications of the concept of the hydrophile-lipophile balance in various branches of science and technology.

INTRODUCTION:

The concepts of lyophilicity and lyophobicity (or, as applied to aqueous media, hydrophilicity and hydrophobicity) are commonly used in colloid chemistry.

At the early stages of the studies of disperse systems, the terms 'lyophilicity' and 'lyophobicity' were used to discriminate between systems which possess weak affinity of the disperse phase to the medium (suspensions) and those displaying a pronounced interaction between the particles and the medium (emulsions). From the modern point of view, lyophobic colloidal solutions and other dispersions are thermodynamically non-equilibrium systems, while lyophilic colloids are equilibrium systems.

Another meaning is ascribed to the terms 'lyophilicity' and 'lyophobicity' with respect to the phenomena of wetting and stabilisation of emulsions by solid particles. In this case the hydrophilicity (or hydrophobicity) of the particle is characterised by the contact angle for the selective wetting, that is, for the contact of the solid surface with a pair of immiscible heteropolar liquids (e.g., water/oil), or by other parameters, for example the work of wetting, quantitatively related to the wetting angle. The surface is called hydrophobic (oleophobic) if it is better wetted by non-polar liquids. Alternatively, if it is better wetted by water, the surface is called hydrophilic (oleophilic). Hereinafter the wetting angle is counted through the polar liquid.

According to these two concepts of lyophilicity, the behaviour of quartz, for example, corresponds to hydrophilic (oleophobic) particles with respect to wetting by water; at the same time the sol of SiO₂ (or SiO₂ suspensions) in water demonstrates the properties of a hydrophobic colloidal system.

The concept of hydrophile-lipophile balance as the quantitative measure of the amphiphilicity of surfactants (primarily emulsifier agents) arose much later (in the late 40s and early 50s), especially in connection to the synthesis and application of non-ionic surfactants, for example, oxyethylated derivatives of alcohols, acids and alkyl phenols.

In particular, W. Clayton in his well-known monograph "The Theory of Emulsions and their Technical Treatment" (p. 243) refers to patents in which substances are proposed that prevent splashing of liquid margarine, and emulsifying agents with balanced contents of hydrophilic and hydrophobic groups.

In these years, in the studies of non-ionic surfactants it was shown that the existence of a definite hydrophile-hydrophobe balance (the ratio of the mean number of moles of ethylene oxide to the number of hydrophobic fragments, e.g. methylene groups) is required to achieve the optimum condition of wetting, detergency, emulsifying and de-emulsifying action, solubilisation, foam formation etc. This concept was subsequently extended over other classes of surfactants; at the same time, the quantitative measure of the hydrophile-lipophile balance for these substances is still controversial.

Clearly, the relative efficiency of the polar and apolar parts of surfactant molecule can be expressed via the particular properties of these parts (or the substance as a whole); it should be also kept in mind that different ways of the estimation of hydrophile-lipophile balance can turn to be practically convenient for different processes in which the surfactants play an important role.

Among the parameters which can be employed to estimate the hydrophile-lipophile balance are the structural characteristics (the volume and configuration of the parts of a surfactant), mass- dependent (various functions of mass of hydrophilic or hydrophobic parts) or energy- dependent characteristics (the work of transfer from one phase to another, the work of adsorption from various phases, including those determined in chromatographic processes, the heat of dissolution, the work of micelle formation), and other complex characteristics (the stability and the type of emulsions formed, phase inversion temperature, detergency, solubilisation, etc.)

In turn, the energetic characteristics can be subdivided into direct (primary) and indirect (secondary) parameters. The primary characteristics are related to the surfactant itself (or to its specific parts). These characteristics, however, depend also on the type of the phases, between which the surfactant is distributed and with which it interacts. Among these characteristics is the energy of the transfer of surfactant from one phase to another, the work of surfactant adsorption, the heat of dissolution and the heat of adsorption, the work of micelle formation.

The indirect characteristics refer to the system as a whole, for example, to the water/oil system in the presence of a surfactant, or to different parts of the system. This group includes interfacial tension, spreading coefficient, activity coefficients for water and oil in the presence of the surfactant and some other parameters.

Possibly the most general characteristic of the hydrophile-lipophile balance should be expressible through some fundamental properties, which are immanent to any surfactant, reflects the influence of both parts of the surfactant molecule, and possesses a clear physical meaning. For example, the characteristics related to the micelle formation do not satisfy these requirements, because micelle formation is not immanent to all kinds of surfactants. On the other hand, the stabilising ability (in foams, emulsions, suspensions) or detergency of surfactants, while belonging to the important properties of these substances, also cannot satisfy these requirements because these properties follow from the complex action of several simple properties, evident in complex kinetic processes and equilibrium states.

Title	Location	Edition / Series / Misc.
74 Industrial Coatings: Properties, Applications Quality and Environmental Compliance		<i>Edition:</i>
<i>Author:</i> ASM/ESD Advanced Coatings Technology Conference (2-5 Nov 1992)	<i>Dynix:</i> 49546	<i>Series:</i>
<i>Publish.:</i> ASM International	<i>Call No.:</i> 667.9 In	
<i>- place:</i> Materials Park, OH	<i>ISBN:</i> 0871704617	
<i>- date:</i> ©1992	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1992
<i>Subject:</i> Coatings		<i>Price:</i> \$83.00
<i>Desc:</i> vi, 170 p., illus., 29 cm.		

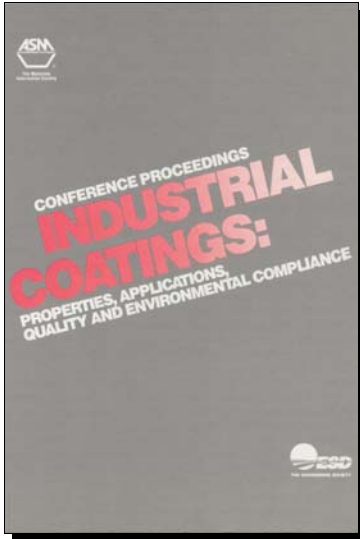


Table of Contents

CHAPTER 1: Engineering Properties of Coatings
 The Development of Intermetallic Phases In Galvannealed Coatings
 U. Chakkingal and R. N. Wright; Rensselaer Polytechnic Institute; Troy, New York
 Appliances for the Nineties: The Switch to Prepaint
 G. R. Pilcher, D. A. Cocuzzi, and E. L. Payne; Akzo Coatings, Inc.; Columbus, Ohio
 Where Coatings Fail, HIP Cladding Succeeds
 J. C. Runkle and J. O. McGeever; Ultra Clad Corporation; Andover, Massachusetts
 Increasing Paint Application Transfer Efficiency on Robotic Waterborne Base Coat Applications
 J. S. Hager; GMFanuc Robotics Corporation; Auburn Hills, Michigan
 Novel Super Low Viscosity Aliphatic Isocyanates Crosslinkers for Polyurethane Coatings
 R. T Wojcik, S. L. Goldstein, H. G. Barnowski, Jr., M. J. Morgan, and K. B. Chandalia; Olin Corporation; Cheshire, Connecticut

CHAPTER 2: Coatings and Applications for Plastic and Metal
 Technical Advances In the Aqueous Preparation of Plastics Prior to Painting
 B. Gunagan; Betz MetChem; Trevose, Pennsylvania
 Prediction of Coating Failure Over Sheet Molding Compound (SMC): Solvent Permeation Studies
 R. A. Ryntz, W. R. Jones, and A. Czarnecki; Akzo Coatings, Inc.; Troy, Michigan
 "Feel Appeal" - A Discussion of Aesthetic Feel Coatings for Automotive and Computer Applications
 J. A. White; Akzo Coatings, Inc.; Troy, Michigan
 Processing and Performance of Silicone Hardcoat Systems
 M. R. Lapinski and W. R. Browall; GE Silicones; Waterford, New York

CHAPTER 3: Environmental Compliance and Safety
 Compliance Options for Auto Assembly Paint Operations
 F. Hussey; Durr Industries, Inc.; Plymouth, Michigan
 Abatement Strategies: Looking at the Big Picture
 O. O'Ryan; ABB Paint Finishing - Environmental Control Group; Troy, Michigan
 Pulmonary Protection from Coating Overspray Aerosols
 R. M. Schreck, T. L. Chan, and J. B. D'Arcy; General Motors Research and Environmental Staff Technical Center; Warren, Michigan

Activated Carbon Fiber Adsorption Systems for Degreasing Processes and for Paint Finishing
 R. E. Kenson; Met-Pro Corporation; Harleysville, Pennsylvania
 CHAPTER 4: Quality Assurance
 Mechanical Properties of Coatings Needed for Good Scratch and Mar Performance
 B. V. Gregorovich and P. J. McGonigal; E. I. DuPont de Nemours; Philadelphia, Pennsylvania
 Improvements In the Surface Preparation of Metals for the Automobile Industry
 M. Petschel; Henkel Corporation-Parker+Amchem; Madison Heights, Michigan
 Testing to Failure of Paint on Plastics
 D. M. Keller; Ford Motor Company; Dearborn, Michigan
 A Review of Methods Used to Evaluate Paint Quality
 J. W. Holubka, P. J. Schmitz, T. J. Pratar, and J. E. deVries; Ford Motor Company; Dearborn, Michigan
 The Power Washer and its Role in Plastics Pretreatment
 C. Soule; DuBois USA; Cincinnati, Ohio

CHAPTER 5: Additional Papers
 VOC Controls for Coatings Under Amended Clean Air Act
 K. R. Schultz; E.I. DuPont de Nemours & Co., Inc.; Wilmington, Delaware
 Quality Testing, How Good Are We and Does It Matter?
 J. R. Flack; ORTECH International; Mississauga, Ontario, Canada

Subjects

239 . Coatings



Reviews - Synopsis - Dust Jacket

Title	Location	Edition / Series / Misc.
75 Industrial Detergency		<i>Edition:</i>
<i>Author:</i> Niven, William W.	<i>Dynix:</i> 34103	<i>Series:</i>
<i>Publish.:</i> Reinhold Publishing Corporation	<i>Call No.:</i> 668.1 Ni	
<i>- place:</i> New York, NY	<i>ISBN:</i>	
<i>- date:</i> [1955]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1955
<i>Subject:</i> Cleaning compounds		<i>Price:</i> \$25.00
<i>Desc:</i> 340 p., illus., 24 cm.		

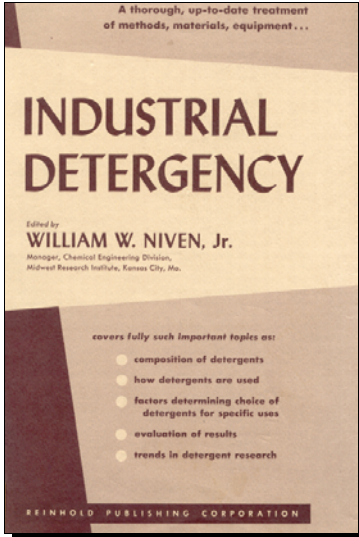


Table of Contents

1. Introduction
2. The Fundamentals of Detergency
3. Detergent Materials (Howard M. Gadberry)
4. The Laundry Industry (Lee G. Johnston)
5. Drycleaning (Howard M. Gadberry and William W. Niven, Jr.)
6. Textile Processing (Martin H. Gurley, Jr.)
7. Foods and Beverages (John P. Greze)
8. The Dairy Industry (John R. Perry)
9. Dishwashing (Howard M. Gadberry)
10. Metals Industries (Milo J. Stutzman)
11. General Industrial Cleaning (Howard M. Gadberry)

AUTHOR INDEX
SUBJECT INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Prepared by a group of experts, each in a specific industry, this valuable book offers a thoroughly up-to-date, practical treatment of the methods, materials and equipment used for industrial cleaning.

On a scientific and engineering level, the book covers the compositions of detergents for specific applications, how detergents are used, factors that determine choice and usage of detergents for each particular job, problems that arise and how they are overcome, how the final results are evaluated, and future trends in detergent research.

Niven's new book is designed primarily for those who directly supervise industrial cleaning operations. It will also prove of exceptional value to chemists and engineers engaged in developing new detergent materials and new cleaning methods.

Subjects

234 .	Cleaning compounds
354 .	Cleaning

PREFACE

The preparation of a technical book is a substantial undertaking, even with the able assistance of a number of authors as in the present case. It is a project that can be justified only if there is an established need for the information presented.

The words "cleaning" and "cleanliness" have several peculiar connotations. To the individual, they are associated with a proper way of living. We wish the foods we eat, the clothing we wear and the surroundings in which we work and live to be clean. To the manufacturer, these two terms are associated with efficiency and economy of operation, quality of product, and betterment of employee relations.

Unfortunately, "cleaning" also is associated all too often with drudgery, a menial task, something to put off until absolutely necessary, and then to do with the least amount of effort that will "get by." Glamorizing with the high-sounding term, "detergency," is not the answer to this situation.

One of the most profound testimonials to advancement of the human race is the ever increasing urge to be cleaner, personally, and to be surrounded with greater cleanliness. In fact, one of the simplest and most accurate measures of the degree of development of a nation is the per capita consumption of the materials used for attaining cleanliness.

If the people assigned in industry to meet the ever more exacting demands for cleanliness are to perform their jobs adequately, they must have more help from chemists and engineers. More efficient cleaning methods must be devised. Those who do the cleaning must be better educated both as to why and how it should be done. Finally, industrial cleaning in general must be freed from the stigma of "a necessary evil," "drudgery," and "meniality". It is to these ends that this volume is directed.

INTRODUCTION

Of all the activities engaged in by industrial enterprises, there probably is none more universal than cleaning or deterging. All industrial operations are faced with cleaning problems. It is only the relative significance of the efforts devoted to cleaning, in respect to the other activities of the operation, that varies from one type of industry to another. On the one hand, we have laundering and dry cleaning, both of which are industries whose very reason for existence is to carry out cleaning processes. At the other extreme, we have industries in which the cleaning requirements involve hardly anything more than routine housekeeping or janitorial practices. In between, there is a multitude of industries wherein cleaning may be of only secondary importance to the operation but, none the less, is essential to the success of the operation.

To appreciate the complexity and importance of industrial detergency, it is appropriate to "type" the objectives of the various industrial cleaning operations. The categories thus developed are:

A. Cleaning as the major basis for the industry (laundering, dry-cleaning)

B. Cleaning as all inherent part of the actual chemical or physical process by which the finished product is made (textile processing, grain milling, metal plating, foods canning)

C. Cleaning as a means of safeguarding the quality of the finished product (dairying, foods and beverages processing, restaurant), applied either to the finished product or to the equipment in which the product is processed;

D. Cleaning as a means of generally upgrading the efficiency of the operation (plant maintenance, industrial housekeeping), practiced for cost reduction, safety, or esthetic advantages.

In an engineering sense, these categories range from the case where detergency is the basic process (A), to the case where detergency is a unit operation within the basic process (B), or is an accessory operation outside the basic process (C and D).

The subject of industrial detergency might be approached in any of several ways. If treated according to the compounds used, it could be divided into cleaning processes depending essentially on surface-active agents and those depending on solvents, all being aided by certain mechanical devices. By using mechanical devices as the basis of approach, the coverage would range from those cleaning operations that are almost entirely mechanical (such as fan-milling of grain and "beating" of rugs) to processes wherein the mechanical device is only one of several essential components (such as in laundering). However, the fact remains that all cleaning operations must be designed according to the characteristics of the substance which is being cleaned. This leaves, then, an industry-by-industry treatment as the only practical approach to the subject, and such has been followed in the later discussions in this book.

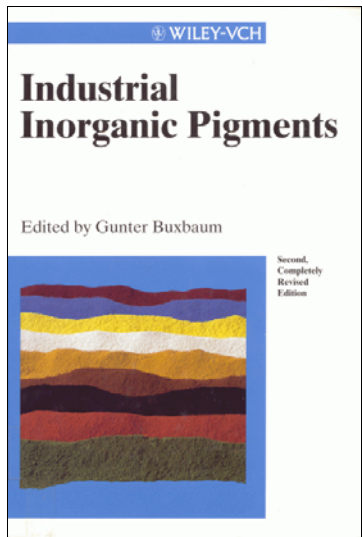
Although, in the broad sense, detergency covers the removal of any objectionable material from anything and by any means, such a broad definition in any one treatise would be prohibitively unwieldy. The present discussions are limited entirely to three-component cleaning systems, involving some liquid some detergency-enhancing material dissolved in that liquid, and a mechanical device; and two-component systems, involving a solvent liquid and a mechanical device. Further, discussions are limited to the cleaning of solid objects and do not include such operations as the "scrubbing" of gases and the removal of foreign material from liquids.

It is well, at least from the viewpoint of the engineer, to consider in more detail the concept of detergency or cleaning as a unit operation. In many industrial processes, detergency is as essential a unit of the over-all operation as is, say, centrifugation, mixing, drying, or grinding in other processes.

Unit operations are defined as physical changes effected in the material being processed. In the mechanical cleaning of wheat prior to milling into flour, only surface conditions on the wheat berry are altered; the berry interior remains physically and chemically unchanged. The same can be said for the cleaning of sugar beets before they are processed into sugar. Nevertheless, the removal of dust and chaff from wheat or of earth from sugar beets is as essential to the production of the final food item as is, say, the actual grinding of the wheat or the centrifugation of mother liquor from the sugar crystals.

The necessity for rapid technological advances in recent years has demanded comprehensive study of each of the many unit operations on which industrial processes depend. With perhaps no unit operation more universally employed than detergency, a comprehensive treatment of detergency as an industrial unit operation is past due and is included in the chapters that follow.

Title	Location	Edition / Series / Misc.
76 Industrial Inorganic Pigments Author: Buxbaum, Gunter (editor) Publish.: Wiley - VCH, Verlag GmbH & Co. - place: New York, NY - date: ©1998 Subject: Pigments Desc: xiii, 289 p., illus. (some color), 25 cm.	Dynix: 73389 Call No.: 667.29 In ISBN: 3527288783 Shelf Reference	Edition: 2nd edition, Completely revised Series: Year: 1998 Price: \$184.00

**Table of Contents**

1. Introduction
- 1.1. General Aspects
- 1.2. General Chemical and Physical Properties
 - 1.2.1. Fundamental Aspects
 - 1.2.2. Methods of Determination
- 1.3. Color Properties
 - 1.3.1. Fundamental Aspects
 - 1.3.2. Color Measurement
 - 1.3.3. Tinting Strength, Lightening Power, and Scattering Power
 - 1.3.4. Hiding Power and Transparency
- 1.4. Stability Towards Light, Weather, Heat, and Chemicals
 - 1.4.1. Fundamental Aspects
 - 1.4.2. Test Methods
 - 1.4.2.1. Light Stability
 - 1.4.2.2. Weather Resistance
 - 1.4.2.3. Heat Stability
 - 1.4.2.4. Fastness to Chemicals
- 1.5. Behavior of Pigments in Binders
 - 1.5.1. Fundamental Aspects
 - 1.5.2. Test Methods
 - 1.5.2.1. Pigment—Binder Interaction
 - 1.5.2.2. Dispersing Behavior in Paint Systems
 - 1.5.2.3. Miscellaneous Pigment—Binder Systems
2. White Pigments
 - 2.1. Titanium Dioxide
 - 2.2.1. Properties
 - 2.1.2. Raw Materials
 - 2.1.2.1. Natural Raw Materials
 - 2.1.2.2. Synthetic Raw Materials
 - 2.1.3. Production
 - 2.1.3.1. Sulfate Method
 - 2.1.3.2. The Chloride Process
 - 2.1.3.3. Pigment Quality
 - 2.1.3.4. Aftertreatment
 - 2.1.3.5. Problems with Aqueous and Gaseous Waste
 - 2.1.4. Economic Aspects
 - 2.1.5. Pigment Properties
 - 2.1.6. Analysis
 - 2.1.7. Uses of Pigmentary TiO₂
 - 2.1.8. Uses of Nonpigmentary TiO₂
 - 2.1.9. Toxicology
 - 2.2. Zinc Sulfide Pigments
 - 2.2.1. Properties

Subjects

293 . Pigments

- 2.2.2. Production
- 2.2.3. Commercial Products
- 2.2.4. Uses
- 2.2.5. Economic Aspects
- 2.2.6. Toxicology

- 2.3. Zinc Oxide (Zinc White)
 - 2.3.1. Introduction
 - 2.3.2. Properties
 - 2.3.3. Production
 - 2.3.4. Quality Specifications
 - 2.3.5. Uses
 - 2.3.6. Economic Aspects
 - 2.3.7. Toxicology and Occupational Health

- 3. Colored Pigments
 - 3.1. Oxides and Hydroxides
 - 3.1.1. Iron Oxide Pigments
 - 3.1.1.1. Natural Iron Oxide Pigments
 - 3.1.1.2. Synthetic Iron Oxide Pigments
 - 3.1.1.3. Toxicology and Environmental Aspects
 - 3.1.1.4. Quality
 - 3.1.1.5. Uses
 - 3.1.1.6. Economic Aspects
 - 3.1.2. Chromium Oxide Pigments
 - 3.1.2.1. Properties
 - 3.1.2.2. Production
 - 3.1.2.3. Quality Specifications and Analysis
 - 3.1.2.4. Storage and Transportation
 - 3.1.2.5. Uses
 - 3.1.2.6. Economic Aspects
 - 3.1.2.7. Toxicology and Occupational Health
 - 3.1.3. Mixed Metal Oxide Pigments
 - 3.1.3.1. Properties
 - 3.1.3.2. Production
 - 3.1.3.3. Quality Specifications and Analysis
 - 3.1.3.4. Storage and Transportation
 - 3.1.3.5. Legal Aspects
 - 3.1.3.6. Uses
 - 3.1.3.7. Economic Aspects
 - 3.1.3.8. Toxicology and Occupational Health
 - 3.2. Cadmium Pigments
 - 3.2.1. Cadmium Sulfide
 - 3.2.2. Cadmium Yellow
 - 3.2.3. Cadmium Sulfoselenide (Cadmium Red)
 - 3.2.4. Cadmium Mercury Sulfide (Cadmium Cinnabar)
 - 3.2.5. Properties and Uses
 - 3.2.6. Quality Specifications
 - 3.2.7. Economic Aspects
 - 3.2.8. Toxicology and Environmental Protection
 - 3.3. Bismuth Pigments
 - 3.3.1. Properties
 - 3.3.2. Production
 - 3.3.3. Uses
 - 3.3.4. Toxicology
 - 3.4. Chromate Pigments
 - 3.4.1. Chrome Yellow
 - 3.4.2. Molybdate Red and Molybdate Orange
 - 3.4.3. Chrome Orange
 - 3.4.4. Chrome Green and Fast Chrome Green

- 3.4.5. Toxicology and Occupational Health
- 3.5. Ultramarine Pigments
 - 3.5.1. Chemical Structure
 - 3.5.2. Properties
 - 3.5.3. Production
 - 3.5.4. Uses
 - 3.5.5. Toxicology and Environmental Aspects
 - 3.5.6. Economic Aspects
- 3.6. Iron Blue Pigments
 - 3.6.1. Structure
 - 3.6.2. Production
 - 3.6.3. Properties
 - 3.6.4. Uses
 - 3.6.5. Toxicology and Environmental Aspects
- 4. Black Pigments (Carbon Black)
 - 4.1. Physical Properties
 - 4.2. Chemical Properties
 - 4.3. Raw Materials
 - 4.4. Production Processes
 - 4.4.1. Furnace Black Process
 - 4.4.2. Gas Black and Channel Black Processes
 - 4.4.3. Lamp Black Process
 - 4.4.4. Thermal Black Process
 - 4.4.5. Acetylene Black Process
 - 4.4.6. Other Production Processes
 - 4.4.7. Oxidative Aftertreatment of Carbon Black
 - 4.4.8. Environmental Problems
 - 4.5. Testing and Analysis
 - 4.6. Transportation and Storage
 - 4.7. Uses
 - 4.7.1. Rubber Blacks
 - 4.7.2. Pigment Blacks
 - 4.7.2.1. Pigment Properties
 - 4.7.2.2. Blacks for Printing Inks
 - 4.7.2.3. Blacks for Paints
 - 4.7.2.4. Blacks for Plastics
 - 4.8. Economic Aspects
 - 4.9. Toxicology and Health Aspects
- 5. Specialty Pigments
 - 5.1. Magnetic Pigments
 - 5.1.1. Iron Oxide Pigments
 - 5.1.2. Cobalt-Containing Iron Oxide Pigments
 - 5.1.3. Chromium Dioxide
 - 5.1.4. Metallic Iron Pigments
 - 5.1.5. Barium Ferrite Pigments
 - 5.2. Anticorrosive Pigments
 - 5.2.1. Principles
 - 5.2.2. Phosphate Pigments
 - 5.2.2.1. Zinc Phosphate

- 5.2.2.2. Aluminum Phosphate
- 5.2.2.3. Chromium Phosphate
- 5.2.2.4. New Pigments Based on Metal Phosphates
- 5.2.2.5. Multiphase Phosphate Pigments
- 5.2.3. Other Phosphorus-Containing Pigments
- 5.2.4. Borosilicate Pigments
- 5.2.5. Borate Pigments
- 5.2.6. Chromate Pigments
- 5.2.7. Molybdate Pigments
- 5.2.8. Lead and Zinc Cyanamides
- 5.2.9. Iron-Exchange Pigments
- 5.2.10. Metal Oxide Pigments
 - 5.2.10.1. Red Lead
 - 5.2.10.2. Calcium Plumbate
- 5.2.10.3. Zinc and Calcium Ferrites
- 5.2.10.4. Zinc Oxides
- 5.2.11. Powdered Metal Pigments
 - 5.2.11.1. Zinc Dust
 - 5.2.11.2. Lead Powder
- 5.2.12. Flake Pigments
- 5.2.13. Organic Pigments
- 5.2.14. Toxicology

- 5.3. Luster Pigments
 - 5.3.1. Nacreous and Interference Pigments
 - 5.3.1.1. Optical Principles
 - 5.3.1.2. Natural Pearl Essence
 - 5.3.1.3. Basic Lead Carbonate
 - 5.3.1.4. Bismuth Oxychloride
 - 5.3.1.5. Metal Oxide—Mica Pigments
 - 5.3.1.6. New Developments for Pearlescent Pigments and Flakes
 - 5.3.1.7. Uses
 - 5.3.2. Metal Effect Pigments

- 5.4. Transparent Pigments
 - 5.4.1. Transparent Iron Oxides
 - 5.4.2. Transparent Iron Blue
 - 5.4.3. Transparent Cobalt Blue and Green
 - 5.4.4. Transparent Titanium Dioxide
 - 5.4.5. Transparent Zinc Oxide

- 5.5. Luminescent Pigments
 - 5.5.1. Introduction
 - 5.5.2. Luminescence of Crystalline Inorganic Phosphors
 - 5.5.2.1. Luminescence Processes
 - 5.5.3. Preparation and Properties of Inorganic Phosphors
 - 5.5.3.1. Sulfides and Selenides
 - 5.5.3.2. Oxyulfides
 - 5.5.3.3. Oxygen-Dominant Phosphors
 - 5.5.3.4. Halide Phosphors
 - 5.5.4. Uses of Luminescent Pigments
 - 5.5.4.1. Lighting
 - 5.5.4.2. X-Ray Technology
 - 5.5.4.3. Cathode-Ray Tubes
 - 5.5.4.4. Product Coding
 - 5.5.4.5. Safety and Accident Prevention
 - 5.5.4.6. Dentistry
 - 5.5.4.7. Other Uses
 - 5.5.5. Testing of Industrial Phosphors

- 6. References

Reviews - Synopsis - Dust Jacket

From Booknews

A comprehensive reference for users of pigments in such applications as coloring construction materials, art, industrial paints, toners in photocopiers, coloring food, and raw materials for catalysts. Discusses their chemistry, physical appearance, and manufacturing process, all of which affect their application properties. Begins by dealing with color and its measurement, incorporating the latest standards then covers white, colored, black, and specialty pigments, including environmental and safety regulations. The specialty pigments considered are magnetic, anti-corrosive, luster, transparent, and luminescent. The 1993 edition has been highly revised to reflect recent trends, new standards, and updated commercial data.

This updated treatment of an industry standard offers a concise and thorough presentation of the chemistry, production, properties, and economic considerations of the industrially important class of materials used as inorganic pigments. The title provides all the knowledge necessary for the optimal selection and utilization of inorganic pigments.

FROM THE DUST JACKET:

Everything there is to know about inorganic pigments. Revised and updated, this book offers a concise and thorough presentation of inorganic pigments in their diversity their manufacturing processes, their applications and markets, their testing procedures and standards, and also the health and environmental regulations relating to them. Over 40 first-class authors from leading chemical companies have created a uniform and clearly structured text, giving an excellent overview of the subject area.

The reader is provided with more than 800 up-to-date references to the pertinent literature, which will be extremely useful for further studies. This book will be of benefit to all chemists, materials specialists, engineers, application technicians and students in pigment-related fields.

PREFACE TO THE SECOND EDITION:

The fact that after only five years a second edition of this book is necessary demonstrates its success. This second edition is not a mere reprint but we have used the opportunity to review all the chapters and the commercial data. Some attention has been given to company mergers in the pigment industry, but this is something that is continually changing. The lists of the standards have been updated as well as the references. New trends in the field of inorganic pigments are described, e.g. the growing importance of luster pigments has led to the inclusion of a more detailed description of them. Sections on pigments whose importance has decreased have been shortened.

Nearly every chapter has been rewritten. Some authors of the first edition are now retired; their contributions have been revised by younger colleagues of known excellence. We express our special thanks to the readers of the first edition who made contributions or gave us valuable hints for this new edition.

Finally we thank the publisher for patience and support.

INTRODUCTION:

Definition: The word "pigment" is of Latin origin (pigmentum) and originally denoted a color in the sense of a coloring matter, but was later extended to indicate colored decoration (e.g., makeup). In the late Middle Ages, the word was also used for all kinds of plant and vegetable extracts, especially those used for coloring. The word pigment is still used in this sense in biological terminology; it is taken to mean dyestuffs of plant or animal organisms that occur as very small grains inside the cells or cell membranes, as deposits in tissues, or suspended in body fluids.

The modern meaning associated with the word pigment originated in this century. According to accepted standards (Table 1, "Coloring materials: Terms and definitions"), the word pigment means a substance consisting of small particles that is practically insoluble in the applied medium and is used on account of its coloring, protective, or magnetic properties. Both pigments and dyes are included in the general term "coloring materials", which denotes all materials used for their coloring properties. The characteristic that distinguishes pigments from soluble organic dyes is their low solubility in solvents and binders. Pigments can be characterized by their chemical composition, and by their optical or technical properties. In this introductory chapter, only inorganic pigments used as coloring materials are discussed.

Extenders (fillers) are substances in powder form that are practically insoluble in the medium in which they are applied. They are usually white or slightly colored, and are used on account of their physical or chemical properties. The distinction between an extender and a pigment lies in the purpose for which it is used. An extender is not a colorant, it is employed to modify the properties or increase the bulk (volume) of a given material. Extenders are beyond the scope of this book and will not be discussed in detail.

Historical: Natural inorganic pigments have been known since prehistoric times. Over 60,000 years ago, natural ochre

was used in the Ice Age as a coloring material. The cave paintings of the Pleistocene peoples of southern France, northern Spain, and northern Africa were made with charcoal, ocher, manganese brown, and clays, and must have been produced over 30000 years ago. About 2000 B.C., natural ocher was burnt, sometimes in mixtures with manganese ores, to produce red, violet, and black pigments for pottery. Arsenic sulfide and Naples yellow (a lead antimonate) were the first clear yellow pigments. Ultramarine (lapis lazuli) and artificial lapis lazuli (Egyptian blue and cobalt aluminum spinel) were the first blue pigments. Terra verte, malachite, and a synthetically prepared copper hydroxychloride were the first green pigments. Colored glazes for bricks (i.e., ceramic pigments) were widely used by the Chaldeans. Calcite, some phases of calcium sulfate, and kaolinite were the white pigments used at that time.

Title	Location	Edition / Series / Misc.
1549 Industrial Organic Pigments: Production, Properties, Applications <i>Author:</i> Herbst, Willy and Klaus Hunger <i>Publish.:</i> Wiley - VCH, Verlag GmbH & Co. KGaA <i>- place:</i> Weinheim, Germany <i>- date:</i> ©2004 <i>Subject:</i> Pigments <i>Desc:</i> xviii, 660 p., illus. (some color), 25 cm.	<i>Dynix:</i> 111667 <i>Call No.:</i> 667 He <i>ISBN:</i> 3527305769 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 3rd edition, Completely revised <i>Series:</i> <i>Year:</i> 2004 <i>Price:</i> \$198.50

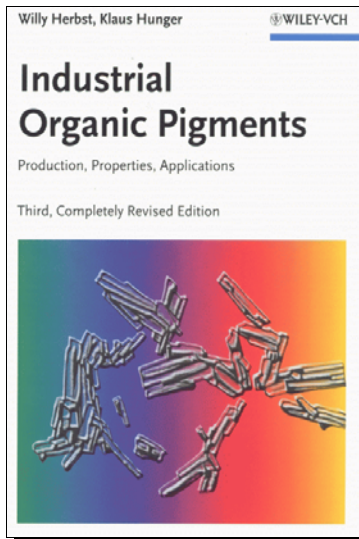


Table of Contents

- 1 General
 - 1.1 Definition: Pigments — Dyes
 - 1.1.1 Organic-Inorganic Pigments
 - 1.2 Historical
 - 1.3 Classification of Organic Pigments
 - 1.3.1 Azo Pigments
 - 1.3.1.1 Monoazo Yellow and Orange Pigments
 - 1.3.1.2 Disazo Pigments
 - 1.3.1.3 b-Naphthol Pigments
 - 1.3.1.4 Naphthol AS Pigments (Naphthol Reds)
 - 1.3.1.5 Azo Pigment Lakes (Salt Type Pigments)
 - 1.3.1.6 Benzimidazolone Pigments
 - 1.3.1.7 Disazo Condensation Pigments
 - 1.3.1.8 Metal Complex Pigments
 - 1.3.1.9 Isoindolinone and Isoindoline Pigments
 - 1.3.2 Polycyclic Pigments
 - 1.3.2.1 Phthalocyanine Pigments
 - 1.3.2.2 Quinacridone Pigments
 - 1.3.2.3 Perylene and Perinone Pigments
 - 1.3.2.4 Diketopyrrolo-Pyrrole (DPP) Pigments
 - 1.3.2.5 Thioindigo Pigments
 - 1.3.3 Anthraquinone Pigments
 - 1.3.3.1 Anthrapyrimidine Pigments
 - 1.3.3.2 Flavanthrone Pigments
 - 1.3.3.3 Pyranthrone Pigments
 - 1.3.3.4 Anthanthrone Pigments
 - 1.3.4 Dioxazine Pigments
 - 1.3.5 Triarylcarbonium Pigments
 - 1.3.6 Quinophthalone Pigments
 - 1.4 Chemical Characterization of Pigments
 - 1.4.1 Hue
 - 1.4.1.1 Crystal Modification and Crystal Structure
 - 1.4.2 Tinctorial Strength
 - 1.4.3 Lightfastness and Weatherfastness
 - 1.4.4 Solvent and Migration Fastness
 - 1.5 Physical Characterization of Pigments
 - 1.5.1 Specific Surface Area
 - 1.5.2 Particle Size Distribution
 - 1.5.2.1 Determination of Particle Size by Ultrasedimentation
 - 1.5.2.2 Determination by Electron Microscopy
 - 1.5.2.3 Data Representation
 - 1.5.3 Polymorphism
 - 1.5.4 Crystallinity
 - 1.6 Important Application Properties and Concepts
 - 1.6.1 Coloristic Properties (by F. Gläser)

Subjects

293 .	Pigments
387 .	Organic compounds

- 1.6.1.1 Color
- 1.6.1.2 Color Depth
- 1.6.1.3 Color Differences
- 1.6.1.4 Optical Behavior of Pigmented Coatings
- 1.6.1.5 Tintorial Strength
- 1.6.1.6 Hiding Power
- 1.6.1.7 Transparency
- 1.6.2 Fastness to Solvents and Special Application Fastness
- 1.6.2.1 Organic Solvents
- 1.6.2.2 Water, Soap, Alkali, and Acids
- 1.6.2.3 Pigment Performance in Special Applications
- 1.6.2.4 Textile Fastness Properties
- 1.6.3 Migration
- 1.6.3.1 Blooming
- 1.6.3.2 Bleeding/Overspraying Fastness
- 1.6.4 Disturbances During the Processing of Pigmented Systems
- 1.6.4.1 Plate-Out
- 1.6.4.2 Overpigmentation/Chalking
- 1.6.4.3 Distortion/Nucleation in Polymers
- 1.6.5 Dispersion
- 1.6.5.1 General Considerations
- 1.6.5.2 Desagglomeration of Pigment Particles
- 1.6.5.3 Wetting of Pigment Particle Surfaces
- 1.6.5.4 Distribution of the Dispersed Pigment in its Medium
- 1.6.5.5 Stabilization
- 1.6.5.6 Dispersion and the Critical Pigment Volume Concentration
- 1.6.5.7 Test Methods
- 1.6.5.8 Flush Pastes
- 1.6.5.9 Pigment Preparations
- 1.6.6 Lightfastness and Weatherfastness
- 1.6.6.1 Definition and General Information
- 1.6.6.2 Evaluation Techniques and Equipment
- 1.6.6.3 Factors Determining the Lightfastness
- 1.6.7 Thermal Stability
- 1.6.8 Flow Properties of Pigmented Systems
- 1.6.8.1 Rheological Properties
- 1.6.8.2 Viscoelastic Properties
- 1.6.8.3 Influence on the Flow Properties
- 1.6.8.4 Correlation between Flow Behavior and Rheological Parameters
- 1.6.8.5 Rheological Measurements

- 1.7 Particle Size Distribution and Application Properties of Pigmented Media
- 1.7.1 Tintorial Strength
- 1.7.2 Hue
- 1.7.3 Hiding Power, Transparency
- 1.7.4 Lightfastness and Weatherfastness
- 1.7.5 Dispersibility
- 1.7.6 Gloss
- 1.7.7 Solvent and Migration Fastness
- 1.7.8 Flow

- 1.8 Areas of Application for Organic Pigments
- 1.8.1 Printing Inks
- 1.8.1.1 Offset/Letterpress Printing
- 1.8.1.2 Gravure Printing
- 1.8.1.3 Flexo and Screen Printing and Other Printing Processes
- 1.8.1.4 Security Printing
- 1.8.2 Coatings
- 1.8.2.1 Oxidatively Drying Paints
- 1.8.2.2 Oven Drying Systems
- 1.8.2.3 Emulsion Paints
- 1.8.3 Plastics
- 1.8.3.1 Polyolefins
- 1.8.3.2 Polyvinyl Chloride (PVC)

- 1.8.3.3 Polyurethane
- 1.8.3.4 Polyamide, Polycarbonate, Polyester, Polyoxymethylene
- 1.8.3.5 Polystyrene, Styrene-Copolymers, Poly(Methyl Methacrylate)
- 1.8.3.6 Elastomers
- 1.8.3.7 Thermosets (Thermosetting Plastics)
- 1.8.3.8 Spin Dyeing
- 1.8.4 Other Areas of Application

- 2 Azo Pigments

- 2.1 Starting Materials, Synthesis
 - 2.1.1 Diazo Components
 - 2.1.2 Coupling Compounds
 - 2.1.3 Important Intermediates

- 2.2 Synthesis of Azo Pigments
 - 2.2.1 Diazotization
 - 2.2.1.1 Diazotization Mechanism
 - 2.2.1.2 Methods of Diazotization
 - 2.2.2 Coupling
 - 2.2.2.1 Coupling Techniques
 - 2.2.3 Finishing
 - 2.2.4 Filtration, Drying, Milling
 - 2.2.5 Azo Pigment Synthesis by Continuous Operation
 - 2.2.6 Production Units for Azo Pigment Manufacture by Batch Operation

- 2.3 Monoazo Yellow and Orange Pigments
 - 2.3.1 Chemistry, Manufacture
 - 2.3.1.1 Non-laked Monoazo Yellow and Orange Pigments
 - 2.3.1.2 Monoazo Yellow Pigment Lakes
 - 2.3.2 Properties
 - 2.3.2.1 Non-laked Monoazo Yellow and Orange Pigments
 - 2.3.2.2 Monoazo Yellow Pigment Lakes
 - 2.3.3 Application
 - 2.3.4 Commercially Available Monoazo Yellow and Orange Pigments

- 2.4 Disazo Pigments
 - 2.4.1 Diarylide Yellow Pigments
 - 2.4.1.1 Chemistry, Manufacture
 - 2.4.1.2 Properties
 - 2.4.1.3 Application
 - 2.4.1.4 Commercially Available Diarylide Yellow and Orange Pigments
 - 2.4.2 Bisacetoacetarylide Pigments
 - 2.4.2.1 Commercially Available Bisacetoacetarylide Pigments and Their Properties
 - 2.4.3 Disazopyrazolone Pigments
 - 2.4.3.1 Chemistry, Manufacture
 - 2.4.3.2 Properties
 - 2.4.3.3 Application
 - 2.4.3.4 Commercially Available Pigments

- 2.5 b-Naphthol Pigments
 - 2.5.1 Chemistry, Manufacture
 - 2.5.2 Properties
 - 2.5.3 Application
 - 2.5.4 Commercially Available 3-Naphthol Pigments

- 2.6 Naphthol AS Pigments
 - 2.6.1 Chemistry, Manufacture
 - 2.6.2 Properties
 - 2.6.3 Application
 - 2.6.4 Commercially Available Naphthol AS Pigments

- 2.7 Red Azo Pigment Lakes
 - 2.7.1 b-Naphthol Pigment Lakes

- 2.7.1.1 Chemistry, Manufacture
- 2.7.1.2 Properties
- 2.7.1.3 Application
- 2.7.1.4 Commercially Available Pigments
- 2.7.2 BONA Pigment Lakes
 - 2.7.2.1 Chemistry, Manufacture
 - 2.7.2.2 Properties
 - 2.7.2.3 Application
 - 2.7.2.4 Commercially Available BONA Pigment Lakes
- 2.7.3 Naphthol AS Pigment Lakes
 - 2.7.3.1 Chemistry, Manufacture, and Properties
 - 2.7.3.2 Commercially Available Naphthol AS Pigment Lakes
- 2.7.4 Naphthalene Sulfonic Acid Pigment Lakes
 - 2.7.4.1 Chemistry, Manufacture, and Properties
 - 2.7.4.2 Commercially Available Pigments
- 2.8 Benzimidazolone Pigments
 - 2.8.1 Chemistry, Manufacture
 - 2.8.1.1 Yellow and Orange Benzimidazolone Pigments — Coupling Component
 - 2.8.1.2 Red Benzimidazolone Pigments — Coupling Component
 - 2.8.1.3 Pigment Synthesis and Aftertreatment
 - 2.8.1.4 Results of Crystal Structure Analyses
 - 2.8.2 Properties
 - 2.8.3 Application
 - 2.8.4 Commercially Available Benzimidazolone Pigments
- 2.9 Disazo Condensation Pigments
 - 2.9.1 Chemistry, Manufacture
 - 2.9.2 Properties
 - 2.9.3 Application
 - 2.9.4 Commercially Available Pigments
- 2.10 Metal Complex Pigments
 - 2.10.1 Chemistry, Synthesis
 - 2.10.1.1 Azo Metal Complexes
 - 2.10.1.2 Azomethine Metal Complexes
 - 2.10.2 Properties
 - 2.10.3 Application
 - 2.10.4 Commercially Available Pigments
- 2.11 Isoindolinone and Isoindoline Pigments
 - 2.11.1 Chemistry, Synthesis, Starting Materials
 - 2.11.1.1 Azomethine Type: Tetrachloroisoindolinone Pigments
 - 2.11.1.2 Methine Type: Isoindoline Pigments
 - 2.11.2 Properties
 - 2.11.3 Application
 - 2.11.4 Commercially Available Isoindolinone and Isoindoline Pigments
- 3 Polycyclic Pigments
 - 3.1 Phthalocyanine Pigments
 - 3.1.1 Starting Materials
 - 3.1.2 Manufacture
 - 3.1.2.1 Phthalonitrile Process
 - 3.1.2.2 Phthalic Anhydride/Urea Process
 - 3.1.2.3 Manufacturing the Different Crystal Modifications
 - 3.1.2.4 Phase- and Flocculation-Stabilized Copper Phthalocyanine Blue Pigments
 - 3.1.2.5 Manufacture of Green Types
 - 3.1.2.6 Metal-free Phthalocyanine Blue
 - 3.1.3 Properties
 - 3.1.4 Application
 - 3.1.5 Commercially Available Pigments
 - 3.2 Quinacridone Pigments

- 3.2.1 Manufacture, Starting Materials
 - 3.2.1.1 Thermal Ring Closure
 - 3.2.1.2 Acidic Ring Closure
 - 3.2.1.3 Dihalo Terephthalic Acid Process
 - 3.2.1.4 Hydroquinone Process
 - 3.2.1.5 Substituted Quinacridones
 - 3.2.1.6 Quinacridone Quinone
 - 3.2.1.7 Polymorphism
- 3.2.2 Properties
- 3.2.3 Application
- 3.2.4 Commercially Available Quinacridone Pigments

- 3.3 Vat Dyes Prepared as Pigments

- 3.4 Perylene and Perinone Pigments
 - 3.4.1 Perylene Pigments
 - 3.4.1.1 Preparation of the Starting Materials
 - 3.4.1.2 Chemistry, Manufacture
 - 3.4.1.3 Properties
 - 3.4.1.4 Application
 - 3.4.1.5 Commercially Available Perylene Pigments
 - 3.4.1.6 Various Other Perylene Tetracarboxylic Acid Pigments
 - 3.4.2 Perinone Pigments
 - 3.4.2.1 Preparation of the Starting Materials
 - 3.4.2.2 Chemistry, Manufacture
 - 3.4.2.3 Properties
 - 3.4.2.4 Commercially Available Perinone Pigments and Their Application

- 3.5 Diketopyrrolo-Pyrrole (DPP) Pigments
 - 3.5.1 Chemistry, Manufacture
 - 3.5.2 Properties and Application
 - 3.5.3 Commercially Available DPP Pigments

- 3.6 Thioindigo Pigments
 - 3.6.1 Chemistry, Manufacture
 - 3.6.2 Properties
 - 3.6.3 Commercially Available Types and Their Application

- 3.7 Various Polycyclic Pigments
 - 3.7.1 Aminoanthraquinone Pigments
 - 3.7.1.1 Anthraquinone-Azo Pigments
 - 3.7.1.2 Other Aminoanthraquinone Pigments
 - 3.7.1.3 Properties and Application
 - 3.7.2 Hydroxyanthraquinone Pigments
 - 3.7.2.1 Properties and Application
 - 3.7.3 Heterocyclic Anthraquinone Pigments
 - 3.7.3.1 Anthrapyrimidine Pigments
 - 3.7.3.2 Indanthrone and Flavanthrone Pigments
 - 3.7.4 Polycarbocyclic Anthraquinone Pigments
 - 3.7.4.1 Pyranthrone Pigments
 - 3.7.4.2 Anthanthrone Pigments
 - 3.7.4.3 Isoviolanthrone Pigments

- 3.8 Dioxazine Pigments
 - 3.8.1 Preparation of the Starting Materials
 - 3.8.2 Chemistry, Manufacture
 - 3.8.3 Properties
 - 3.8.4 Commercially Available Dioxazine Pigments and Their Application

- 3.9 Quinophthalone Pigments
 - 3.9.1 Chemistry, Manufacture
 - 3.9.2 Properties and Application

- 3.10 Triarylcarbonium Pigments

- 3.10.1 Inner Salts of Sulfonic Acids (Alkali Blue Types)
 - 3.10.1.1 Chemistry, Manufacture
 - 3.10.1.2 Properties
 - 3.10.1.3 Commercially Available Types and Their Application
- 3.10.2 Dye Salts with Complex Anions
 - 3.10.2.1 Chemistry, Manufacture
 - 3.10.2.2 Properties
 - 3.10.2.3 Application
 - 3.10.2.4 Important Representatives
- 4 Miscellaneous Pigments
 - 4.1 Aluminum Pigment Lakes
 - 4.2 Pigments with Known Chemical Structure Which Cannot be Assigned to Other Chapters
 - 4.3 Pigments with Hitherto Unknown Chemical Structure
- 5 Legislation, Ecology, Toxicology
 - 5.1 Introduction
 - 5.2 Legislation
 - 5.2.1 General
 - 5.2.2 Legislation Concerning Organic Pigments
 - 5.2.2.1 Food Packaging
 - 5.2.2.2 Toys
 - 5.2.2.3 Consumer Goods
 - 5.3 Ecology
 - 5.4 Toxicology
 - 5.4.1 Acute Toxicity
 - 5.4.2 Irritation of Skin and Mucous Membrane
 - 5.4.3 Toxicity After Repeated Application
 - 5.4.4 Mutagenicity
 - 5.4.5 Chronic Toxicity — Carcinogenicity
- Review of Chemical Structures and Chemical Reactions
- List of Commercially Available Pigments
- Subject Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

> > Everything there is to know about organic pigments.

Revised and updated, this highly acclaimed work, now in its third edition, remains the most comprehensive source of information available on synthetic organic pigments.

The book provides up-to-date information on synthesis, reaction mechanisms, physical and chemical properties, test methods, and applications of all industrially produced organic pigments of the world market.

Standardized methods have been used to obtain the data thus facilitating comparison between pigments. Chemists, engineers, colorists, and technicians are sure to find this book invaluable.

> > From reviews of the previous editions:

"Presentation throughout is of the highest quality and the volume must now become the standard reference text in this important area of coloring matters." -- Dyes and Pigments

"This is a very wide-ranging reference work. . . it would be difficult to find a topic in this field not covered by this book." --

Ecochem

"The strength of this work lies in the logic and consequence of its structure. Thanks to its clarity, the numerous tables and the index, one can quickly find a comprehensive answer to almost every question in the subject area of organic pigments." -- farbe und lack

"The authors have succeeded to present an excellent and critical review on the state of the art of organic pigments. . This book has already become a standard in the field of organic coatings science." -- Progress in Organic Coatings

"The book shows masterly treatment of the subject with high-quality presentation." -- Chemical Engineering World

"This book definitely fills a gap in the literature of pigment application properties and can be recommended to every technologist working in this subject area." -- Nachrichten aus Chemie, Technik und Laboratorium

"A comparable work does not exist." --Kunststoffe

PREFACE TO THE THIRD EDITION:

The second edition of our book has again found a favorable reception worldwide, triggering even a reprint of that edition some time ago. We are therefore pleased to present the third edition, again as a comprehensively reviewed and updated version. Due to the friendly acceptance of the former editions, principle and basic concepts of the book have not been changed.

Although Willy Herbst has resigned from work on this new edition, we were able to win three experts on the applications of organic pigments as new coauthors to help continue maintaining the expected standard of Industrial Organic Pigments.

Together with Heinfred Ohleier, Gerhard Wilker and Rainer Winter of Clariant Deutschland GmbH, we thoroughly reviewed and updated all parts of the book and included many pigments newly launched into the market since the second edition, with all properties and applications which were available to us.

Again, we are grateful for comments, advice and additions from colleagues from chemical companies, especially from Clariant, Ciba Specialty Chemicals and Engelhard USA. Furthermore, we express our gratitude to the publishing team of Wiley-VCH, in particular to Karin Sora, who, as always, accompanied our work with great devotion.

Title	Location	Edition / Series / Misc.
77 Industrial Organic Pigments: Production, Properties, Applications Author: Herbst, Willy and Klaus Hunger Publish.: VCH, Verlagsgesellschaft mbH - place: Weinheim, Germany - date: ©1997 Subject: Pigments Desc: xvi, 652 p., illus. (some color), 25 cm.	Dynix: 73390 Call No.: 667.29 He ISBN: 3527288368 Shelf Reference	Edition: 2nd edition, Completely revised Series: Year: 1997 Price: \$288.75

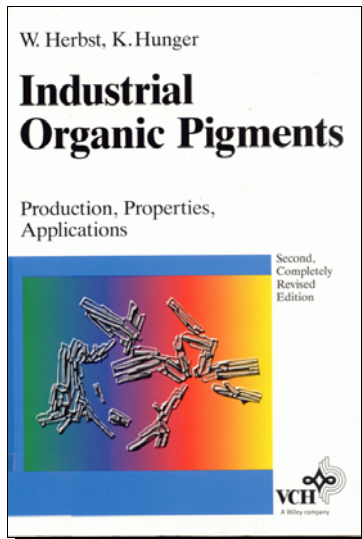


Table of Contents

- 1 General
 - 1.1 Definition: Pigments—Dyes
 - 1.1.1 Organic—Inorganic Pigments
 - 1.2 Historical
 - 1.3 Classification of Organic Pigments
 - 1.3.1 Azo Pigments
 - 1.3.1.1 Monoazo Yellow and Orange Pigments
 - 1.3.1.2 Disazo Pigments
 - 1.3.1.3 b-Naphthol Pigments
 - 1.3.1.4 Naphthol AS Pigments (Naphthol Reds)
 - 1.3.1.5 Azo Pigment Lakes (Salt Type Pigments)
 - 1.3.1.6 Benzimidazolone Pigments
 - 1.3.1.7 Disazo Condensation Pigments
 - 1.3.1.8 Metal Complex Pigments
 - 1.3.1.9 Isoindolinone and Isoindoline Pigments
 - 1.3.2 Polycyclic Pigments
 - 1.3.2.1 Phthalocyanine Pigments
 - 1.3.2.2 Quinacridone Pigments
 - 1.3.2.3 Perylene and Perinone Pigments
 - 1.3.2.4 Diketopyrrolo Pyrrole (DPP) Pigments
 - 1.3.2.5 Thioindigo Pigments
 - 1.3.2.6 Anthrapyrimidine Pigments
 - 1.3.2.7 Flavanthrone Pigments
 - 1.3.2.8 Pyranthrone Pigments
 - 1.3.2.9 Anthanthrone Pigments
 - 1.3.2.10 Dioxazine Pigments
 - 1.3.2.11 Triarylcarbonium Pigments
 - 1.3.2.12 Quinophthalone Pigments
 - 1.4 Chemical Characterization of Pigments
 - 1.4.1 Hue
 - 1.4.1.1 Crystal Modification and Crystal Structure
 - 1.4.2 Tinctorial Strength
 - 1.4.3 Lightfastness and Weatherfastness
 - 1.4.4 Solvent and Migration Fastness
 - 1.5 Physical Characterization of Pigments
 - 1.5.1 Specific Surface Area
 - 1.5.2 Particle Size Distribution
 - 1.5.2.1 Determination of Particle Size by Ultrasedimentation
 - 1.5.2.2 Determination by Electron Microscopy
 - 1.5.2.3 Data Representation
 - 1.5.3 Polymorphism
 - 1.5.4 Crystallinity
 - 1.6 Important Application Properties and Concepts
 - 1.6.1 Coloristic Properties (by F. Gläser)
 - 1.6.1.1 Color
 - 1.6.1.2 Color Depth

Subjects

293 .	Pigments
387 .	Organic compounds

- 1.6.1.3 Color Differences
- 1.6.1.4 Optical Behaviour of Pigmented Coatings
- 1.6.1.5 Tintorial Strength
- 1.6.1.6 Hiding Power
- 1.6.1.7 Transparency
- 1.6.2 Fastness to Solvents and Special Application Fastness
- 1.6.2.1 Organic Solvents
- 1.6.2.2 Water, Soap, Alkali, and Acids
- 1.6.2.3 Pigment Performance in Special Applications
- 1.6.2.4 Textile Fastness Properties
- 1.6.3 Migration
- 1.6.3.1 Blooming
- 1.6.3.2 Bleeding/Overspraying Fastness
- 1.6.4 Disturbances During the Processing of Pigmented Systems
- 1.6.4.1 Plate-Out
- 1.6.4.2 Overpigmentation/Chalking
- 1.6.4.3 Distortion/Nucleation in Polymers
- 1.6.5 Dispersion
- 1.6.5.1 General Considerations
- 1.6.5.2 Desagglomeration of Pigment Particles
- 1.6.5.3 Wetting of Pigment Particle Surfaces
- 1.6.5.4 Distribution of the Dispersed Pigment in its Medium
- 1.6.5.5 Stabilization
- 1.6.5.6 Dispersion and the Critical Pigment Volume Concentration
- 1.6.5.7 Test Methods
- 1.6.5.8 Flush Pastes
- 1.6.5.9 Pigment Preparations
- 1.6.6 Lightfastness and Weatherfastness
- 1.6.6.1 Definition and General Information
- 1.6.6.2 Evaluation Techniques and Equipment
- 1.6.6.3 Factors Determining the Lightfastness
- 1.6.7 Thermal Stability
- 1.6.8 Flow Properties of Pigmented Systems
- 1.6.8.1 Rheological Properties
- 1.6.8.2 Viscoelastic Properties
- 1.6.8.3 Influence on the Flow Properties
- 1.6.8.4 Correlation between Flow Behavior and Rheological Measurements
- 1.6.8.5 Particle Size Distribution and Application of Pigmented Media

- 1.7 Particle Size Distribution and Application Properties of Pigmented Media
- 1.7.1 Tintorial Strength
- 1.7.2 Hue
- 1.7.3 Hiding Power, Transparency
- 1.7.4 Lightfastness and Weatherfastness
- 1.7.5 Dispersibility
- 1.7.6 Gloss
- 1.7.7 Solvent and Migration Fastness
- 1.7.8 Flow

- 1.8 Areas of Application for Organic Pigments
- 1.8.1 Printing Inks
- 1.8.1.1 Offset/Letterpress Printing
- 1.8.1.2 Gravure Printing
- 1.8.1.3 Flexo and Screen Printing and Other Printing Processes
- 1.8.2 Coatings
- 1.8.2.1 Oxidatively Drying Paints
- 1.8.2.2 Oven Drying Systems
- 1.8.2.3 Emulsion Paints
- 1.8.3 Plastics
- 1.8.3.1 Poly(Vinyl Chloride)
- 1.8.3.2 Polyolefins
- 1.8.3.3 Polystyrene, Styrene-Copolymers, Poly(Methyl Methacrylate)
- 1.8.3.4 Polyurethane
- 1.8.3.5 Polyamide, Polycarbonate, Polyester, Polyoxymethylene, Cellulose Derivatives

- 1.8.3.6 Elastomers
- 1.8.3.7 Thermosetting Plastics
- 1.8.3.8 Spin Dyeing
- 1.8.4 Other Areas of Application

- 2. Azo Pigments
 - 2.1 Starting Materials, Synthesis
 - 2.1.1 Diazo Components
 - 2.1.2 Coupling Compounds
 - 2.1.3 Important Intermediates
 - 2.2 Synthesis of Azo Pigments
 - 2.2.1 Diazotization
 - 2.2.1.1 Diazotization Mechanism
 - 2.2.1.2 Methods of Diazotization
 - 2.2.2 Coupling
 - 2.2.2.1 Coupling Techniques
 - 2.2.3 Finishing
 - 2.2.4 Filtration, Drying, Milling
 - 2.2.5 Azo Pigment Synthesis by Continuous Operation
 - 2.2.6 Production Units for Azo Pigment Manufacture by Batch Operation
 - 2.3 Monoazo Yellow and Orange Pigments
 - 2.3.1 Chemistry, Manufacture
 - 2.3.1.1 Non-laked Monoazo Yellow and Orange Pigments
 - 2.3.1.2 Monoazo Yellow Pigment Lakes
 - 2.3.2 Properties
 - 2.3.2.1 Non-laked Monoazo Yellow and Orange Pigments
 - 2.3.2.2 Monoazo Yellow Pigment Lakes
 - 2.3.3 Application
 - 2.3.4 Commercially Available Monoazo Yellow and Orange Pigments

 - 2.4 Disazo Pigments
 - 2.4.1 Diarylide Yellow Pigments
 - 2.4.1.1 Chemistry, Manufacture
 - 2.4.1.2 Properties
 - 2.4.1.3 Application
 - 2.4.1.4 Commercially Available Diarylide Yellow and Orange Pigments
 - 2.4.2 Bisacetoacetarylide Pigments
 - 2.4.2.1 Commercially Available Bisacetoacetarylide Pigments and Their Properties
 - 2.4.3 Disazopyrazolone Pigments
 - 2.4.3.1 Chemistry, Manufacture
 - 2.4.3.2 Properties
 - 2.4.3.3 Application
 - 2.4.3.4 Commercially Available Pigments

 - 2.5 b-Naphthol Pigments
 - 2.5.1 Chemistry, Manufacture
 - 2.5.2 Properties
 - 2.5.3 Application
 - 2.5.4 Commercially Available b-Naphthol Pigments

 - 2.6 Naphthol AS Pigments
 - 2.6.1 Chemistry, Manufacture
 - 2.6.2 Properties
 - 2.6.3 Application
 - 2.6.4 Commercially Available Naphthol AS Pigments

 - 2.7 Red Azo Pigment Lakes
 - 2.7.1 b-Naphthol Pigment Lakes
 - 2.7.1.1 Chemistry, Manufacture
 - 2.7.1.2 Properties
 - 2.7.1.3 Application
 - 2.7.1.4 Commercially Available Pigments
 - 2.7.2 BONA Pigment Lakes
 - 2.7.2.1 Chemistry, Manufacture

- 2.7.2.2 Properties
- 2.7.2.3 Application
- 2.7.2.4 Commercially Available BONA Pigment Lakes
- 2.7.3 Naphthol AS Pigment Lakes
 - 2.7.3.1 Chemistry, Manufacture, and Properties
- 2.7.3.2 Commercially Available Naphthol AS Pigment Lakes
- 2.7.4 Naphthalene Sulfonic Acid Pigment Lakes
 - 2.7.4.1 Chemistry, Manufacture, and Properties
 - 2.7.4.2 Commercially Available Pigments
- 2.8 Benzimidazolone Pigments
 - 2.8.1 Chemistry, Manufacture
 - 2.8.1.1 Yellow and Orange Benzimidazolone Pigments— Coupling Component
 - 2.8.1.2 Red Benzimidazolone Pigments—Coupling Component
 - 2.8.1.3 Pigment Synthesis and Aftertreatment
 - 2.8.1.4 Results of Crystal Structure Analyses
 - 2.8.2 Properties
 - 2.8.3 Application
 - 2.8.4 Commercially Available Benzimidazolone Pigments
- 2.9 Disazo Condensation Pigments
 - 2.9.1 Chemistry, Manufacture
 - 2.9.2 Properties
 - 2.9.3 Application
 - 2.9.4 Commercially Available Pigments
- 2.10 Metal Complex Pigments
 - 2.10.1 Chemistry, Synthesis
 - 2.10.1.1 Azo Metal Complexes
 - 2.10.1.2 Azomethine Metal Complexes
 - 2.10.2 Properties
 - 2.10.3 Application
 - 2.10.4 Commercially Available Pigments
- 2.11 Isoindolinone and Isoindoline Pigments
 - 2.11.1 Chemistry, Synthesis, Starting Materials
 - 2.11.1.1 Azomethine Type: Tetrachloroisoindolinone Pigments
 - 2.11.1.2 Methine Type: Isoindoline Pigments
 - 2.11.2 Properties
 - 2.11.3 Application
 - 2.11.4 Commercially Available Isoindolinone and Isoindoline Pigments
- 3 Polycyclic Pigments
 - 3.1 Phthalocyanine Pigments
 - 3.1.1 Starting Materials
 - 3.1.2 Manufacture
 - 3.1.2.1 Phthalonitrile Process
 - 3.1.2.2 Phthalic Anhydride/Urea Process
 - 3.1.2.3 Manufacturing the Different Crystal Modifications
 - 3.1.2.4 Phase- and Flocculation-Stabilized Copper Phthalocyanine Blue Pigments
 - 3.1.2.5 Manufacture of Green Types
 - 3.1.2.6 Metal-free Phthalocyanine Blue
 - 3.1.3 Properties
 - 3.1.4 Application
 - 3.1.5 Commercially Available Pigments
 - 3.2 Quinacridone Pigments
 - 3.2.1 Manufacture, Starting Materials
 - 3.2.1.1 Thermal Ring Closure
 - 3.2.1.2 Acidic Ring Closure
 - 3.2.1.3 Dihalo Terephthalic Acid Process
 - 3.2.1.4 Hydroquinone Process
 - 3.2.1.5 Substituted Quinacridones
 - 3.2.1.6 Quinacridone Quinone

- 3.2.1.7 Polymorphism
- 3.2.2 Properties
- 3.2.3 Application
- 3.2.4 Commercially Available Quinacridone Pigments

- 3.3 Vat Dyes Prepared as Pigments
- 3.4 Perylene and Perinone Pigments
 - 3.4.1 Perylene Pigments
 - 3.4.1.1 Preparation of the Starting Materials
 - 3.4.1.2 Chemistry, Manufacture
 - 3.4.1.3 Properties
 - 3.4.1.4 Application
 - 3.4.1.5 Commercially Available Perylene Pigments
 - 3.4.1.6 Various Other Perylene Tetracarboxylic Acid
 - 3.4.2 Perinone Pigments
 - 3.4.2.1 Preparation of the Starting Materials
 - 3.4.2.2 Chemistry, Manufacture
 - 3.4.2.3 Properties
 - 3.4.2.4 Commercially Available Perinone Pigments and Their Application

- 3.5 Diketopyrrolo-pyrrole (DPP) Pigments
 - 3.5.1 Chemistry, Manufacture
 - 3.5.2 Properties and Application
 - 3.5.3 Commercially Available DPP Pigments

- 3.6 Thioindio Pigments
 - 3.6.1 Chemistry, Manufacture
 - 3.6.2 Properties
 - 3.6.3 Commercially Available Types and Their Application

- 3.7 Various Polycyclic Pigments
 - 3.7.1 Aminoanthraquinone Pigments
 - 3.7.1.1 Anthraquinone-Azo Pigments
 - 3.7.1.2 Other Aminoanthraquinone Pigments
 - 3.7.1.3 Properties and Application
 - 3.7.2 Hydroxyanthraquinone Pigments
 - 3.7.2.1 Properties and Application
 - 3.7.3 Heterocyclic Anthraquinone Pigments
 - 3.7.3.1 Anthrapyrimidine Pigments
 - 3.7.3.2 Indanthrone and Flavanthrone Pigments
 - 3.7.4 Polycarbocyclic Anthraquinone Pigments
 - 3.7.4.1 Pyranthrone Pigments
 - 3.7.4.2 Anthanthrone Pigments
 - 3.7.4.3 Isoviolanthrone Pigments

- 3.8 Dioxazine Pigments
 - 3.8.1 Preparation of the Starting Materials
 - 3.8.2 Chemistry, Manufacture
 - 3.8.3 Properties
 - 3.8.4 Commercially Available Dioxazine Pigments and Their Application

- 3.9 Quinophthalone Pigments
 - 3.9.1 Chemistry, Manufacture
 - 3.9.2 Properties and Application

- 3.10 Triarylcarbonium Pigments
 - 3.10.1 Inner Salts of Sulfonic Acids (Alkali Blue Types)
 - 3.10.1.1 Chemistry, Manufacture
 - 3.10.1.2 Properties
 - 3.10.1.3 Commercially Available Types and Their Application
 - 3.10.2 Dye Salts with Complex Anions
 - 3.10.2.1 Chemistry, Manufacture
 - 3.10.2.2 Properties
 - 3.10.2.3 Application

3.10.2.4 Important Representatives

4 Miscellaneous Pigments

4.1 Aluminum Pigment Lakes

4.2 Pigments with Known Chemical Structure Which Cannot be Assigned to Other Chapters

4.3 Pigments with Hitherto Unknown Chemical Structure

5 Ecology, Toxicology, Legislation

5.1 General

5.2 Ecology

5.3 Toxicology

5.3.1 Acute Toxicity

5.3.2 Irritation of Skin and Mucous Membrane

5.3.3 Toxicity After Repeated Application

5.3.4 Mutagenicity

5.3.5 Chronic Toxicity — Carcinogenicity

5.3.6 Impurities in Pigments

5.4 Legislation

Review of Chemical Structures and Chemical Reactions

List of Commercially Available Pigments

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Everything there is to know about organic pigments! Revised and updated, this highly acclaimed work, now in its second edition, remains the most comprehensive source of information available on synthetic organic pigments

The book provides up-to-date information on synthesis, reaction mechanisms, physical and chemical properties, test methods, and applications of all industrially produced organic pigments of the world market

Standardized methods have been used to obtain the data thus facilitating comparison between pigments

Chemists, engineers, colorists, and technicians are sure to find this book invaluable

"Presentation throughout is of the highest quality and the volume must now become the standard reference text in this important area of colouring matters"

"This is a very wide-ranging reference work...it would be difficult to find a topic in this field not covered by this book."

PREFACE TO THE SECOND EDITION:

The current trend in the manufacture and use of organic pigments is a steady increase, the present worldwide consumption being estimated as 160,000 tons, with an equivalent value of about 3 billion dollars.

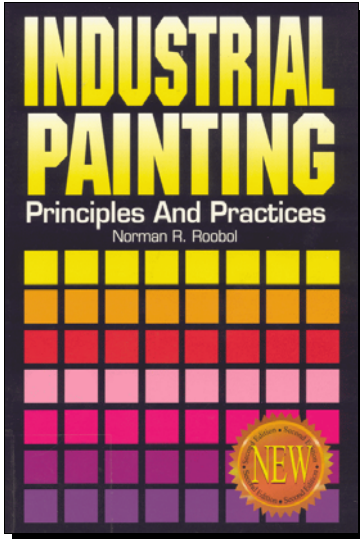
As a result of the favorable reception of the first edition of this book, we decided to maintain its structure and conception to the greatest possible extent in this new edition. Thus, we have tried to include comprehensively all organic pigments available on the market. The book has been thoroughly reviewed and carefully updated with regard to production, properties, test methods, application, chemical formulas, and the list of commercially available organic pigments. We have considered all the information accessible to us about pigments newly launched on the market as well as additional information about pigments described in the previous edition. The list of commercially available pigments was further supplemented by more C.I. Formula numbers and CAS numbers. Section 1.6.1 (Coloristic Properties) has been kindly revised by Dr. Gläser, DPP pigments and quinophthalone pigments are now included in Chapter 3. The index was completely revised and considerably extended by a great many additional terms.

For several reasons, ranges of pigments have been rationalized in recent years, causing a withdrawal of a considerable number of pigments from the market. The rationale behind the removal of these pigments, when known to us, is given.

Since these brands will still be used for some years, for example in automotive repair finishes, we have continued to describe their properties in the new edition.

The introduction of newly developed, especially high-performance pigments, may take a considerable period of time. Owing to the outdoors weathering tests required, the extensive and comprehensive testing procedures of very lightfast and weatherfast pigments for automotive finishes or certain plastics applications may last two years or even longer. Because of the dependence of lightfastness and weatherfastness on the entire application media, correspondingly comprehensive testing procedures have to be performed by the pigment manufacturer, i.e., the paint company or plastics processor. For this reason, high-performance pigments may often take several years to reach the market.

Title	Location	Edition / Series / Misc.
78 Industrial Painting: Principles and Practices Author: Roobel, Norman R. Publish.: Hanser Gardner Publications, Inc. - place: Cincinnati, OH - date: ©1997 Subject: Painting, Industrial Desc: xii, 340 p., illus., 26 cm.	Dynix: 78748 Call No.: 667 Ro ISBN: 1569902151 Shelf Adult Non-Fiction	Edition: 2nd edition Series: Year: 1997 Price: \$49.95



Subjects

287 . | Painting, Industrial

Table of Contents

Preface
 CHAPTER 1: Paint Components and Their Functions.
 CHAPTER 2: Classifying Industrial Paints.
 CHAPTER 3: Industrial Paints Categorized by Resin Category, Physical Makeup and Cure Mechanism
 CHAPTER 4: Low- and High-Solids Coatings.
 CHAPTER 5: Waterborne Coatings.
 CHAPTER 6: Powder Coating.
 CHAPTER 7: Cleaning the Surface.
 CHAPTER 8: Conversion Coatings.
 CHAPTER 9: Paint Application I: Traditional Methods
 CHAPTER 10: Paint Application II: Electrocoating and Autodeposition Coating
 CHAPTER 11: Paint Application III: Spray Guns
 CHAPTER 12: Paint Application IV: Airless Spray and Air-Assisted Spray
 CHAPTER 13: Paint Application V: Electrostatic Painting
 CHAPTER 14: Paint Application VI: Rotary Atomizers.
 CHAPTER 15: Coating Types and Curing Methods.
 CHAPTER 16: Film Defects in Liquid Coatings.
 CHAPTER 17: Paint-Related Testing.
 CHAPTER 18: Stripping.
 CHAPTER 19: Special Considerations for Plastics.
 CHAPTER 20: Conveyors for Painting.
 CHAPTER 21: Finishing Robots.
 CHAPTER 22: Spray Booths for Liquid Painting.
 Glossary
 Index

Reviews - Synopsis - Dust Jacket

Written to be practical and useful, rather than theoretical, this book contains information that will be of value on the shop floor. No knowledge of chemistry is necessary and, where necessary, the science of any process is carefully explained in a straight-forward manner. Completely revised, this new edition provides a broad overview of painting and finishing and serves as a reliable reference covering all basic and advanced techniques of painting and finishing.

Book News, Inc.

Not a review of the visual equivalent to industrial music, but a practical guide to painting and finishing parts and finished products as part of the manufacturing process, based on Roobel's three-day industrial training course. He assumes no knowledge of chemical theory and introduces basic science only when he thinks it will be immediately useful. He explains the various materials used for coating, the wide range of application methods, and such aspects as cleaning the surface. No date is noted for the first edition. – Copyright © 1999 Book News, Inc., Portland, OR All rights reserved

FROM THE DUSTJACKET:

Industrial Painting: Principles and Practices, Second, Edition, serves as an invaluable tool for both the beginner and veteran industrial finisher, on or off the plant floor. Completely revised, this new edition is presented in a logical, easy-to-follow format that can be readily applied. Its broad overview of painting and finishing serves as a handy day-to-day reference covering all the basic and advanced techniques of painting and finishing. Without a doubt, everyone involved in industrial finishing will find this book to be a useful resource and a vital addition for personal or in-plant libraries.

PREFACE:

I have designed this book on industrial painting to be useful and practical rather than deeply theoretical. It provides information that will be of value on the plant floor. No knowledge of chemical theory is necessary to understand any section, and everything is explained in a straight- forward manner. Where it is instructive, I have included small amounts of basic science, so you can fully comprehend the principles involved and also to avoid a "do this, do that" style presentation. The book contains a wealth of information for everyone who is associated with painting; those new to paint and those veterans of many years' painting experience can learn from it.

The chapter order in this second edition follows even more closely to that of my three-day Industrial Painting Processes course. That instructional painting seminar has been presented over 200 times, both as a public offering and as private in-plant sessions. The actual course content has constantly been altered over the past twenty years. The methods and procedures of industrial painting operations undergo constant gradual shifts, but the topic order of this book is basically the same as the current course. This sequence has been found to be best for maximizing the learning experience.

For many years I had been looking for a strong and accurate industrial painting textbook. Even after I realized that I would probably need to write it myself, the hope remained that someone else would go through the long and arduous task of putting together a book such as this. Yet when the need for a text finally forced me to begin this book, it was often enjoyable despite the inevitable delays, frustrations, and difficulties. If this book helps people to improve paint quality and economy, my goal will be achieved.

Title	Location	Edition / Series / Misc.
1095 Industrial Plastics: Theory and Applications Author: Lokensgard, Erik Publish.: Thomson Delmar Learning - place: Albany, NY - date: ©2004 Subject: Plastics Desc: xvii, 528 p., illus., 28 cm.	Dynix: 111666 Call No.: 668.4 Ri ISBN: 1401804691 Shelf Adult Non-Fiction	Edition: 4th edition Series: Year: 2004 Price: \$76.50

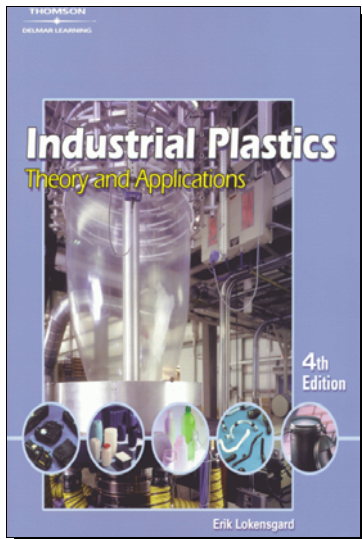


Table of Contents

Preface

Chapter 1: Historical Introduction to Plastics
 Introduction
 Natural Plastics
 Early Modified Natural Materials
 Early Synthetic Plastics
 Commercial Synthetic Plastics
 Summary
 Related Internet Sites
 Vocabulary
 Questions
 Activities

Chapter 2: Current Status of the Plastics Industry
 Introduction
 Major Plastics Materials
 Recycling of Plastics
 Disposal by Incineration or Degradation
 Organizations in the Plastics Industry
 Related Internet Sites
 Vocabulary
 Questions
 Activities

Chapter 3: Elementary Polymer Chemistry
 Introduction
 Review of Basic Chemistry
 Hydrocarbon Molecules
 Macromolecules
 Molecular Organization
 Intermolecular Forces
 Molecular Orientation
 Thermosets
 Summary
 Related Internet Sites
 Vocabulary
 Questions
 Activities

Chapter 4: Health and Safety
 Introduction
 Physical Hazards
 Biomechanical Hazards
 Chemical Hazards
 Sources of Chemical Hazards
 Reading and Understanding MSDS
 Related Internet Sites
 Vocabulary
 Questions
 Activities

Subjects

304 .	Plastics
309 .	Plastics -- Handbooks, manuals, etc.

Chapter 5: Elementary Statistics
Introduction
Calculating the Mean
The Normal Distribution
Calculating the Standard Deviation
The Standard Normal Distribution
Graphical Representation of Hardness Test Results
Sketching Graphs
Graphic Comparison of Two Groups
Summary
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 6: Properties and Tests of Selected Plastics
Introduction
Testing Agencies
Mechanical Properties
Physical Properties
Thermal Properties
Environmental Properties
Optical Properties
Electrical Properties
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 7: Ingredients of Plastics
Introduction
Additives
Reinforcements
Fillers
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 8: Characterization and Selection of Commercial Plastics
Introduction
Basic Materials
Selection of Material Grade
Computerized Databases for Material Selection
Summary
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 9: Machining and Finishing
Introduction
Sawing
Filing
Drilling
Stamping, Blanking, and Die Cutting
Tapping and Threading
Turning, Milling, Planing, Shaping, and Routing
Laser Cutting
Induced Fracture Cutting
Thermal Cutting
Hydrodynamic Cutting
Smoothing and Polishing

Tumbling
Annealing and Postcuring
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 10: Molding Processes
Introduction
Injection Molding
Molding Liquid Materials
Molding Granular and Sheet Thermoset Materials
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 11: Extrusion Processes
Introduction
Extrusion Equipment
Compounding
Major Types of Extrusion Products
Blow Molding
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 12: Laminating Processes and Materials
Introduction
Layers of Differing Plastics
Layers of Paper
Layers of Glass Cloth or Mat
Layers of Metal and Metal Honeycomb
Layers of Metal and Foamed Plastics
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 13: Reinforcing Processes and Materials
Introduction
Matched Die
Hand Layup or Contact Processing
Sprayup
Rigidized Vacuum Forming
Cold-Mold Thermoforming
Vacuum Bag
Pressure Bag
Filament Winding
Centrifugal Reinforcing and Blown-Film Reinforcing
Pultrusion
Cold Stamping/Forming
Related Internet Sites
Vocabulary
Questions

Chapter 14: Casting Processes and Materials
Introduction
Material Types
Simple Casting
Film Casting
Hot-Melt Casting
Slush Casting and Static Casting

Rotational Casting
Dip Casting
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 15: Thermoforming
Introduction
Straight Vacuum Forming
Drape Forming
Matched-Mold Forming
Pressure-Bubble Plug-Assist Vacuum Forming
Plug-Assist Vacuum Forming
Plug-Assist Pressure Forming
Solid Phase Pressure Forming (SPPF)
Vacuum Snap-Back Forming
Pressure-Bubble Vacuum Snap-Back Forming
Trapped-Sheet Contact-Heat Pressure Forming
Air-Slip Forming
Free Forming
Twin Sheet Thermoforming
Blister Pack or Skin Pack Thermoforming
Mechanical Forming
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 16: Expansion Processes
Introduction
Molding
Casting
Expanding-in-Place
Spraying
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 17: Coating Processes
Introduction
Extrusion Coating
Calendar Coating
Powder Coating
Transfer Coating
Knife or Roller Coating
Dip Coating
Spray Coating
Metal Coating
Brush Coating
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 18: Fabrication Processes and Material
Introduction
Mechanical Adhesion
Chemical Adhesion
Mechanical Fastening
Friction Fitting
Related Internet Sites
Vocabulary

Questions
Activities

Chapter 19: Decoration Processes
Introduction
Coloring
Painting
Hot-Leaf Stamping
Plating
Engraving
Printing
In-Mold Decorating
Heat-Transfer Decorating
Miscellaneous Decorating Methods
Related Internet Sites
Vocabulary
Questions
Activities

Chapter 20: Radiation Processes
Introduction
Radiation Methods
Radiation Sources
Irradiation of Polymers
Related Internet Sites
Vocabulary
Questions

Chapter 21: Design Considerations
Introduction
Material Considerations
Design Considerations
Production Considerations
Related Internet Sites
Vocabulary
Questions

Chapter 22: Tooling and Moldmaking
Introduction
Planning
Tooling
Machine Processing
Related Internet Sites
Vocabulary
Questions

Chapter 23: Commercial Considerations
Introduction
Financing
Management and Personnel
Plastics Molding
Auxiliary Equipment
Molding Temperature Control
Pneumatics and Hydraulics
Price Quotations
Plant Site
Shipping
Related Internet Sites
Vocabulary
Questions

Appendix A: Glossary

Appendix B: Abbreviations for Selected Materials

Appendix C: Trade Names and Manufacturers

Appendix D: Material Identification
Identifying Plastics
Identification Methods

Appendix E: Thermoplastics
Polyacetal Plastics (POM)
Acrylics
Cellulosics
Chlorinated Polyethers
Coumarone-Indene
Fluoroplastics
Ionomers
Nitrile barriers
Phenoxy
Polyallomers
Polyamides (PA)
Polycarbonates (PC)
Polyetheretherketone (PEEK)
Polyetherimide (PEI)
Thermoplastic Polyesters
Thermoplastic Polyimides
Polymethylpentene
Polyolefins: Polyethylene (PE)
Polyolefins: Polypropylene
Polyolefins: Polybutylene (PB)
Polyphenylene Oxides
Polystyrene (PS)
Polysulfones
Polyvinyls

Appendix F: Thermosetting Plastics
Alkyds
Allylics
Amino Plastics
Casein
Epoxy (EP)
Furan
Phenolics (PF)
Unsaturated Polyesters
Thermosetting Polyimide
Polyurethane (PU)
Silicones (SI)

Appendix G: Useful Tables

Appendix H: Sources of Help and Bibliography

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The fourth edition of applications and processes employed in the plastics industry — current technologies and manufacturing methods are the keystones for this introductory text. An extensive art program and up-to-date coverage are complimented by practical lab activities that build on the topics covered, involving readers in hands-on learning and strengthening the link between theory and practice. Subjects covered include plastics recycling, ISO and ASTM test specifications, and current health and safety standards. Broad coverage of the developments in materials and processes makes this edition of "Industrial Plastics" and outstanding resource for students and professionals alike.

Key features:

- > new section on nano-composites keeps students ahead of the curve in learning this new technology, and how it applies to the production of automotive parts

- > information on new all-electric injection molding machines familiarizes students with the latest in plastics molding equipment
- > theory is reinforced with hands-on applications, enabling readers to more fully understand the subject matter
- > information on related internet sites as well as resource information for industrial operations offer opportunities for further study and exploration

"Target Audience: Introductory-level students concerned with plastics processing technology; also a valuable overview and quick reference to newcomers to the field.

PREFACE:

Intended Use:

"Industrial Plastics: Theory and Applications, 4th edition", covers all facets of industrial plastics technology, as well as major manufacturing processes, serving as an indispensable resource for those individuals enrolled in polymer technology or plastics technology programs at community colleges, technical colleges, and universities. Comprehensive in nature, professionals who wish to review the basics, and remain up-to-date on the latest technology in plastics manufacturing will also find this text useful.

Text Layout:

Presented in a logical sequence, Industrial Plastics builds topics from the ground up — covering everything from the history of plastics, to the running of a successful plastics business:

Chapter 1, provides an historical introduction to plastics.

Chapter 2, includes extensive updates on the current status of the plastics industry. It features U.S. consumption of major plastics materials, recycling, disposal, and significant organizations within the industry.

Chapter 3, treats elementary polymer chemistry. It attempts to present basics about plastics and polymer chemistry in a practical context.

Chapter 4, on health and safety, reflects the organization in Material Safety Data Sheets. The intent of this chapter, which has been updated to reflect current standards, is to assist students in becoming adept at reading and understanding MSDS for plastics.

Chapter 5, on elementary statistics, relies on graphical techniques rather than hypothesis testing.

Chapter 6, on properties and tests, has been updated to show current varieties of testing equipment.

Chapter 7, on ingredients of plastics, includes a new section on nanocomposites.

Chapter 8, on the selection of plastics for specific applications, has the intent of explaining the differences between various grades of plastics.

Chapter 9, on machining and finishing, treats common processes for shaping and polishing plastics products.

Chapter 10, on molding processes, includes a new section on all-electric and hybrid injection molding machines. It continues to feature thorough treatment of injection-molding safety.

Chapter 11, on extrusion, now includes several recent photos of multilayer blowmolding equipment and blown film equipment.

Chapter 12, on laminating processes, discusses layers of plastics, paper, glass fibers, and metal.

Chapter 13, on reinforcing processes, includes numerous processes to create a matrix of fibrous reinforcements and plastics.

Chapter 14, on casting processes, includes several new photographs of large rotational molding equipment.

Chapter 15, on thermoforming, treats the major methods to form sheet materials with vacuum, pressure, and mechanical forces.

Chapter 16, on expansion processes, discusses techniques to create foamed materials. It includes several new

photographs of synthetic turf.

Chapter 17, on coating processes, concerns the application of coatings onto plastics substrates and the application of plastics onto non-polymeric substrates.

Chapter 18, on fabrication, treats both mechanical and chemical techniques.

Chapter 19, on decoration processes, includes updated information on hot foil stamping, as well as other decorating techniques.

Chapter 20, on radiation processes, treats growth in the use of radiation processing.

Chapter 21, on design, includes a new section on stereolithography.

Chapter 22, on tooling and moldmaking, covers major machining techniques.

Chapter 23, on commercial considerations, provides updated coverage of auxiliary equipment.

Appendix A, glossary, provides definitions of terms.

Appendix B, abbreviations, includes chemical or generic names for an updated list of abbreviations.

Appendix C, trade names, provides trade names, the corresponding name of the plastics, and the manufacturer.

Appendix D, on material identification, offers several methods to identify unknown plastics.

Appendix E, thermoplastics, contains extensive material and a thorough list of thermoplastics.

Appendix F, thermosets, treats most major thermoset materials.

Appendix G, useful tables, provides conversions of various units.

Appendix H, help and bibliography, provides contacts for many organizations and also a selected bibliography.

The new and updated 4th edition of Industrial Plastics will further enhance the ease of use and the depth of content.

New to this Edition

The Latest Technology:

The 4th edition of "Industrial Plastics: Theory and Applications" provides new and updated materials in every chapter. Many new photos and drawings, as well as the treatment of new methods and materials, bring this text up-to-date with the latest in plastics manufacturing.

Related Internet Sites:

A list of Internet sites at the end of each chapter guide students to find more information on specific topics. Each site relates to the material found in the previous chapter, and further enhances learning for the reader. Many of these companies provide extensive discussions of their materials, processes, and products on their websites. The more elaborate related Internet sites also include photos, video, and audio presentations.

Other Features

Lab Activities:

Where applicable, lab activities are included at the end of the chapter. The philosophy embedded in the laboratory activities is that practical applications are essential for thorough understanding of many theoretical concepts. The activities contain tried approaches, but also include suggestions for further investigations. It is hoped that students and instructors will build on the laboratory activities and customize them for available equipment and materials.

Chapter Review:

All chapters provide vocabulary lists and review questions for students to use as a self-study guide, and to test their knowledge of important concepts.

Title	Location	Edition / Series / Misc.
79 Industrial Water-Based Paint Formulations		Edition:
Author: Flick, Ernest W.	Dynix: 64073	Series:
Publish.: Noyes Publications	Call No.: 667.63 FI	
- place: Park Ridge, NJ	ISBN: 0815511469	Year: 1988
- date: ©1988	Shelf Adult Non-Fiction	Price: \$42.00
Subject: Emulsion paint		
Desc: xvi, 277 p., 25 cm.		

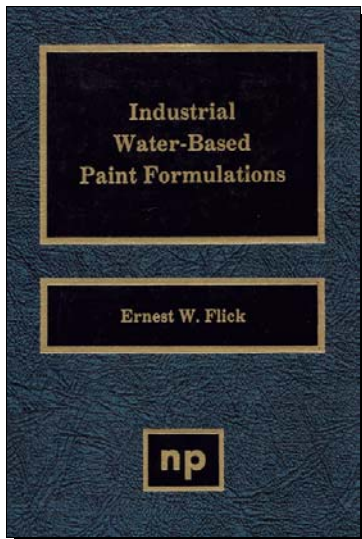


Table of Contents

- Section I: Air Dry Coatings
- Section II: Air Dry or Force Dry Coatings
- Section III: Anti-Skid or Non-Slip Coatings
- Section IV: Bake-Dry Coatings
- Section V: Clear Coatings
- Section VI: Coil Coatings
- Section VII: Concrete Coatings
- Section VIII: Dipping Enamels
- Section IX: Lacquers
- Section X: Primers
- Section XI: Protective Coatings
- Section XII: Spray Enamels
- Section XIII: Topcoats
- Section XIV: Traffic and Airfield Paints
- Section XV: Miscellaneous
- Section XVI: Trade-Named Raw Materials
- Section XVII: Suppliers' Addresses

Reviews - Synopsis - Dust Jacket

PREFACE

This collection of 220 up-to-date water-based industrial paint formulations will be of value to technical and managerial personnel in paint manufacturing companies, firms which supply raw materials or services to these companies, and those generally interested in less hazardous, environmentally safer formulations. The book will be useful to those with extensive experience as well as those new to the field.

The data consist of selections of manufacturers' suggested formulations made at no cost to, nor influence from, the makers or distributors of these materials. The information given is presented as supplied. The manufacturer should be contacted if there are any questions. Only the most recent data supplied us has been included. Any solvent contained is minimal.

The table of contents is organized in such a way as to serve as a subject index. The book is divided into the following Sections.

- I. Air dry coatings
- II. Air dry or force dry coatings
- III. Anti-skid or non-slip coatings
- IV. Bake dry coatings
- V. Clear coatings
- VI. Coil coatings
- VII. Concrete coatings
- VIII. Dipping enamels
- IX. Lacquers
- X. Primers
- XI. Protective coatings
- XII. Spray enamels
- XIII. Topcoats
- XIV. Traffic and airfield paints
- XV. Miscellaneous

In addition to the above, there are two other Sections which will be helpful to the reader:

Subjects

256 . Emulsion paint

XVI. A chemical trade name section where trade-named raw materials are listed with a chemical description and the supplier's name. The specifications which the raw materials meet are included, if applicable.
XVII office addresses of the suppliers of trade-named raw materials.

Included in the descriptive information for each formulation, where available, the following may be listed:

1. Type of paint or coating
2. End use
3. Ingredients, by weight and/or volume
4. Mixing suggestions
5. Properties such as viscosity, total solids (by weight and/or volume), gloss, pencil hardness, pH, nonvolatiles, pigment/binder ratio, density, flash point, adhesion
6. Formulation source

Each formula is indexed in the Section which is most applicable. The reader, if seeking a formula, for a specific end use, should check each Section which could possibly apply.

Title	Location	Edition / Series / Misc.
80 Infrared Absorption Spectroscopy		<i>Edition:</i> 2nd edition
<i>Author:</i> Nakanishi, Koji, 1925- and Philippa H. Solomon	<i>Dynix:</i> 44141	<i>Series:</i>
<i>Publish.:</i> Holden-Day, Inc.	<i>Call No.:</i> 535.842 Na	
<i>- place:</i> San Francisco, CA	<i>ISBN:</i> 0816262519	
<i>- date:</i> ©1977	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1977
<i>Subject:</i> Infrared spectroscopy		<i>Price:</i> \$25.00
<i>Desc:</i> x, 287 p., illus., 26 cm.		

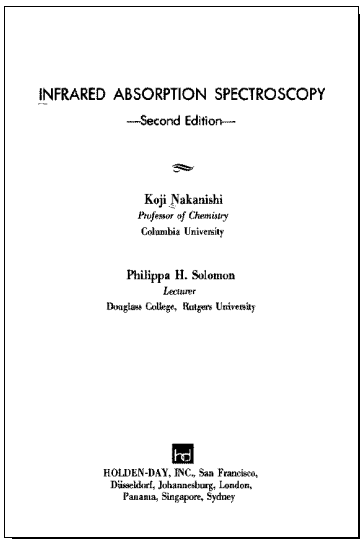


Table of Contents

Foreword
Preface

QUALITATIVE DATA.

Chapter 1. The Infrared Spectrum
Chapter 2. Tables of Characteristic Frequencies

2.1. Position of Absorption Bands
2.2. Intensity
2.3. Assignments

Table 1. Alkanes
Table 2. Alkenes
Table 3. Aromatics
Table 4. X=Y, X=Y=Z groups
Table 5. Alcohols and phenols
Table 6. Ethers and related groups
Table 7. Amines and ammonium salts
Table 8. Carbonyl groups
Table 9. Nitro, nitroso, etc
Table IOa. Heterocyclic compounds
Table IOb. Pyridine derivatives
Table 11. Sulfur groups
Table 12. Phosphorus groups
Table 13. Silicon groups
Table 14. Halogens and miscellaneous groups
Table 15. Inorganic salts

Chapter 3. Band Positions and Intensity

3.1. Band positions
3.2. Deuteration
3.3. Band Intensities

Chapter 4. Example of Absorption Band Shifts

RAMAN SPECTROSCOPY

Chapter 5. Laser Raman Spectroscopy

5.1. Introduction
5.2. Examples of Raman Spectra

PROBLEMS
ANSWERS
APPENDICES

Appendix I. NMR

Table 1. Approximate chemical shift of methyl, methylene, and methine protons
Table 2. Chemical shift of miscellaneous protons

Appendix II. Wave-number Wavelength Conversion Table

INDICES
General Index
Index of Compounds

Subjects

271 .	Infrared spectroscopy
352 .	Chemistry, Organic

Reviews - Synopsis - Dust Jacket

PREFACE

For the effective usage of infrared spectroscopy in qualitative problems, it is important to become acquainted with the appearance as well as the range of absorption of the various characteristic absorption bands. The simplest way to achieve this is naturally to become familiar with actual curves. This book is set up as follows to accomplish this purpose. After a short introductory chapter, Chapter 2 presents tables of qualitative data. These are followed by Chapters 3 and 4 describing the factors that influence band positions and intensities. To supplement and enlarge on the material presented in the tables, the problem section gives a wide variety of curves to be analyzed. The answer section gives assignments of individual bands as well as interpretations of curves.

Circled figures in the "Figs." column of tables denote the problem number in which the particular band can be found.

The figures in parentheses following explanations of respective bands in the answer section refer to the standard range of absorption of that group.

The infrared and nuclear magnetic resonance data are complementary in the detection of groups. For example, the various methyl groups such as gem- dimethyl, methoxyl, and N-methyl are more easily detected by NMR, and accordingly a table of chemical shifts has been added (Appendix).

The book was first published in Japanese in 1960 (Nankodo, Tokyo). The qualitative section of the present book is a translation with minor revisions, while the problem and answer sections have been largely rewritten with free inclusion of curves from the IRDC Cards (cf. p. 9).

Title	Location	Edition / Series / Misc.
815 Infrared Spectroscopy Atlas for the Coatings Industry		<i>Edition:</i> 4th edition
<i>Author:</i> Chicago Society for Coatings Technology (Infrared Spectroscopy Atlas	<i>Dynix:</i> 100378	<i>Series:</i> FSCT Item No. TV2
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 In	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 093401003X	
<i>- date:</i> ©1991	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1991
<i>Subject:</i> Plastic coatings -- Spectra -- Atlases		<i>Price:</i> \$150.00
<i>Desc:</i> Vol 1: vi, pp. 1-510, illus., 29 cm. --- Vol 2: vi, pp. 511-1001, illus., 29 cm.		

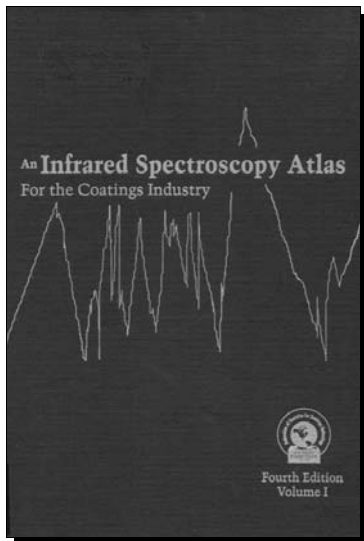


Table of Contents

VOLUME I

Preface

Acknowledgments

Chapter I: Theory

- A. Electromagnetic Radiation
- B. Molecular Energy
- C. Degrees of Freedom and Molecular Motions
- D. Fundamental Vibrations
- E. Theoretical Considerations
- F. Group Frequencies
- G. Additional Considerations
- H. Nomenclature

Chapter II: Instrumentation

- A. Introduction
- B. Dispersive Spectrophotometers
 - 1. Infrared Sources
 - 2. The Chopper
 - 3. Infrared Monochromators
 - 4. Filters
 - 5. Infrared Detectors
 - 6. Spectrum Recording
- C. Fourier Transform Infrared Spectrophotometers
 - 1. The Interferometer
 - 2. The Fourier Transform
 - 3. Sources
 - 4. Detectors
 - 5. Advantages of the FTIR Technique over Dispersive Spectroscopy

Chapter III: Accessories for Infrared Instrumentation

- A. Transmission Spectroscopy—Crystals and Cells
 - 1. Liquid Sampling
 - 2. Gas Sampling
 - 3. Solid Sampling
 - 4. Maintenance of Crystals and Cells
- B. Accessories for Surface Studies
 - 1. Attenuated Total Reflectance (ATR) and Multiple Internal Reflectance (MIR)
 - 2. Specular Reflectance
 - 3. Diffuse Reflectance
 - 4. Photoacoustic Spectroscopy
 - 5. Cylindrical Internal Reflection
- C. Microsampling
 - 1. Microscopes
 - 2. GC/FTIR
 - 3. Beam Condensers
 - 4. Diamond Anvil Cell
 - 5. Diffuse Reflectance
 - 6. Other Microsampling Accessories
- D. Accessories for Elevated Pressure and Temperature Analyses
 - 1. Cylindrical Internal Reflectance Reaction Cell

Subjects

531 .	Infrared spectroscopy -- Atlases
532 .	Plastic coatings -- Spectra -- Atlases

2. Other High Temperature Accessories

Chapter IV: Sample Preparation for Infrared Analysis

A. Sampling Techniques

1. Solid Phase Techniques
2. Liquid Phase Techniques
3. Gas Phase Technique

B. Physical Separation Techniques

1. Non-Aqueous Systems
2. Aqueous Systems
3. Solventless Systems

C. Chemical Degradation of Sample Components

1. Polyester and Alkyd Resins
2. Polyurethane Resins

D. Spectral "Separation" Techniques

E. Chromatographic Techniques

1. Gas Chromatography
2. Liquid Chromatography
3. Gel Permeation Chromatography
4. Thin Layer Chromatography
5. Ion Exchange Separation

F. Thermal Techniques

1. Pyrolysis
 2. Thermogravimetric Analysis
- G. Analysis of Cured Coatings
1. Surface Contamination
 2. Surface Analysis by Multiple Internal Reflectance Techniques.
 3. Removal of Films from Substrates

Chapter V: Qualitative Analysis

A. Introduction

B. Preliminary Studies

1. Position
2. Shape
3. Intensity

C. Techniques of Interpretation

1. Sight Recognition and Direct Comparison
2. Negative Interpretation
3. Positive Interpretation

D. Additional Considerations

1. Sample Purity
2. Limits of Detectability
3. Indistinguishable Spectra

E. Spectral Interpretation

1. Application of Negative Interpretation
2. Application of Positive Interpretation
3. Combined Application of Positive and Negative Interpretation.
4. Examples of Interpretation of Polymer Spectra
5. Spectral Interpretation of Nonpolymeric Materials

F. Computerized Searching

G. Other Computer Techniques

H. Summary

Chapter VI: Quantitative Analysis

A. Introduction

B. Basis for Quantitative Analysis — The Absorption Law

C. The Absorbance, A

1. Cell-In-Cell-Out Method
2. Base-Line Method
3. Integrated Intensities
4. Derivative Spectroscopy

D. Special Considerations for Quantitative Analysis

1. Selection of the Analytical Band
2. Optimum Absorbance Range

- 3. Sources of Error
- E. Quantitative Infrared Methods
 - 1. Direct Calculation
 - 2. Calibration "Working" Curve Method
 - 3. Standard Addition Method
 - 4. Absorbance Ratio Method
 - 5. Internal Standard Method
 - 6. Coincident Band Method
 - 7. Quantitative Analysis Using Reflectance Techniques

- Chapter VII: Bibliography
- Section I. Theory
- Section II. General
- Section III. Reviews
- Section IV. Instrumentation
- Section V. Experimental Techniques
- Section VI. Qualitative Analysis
- Section VII. Compilation of Spectra
- Section VIII. Quantitative Analysis
- Section IX. Coatings Applications
- Section X. Polymer Applications
- Section XI. Pigment Applications
- Section XII. Miscellaneous Applications

- Chapter VIII: Catalog of Spectra
- A. Instrumentation
- B. Experimental
 - 1. Film Formers and Non-Crystalline Solids
 - 2. Liquids
 - 3. Pigments, Extenders, and Other Crystalline Materials.
- C. Spectra Selection and Organization (Spectra 0001-1224)

- VOLUME II
- Chapter VIII: Catalog of Spectra (continued)
- C. Spectra Selection and Organization (Spectra 1225-2507)

- Indices
- Numerical Spectral Index
- Alphabetical Spectral Index

Reviews - Synopsis - Dust Jacket

This two-volume desk reference contains a compilation of approximately 2,500 spectra of raw materials commonly used throughout the coatings industry. All spectra have been obtained using high-resolution Fourier transform infrared spectrophotometers. Spectra include those of polymers, resins, vehicles, organic and inorganic pigments, extenders, acrylic monomers, radiation curable monomers and oligomers, sensitizers, blocked isocyanates, inhibitors/stabilizers, fungicides, mildewcides, solvents, and other additives, etc.

PREFACE

In 1987, the Federation of Societies for Coatings Technology established an Advisory Board to oversee preparation of the fourth edition of the "Infrared Spectroscopy Atlas for the Coatings Industry." The Advisory Board consisted of the following members: Darlene R. Brezinski, Glen P. Cunningham, Loren W. Hill, Joseph V. Koleske, Stan LeSota, Percy E. Pierce, and Harold D. Swafford. An Infrared Committee was subsequently established to author the current edition of the Atlas and was comprised of the following members: Dennis G. Anderson, Alan H. Brandau, James M. Julian, John R. McGinn, and Anne M. Millon.

In the time since the previous Infrared Spectroscopy Atlas was published in 1980, both the coatings industry and the field of analytical chemistry experienced a renaissance in technology. During this decade, the coatings industry responded to environmental regulations, a heightened safety consciousness, and an increasing raw material and energy shortage. Completely new coatings systems evolved as well. These new frontiers firmly established the need to update the prior Atlas with a current reference source for the industry.

The present publication contains a compilation of infrared spectra for materials commonly utilized in the industry. Spectra

include those of polymers, resins, vehicles, organic and inorganic pigments, extenders, acrylic monomers, radiation curable monomers and oligomers sensitizers, blocked isocyanates, inhibitors/stabilizers, fungicides, mildewcides, solvents, other additives, etc. Many new raw materials have been marketed within the last ten years and inclusion of their spectra should prove useful during spectral interpretation. Approximately 2,500 spectra are in the current book, all of which have been obtained using high resolution Fourier Transform infrared spectrophotometers. The recorded spectral range of all spectra in the reference collection covers the region between 4,000 and 400 cm^{-1} . In addition, a digitized library of all spectra has been generated which will greatly simplify computer searching during qualitative infrared analysis.

To put the present work in a historical perspective, in 1960, the Chicago Society for Paint Technology established a committee to introduce infrared spectroscopy to the coatings industry. The committee began to prepare a pamphlet to aid the coatings chemist over the initial hurdles of infrared spectroscopy. In 1961, the Federation of Societies for Paint Technology published a laboratory manual "Infrared Spectroscopy—Its Use as an Analytical Tool in the Field of Paints and Coatings."

In 1969, a second Infrared Committee of the Chicago Society compiled an extensive volume of infrared spectra of materials used in the coatings industry. This book, "Infrared Spectroscopy—Its Use in the Coatings Industry" was also published by the Federation of Societies for Paint Technology.

In the decade between 1968 and 1978, significant changes occurred within the field of infrared spectroscopy and the technology of the coatings industry. Thus, a third Infrared Committee of the Chicago Society was formed. The product of their work, "An Infrared Spectroscopy Atlas for the Coatings Industry," contained 1400 reference spectra and an additional chapter on sample preparation prior to infrared analysis.

CATALOG OF SPECTRA

A. INSTRUMENTATION

Three FTIR instruments were employed to obtain the spectra reproduced in this book: a Nicolet 60SX, a Nicolet 55XC, and a Nicolet 710. All spectra were obtained from 128 coadded scans at 2 cm resolution using a TGS detector. The mirror velocity of each instrument was adjusted for optimum energy throughput. Spectra were repeatedly checked to minimize water vapor and carbon dioxide interferences. New background files were obtained as required. Any traces of water vapor and carbon dioxide were digitally removed from the spectra. All spectra were then corrected for baseline drift and adjusted such that the highest transmission point in the spectrum is at 100%. The authors wish to thank Dennis Shanks and his group at Nicolet Instruments for completing these enormous tasks. Because of this, the appearance of the spectra is enhanced and the degree of reliability for computer library searching is significantly improved.

B. EXPERIMENTAL

All samples were commercial grade as normally utilized in the coatings industry. Since these reference spectra are intended to be used for the identification and characterization of this type of material, no effort was made to purify the samples. An effort was made to select sample thickness or concentration so that, at the most intense band, 5 to 20% of the incident radiation was transmitted. With the exception of a few select materials, each spectrum, after baseline correction, was computer adjusted to place the most intense band at 10% transmission. Different sampling techniques were employed with the various classes of compounds whose spectra are in this book. This was necessary to obtain optimum spectra of these diverse types of materials. The specific technique employed for each material is shown with the spectrum. In general, the techniques used are listed below.

1. Film Formers and Non-Crystalline Solids

This class of compounds includes all polymers and driers, most surfactants, and a number of miscellaneous materials. With the exception of emulsions and water-soluble polymers, all samples were cast from solutions onto KBr windows. Emulsions and water soluble polymers were cast from solutions onto KRS-5 plates. Normally all samples were dried for 20 minutes at 100°C in a vacuum oven at approximately 30 Torr. In a few cases, longer drying times were required to remove the last traces of solvent. Drying at elevated temperatures was avoided for temperature sensitive materials such as amino resin crosslinkers.

2. Liquids

This class of compounds includes all solvents and oils, most monomers and plasticizers, and some surfactants. The majority of these materials were run as capillary films between KBr plates with the pressure adjusted to give the desired sample thickness.

3. Pigments, Extenders, and Other Crystalline Materials

All spectra in this class of compounds were obtained as KBr pressed pellets. Sample sizes varied from 0.3 to 3.0 mg in 300 mg of KBr powder. The triple pressing technique was employed for pellet preparation. In addition to pigments and extenders, this class of compounds contains a few monomeric acids, preservatives, antioxidants, and initiators.

C. SPECTRA SELECTION AND ORGANIZATION

The index to the spectra is contained at the end of volume II. This spectral index is presented in the format of class, subclass, and alphabetically within the subclass. In addition, there is also an alphabetical listing of the spectra. Wherever possible, the composition and/or structure of all materials has been included on the spectra. This information was obtained using MSDS data from the various suppliers of these materials and was not confirmed. Every effort was made to obtain the spectra of all of the common materials utilized in the coatings industry. A number of experimental materials were also included for future use. Where a number of materials were known to give identical spectra, only a few were included.

The following list contains the categories and arrangement of spectra included in this collection.

SPECTRA NUMBERS||MATERIAL

POLYMERS

Acrylics|||0001-0100
Alkyds|||0101-0133
Cellulosics|||0134-0143
Epoxies|||0144-0222
Halogenated|||0223-0231
Hydrocarbons|||0232-0254
Melamine-Formaldehyde||0255-0305
Urea-Formaldehyde||0306-0315
Benzoguanamine-Formaldehyde||0316-0317
Multifunctional Carbodiimides||0318-0320
Natural Resins|||0321-0353
Phenol-Formaldehyde||0354-0397
Polyamides|||0398-0407
Polyamidoamines|||0408-0414
Polyesters|||0415-0468
Polyethyleneimines|||0469-0471
Polysulfides|||0472-0474
Polyurethanes|||0475-0506
Silicones|||0507-0512
Vinyls|||0513-0621
Miscellaneous|||0622-0637

MONOMERS

Acids and Anhydrides||0638-0704
Acrylates|||0705-0817
Epoxies|||0818-0822
Isocyanates|||0823-0868
Natural Oils|||0869-0886
Polyols|||0887-0963
Vinyls|||0964-0981
Miscellaneous|||0982-0989

SOLVENTS

Alcohols|||0990-1011
Chlorinated|||1012-1022
Esters|||1023-1058
Ethers|||1059-1065
Ether Alcohols|||1066-1105
Ether Esters|||1106-1117
Hydrocarbons|||1118-1170
Ketones|||1171-1184
Nitroparaffins|||1185-1188
Miscellaneous|||1189-1198

AMINES

Amines|||1199-1209
Alkanol Amines|||1210-1224

INORGANICS

Whites and Extenders||1225-1307
Blacks|||1308-1313

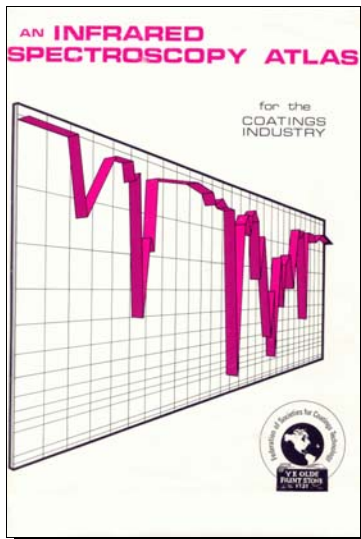
Blues 1314-1335
Browns 1336-1367
Greens 1368-1378
Reds 1379-1385
Yellows 1386-1405
Miscellaneous 1406-1420

ORGANIC PIGMENTS
Blues, Violets 1421-1433
Browns 1434-1435
Greens 1436-1440
Reds, Maroons 1441-1483
Oranges 1484-1494
Yellows 1495-1522

ADDITIVES
Anti-Float Additives 1523-1527
Antiflocculants 1528-1531
Antioxidants 1532-1533
Antiskinning Agents 1534-1538
Catalysts 1539-1599
Coupling Agents 1600-1613
Curing Agents 1614-1682
Defoamers 1684-1727
Dispersants 1728-1766
Driers 1767-1807
Flow Control Agents 1808-1839
Initiators 1840-1868
Leveling Agents 1869-1878
Opacifiers 1879-1881
Plasticizers 1882-2026
Preservatives 2027-2061
Rheological Additives 2062-2101
Silicates 2102-2106
Silicones 2107-2146
Slip Agents 2147-2177
Stabilizers 2178-2229
Surfactants 2230-2415
Waxes 2416-2469
Miscellaneous 2470-2486

MISCELLANEOUS MATERIALS
Miscellaneous 2487-2507

Title	Location	Edition / Series / Misc.
13 Infrared Spectroscopy Atlas for the Coatings Industry		<i>Edition:</i>
<i>Author:</i> Chicago Society for Coatings Technology (Infrared Spectroscopy Com	<i>Dynix:</i> 02019	<i>Series:</i>
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Ch	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0934010005	
<i>- date:</i> ©1980	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1980
<i>Subject:</i> Plastic coatings -- Spectra		<i>Price:</i> \$25.00
<i>Desc:</i> xi, 896 p., illus., 29 cm.		



Subjects

300 . Plastic coatings -- Spectra

Table of Contents

PREFACE
ACKNOWLEDGMENTS

CHAPTER 1: THEORY
 A. Electromagnetic Radiation
 B. Molecular Energy
 C. Degrees of Freedom and Molecular Motions
 D. Fundamental Vibrations
 F. Theoretical Considerations
 F. Group Frequencies
 G. Additional Considerations
 H. Nomenclature

CHAPTER 2: INSTRUMENTATION
 A. Introduction
 B. Dispersion Spectrophotometers
 1. Infrared Sources
 2. Infrared Monochromators
 3. Infrared Detectors
 4. Spectrum Recording
 a. Optical-Null Method
 b. Ratio-Recording Method
 c. Computer-Assisted Infrared Spectrophotometry
 C. Fourier Transform Spectrophotometers
 1. Fellgett's Advantage
 2. Jacquinot's Advantage
 3. Connes' Advantage
 4. Stray Light Advantage
 D. Special Purpose Infrared Spectrophotometers

CHAPTER 3: ACCESSORIES FOR INFRARED INSTRUMENTATION
 A. Infrared Absorption Cells and Crystals
 1. Sealed Cells
 2. Demountable Cells
 3. Variable Thickness Cells
 4. Microcells
 5. Gas Cells
 6. Multiple Pass Cells
 7. High and Low Temperature Cells
 8. Elevated Pressure Cells
 9. Flow-Through Cells
 10. Maintenance of Crystals and Cells
 B. Accessories for Surface Studies
 1. Attenuated Total Reflectance (ATR) and Multiple Internal Reflectance (MIR)
 2. Micro Multiple Internal Reflectance (MMIR)
 3. Specular Reflectance (Double Transmission)

CHAPTER 4: SAMPLE PREPARATION FOR INFRARED ANALYSIS
 A. Sampling Techniques
 1. Solid Phase Techniques
 a. Free and Cast Films

- b. Hot Melts
- c. Mulls and Pressed Pellets
- 2. Liquid Phase Techniques
- 3. Gas Phase Technique
- B. Physical Separation Technique
- 1. Non-Aqueous Systems
- 2. Aqueous Systems
- C. Chemical Degradation of Sample Components
- 1. Polyester and Alkyd Resins
- a. Saponification
- b. Aminolysis
- 2. Polyurethane Resins
- D. Spectral "Separation" Techniques
- E. Chromatographic Techniques
- 1. Gas Chromatography
- a. U Tube
- b. Multiple Internal Reflectance (MIR)
- c. Combined Gas Chromatography—Infrared Spectroscopy
- 2. Liquid Chromatography
- a. Sample Collection
- b. Micro MIR
- 3. Gel Permeation Chromatography
- 4. Thin Layer Chromatography
- 5. Ion Exchange Separation
- F. Thermal Techniques
- I. Pyrolysis
- 2. Thermogravimetric Analysis
- G. Analysis of Cured Coatings
- 1. Surface Contamination
- 2. Surface Analysis by MIR
- 3. Removal of Films from Substrates

CHAPTER 5: QUALITATIVE ANALYSIS

- A. Introduction
- B. Preliminary Studies
- C. Techniques of Interpretation
- 1. Sight Recognition and Direct Comparison
- 2. Negative Interpretation
- 3. Positive Interpretation
- D. Additional Considerations
- 1. Sample Purity
- 2. Limits of Detectability
- 3. Indistinguishable Spectra
- E. Spectral Interpretation
- 1. Application of Negative Interpretation
- 2. Application of Positive Interpretation
- 3. Combined Application of Positive and Negative Interpretation
- 4. Examples of Interpretation of Polymer Spectra
- a. Poly (vinyl acetate)
- b. o-Phthalic Alkyds and Polyesters
- c. Melamine-, Benzoguanamine-, and Urea- Formaldehyde Resins
- d. Polyamides
- e. Silicones
- f. Fatty Acids
- g. Epoxies
- h. Poly (vinyl chloride) Polyglycols
- j. Polymer Classification Scheme
- 5. Spectral Interpretation of Nonpolymeric Materials
- a. Inorganic Materials
- b. Liquids
- c. Gases
- F. Summary

CHAPTER 6: QUANTITATIVE ANALYSIS

- A. Introduction
- B. Basis for Quantitative Analysis—The Absorption Law
- C. The Absorbance, A
 - 1. Cell-In-Cell-Out Method
 - 2. Base-Line Method
 - 3. Integrated Intensities
- D. Special Considerations for Quantitative Analysis
 - 1. Selection of the Analytical Band
 - 2. Optimum Absorbance Range
 - 3. Sources of Error
 - a. Instrumental
 - h. Chemical
 - c. Physical
- E. Quantitative Infrared Methods
 - I. Direct Calculation
 - 2. Determination of Cell Thickness
 - 3. Calibration "Working" Curve Method
 - 4. Standard Addition Method
 - 5. Absorbance Ratio Method
 - 6. Internal Standard Method
 - 7. Coincident Band Method
 - 8. Quantitative Analysis Without the Use of Standards
 - 9. Internal Reflection Method

CHAPTER 7: SELECTED APPLICATIONS

- A. Polymer Applications
 - 1. Functional Group Analysis
 - 2. Monomer Distribution and Monomer Sequence
 - 3. Polymerization Rate, Curing Rate, and Oxidation Studies
 - 4. Surface Analysis and Interface Studies
 - 5. Hydrogen Bonding Studies
 - 6. Degree of Branching
 - 7. Crystallinity and Chain Orientation Studies
 - 8. Polymer Degradation: Thermal, Chemical, Photochemical, and Weathering
- B. Pigment Applications
 - 1. Analysis of Pigments and Extenders
 - 2. Surface Characteristics
 - 3. Hydration or Dehydration Studies
 - 4. Orientation Studies
- C. Coatings Applications
 - 1. Characterization of Coatings
 - 2. Surface Interactions
 - 3. Curing Studies
 - 4. Coating Degradation
- D. Miscellaneous Applications
 - 1. Analysis of Coating Substrates
 - 2. Environmental Analysis
 - 3. Special Topics

CHAPTER 8: BIBLIOGRAPHY

- Section I. Theory (T)
- Section II. General (G)
- Section III. Reviews (R)
- Section IV. Instrumentation (I)
- Section V. Experimental Techniques (E)
- Section VI. Qualitative Analysis (Q)
- Section VII. Compilation of Spectra (5)
- Section VIII. Quantitative Analysis (A)
- Section IX. Coatings Applications (C)
- Section X. Polymer Applications (P)
- Section XI. Pigment Applications (H)
- Section XII. Miscellaneous Applications (M)

CHAPTER 9: CATALOG OF SPECTRA

- A. Instrumentation
- B. Experimental
 - 1. Film Formers and Non-Crystalline Solids
 - 2. Liquids
 - 3. Pigments, Extenders, and Other Crystalline Materials
 - 4. Preservatives
 - 5. Gases
- C. Spectra—Selection and Organization

INDICES

- A. Spectral Indices
 - 1. Numerical
 - 2. Alphabetical
- B. Subject Index
- C. Bibliographic Index

Reviews - Synopsis - Dust Jacket

PREFACE

The Chicago Society for Coatings Technology established a committee in 1976 to write a new book covering infrared spectroscopy and its application in the coatings industry. The Infrared Spectroscopy Committee authoring this new book consists of D.G. Anderson, J. K. Duffer, J. M. Julian, R. W. Scott, T. M. Sutliff, M. J. Vaickus, and J. T. Vandenberg.

Infrared spectroscopy in the coatings industry is not new to the Chicago Society for Coatings Technology. In 1960 the Chicago Society for Paint Technology established a committee to introduce infrared spectroscopy to the coatings industry. This committee, comprised of W. H. Brown, R. E. Ansel, C. A. Lucchesi, and J. D. McGinness, began to prepare a pamphlet to aid the coatings chemist over the initial hurdles of infrared spectroscopy. In 1961, the Federation of Societies for Paint Technology published the laboratory manual "Infrared Spectroscopy—Its Use As An Analytical Tool In The Field of Paints and Coatings." The acceptance of this manual was beyond all expectations and thousands of copies were requested from all over the world. This basic infrared paper introduced infrared spectroscopy to coatings chemists aided the chemist in adopting infrared methods of analysis. Infrared spectroscopy rapidly became a powerful analytical technique in the coatings industry.

In 1969, a second Infrared Committee of the Chicago Society compiled an extensive volume on infrared spectra of materials used in the coatings industry. This book, "Infrared Spectroscopy—Its Use In The Coatings Industry" was also published by the Federation of Societies for Paint Technology. The Infrared Committee responsible for this publication included L. C. Atremow, K. E. Isakson, D. A. Netzel, D. J. Tessari, and J. T. Vandenberg.

"Infrared Spectroscopy—Its Use In The Coatings Industry" also gained international acceptance, and remains a recognized reference source. In this publication, the authors included 740 infrared reference spectra. They also included brief but comprehensive chapters covering the more important theoretical and practical aspects of infrared spectroscopy. This book became available just as water-based systems were replacing alkyd coatings, when a new generation of infrared spectrometers had become commercial and, finally, when infrared spectroscopists in the coatings industry had gained a degree of sophistication comparable to infrared spectroscopists in any other industry.

In the decade between 1968 and 1978, significant changes have occurred within the field of infrared spectroscopy and the technology of the coatings industry. Voluminous amounts of literature, including about 6500 publications in infrared spectroscopy, had appeared each year. New infrared spectrophotometers, namely, Fourier transform spectrometers, led the general trend in better infrared spectroscopy instrumentation.

In the coatings industry, a renaissance in technology spanned the recent decade. More and more governmental intervention in the internal process of business decision-making led the change. During this period, the industry responded to air pollution regulations, the oil embargo, and the ensuing raw material and energy shortages. Completely new coatings evolved. These new frontiers firmly established the need to replace the previous infrared spectroscopy book and to create a more current reference source for the coatings industry.

The present publication contains a compilation of infrared spectra of materials commonly utilized in the coatings industry. Spectra include those of polymers, resins, vehicles, organic and inorganic pigments, extenders, acrylic monomers, radiation cure monomers, oligomers, sensitizers, blocked isocyanates, inhibitors/stabilizers, fungicides, mildewcides, natural products, solvents, other additives, etc. Several new raw materials have been marketed within the last 10 years and inclusion of their spectra should prove useful in spectral interpretation. Approximately 1400 spectra are in this book. The spectra are fully indexed as an aid to users.

High resolution, extended range infrared spectrophotometers have been used to generate all spectra reproduced in this

hook. Examples of Fourier transform infrared spectra have been included. The recorded spectral range of all spectra in the reference collection covers the region between 4000 and 200 cm^{-1} .

This publication contains a fundamental and comprehensive dissertation on the theory of infrared spectroscopy, qualitative analysis, and quantitative analysis. The discussion on instrumentation includes the most modern equipment. Experimental infrared instrumentation accessories have been de and a chapter completely devoted to sample preparation for infrared analysis has been included. This should be extremely valuable to both the novice and experienced practicing spectroscopist.

Selected applications have been cited to help the reader become aware of the multitude of applications of infrared spectroscopy to coatings chemistry. This chapter contains a comprehensive text which should be valuable to anyone practicing infrared spectroscopy.

Finally, the extensive literature survey complements the hook and represents the most complete bibliography published in this type of text. The bibliography has been organized into sections, such as theory, general, reviews, instrumentation, experimental techniques, qualitative analysis, compilations of spectra, quantitative analysis, coatings applications, polymer applications, pigment applications, and miscellaneous applications. This arrangement should give the spectroscopist easy access to the bibliography. In addition, each section has been organized in chronological order and the article title or a statement explaining the substance of the article is included.

It is hoped that this new publication will be received in this country and abroad as a significant contribution to the sciences of infrared spectroscopy and coatings technology.

CATALOG OF SPECTRA

A. INSTRUMENTATION

Two spectrophotometers were employed to obtain the spectra reproduced in this hook. One was a Beckman IR-12; the other was a Beckman IR-4250. These are both filter grating instruments with identical chart formats. Instrument calibration was repeatedly checked using polystyrene as a reference standard. Filter and grating change positions were used to confirm chart position. All band positions in the following reference spectra should be accurate to better than ± 5 cm^{-1} . Spectra were recorded at a scanning speed of approximately 300 cm^{-1} with speed suppression. Both instruments were constantly purged with dry air. Other instrumental specifications can be obtained from the manufacturer's literature.

B. EXPERIMENTAL

All samples were commercial grade as normally utilized in the coatings industry. Since these reference spectra are intended to be used for the identification and characterization of this type of material, no effort was made to purify the samples. An effort was made to select sample thicknesses or concentrations so that, at the most intense band, 5% to 25% of the incident radiation was transmitted.

Different sampling techniques were employed with the various classes of compounds whose spectra are contained in this book. This was necessary to obtain optimum spectra for these diverse types of materials. The specific technique employed for each material is shown in the lower left-hand corner of the spectrum. In general, techniques used are listed below.

1. Film Formers And Non-Crystalline Solids

This class of compounds includes all polymers and driers, some surfactants, and a number of miscellaneous materials. With the exception of emulsions and water-soluble polymers, all samples were cast from dilute solutions onto CsI plates. Emulsions and water soluble polymers were cast from dilute solutions onto KRS-5 plates. Normally all samples were dried for 20 minutes at 100°C in a vacuum oven at approximately 30 Torr. In a few cases, longer drying times were required to remove the last traces of solvent.

2. Liquids

This class of compounds includes all solvents and oils, most monomers and plasticizers, and some surfactants. The majority of these materials were run between CsI plates with the pressure adjusted to give the desired sample thickness. A few highly volatile materials were run in a 0.015 mm fixed pathlength cell.

3. Pigments, Extenders, And Other Crystalline Materials

All spectra of this class of compounds were obtained as CsI pressed pellets. Sample sizes varied from 0.3 to 3.0 mg in 300 mg of CsI powder. The triple pressing technique was employed for pellet preparation. In addition to pigments and extenders, this class of compounds contained a few monomeric acids and some surfactants.

4. Preservatives

Some preservatives reacted with CsI during the pressing procedure. Therefore, these were run using the split mull technique.

5. Gases

This class of compounds consisted solely of propellants. These materials were run in a 10 cm gas cell fitted with NaCl windows. The cell was evacuated to a pressure of one Torr and then filled with sufficient propellant to give a spectrum of the proper intensity. Since a gas cell fitted with NaCl windows was employed, only the spectral region above 650 cm⁻¹ was scanned.

C. SPECTRA—SELECTION AND ORGANIZATION

The index to the spectra is contained in the back of this book. This spectral index is presented in the format of class, subclass, and alphabetically within the subclass. In addition, there is also a total alphabetical listing of spectra. Wherever possible, the composition and/or structure of all materials has been included on their spectra. This information was obtained from the various suppliers of these materials and was not confirmed. Every effort was made to obtain the spectra of all of the common materials utilized in the coatings industry. A large number of experimental materials were also included for possible future use. Where a number of materials were known to give identical spectra, only a few of the more common ones were included.

The following list contains the categories and arrangement of spectra included in this collection.

Material Spectra Numbers

POLYMERS

Acrylics 1-58
Alkyds 59-108
Cellulosics 109-118
Epoxyes 119-165
Hydrocarbons 166-176
Melamine-Forma 177-190
Urea-Formaldehyde 191-196
Benzoquanamine-Formaldehyde 197-201
Natural Resins 202-245
Phenol Formaldehydes 246-265
Polyamides 266-275
Polyesters 276-308
Polyethers 309-324
Polyethylenimines 325-327
Polyketones 328-332
Polysulfides 333-336
Polyurethanes 337-350
Silicones 351-368
Vinyls 369-445
Miscellaneous 446-470

MONOMERS

Acids and Anhydrides 471-521
Acrylics 522-554
Isocyanates 555-566
Natural Oils 567-603
Polyols 604-627
UV Curable 628-651
Vinyls 652-666

SOLVENTS

Alcohols 667-685
Amines 686-689
Esters 670-701
Ether Alcohols 702-712
Ether Esters 713-717
Ethers 718-720
Hydrocarbons, Aliphatic 721-724
Hydrocarbons, Aromatic 725-733
Hydrocarbons, Halogenated 734-745
Hydrocarbons, Mixed 746-763
Ketones 764-775
Miscellaneous 776-786

INORGANIC PIGMENTS AND EXTENDERS

Whites and Extenders 787-836
Blacks 837-841

Blues 842-854
Browns 855-864
Grays 865-868
Greens 869-884
Reds, Violets, Maroons 885-903
Yellows, Oranges 904-937
Miscellaneous 938-945

ORGANIC PIGMENTS

Blues, Violets 946-972
Browns 973-975
Greens 976-989
Reds, Maroons 990-1055
Yellow, Oranges 1056-1122

MISCELLANEOUS MATERIALS

Anti-Oxidants and Anti-Skinning 1123-1134
Catalysts and Curing Agents 1135-1156
Defoamers 1157-1172
Dispersants 1173-1186
Driers 1187-1218
Plasticizers 1219-1287
Preservatives 1288-1314
Propellants 1315-1317
Surfactants 1318-1359
Thickeners 1360-1377
Ultra-Violet Absorbers and Stabilizers 1378-1397
Waxes 1398-1408
Miscellaneous 1409-1433

Title	Location	Edition / Series / Misc.
81 Infrared Spectroscopy: Its Use in the Coatings Industry		<i>Edition:</i>
<i>Author:</i> Chicago Society for Paint Technology (Infrared Spectroscopy Committ	<i>Dynix:</i> 44140	<i>Series:</i>
<i>Publish.:</i> Federation of Societies for Paint Technology	<i>Call No.:</i> 535.842 Ch	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i>	
<i>- date:</i> ©1969	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1969
<i>Subject:</i> Infrared spectroscopy		<i>Price:</i> \$25.00
<i>Desc:</i> x, 456 p. chiefly graphs, 29 cm.		

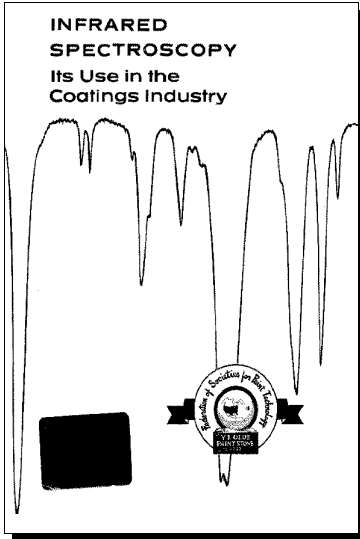


Table of Contents

1. Theory
2. Instrumentation
3. Experimental Techniques
4. Qualitative Analysis
5. Quantitative Analysis
6. Selected Applications
7. Bibliography
8. Catalog of Spectra
9. Spectra

Reviews - Synopsis - Dust Jacket

PREFACE

In 1960, the Chicago Society for Paint Technology established a committee to introduce infrared spectroscopy to the coatings industry. While infrared spectroscopy had long been recognized as an indispensable tool, this technique had not yet found wide application in the coatings industry. It was reasoned that a basic introductory manual designed to guide the coatings chemist over the initial hurdles of spectroscopy would overcome much of the reluctance of the industry to adopt infrared methods of analysis. This was indeed the case.

In 1961, the Infrared Spectroscopy Committee of the Chicago Society for Paint Technology published their widely accepted paper entitled, "Infrared Spectroscopy-Its Use as an Analytical Tool in the Field of Paints and Coatings." The acceptance of this paper was beyond all expectations and several thousand copies were requested from all over the world. Infrared spectroscopy rapidly became an invaluable aid to the coatings chemist, and today infrared spectrophotometers are rather commonplace in the industry. During this seven-year period since 1961, which saw a remarkable growth in the incorporation of infrared spectrophotometers into the coatings industry, several other equally remarkable changes occurred.

First of all, alkyd coatings, once the standard of the industry, were being rapidly replaced by water based systems. The complexity and type of materials used in chemical coatings have changed markedly over the last few years. Secondly, a new generation of infrared spectrophotometers have become commercially available and are now appearing in the laboratories of many coatings companies. Finally, infrared spectroscopists in the coatings industry have gained a degree of sophistication that is comparable to that of infrared spectroscopists in any other industry. It is for these reasons that the rewriting and updating of this publication has been undertaken.

This new publication contains a compilation of infrared spectra of virtually all materials commonly utilized in the coatings industry. Since this book is meant to replace rather than augment the previous book, it will contain spectra of many of the same materials. These materials are classical in the industry. An effort has been made to include all the newer pigments, solvents, modifiers, additives and vehicles. This is especially true in the latter case since vehicles have changed most markedly during the last seven years. More definitive information of vehicle composition is also given. This should prove useful in spectral interpretations.

High resolution, extended range infrared instrumentation has been used to obtain all of the spectra contained in this book. This instrumentation is substantially more sophisticated than that utilized for the previous manual. In addition to providing additional interpretive information due to greater resolution, a new region of the infrared spectrum is now available between 650 and 200 cm-1 or 15.5 and 50 microns. The usefulness of this spectral region for quantitative analysis, the determination of crystal structure differences and rapid qualitative identification of virtually all in-organic pigments and extenders was reported by Afremow and Vandenberg.

This publication also contains a more fundamental and comprehensive treatment of the theory of infrared spectroscopy. The present level of sophistication of spectroscopists in the coatings industry is evidence of their desire to obtain a more theoretical understanding of this technique.

Subjects

271 .	Infrared spectroscopy
358 .	Coatings -- Spectra
455 .	Polymers and polymerization -- Spectra

Also included are the newer sampling techniques such as specular reflectance, internal reflection, the use of cesium iodide and KRS-5 plates and the triple pressing technique for alkali halide pellets.

Finally, the already excellent literature survey contained in the first paper has been expanded to include the region between 650 and 200 cm^{-1} as well as all pertinent papers published since 1961.

It is hoped that this revised publication will serve as a single, comprehensive and up-to-date reference source for infrared spectroscopists and users of infrared spectroscopy in the coatings industry and all other allied areas.

Title	Location	Edition / Series / Misc.
82 Inorganic Pigments: Manufacturing Processes Author: Gutcho, M. H. (Marcia Halpern), 1924- (editor) Publish.: Noyes Data Corporation - place: Park Ridge, NJ - date: ©1980 Subject: Pigments -- Patents Desc: xvi, 488 p., illus., 25 cm.	Dynix: 12984 Call No.: 667.29 In ISBN: 0815508115 Shelf Adult Non-Fiction	Edition: Series: Chemical Technology Review: No. 166 Year: 1980 Price: \$25.00

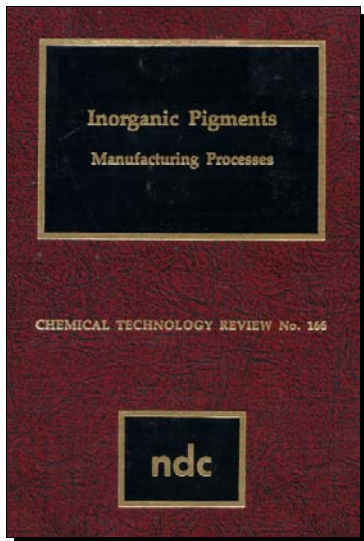


Table of Contents

- Introduction
- Titanium Dioxide Paints
- Yellow and Green Pigments
- Iron Oxide Pigments
- Carbon Black
- Lustrous Pigments
- Clay Pigments
- Pigment Dispersion
- Anticorrosion Pigments
- Pigments for Synthetic Materials
- Improving Optical Properties of Paint and Paper
- Pigments for Other Specific Needs
- Other Processes
- Company Index
- Inventor Index
- U. S. Patent Number Index

Reviews - Synopsis - Dust Jacket

INTRODUCTION

Pigments have been used for thousands of years for a wide range of purposes. During this time a variety of materials have been tried as pigments with varying degrees of success.

Inorganic pigments are finely powdered, insoluble, solid particles which are used to color another material by being mixed with the material or by application in a thin layer over its surface. Inorganic pigments are used today in many industries to impart a desirable color and appearance to media such as paints, inks, varnishes, lacquers, glazes, organic resins, ceramics, etc. or as opacifiers in paint and paper.

Desirable properties in a pigment include strength (so that only a small quantity of pigment is required for mixing with a white pigment to make tints), purity of shade with absence of dullness, lightfastness, resistance to bleeding and good hiding power. Not all pigments are suitable for all purposes. For a particular application, one pigment may be superior to another because of color or hiding power. For another use, the properties of intensity or lightfastness may determine the pigment of choice.

Inorganic pigments, because they are more stable to light and temperature than organic pigments, have a greater scope of application. They are required for use in ceramics and glazes, and for coloring thermoplastic resins manufactured at high temperatures.

In paper manufacturing, pigments and fillers are applied to increase brightness and opacity and to enhance smoothness of the paper. The pigments and fillers are preferably supplied as high solids concentration aqueous slurries, which must be stabilized against settling and forming a cake in the storage tank.

This book is concerned with the search for new pigments as well as with modifications of known pigments which will result in making available pigments of superior properties. Included are processes for the production and improvement of titanium dioxide pigments, chrome yellow pigments, iron oxide pigments, carbon black pigments, mineral pigments such as clays and silicates, etc. In addition, the book relates also to pigments useful for special purposes (anticorrosion, opacifiers, protective coatings, lustrous pigments for cosmetics, pigments for coloring ceramics, synthetic polymers, synthetic fibers, etc.). Processes for facilitating the dispersion of pigments in aqueous organic liquids are of particular importance. Of interest, too, are new pigment compositions and composites of high performance at low cost.

Subjects

294 . | Pigments -- Patents

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents issued since January 1975 that deal with the manufacture of inorganic pigments.

This book is a data-based publication, providing information retrieved and made available from the U.S. patent literature. It thus serves a double purpose in that it supplies detailed technical information and can be used as a guide to the patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced commercially oriented review of inorganic pigments manufacture.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into re- search in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The table of contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy to access to the information contained in this book.

16 Reasons Why the U.S. Patent Office Literature Is Important to You

1. The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical commercial process information assembled here than is available from any other source. Most important technological advances are described in the patent literature.
2. The technical information obtained from the patent literature is extremely comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure."
3. The patent literature is a prime source of basic commercially utilizable information. This information is overlooked by those who rely primarily on the periodical journal literature.
4. An important feature of the patent literature is that it can serve to avoid duplication of research and development.
5. Patents, unlike periodical literature, are bound by definition to contain new information, data and ideas.
6. It can serve as a source of new ideas in a different but related field, and may be outside the patent protection offered the original invention.
7. Since claims are narrowly defined, much valuable information is included that may be outside the legal protection afforded by the claims.
8. Patents discuss the difficulties associated with previous research, development or production techniques, and offer a specific method of overcoming problems. This gives clues to current process information that has not been published in periodicals or books.
9. Can aid in process design by providing a selection of alternate techniques. A powerful research and engineering tool.
10. Obtain licenses-many U.S. chemical patents have not been developed commercially.
11. Patents provide an excellent starting point for the next investigator.
12. Frequently, innovations derived from research are first disclosed in the patent literature, prior to coverage in the periodical literature.
13. Patents offer a most valuable method of keeping abreast of latest technologies, serving an individual's own "current awareness" program.

-
14. Identifying potential new competitors.
 15. It is a creative source of ideas for those with imagination.
 16. Scrutiny of the patent literature has important profit-making potential.

Title	Location	Edition / Series / Misc.
790 Inorganic Primer Pigments <i>Author:</i> Smith, Alan <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1988 <i>Subject:</i> Pigments -- Periodicals <i>Desc:</i> 26 p., illus., 28 cm.	<i>Dynix:</i> 55947-11 <i>Call No.:</i> 667.9 Fe <i>ISBN:</i> 0934010234 <i>Shelf:</i> Reference	<i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS11 <i>Year:</i> 1988 <i>Price:</i> \$50.00

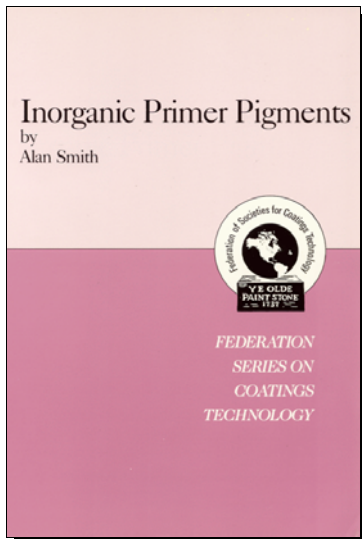


Table of Contents

- I. INTRODUCTION
 - A. Anticorrosive Pigments
 - B. Toxicity
- II. BASIC CORROSION THEORY
 - A. Electrochemical Theory of Corrosion
 - B. Sacrificial Anodes and Cathodic Protection
- III. ZINC METAL IN PRIMERS
 - A. Single Package Zinc Silicates
- IV. INHIBITIVE PIGMENTS
 - A. Lead- and Chromate-Containing Pigments
 - B. Lead- and Chrome-Free Pigments
- V. BARRIER PIGMENTS, FILM REINFORCERS, AND EXTENDERS
 - A. Barrier Pigments
 - B. Film Reinforcers and Extender Pigments
- VI. FORMULATION OF PAINTS CONTAINING ANTICORROSIVE PIGMENTS
 - A. High Acid Value Resins
 - B. Modified Vinyls
 - C. Seeding (Granulation, Gelling, and Livering)
 - D. Acid Catalysts
 - E. Water-Based Paints
 - F. Critical Pigment Volume Concentration
 - G. Solubility and Blistering
 - H. Anticorrosive Pigments in Immersion Service
- VII. EVALUATION OF ANTICORROSIVE PIGMENTS
 - A. Substrates for Testing
 - B. Exterior Exposure Testing
 - C. Testing Methods
 - D. Comparative Testing Levels
- VIII. SUMMARY
- IX. REFERENCES

Subjects

293 .	Pigments
321 .	Primers (Coating)

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Liquid paint can generally be described as an intimate mixture of pigment, vehicle, and solvent. In this monograph, attention is focused on inorganic pigments as they are utilized in primers for the protection of metallic substrates. Particular attention is paid to those pigments which are loosely termed anticorrosive pigments. White hiding, extender, inorganic color, and metallic pigments are discussed in other monographs; they will only be discussed here as they specifically relate to anticorrosive primers.

The system of nomenclature in the coatings industry classifies coatings primarily by resin type, i.e., alkyd primer, or acrylic enamel, etc. This is easily justified since the resin is the component of a coating which most readily characterizes its essential properties. It should be borne in mind, though, that the resin in primers, despite its preeminence, is not the major component — the inorganic pigments are. Analysis of a typical long oil alkyd primer would show it contained

around twice as much pigment as resin or, to put it another way, over 50% of the formulation weight is inorganic pigment. Considering these facts, it is obvious that inorganic pigments can have a large influence on the performance of primers and they do, therefore, merit special attention.

A. Anticorrosive Pigments

The most dramatic way the performance of a primer can be affected by pigmentation is by incorporation of an anticorrosive pigment. Anticorrosive pigments can improve primer performance in many ways:

- Prevention of underfilm corrosion
- Protection of the metal substrate where the paint film discontinues due to mechanical damage
- Prevention of undercutting in damaged areas
- Improved durability per unit of film thickness making equivalent performance at lowest cost possible
- Improved durability in thin films making application errors less damaging

Inorganic pigments which are used to improve the anticorrosive properties of paints can be divided into four groups.

1. **ANTICORROSIVE OR INHIBITIVE PIGMENTS:** These pigments interact chemically, either directly or via intermediates formed by reaction with the resin system, with the metal substrate to reduce the rate of corrosion. Examples of inhibitive pigments are chromates, phosphates, phosphites, molybdates, borates, and red lead.

2. **SACRIFICIAL PIGMENTS:** These are metallic pigments which function by galvanically protecting the steel substrate. The pigment must be a metal which is higher in the electrochemical series than the metal of the substrate to be protected. Under corrosive conditions, the metallic pigment, being more reactive than the substrate, becomes the anode in an electrical cell in which the substrate is the cathode. The substrate is therefore cathodically protected by the sacrificial pigment.

The only sacrificial pigment of any significance in the paint industry is metallic zinc, supplied as either zinc dust or zinc flake. Paints containing zinc pigment are always heavily loaded with zinc because particle to particle contact is necessary to achieve electrical conductivity between the pigment and substrate. This makes zinc rich primers unusual in that they are more effective when formulated above the Critical Pigment Volume Concentration (CPVC).

3. **BARRIER PIGMENTS:** Barrier pigments function by physically reinforcing the barrier properties of the paint film, i.e., they reduce the permeability of the paint film to the agents which support corrosion. This barrier effect is achieved through the physical shape of the pigments. They are platy or lamellar; that is to say, the pigment particles are flat and thin. It should be noted here that water vapor can diffuse through the binder but not through inorganic pigments. Platy pigments, therefore, dictate that water and electrolytes take a less direct route through the paint film to the substrate.

4. **FILM REINFORCERS:** There are many instances in coatings literature where it is stated that certain pigments have "good film forming properties." This is an unfortunate choice of words since inorganic pigments are not capable of forming films. The intended meaning of the statement is that certain pigments can be incorporated into the coating to improve the overall integrity of the film.

While pigments of this group are chemically inert, their contribution to film integrity is attributed to their ease of wetting and the tenacity of the pigment to resin bond. Given good pigment/resin bonding, an inorganic pigment will reduce the water permeability of the paint film since the pigment itself is impermeable to water. If an inorganic pigment which does not bond well with the resin is used, water permeability will increase as the weakly associated pigment resin interface provides a route for water to migrate through the paint film.

Much work has been conducted in demonstrating the effect of inert inorganic pigments on paint film water permeability. Kresse suggests a simple test to indicate whether a given pigment/binder interaction will be favorable. Examples of film reinforcing pigments are iron oxides and rutile titanium dioxide.

B. Toxicity

Red lead, basic lead silico-chromate, zinc chromate, and strontium chromate are the traditionally used anticorrosive primer pigments. Lead pigments are legislated against in trade sales paints. The American Conference of Governmental Industrial Hygienists recommends a time weighted average (TWA) limit of 0.15 mg/cubic meter as lead in respired air. Hexavalent chromium compounds are suspected carcinogens but to date there is no U.S. legislation against using chromates in paints. In some European countries, however, chromate-containing paints are required to be labeled as

containing suspected carcinogens. The American Conference of Governmental Industrial Hygienists recommends a TWA of 0.05 mg/cubic meter as chromium in respired air.

As indicated by these recommendations, the main route for absorption of toxic pigments is through inhalation of dusts. Thus, the most significant hazard is faced by the pigment manufacturer and the paint manufacturer; the end user does not come into contact with the dry pigment so inhalation of dust is not a problem. The hazards presented to the end user are through inhalation of spray mists or through inhalation of dust created by abrasive removal of old coatings. Removing old lead-based paints from bridges has recently become a major problem because of concerns about contaminating the water over which the bridge passes. This problem is discussed in detail by Snyder and Bendersky. The expense of containment during blasting and of disposing of the collected toxic waste has become a major incentive for State Departments of Transportation to replace lead-based paints. This is occurring despite the fact that there is no legislation against industrial use of lead-based paints.

These environmental and toxicity problems have given rise to a major effort by pigment manufacturers to produce viable nontoxic alternatives to lead- and chrome-containing pigments. The challenge here is to produce an inorganic compound which is chemically active in reducing corrosion rates but not so chemically active that it presents toxicity problems. The most significant lead- and chrome- free inhibitive pigments available to date can be classified among the following chemical groups: Borates, Metal Oxides, Phosphates, Phosphites, Molybdates, and Silicates.

The significant commercially available inhibitive pigments are proprietary mixtures, or compounds of the previously mentioned chemical types produced with or without inert fillers. The only nonproprietary lead- and chrome-free inhibitive pigment of any significance is zinc phosphate.

Inside the Technical Consulting Business: Launching and Building Your Independent Practice

LASCT Holdings - maximum detail by Title

Title	Location	Edition / Series / Misc.
922 Inside the Technical Consulting Business: Launching and Building Your Independent Practice		Edition: 3rd edition
Author: Kaye, Harvey	Dynix: 105713	Series:
Publish.: John Wiley & Sons	Call No.: 620 Ka	
- place: New York, NY	ISBN: 0471183415	
- date: ©1998	Shelf Adult Non-Fiction	Year: 1998
Subject: Consulting engineers		Price: \$71.50
Desc: xvii, 366 p., illus., 24 cm.		

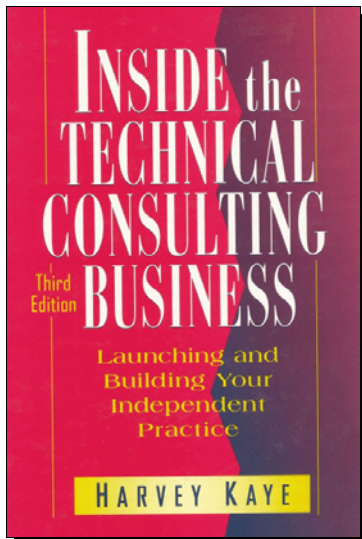


Table of Contents

Preface
 Acknowledgments

CHAPTER 1. How to Leave Your Career Problems Behind
 Are You an Engineering Career Victim?
 The Secret of Success: Developing "Growth Vision"
 Claim Credit for Your Innate Creativity
 Direct Employment vs. Consulting — A Fundamental Change
 Gain Control Over Your Future!
 The Changing Face of Corporate America
 Benefit from My Experience

CHAPTER 2. Defining Your Own Business Identity
 Consulting: The Fast Track to Success
 How the System "Rewards" Directly Employed Professionals
 The Magic of Doing Your Own Thing
 You Are Responsible for Your Own Future
 Your Unique Knowledge Makes You Valuable
 A True Story: How a Small Consultant Beat Out the Big Guys in a Competitive Bid
 Visualizing Your Own Options
 Learning Survival Skills

CHAPTER 3. Who Becomes a Consultant?
 How Much Experience Is Needed?
 Technical Abilities Are Only Half the Story
 Real-Life Cases: Consultants Who Made It and Those Who Didn't
 Consultants Gravitate to "Niches"
 Technical Consulting Is Different from Management Consulting
 Find Your Own "Style"
 You Don't Have to Be a Genius
 The Story of David and Goliath, Retold
 Desire to Help the Client Can Go a Long Way
 Consultants Aren't All Mavericks

CHAPTER 4. Three Fundamental Truths of Technical Marketing
 Marketing Your Skills: A Learning Experience
 First Fundamental Truth of Marketing
 Second Fundamental Truth of Marketing
 Why You Never Have to Worry about Competition
 What Are You Selling?
 Your Marketing "Mix"
 Importance of Acquiring Broad Business Knowledge
 The Third Fundamental Truth
 How to Get in the "Novelty Groove"
 The Best Consulting Lies on the Ground Floor

CHAPTER 5. Marketing Secrets Other Consultants Won't Tell You
 The Secret of Finding Clients
 Have Something to Sell
 Advertising: The Art of Creating Demand
 Find Out Who Your Customers Are

Subjects

579 .	Consulting engineers
580 .	Engineering firms -- Management

Define Your Target Markets
How to Qualify Prospects
Three Principles for Reaching Prospects
Tracking Your Prospects
Why You Must Make Personal Contacts
Keep Contacts "Professional"
Contacts Are the "Seeds" of Your Crop
How Contacts Work
How Many Customers Do You Need?
Learn Which Companies You Can Do Business With
Other Consultants May Need Your Specific Talent
How to Get Extra Mileage from a Contract
Marketing the Public Sector
The Internet: Your Key to the World
Globalization
Get Your Foot in the Door
How to Convert an Inquiry into a Sale

CHAPTER 6. Your Blueprint for Marketing Success
First Vision, Then Goals
Gather Market Intelligence
Position Yourself in the Market
Put It All Together: Your Marketing Plan
Set Your Plan into Action!
Guerrilla Marketing
Invitation to Entrepreneurial Creativity
Harvey's Handy "Hate-to-Do-Marketing" Checklist

CHAPTER 7. The Sales Meeting
What You Must Know Before Visiting a New Client
What Can Happen If You Don't "Qualify" a Sales Meeting
Why You Will Always Be Doing Some Sales Work
How to Develop Sales Abilities
Project a Confident Image
Gain Rapport
Establish the Need
The Magic Power of Listening
Show How You Can Satisfy the Need
Elicit the Client's Objections and Concerns
Lead—Don't Push—the Client to Agreement on Action
Solving Your Customer's Real Problem Can Pay Off
My "Secret Weapon" Makes Clients Salivate with Interest
What to Do After the Meeting
Guidelines for Successful Sales Meetings

CHAPTER 8. Proposals and Contracts
Proposals and Contracts: Your Key to Winning Jobs
What Is a Contract?
Quotation Letters
What Should Be Included in a Proposal?
Fixed-Price-Basis Proposals
The "Menu" Proposal
Time-and-Materials-Basis Contracts
What Is the Difference between a Proposal and a Contract?
How to Respond to a Request for Proposal
Know the True Value of Your Expertise!
Let Your Proposals Show Your Strength
Protecting Your Own Property
Common Sense in Legal Matters Can Save You Headaches
When to Decline Work
What to Look for in Verbal Go-Aheads

CHAPTER 9. Billing Rates
Why Money Is a Sensitive Issue

Is Your Money Attitude Realistic?
You Are Not Selling Oranges
On Negotiating Billing Rates
How Much to Charge?
Method 1: Detailed Calculation of Costs
Method 2: What the Market Will Bear
How to Invoice Your Customers
Getting Paid

CHAPTER 10. Projecting a Professional Image
Client Relations Will Make You or Break You
Putting the Client at Ease
Putting Yourself at Ease
How to Dress: My "One-Over" Method
On the Image You Project
My List of Things Not to Do if You Want to Maintain a Professional Image
Don't "Charm" Your Clients!
Does a Sense of Humor Help?
The Art and Science of Meetings
Good Reports Become Your Calling Cards

CHAPTER 11. Dealing with the Client
Building the Client Relationship
Resistance
Dependence
Control
Develop Negotiation Skills
Is Satisfaction Guaranteed?
Dealing with Unrealistic Customer Expectations
On "Happy" Situations in Consulting
On Fixing Mistakes Made by the Consultant
Dealing with Client Employment Offers
On Forecasting the End of a Project

CHAPTER 12. Financing a New Consulting Practice
A Realistic Look at Money
The Necessity of Financial Planning
What's in a Business Plan?
How Much Money Do I Need to Start?
Cash Flow in a Typical Business Plan
Jobshopping as a Means to Avoid Cash Flow Crunch
Take This Quiz to Evaluate Your Business Plan
First Things First: Your First Contract
Tax Angles
What to Do with the Money That Comes In

CHAPTER 13. Setting Up Your Business
Choose Your Form of Business Ownership
Should You Incorporate?
On Forming Partnerships
Will You Need a Lawyer?
Records and Accounting
Using an Accountant
Paying Taxes
Estimated Taxes
How to Hire Help
Strategies for Maintaining Your Independent Contractor Status
What Kinds of Insurance Must You Carry?
Should You Hire a Marketing Rep?
Your Computerized Office

CHAPTER 14. Office Space and Stationery Needs
What's the Best Location for Your Office?
Home Office vs. Rented Space

Welcome to My Office
A Shaggy-Dog Story
Your Portable Office
Options for Office Phones
Stationery Needs
Creating Your Company Logo
Why You Need Business Cards
How to Write a Dynamite Brochure
What Is a Consulting Résumé?
What Is a Company Business Description?

CHAPTER 15. Goals and Planning for the Future
Planning: Engineer Your Own Future What Are Your Goals?
Asking the Right Questions
The Hierarchy of Business Goals
Striving to Survive
Planning for Tomorrow's Success
Expanding Your Practice with Additional Workers
Complementary Activities
Let Your Clients Pay Your Development Costs
Why One-Year Plans Are Better than Five-Year Plans
What to Do with Goals That Never Get Accomplished

CHAPTER 16. The Technical Challenges of Consulting
A Mini-Essay on the Information Explosion
Be a Surfer on the "Wave of Knowledge"
Become Efficient at Handling Information
Organize for Maximum Productivity
Your Own R & D Department
Problem-Solving Skills Pay Off Handsomely
Manage Your Own Projects

CHAPTER 17. Decision Making
The Story of George
Is Consulting a Goal or an Escape?
How to Get Yourself Out of a Decision Rut
Does It Help to See a Career Counselor?
Values vs. Rational Choices
Are You Suited for Consulting?
Do You Need a Professional Engineer License?
Don't Wait for Things to Be "Perfect"

CHAPTER 18. Making the Transition
Where Do You Start?
What to Look for in Your First Contract
Leaving Your Present Employer
Why Some Things Should Remain Secret
Where to Get Advice
Selecting Your Company Name
Your Timetable to Success
Time Management

CHAPTER 19. Playing Your Game
Consulting Is Like a Game of Tennis
The "Secret" to Playing Your Game
What "Playing Your Game" Means in Consulting
Self-Knowledge Improves Your Strategic Advantage
Stress Reduction for the Advanced Player
Setting the Style of Your Practice
Dry Spells and the Value of an Ongoing Business
Developing a Company Identity
Motivate Yourself to Succeed
A Radical Method for Handling Doubts
An Invitation to Winning

Epilogue
When Have You "Made It" in Consulting?
Encourage Yourself by Associating with Other Successful Professionals
What I've Learned in Consulting
No One Can Do It for You
This Is Not a Get-Rich Book—It Is a Get-Professional Book

Appendix: Case Study
First Contact
How to Understand This Damn Thing?
Discovery Time
Plotting a Solution Strategy
Who Said It Would Be Easy?
Negotiating a Useful Answer
Preparing the Report
Follow-Up

Suggested Reading List
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Join the thousands of professionals who have already "Inside the Technical Consulting Business" — and discover how to channel your technical know-how into an exciting career as an independent consultant. This Third Edition of Harvey Kaye's bestselling guide gives you the focused, no-nonsense help you need to start and run your own consulting practice in today's environment. What's inside:

Setting up your own consulting business. The lowdown on finances, record-keeping, office space, taxes and choosing the form of business organization that's right for you.

Insider's guide to proposals and contracts. Gives plenty of examples to use in your own consulting practice.

Marketing secrets your boss never told you. Tips on creating demand for your services and keeping your clients coming back for repeat business.

Plus All-New Material On:

Creating your personal strategic marketing plan. A step-by-step guide to developing and maintaining your competitive edge.

Learn from the pros. "Meet the Pros" interviews show how successful consultants handled some of the very problems you're likely to encounter.

Building successful client relationships. The inside scoop on keeping clients happy while protecting your own business interests.

The technical challenges of consulting. A consultant's primer on problem-solving, coping with the information explosion and organizing for maximum productivity.

PREFACE

ENGINEERS, SCIENTISTS, AND TECHNICAL SPECIALISTS:

This book shows how you can become a consultant in your technical field and enjoy professional independence and high income. If you are an engineer, a scientist, a technical writer, a computer programmer, a quality control expert, a mechanical designer, a patent expert—in fact, any kind of technical specialist—looking for career enhancement options, this book is for you! By following the tips and guidance in this book, you can start and manage your own consulting practice.

This book is not a frilly or eulogistic praise of consulting. It shows, in no-nonsense terms, what it takes to be a successful consultant. It gives you marketing, client relations, and self-management know-how that has taken the author twenty-five years to accumulate, and that is not in print anywhere else. The secrets of successful marketing are told clearly and concisely, so that you can concentrate on your best bets and minimize activities that have no payoff.

WHAT IS CONSULTING REALLY LIKE?

I give you a behind-the-scenes look that other consultants are too tight-lipped to share. You gain valuable insight into what it is like to be a consultant without leaving the comfort of your own chair!

Many successful consultants portray consulting as mysterious and nearly impossible, like climbing Mount Everest. This makes them look like geniuses, but it doesn't help you figure out how to go about it yourself. I show you, in simple language, how you can build on your present knowledge and abilities and plan your business growth. I can't do the work for you, but I can illuminate your own path to professional satisfaction as a consultant.

LEARN TO BREAK AWAY FROM THE FRUSTRATION OF WORKING FOR OTHERS

Are you an engineering career victim? Are you ready for a promotion that never seems to materialize? Are others in your company passing you in salary, or position, or in their ability to get more interesting projects? Have you been shuffled off to the company sidelines because you are too specialized? Do you work in constant fear of being laid off? Do you suffer from the negative thinking and "can't do" attitudes of your co-workers? Are you bored or underutilized in your work? Do you want more say about the way things get done? And most important, are you getting the most mileage out of your knowledge and abilities? Chapter 1 shows you how to leave all these problems behind by becoming a consultant!

CASH IN ON YOUR UNIQUE SKILLS!

Have you worked long and hard to attain your technical skills? You deserve to cash in on them! In Chapter 2, I tell you why you must assume responsibility for your own advancement and explain why it is so hard to do that within someone else's company. You will learn why technical abilities are only half the story and why you must learn certain business skills if you want professional independence.

I show you why you never have to worry about competition if you develop the ability to find situations that match your skills. I tell you how I beat the big-time consulting companies by finding a project that matched my skills exactly! And in Chapter 15, I show you how to develop new areas that expand your capabilities.

MARKETING SECRETS MY BOSS NEVER TOLD ME

Want to make your customers eager to obtain your services? It's not easy, but it can be done by learning how to be an expert in something they just happen to want. You're not selling oranges, and the way you create demand is different from the techniques used by your neighborhood grocer. The financial rewards are spectacular for those who learn the tricks. In Chapters 4, 5, and 6, you learn the real story behind the marketing of technical consulting.

DEALING WITH CLIENTS IS A SNAP—IF...

you know what you're doing. This book gives you a crash course on client relations. You learn the techniques for putting both your customer and your self at ease. I tell you about my "one-over" method of dressing for client visits, and give you my list of things not to be done—"nevers" that could save your professional rear end! Finally, in Chapter 11, I show you how to negotiate with the client, how to deal with unrealistic client expectations, and how to build the kind of trust and customer satisfaction that keeps 'em coming back for more of what you have to offer.

THIS BOOK TELLS YOU HOW TO GET STARTED FROM GROUND ZERO

Many business advisers have limited vision. They can tell you about some thing only if it already exists. Well, chances are that you are not already a consultant, and you're wondering what the first steps are. This book gives you sufficiently detailed guidance to make a smooth transition to consulting. For example, in Chapter 7, you'll learn how to sharpen your sales abilities. I'll show you my "secret weapon" that makes clients salivate with interest! The financial aspects of starting a practice are concisely explained in Chapter 12. I'll tell you why a business plan is vitally important in starting your company. You'll get an idea of typical start-up costs for office and equipment and learn the tradeoffs in locating an office in your home versus commercially rented space. In Chapter 14, I'll help you write a brochure for your new business that will display your "wares" and credentials to maximum benefit.

YOU CAN CREATE YOUR OWN FUTURE

If you are stuck in a go-nowhere job, it may seem hard to believe that you have any control over your future. But with some encouragement and self-understanding, you can set your goals and "engineer" your own future! In Chapter 15, I'll tell you about my experiences with goal setting. In becoming a consultant, you are not pursuing a single business goal, but a whole hierarchy of them. What's so special about this way of describing goals? It shows very clearly which goal is the one you must tackle first! And it shows why you can't help but reach your highest professional goals if you follow the planning and evaluation guidelines.

HOW MUCH ARE YOU WORTH?

Many engineers and technical people go through training every bit as intensive and demanding as doctors and lawyers, but they can't seem to make their unique background pay off. Instead, they stick with low-paying positions in large firms and feel sorry for themselves. It doesn't have to be that way! You can earn in excess of \$100 per hour by selling your specialized technical abilities!

I remember being told by a well-intentioned boss many years ago, "We think your performance this past year has been

spectacular. But we can't give you a raise, because money is tight this year and because you are already at the top of the salary schedule for your level..." When you become your own business entity, your worth is not limited by a salary schedule or any other factor that is unrelated to your actual contribution. As a consultant, you can also pyramid your wealth by expanding into a multiperson company—your company—or by collecting lucrative commissions for deals that you put together. Your income is limited only by the scope of your entrepreneurial vision and initiative!

PROPOSALS AND CONTRACTS

Afraid of writing proposals? Don't be! They are your key to winning high income, and they are your chance to show that you can do the job better than your competitors.

In Chapter 8, I explain the basics of proposal writing for the technical consultant. You learn what to say, how to phrase it, and how to price your efforts. I illustrate the subject with real-life proposals, contracts, and quotation letters to give you a concrete idea of the formats. Things are much easier when you have straightforward examples to follow!

A BOLD STATEMENT ABOUT THE REWARDS OF CONSULTING

Are the rewards of consulting worth the effort? Let me answer the question this way: In all my years of engineering, I have never met a person who was happy working for another company after being his own boss! Never! Once a person has tasted professional independence, experienced the monetary benefits, and felt the power of determining his own future, he will never go back to a lesser situation!

IS CONSULTING FOR YOU?

I think consulting is absolutely the best career path available to engineers and technical specialists, but it may not be everybody's answer to professional satisfaction. For some, the needed combination of talents, credentials, and attitudes is simply not there, or is too difficult to obtain. For others, the desire to be a part of a larger business organization may be more important than professional independence and high income. To find out if consulting is for you, turn to the unique self-appraisal quiz given in Chapter 17.

Title	Location	Edition / Series / Misc.
84 Interfacial Forces and Fields: Theory and Applications Author: Jyh-Ping, Hsu (editor) Publish.: Marcel Dekker, Inc. - place: New York, NY - date: ©1999 Subject: Surface chemistry Desc: xi, 671 p., illus., 24 cm.	Dynix: 89750 Call No.: 541.33 In ISBN: 0824719646 Shelf Adult Non-Fiction	Edition: Series: Surfactant Science Series: Vol. 85 Year: 1999 Price: \$193.50

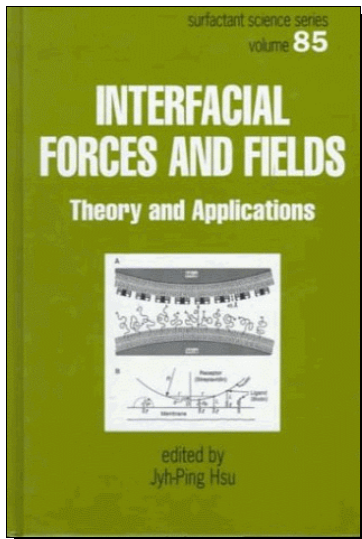


Table of Contents

- Preface
 Contributors
 1. Structural Properties of Colloidal Suspensions (Jose Luis Arauz-Lara)
 2. Thermodynamics of Microporous Material Formation (Freddy A. Romm)
 3. Electrical Double Layer Structure and Interactions: Methods for Nonideal Surfaces (S. J. Miklavcic)
 4. Electrical Double Layer at the Metal Oxide--Electrolyte Interface (Wladyslaw Janusz)
 5. Electrical Double Layer Structure, Forces, and Fields at the Clay--Water Interface (Garrison Sposito and Domenico Grasso)
 6. Electrostatic Forces Between Particles and Planar Interfaces (Ronald J. Phillips)
 7. Electrical Interactions Between Charged Membrances (Yung-Chih Kuo and Jyh-Ping Hsu)
 8. Adhesive Interactions Between Polymer Surfaces in Water (Yoshikimi Uyama, Emiko Uchida and Yoshito Ikada)
 9. Long-range Force Contributions to Surface Dynamics (Soo-Jin Park)
 10. Image Forces at Charged Dielectric Plates (S. Yu. Shulepov)
 11. The Stability of Charged Colloids (Lena Sjoström)
 12. Kinetic Models of Colloid Aggregation (Kevin H. Gardner)
 13. Interactions Between Colloidal Particles (Douglas Henderson and Darsh T. Wasan)
 14. Boundary Effects and Particle Interactions in Electrophoresis (Shing Bor Chen and Huan J. Keh)
 15. The Nonprimitive Model of the Electric Double Layer at a Metal/Aqueous Electrolyte Interface (S. Levine)
 Index

Subjects

333 .	Surface chemistry
383 .	Interfaces (Physical sciences)

Reviews - Synopsis - Dust Jacket

Book News, Inc.
 Reference and textbook introduces typical problems associated with particle-particle, particle-surface, and surface-surface interactions, concentrating on solid phases dispersed in a liquid phase, featuring a systematic presentation of the physical and mathematical models established over the last 50 years. Discusses how theoretical analyses are conducted in practical situations, offering examples of practical applications in such fields as wastewater management and high-tech semiconductor processing. -- Copyright © 1999 Book News, Inc., Portland, OR All rights reserved
 Journal of the American Chemical Society, 2000
 "...book's scope has applications for both scientists and engineers... In addition, the book is invaluable to students of colloidal science."

Title	Location	Edition / Series / Misc.
670 Interior Water-Based Trade Paint Formulations		Edition:
Author: Flick, Ernest W.	Dynix: 13000	Series:
Publish.: Noyes Data Corporation	Call No.: 667.63 FI	
- place: Park Ridge, NJ	ISBN: 0815508034	
- date: ©1980	Shelf Adult Non-Fiction	Year: 1980
Subject: Emulsion paint		Price: \$25.00
Desc: xvii, 364 p., 25 cm.		

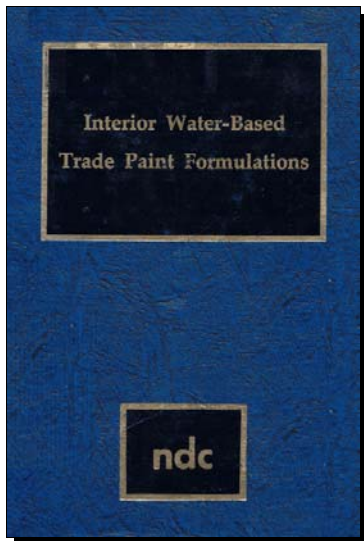


Table of Contents

- Introduction
- Section I: Interior Flat Paints
- Section II: Interior Semigloss Paints and Enamels
- Section III: Interior Gloss Paints and Enamels
- Section IV: Interior Eggshell and Satin Finish Paints and Enamels
- Section V: Miscellaneous Interior Paints, Enamels and Primer-Sealers
- Section VI: Floor Paints and Enamels
- Section VII: Interior or Exterior Paints and Enamels
- Section VIII: Trademarked Raw Materials
- Section IX: Base Chemical Descriptions
- Section X: Suppliers' Addresses

Reviews - Synopsis - Dust Jacket

FOREWARD

This book of 305 interior water-based trade paint formulations has been compiled for the paint industry. It will be of value to technical and managerial personnel in paint manufacturing companies and companies which supply raw materials or services to these companies. This book will be useful to both those with extensive experience as well as those who are novices in the field.

The data consist of selections of manufacturers formulations made at no cost to, nor influence from, the makers or distributors of these materials.

Subjects

256 . Emulsion paint

Only the most recent data have been included. Only trade sales water-based formulations are included. Any solvent contained is in the form of high boiling point modifiers.

The table of contents is organized in such a way as to serve as a subject index.

INTRODUCTION

This book is a compilation of 305 interior trade sales water-based paint formulations. It is the result of information received from numerous industrial companies and other organizations. The data represent selections from manufacturers' descriptions made at no cost to, nor influence from, the makers or distributors of these materials. Only the most recent formulas have been included. I believe that all of the trademarked raw materials listed here are currently available, which will be of utmost concern to readers who are familiar with the raw material shortages and discontinuances of recent years.

There are no lead-containing raw materials in any of the formulations. Only water-based formulations are included and any solvent contained is in the form of high boiling point modifiers, which fact will be of interest to readers concerned with OSHA, EPA and CARB regulations.

The formulations in this book are divided into the following seven sections:

- Section I Interior Flat Paints
- Section II Interior Semigloss Paints and Enamels
- Section III Interior Gloss Paints and Enamels
- Section IV Interior Eggshell and Satin Finish Paints and Enamels
- Section V Miscellaneous Interior Paints, Enamels and Primer-Sealers
- Section VI Floor Paints and Enamels
- Section VII Interior or Exterior Paints and Enamels

Each formula is indexed in the section which is most applicable. The reader, if he is seeking a formula for a specific end use, should check each section which could possibly apply. In addition to the above, there are three other sections which will be helpful to the reader:

Section VIII: A chemical trademark section where each tradenamed raw material included in the book is listed with a chemical description and the supplier's name. The specifications which each raw material meets are included, if applicable.

Section IX: A base chemical description section listing all the latexes and alkyds which are found in the formulations, plus any other related ones from the suppliers which we consider to merit attention for trade sales paints. It is the most reliable compilation we could derive and is based on the best information we could obtain from our data. This section lists chemical type, average physical property test data and the key outstanding properties for each base listed.

Section X: Main office addresses of the suppliers of trademarked raw materials, some of which are not available in the usual reference books.

Each formulation in this book lists the following information, which has been standardized as much as possible:

- (1) Description of end use and most outstanding properties.
- (2) Base chemical and modifier(s) in the heading. The first chemical listed is the base. The chemical listed after the first slash is the major modifier. Another slash is used to indicate a secondary modifier, if applicable.
- (3) The formulas include the following:
 - (A) A listing of each raw material contained.
 - (B) A capsule description of each trademarked raw material or the name of any common chemical.
 - (C) The number of pounds of each raw material included in the formula, sometimes to a decimal figure.
 - (D) Conversion of the pounds to gallons, expressed as a decimal figure to hundredths.
 - (E) The total of each of the pound and gallon figures.
 - (F) Formulation notes which list formula modifications or improvements which may be made and any other formula suggestions.
 - (G) Physical constants of the finished formulation. These list the test results obtained on the formula, whenever available.
 - (H) Key properties of the formula, which are the features that the source considers to be more outstanding than other formulations of the same type.
 - (J) The formula source, which is the company or organization, that supplied the formula. The secondary source may be the originating company and/or the primary source publication title, or both. A formula number is included, if applicable.

Title	Location	Edition / Series / Misc.
791 Introduction to Coatings Technology Author: Brandau, Alan H. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1990 Subject: Coatings -- Periodicals Desc: 46 p., illus., 28 cm.	Dynix: 55947-15 Call No.: 667.9 Fe ISBN: 0934010242 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS15 Year: 1990 Price: \$50.00

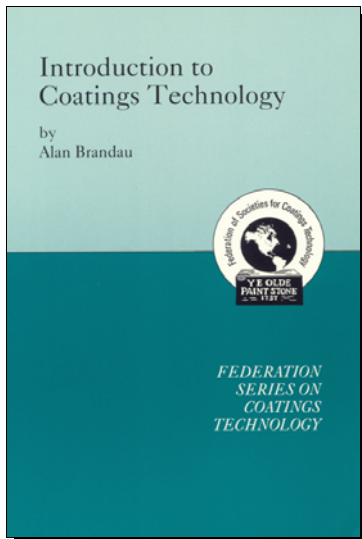


Table of Contents

- I. INTRODUCTION
 - A. Value of Coatings
 - B. Paint
 - C. Varnish
 - D. Stain
- II. HISTORY OF COATINGS
- III. COLOR
 - A. Metamerism
 - B. Shading
- IV. VIGMENTS
- V. SOLVENTS
- VI. PAINT ADDITIVES
 - A. Anti-Settling Agents
 - B. Anti-Skinning Agents
 - C. Defoamers and Antifoams
 - D. Dispersing and Emulsifying Agents
 - E. Driers
 - F. Preservatives and Fungicides
 - G. Ultraviolet Absorbers
 - H. Catalysts
 - I. Coalescing Agents
 - J. Surfactants
- VII. POLYMERS
 - A. Alkyd Resins
 - B. Polyester Resins
 - C. Polyurethane Resins
 - D. Phenolic Resins (Phenol-formaldehyde)
 - E. Epoxy Resins
 - F. Acrylic Resins
 - G. Polystyrene Resins
 - H. Fluorocarbon Polymers
 - I. Vinyl Resins
 - J. Amino Resins
 - K. Silicone Polymers
 - L. Cellulosic Resins
 - M. Emulsion or Latex Polymers
- VIII. BASIC PAINT MANUFACTURING
- IX. APPLICATION TECHNIQUES FOR COATINGS
 - A. Do-It-Yourself Application
 - B. Electrocoating
 - C. Coil Coating
 - D. Radiation Curable Coatings
 - E. Powder Coatings

Subjects

239 . Coatings

- F. Roll Coating
- G. Curtain Coating
- H. Spray Coating

X. COATINGS BY INDUSTRY

- A. Aerospace Coatings
- B. Marine Coatings
- C. Waterborne Coatings
- D. Trade Sales Paints
- E. Traffic Paint
- F. Coatings for Plastics
- G. Container Coatings
- H. Automotive Coatings

XI. HAZARDOUS MATERIALS

- A. Lead
- B. Mercury
- C. Vinyl Chloride
- D. Isocyanate
- E. Methylene Chloride
- F. Chromium
- G. Toluene and Xylene
- H. VOC (Volatile Organic Compounds)

XII. CORROSION

- A. Chromates
- B. Phosphates
- C. Borates
- D. Ferrites
- E. Molybdates
- F. Ion Exchange Resins
- G. Rare Earth Metals
- H. Tannins

XIII. DETERIORATION OF COATINGS

XIV. METAL PREPARATION

XV. COMPUTERIZATION OF COATINGS TECHNOLOGY

- A. Formula Databases
- B. Color Matching
- C. Solvent Blends
- D. Future Computer Applications
- E. Robotics Used in Coatings

XVI. FUTURE OF THE COATINGS INDUSTRY

XVII. REFERENCES

XVIII. BIBLIOGRAPHY

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

The objective of this monograph is to provide the reader with a general understanding and basic overview of the Coatings Industry. The author hopes to provide information on the large spectrum of coatings applications as well as the chemistry of the many systems that are used to satisfy unique application demands. The evolution of coatings will be reviewed as new technology and governmental regulation direct the industry's course.

Since this is the introductory monograph to an impressive series of monographs which review many of the same topics in much greater detail, the scope of this writing provides general knowledge easily understood by experienced coatings professionals as well as by individuals with no coatings experience.

- A. Value of Coatings

The average consumer normally does not appreciate the value of coatings. For example, when people admire the finish on a brand new car, they say, "What a beautiful car," not "What a beautiful finish." This is also true of houses and many other objects and yet that same coating, that is essential to the beauty and protection of those objects, represents only a fraction of a percent of the object's cost. This phenomenon is even more true of products such as interior beverage container coatings. Without the coating, the taste would be unacceptable and even the safety of the beverage would not be possible, but most consumers do not know that the container's interior was even coated. It is fair to say that coatings are taken for granted, or "get no respect," but, nevertheless, are essential to our way of life.

There are, of course, many coatings applications that are obvious, such as house paint, metal coatings for automobiles, appliances, aluminum siding, etc., but there are also many applications that are not as obvious but no less important. The majority of the paint on an aircraft, for example, is not visible. The entire superstructure of an aircraft is actually coated to prevent corrosion even before assembly. This is done to insure that high performance adhesives, used together with rivets, do not lose their bond due to corrosion. There are fluids, such as jet fuel and Skydrol hydraulic fluid, that can accelerate the corrosion process. Camouflage and radar absorbing coatings, used for military aircraft, are further examples of coatings which are not so obvious to the eye of the general consumer.

Other coatings we may not think of are: clear protective conformal coatings on circuit boards, coatings on fiber optic cables, lenses, decorative brass and aluminum, multitudes of coated plastic products, strippable coatings to protect finishes, release coatings, and paper coatings, to name a few.

B. Paint

Paint is a pigmented coating layer on a substrate that is applied by brush, roller, spray, or other techniques. The basic components in paint are the vehicle (resin binder), solvent (except in 100% solids coatings), pigment (except for clear coatings), and additives. For the most part, paint is used for either protective or decorative applications or for both.

Curing of a paint can be defined as the chemical reactions which occur as the coating is drying. The reactions result in significant increases in physical strength and chemical resistance of the coating film. A coating film that has cured cannot be easily dissolved by the same solvents used in the liquid coating.

Coatings are cured in a variety of ways depending on the application and the associated requirements. The vehicle and its properties dictate the curing mechanism used. Consumer house paint is cured by the evaporation of the solvent after application to the substrate. Most industrial coatings are cured through polymerization initiated by catalysis, stoving (oven baking), or through a form of radiation. These processes will be discussed in more detail later in this monograph.

C. Varnish

Varnishes are basically unpigmented liquid compositions which are converted to a transparent solid film after application by either solvent evaporation or chemical reaction. The purpose of a varnish is to protect an interior or exterior substrate surface without hiding the surface appearance. A varnish enhances the appearance of the substrate by yielding a uniform smooth gloss.

A major problem with many exterior varnishes is fading and yellowing when exposed to ultraviolet radiation which can be minimized by using UV absorbers. Historically, exterior varnishes were formulated with tung oil and phenolic resins. Currently, exterior varnishes are most often urethane based systems.

At one time, interior floor varnishes were primarily shellac but now urethanes, epoxies, and alkyds are utilized. Shellacs are alcohol soluble resins which are derived from secretions of the lac beetle found in quantity in China and India.

D. Stain

Stain is neither paint nor varnish, but instead a coating that falls in between both that is designed for poor hiding. The object of a stain is to provide protection as well as to furnish a transparent color to a wood substrate while still showing the graining of the wood. This is accomplished by using a limited amount of pigmentation that could be either semi-transparent or opaque but without the hiding that paint provides.

Exterior stains utilize pigments that do not deteriorate in an exterior environment such as titanium dioxide, carbon black, and iron oxide. Interior stains are formulated with organic dyes and less expensive pigments. The color and type of wood stained will affect the color of the finished substrate, as can be seen on stained wood samples normally on display in paint retail establishments.

Besides having faster drying times and easier clean-up features, exterior latex stains also yield a more uniform surface gloss than solvent based stains and will also remain more flexible and, therefore, more durable. Solvent based stains still outsell latex stains by a two to one margin, but the steady trend toward latex stains is growing. This is due to both

increased consumer awareness of the quality of latex stains and manufacturers dropping many of their solvent based lines to comply with governmental regulations.

Title	Location	Edition / Series / Misc.
85 Introduction to Paint Chemistry and Principles of Paint Technology		Edition: 2nd edition
Author: Turner, G. P. A. (Gerald Patrick Anthony)	Dynix: 12996	Series:
Publish.: Chapman and Hall	Call No.: 667.6 Tu	
- place: New York, NY	ISBN: 041216180X	
- date: ©1980	Shelf Adult Non-Fiction	Year: 1980
Subject: Paint		Price: \$25.00
Desc: 229 p., illus., 23 cm.		

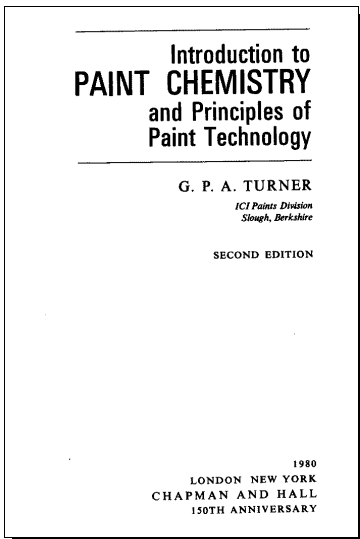


Table of Contents

Preface to the second edition
 Acknowledgements
 Units

PART ONE: GENERAL SCIENCE

1. Atoms to equations
2. Inorganic chemistry
3. Organic chemistry: Paraffins to oils
4. Organic chemistry: Ethers to isocyanates
5. Solid forms
6. Colour

PART TWO: APPLIED SCIENCE

7. Paint: First principles
8. Pigmentation
9. Solvents
10. Paint additives
11. Lacquers, emulsion paints and non-aqueous dispersions
12. Oil and alkyd paints
13. Thermosetting alkyd, polyester and acrylic paints based on nitrogen resins
14. Epoxy coatings
15. Polyurethanes
16. Unsaturated polyesters and acrylics

Appendix: Suggestions for further reading
 Index

Subjects

276 . Paint

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The second edition of this book continues to offer a unique combination of relevant aspects of chemistry and physics and a study of paint technology.

The book is divided into two parts. The first covers the basic science without assuming any prior knowledge on the reader's part. In the second part, chapters are devoted to paint composition and formulation, drying mechanisms, paint ingredients such as solvents, pigments and additives, and paint coatings. Throughout the author emphasizes the factors which govern the choice of a particular paint for a particular job.

This second edition has been thoroughly up-dated and all the major technical developments over the past 13 years are covered. These include a fuller treatment of electrodeposition coatings and non-aqueous dispersions; emphasis on non-polluting, petroleum-conserving coatings; waterborne, high-solids, radiation curing and powder coatings and a fuller coverage of newer resins. Throughout, points of safety and toxicity have been emphasized.

The author has had wide experience of research in the paint industry and in the teaching of paint science. Thus, this book continues to be ideal for the aspiring paint technologist or new comer to the paint industry, and to anyone involved in the use, specification or selling of paint.

Preface to the Second Edition

Introduction to Paint Chemistry was first published in 1967 with the intention of providing both a textbook for students and an introduction to the subject for those with little or no technical knowledge. This remains the objective of the second

edition, in which I have attempted a complete revision, to take account of all the developments which have occurred in over a decade.

As before, the reader should absorb as much of Part One as he or she feels necessary. It is worth noting, however, that the topics in it are specially selected from a paint point of view and that, for example, detail on oils in Chapter 3, on polymers in Chapter 5 and on light and colour in Chapter 6 could well be missing in some Chemistry degree courses.

Part Two begins with four chapters applicable to paints of every sort and then goes on to six particular paint systems, covering the greater part of paints and varnishes in current use. The classification of paints within these six chapters is largely by drying mechanism. Thus the important family of acrylic finishes does not get a chapter to itself, since the drying mechanisms of the seven types of acrylic coating covered in this book are all different and not essentially acrylic mechanisms. The finishes are described in Chapters 11, 13, 14, 15 and 16. Again, there is no chapter on water-based paints, since water-based paints may be made from a variety of chemically different water-soluble or water-dispersible resins and require no special techniques of formulation. The techniques for making resins soluble or dispersible in water are described in Chapters 9 and 11 and exemplified in other chapters.

The Appendix contains suggestions for further reading and I hope that the Index will be sufficiently full to allow quick and easy reference back to any topic covered earlier in the book.

Title	Location	Edition / Series / Misc.
792 Introduction to Pigments Author: Braun, Juergen H. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1993 Subject: Pigments -- Periodicals Desc: 34 p., illus., 28 cm.	Dynix: 55947-19 Call No.: 667.9 Fe ISBN: 0934010269 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS19 Year: 1993 Price: \$50.00



Subjects

293 . Pigments

Table of Contents

- I. INTRODUCTION
- II. PIGMENTS WITHIN PAINT FILMS
 - A. Qualitative Description
 - B. Quantitative Concepts
 - 1. Pigment to Binder Ratio
 - 2. Pigment Volume Concentration
 - 3. Critical Pigment Volume Concentration
 - 4. Reduced Pigment Volume Concentration
- III. OPTICS, APPEARANCE AND AESTHETICS
 - A. Hiding
 - B. Color
 - C. Aesthetics and Value
- IV. LIGHT SCATTERING AND BRIGHTNESS
 - A. White Pigments
 - 1. Compounds
 - 2. Light Scattering
 - 3. Size
 - 4. Crowding and Orientation
 - 5. Titanium Dioxide Pigments
 - a. Pigment Grades
 - b. Crystal Phase
 - c. Commodity Composition
 - d. Particle Size
 - e. Surface
 - f. Color
 - 6. Titanium Dioxide Substitutes
 - B. Hiding By Voids
 - C. Extenders
- V. LIGHT ABSORPTION AND COLOR
 - A. Color Pigments
 - 1. Compounds
 - 2. Particle Size
 - 3. Surface
 - 4. Crystal Phase
 - 5. Commodity Composition
 - B. Black Pigments
- VI. SPECIALTY PIGMENTS
 - A. Metallic and Pearlescent Pigments
 - B. Opalescent Pigments
- VII. PERFORMANCE OF PIGMENTS
 - A. Dispersibility
 - B. Durability
 - C. Gloss
 - D. Pigment Interactions

VIII. MEASUREMENT OF PERFORMANCE

- A. Optical Performance
 - 1. Pigment Strength
 - a. Contrast Ratio
 - b. Tinting Strength
 - c. Kubelka-Munk Measurements
- B. Durability
 - 1. Color Pigments
 - 2. Coatings
- C. Chemical and Mechanical Performance

IX. OUTLOOK

X. ACKNOWLEDGMENTS

XI. REFERENCES

XII. BIBLIOGRAPHY

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Surfaces have been decorated with coatings since the beginnings of human history. In Babylon, surface coatings were produced in mass. Artisans' ways, protective of skill and secretive about knowledge, dominated the manufacture of coatings for 4000 years. Paint science, by contrast, had its beginnings only 40 years ago when Asbeck and VanLoo explained paint performance in terms of film geometry. Because of the industry's history, its art is long on know-how but short on know-why. Thus, the paint literature is fragmented into details with focus on chemical features that are irrelevant to pigment function.

We hope to help catalyze the transition from art to technology, ultimately to help the coating technologists formulate better coatings at lower cost. Toward this objective, we will attempt to present a holistic view of pigment technology. We will survey, explain, compare, and distinguish the common elements and the important differences between pigment classes and their functions. We shall do so from a consumer's rather than producer's perspective and ask:

- What characterizes the environment in which pigments function?
- How does "white" differ from "color"?
- What particle characteristics affect pigment function?
- What are the secondary qualities and the detriments of pigments?
- How well can one measure and control pigment performance?

The specifics of commercial pigments will be left to other, more readily available sources.

Our subject is Pigment — "a powdered substance that is mixed with a liquid in which it is relatively insoluble and used to impart [black or white or a] color to coating materials." We will include extenders and the decorative specialty pigments. Corrosion resistant pigments do not fall under Webster's definition and will be ignored.

To perform as a pigment, a substance must:

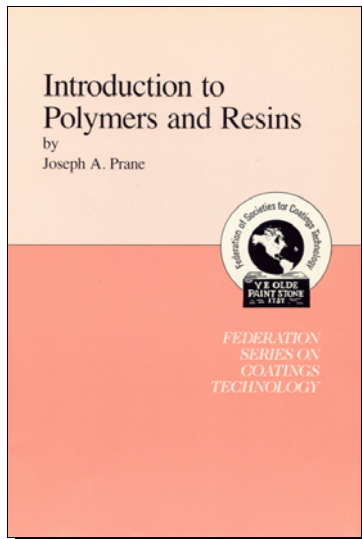
1. Have truly extreme optical characteristics: refractive or absorption indices;
2. Be smaller than about 10 microns;
3. Be essentially insoluble in water and most organic solvents; and
4. Be chemically inert.

Because pigments perform as finely divided, crystalline solids, particle size, crystal structure and surface characteristics are important to function, must be controlled during pigment manufacture, and must be preserved through coatings production and application.

Low solubility and low reactivity combine toward relatively low toxicity and low handling hazards. Low density helps

toward favorable economics since pigments function by volume but are sold by weight. Much of a pigment's chemistry is not relevant to pigment function.

Title	Location	Edition / Series / Misc.
793 Introduction to Polymers and Resins		Edition:
Author: Prane, Joseph W.	Dynix: 55947-03	Series: Federation Series on Coatings
Publish.: Federation of Societies for Coatings Technology	Call No.: 667.9 Fe	Technology: No. FS3
- place: Philadelphia, PA	ISBN: 0934010285	
- date: ©1986	Shelf Reference	Year: 1986
Subject: Polymers -- Periodicals		Price: \$50.00
Desc: 35 p., illus., 28 cm.		



Subjects

313 . Polymers

Table of Contents

- I. INTRODUCTION
 - A. Importance of Polymeric Materials in the Coatings Industry
 - B. Brief History of Natural and Synthetic Polymers
- II. TERMINOLOGY
 - A. Monomers
 - 1. Functionality
 - 2. Monomers with More Than One Functional Group
 - B. Polymers — General
 - C. Homopolymers, Copolymers
- III. CLASSIFICATION, TYPES, MECHANISMS
 - A. Polymerization Methods
 - 1. Addition Polymerization
 - 2. Condensation Polymerization
 - 3. Rearrangement Polymerization
 - 4. Copolymerization
 - 5. Block and Graft Copolymers
 - 6. Ionic Polymerization
 - 7. Coordination Catalyst Polymerization
 - 8. Group Transfer Polymerization
 - 9. Other Polymerization Methods and Selected Polymers
 - B. Polymerization Media and Techniques
 - 1. Bulk Polymerization
 - 2. Solution Polymerization
 - 3. Suspension Polymerization
 - 4. Emulsion Polymerization
 - C. Polymer Curing Methods; Crosslinking
 - 1. Air Dry
 - 2. Forced Dry
 - 3. Thermal Cure
 - 4. Chemical Cure
- IV. MOLECULAR WEIGHT OF POLYMERS
 - A. Number-Average Molecular Weight
 - B. Weight-Average Molecular Weight
 - C. Molecular Weight Distribution
 - D. Molecular Weight Measurement
 - 1. End-Group Analysis
 - 2. Colligative Property Measurement
 - 3. Light Scattering
 - 4. Ultracentrifuge
 - 5. Solution Viscosity
 - 6. Gel Permeation Chromatography
- V. POLYMER STRUCTURE
 - A. Polymer Morphology
 - B. Polymer Tacticity
 - C. Phase Transition in Polymers
 - 1. Melting Point
 - 2. Glass Transition

D. Other Polymer Measurements

VI. SUMMARY, FUTURE TRENDS

VII. REFERENCES

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

A. Importance of Polymeric Materials In the Coatings Industry

Polymers are chain-like molecules of high molecular weight (also called macromolecules); they are comprised of repeating structural units joined by covalent bonds. Polymers are built up from smaller, simpler molecules called monomers. A different monomer, or combination of monomers, is used to make each specific type or family of polymers used in the coatings and allied industries.

The term "resin" is often used to refer to any material in the polymeric state. Originally, the use of the word resin was restricted to natural products, e.g., rosin (derived from pine trees or tall oil). However, it has become common to use the term to include synthetic macromolecules, particularly precursor polymers, such as epoxy resins and novolak phenolics. The latter are prepared from formaldehyde with excess phenol (as explained later). These precursors are subsequently chemically reacted to produce industrially useful higher polymers.

Two other terms — binder and vehicle — are commonly used to describe the liquid portion of a paint or coatings composition that is used to bind (by dispersion) pigmentary materials, and to carry them in dispersion through subsequent stages of manufacture, storage, application, and performance. Polymers are almost always the major functional ingredient of binders and vehicles; they are present initially in the binder, or are formed during the subsequent drying or curing process.

Polymers are the heart of the coatings formulation. Their properties govern to a great extent the properties and performance of the finished coatings composition, e.g., hardness, strength, elongation, adhesion, chemical resistance, exterior durability, etc. Indeed, the improper choice of polymer and/or curing system can have adverse and drastic effects on the performance of coatings derived there from.

B. Brief History of Natural and Synthetic Polymers

Natural polymeric products, e.g., pitch, milk, egg white, gum arabic, and beeswax were known to the ancient Egyptians and Greeks. In combination with minerals, these products were used to prepare coating compositions for walls, burial chambers, etc. During the Middle Ages, linseed oil (from flax) began to be used by artists in painting.

The monk, Theophilus, in the 11th century, described the preparation ("cooking") of a varnish from linseed oil and a gum called "Fornis" (which may have been rosin or amber). In 1773, in England, varnish compositions were published using copal and amber resins, with linseed, walnut, hempseed, and poppy seed oils, and with turpentine as the solvent. (Copal is a resin or gum derived from fossil exudation of trees. Amber is a form of resin from an extinct variety of pine tree.)

Table 1 lists chronologically the approximate introduction dates of the most important synthetic polymers for coatings. The key polymers listed are phenolics, alkyds, acrylics, epoxies, and urethanes; these polymers form the backbone of the coatings industry.

Table 1 — Coatings Polymers — Milestone Events

Year	Polymer
1907	Phenol-formaldehyde resins patented
1912	Acrylic resins patented
1913	Rosin-modified phenolic resins
1915-1920	Other modified phenolic resins
1920	Nitrocellulose resins for lacquers
1921-1925	Alkyd resins
	Maleated rosin varnish gums
1926-1930	Oil soluble phenolic resins
1930	Chlorinated rubber
1930-1935	Urea formaldehyde resins, combined with alkyd resins

	Vinyl chloride polymers
	Oil-based emulsions for paints
1935	Polyvinyl butyral (in wash primers)
1940	Melamine formaldehyde resins
1941-1945	Styrenated, acrylated and cyclopentadiene-reacted oils
1944	Silicone resins and polymers
1946-1950	Styrene-butadiene polymers for emulsion paints
	Polyvinyl acetate for emulsion paints
1947-1950	Epoxy resins
1950	Unsaturated polyester resins
1951-1955	Epoxy/polyamide blends
1951	Acrylic polymers for emulsion paints
1954	Thixotropic alkyd resins
1955	Water soluble/dispersible thermosetting resins, (e.g., alkyds, acrylics)
1956-1960	Urethane oils and alkyds
	Thermoplastic acrylics — for lacquers
	Thermosetting acrylics — for enamels
	Silicone copolymers
	Powder coatings — fluidized bed patent
1961-1965	Epoxy, acrylic and other resins— <i>anodic electrodeposition</i>
	Fluoropolymers
1966-1970	Ultraviolet and electron beam curable polymer coatings
	Non-aqueous dispersions, e.g., acrylics
1970-1975	Epoxy, acrylic, and other resins — <i>cathodic electrodeposition</i>
	Autophoretic polymers
	Interpenetrating networks
1976	Acrylic, polyester and urethane oligomers — for high solids coatings
1983	Group transfer polymerization

Table 2 lists most of the polymers currently used in coatings (often in combination with each other). Those which are of natural origin are so identified; the remainder are synthetic polymers. The list is large, but certainly not all-inclusive.

Table 2 — Polymers Used in Coatings

Vegetable and marine oils*	Vinyl acetate resins
Shellac*	Polyvinyl acetals
Oleoresinous varnishes	Polyvinyl ethers
Alkyd resins	Silicones
Polyesters	Polyurethanes
Acrylic resins	Fluoropolymers
Cellulosics	Polyamides
Maleic resins	Polyolefins
Phenolic resins	Ionomers
Epoxy resins	Polybutadiene
Amino resins	Polyimides
Elastomers	Polyamide-imides
Natural resins*	Polyester-imides
Pine-derived resins*	Polybenzimidazoles
Petroleum resins*	Polyphenylenes
Polyketones	Polyphenylene oxide
Styrene resins	Polycarbonates
Vinyl chloride resins	Polysulfones

* - Polymers of natural origin

Imports into Europe from the Far East in the 17th century included tables and other wooden objects finished with Oriental lacquer (or Chinese lacquer). This lacquering technique is believed to have been developed in China during the Chou dynasty (1169-255 B.C.). The functional basis for this lacquer is an unsaturated phenol, Urushiol, which is an ingredient of the sap of the Chinese tree, *Rhus Vernicifera*.

Until the beginning of the 20th century, man had done little to improve on the natural materials available to him for the production of protective coatings. Starting with the work of Dr. Leo Baekeland with phenolic resins in the early 1900's, the development of synthetic polymers for coatings proceeded rapidly. Much of the progress in synthetic polymers can be attributed to the pioneering work of Staudinger in Germany (1920), Carothers (1929) and Flory (1937) in the U.S.

Title	Location	Edition / Series / Misc.
45 Kirk-Othmer Encyclopedia of Chemical Technology		Edition: 3rd edition
Author: Grayson, Martin (executive editor)	Dynix: 16482	Series:
Publish.: Wiley - Interscience Publishers	Call No.: 660.3 En 1984 ind	
- place: New York, NY	ISBN: 0471041548	Year: 1978
- date: ©1984, 1978	Shelf Reference	Price: \$50.00
Subject: Chemistry, Technical -- Dictionaries		
Desc: 24 v., illus., diagrams., 27 cm.		

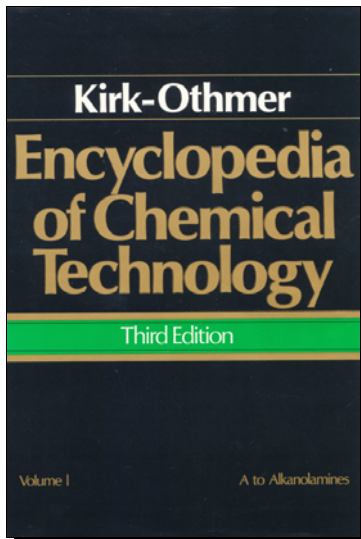


Table of Contents

Abherents
 Ablative materials
 Abrasives
 Absorption
 Acetal resins
 Acetaldehyde
 Acetic acid
 Acetone
 Acetylene
 Acetylene-derived chemicals
 Acrolein and derivatives
 Acrylamide
 Acrylamide polymers
 Acrylic acid and derivatives
 Acrylic and modacrylic fibers
 Acrylic ester polymers
 Acrylonitrile
 Acrylonitrile polymers
 Actinides and transactinides
 Adhesives
 Adipic acid
 Adsorptive separation
 Aerosols
 Air conditioning
 Air pollution
 Air pollution control methods
 Alcohols, higher aliphatic
 Alcohols, polyhydric
 Aldehydes
 Alkali and chlorine products
 Alkaloids
 Alkanolamines
 Alkoxides, metal
 Alkyd resins
 Alkylation
 Alkylphenols
 Allyl compounds
 Allyl monomers and polymers
 Aluminum and aluminum alloys
 Aluminum compounds
 Amides, fatty acid
 Amine oxides
 Amines
 Amines by reduction
 Amino acids
 Amino resins and plastics
 Aminophenols
 Ammonia
 Ammonium compounds
 Amorphous magnetic materials

Subjects

231 . Chemistry, Technical --
Dictionaries

Amyl alcohols
Analgesics, antipyretics, and anti-inflammatory agents
Analytical methods
Anesthetics
Anthraquinone
Anthraquinone derivatives
Anti-asthmatic agents
Antibacterial agents, synthetic
Antibiotics
Blood fractionation
Blood, coagulants and anticoagulants
Boron compounds
Boron, elemental
Brake linings and clutch facings
Brighteners, fluorescent
Bromine
Bromine compounds
BTX processing
Burner technology
Butadiene
Butyl alcohols
Butylenes
Butyraldehyde
Cadmium and cadmium alloys
Cadmium compounds
Calcium and calcium alloys
Calcium compounds
Calorimetry
Carbamic acid
Carbides
Carbohydrates
Carbon
Carbon dioxide
Carbon disulfide
Carbon monoxide
Carbonated beverages
Carbonic and chloroformic esters
Carbonyls
Carboxylic acids
Cardiovascular agents
Castor oil
Catalysis
Catalysis, phase-transfer
Cellulose
Cellulose acetate and triacetate fibers
Cellulose derivatives, esters
Cellulose derivatives, ethers
Cement
Centrifugal separation
Ceramics
Ceramics as electrical materials
Cerium and cerium compounds
Cesium and cesium compounds
Chelating agents
Chemical grouts
Chemicals from brine
Chemicals in war
Chemiluminescence
Chemotherapeutics, anthelmintic
Chemotherapeutics, antimetabolic
Chemotherapeutics, antimycotic and antitrichetisial
Chemotherapeutics, antiprotozoal
Chemotherapeutics, antiviral
Chemurgy

Chloramines and bromamines
Chlorine oxygen acids and salts
Chlorocarbons and chlorohydrocarbons
Chlorohydrins
Chlorophenols
Chlorosulfuric acid
Chocolate and cocoa
Choline
Cholinesterase inhibitors
Chromatography, affinity
Chromium and chromium alloys
Chromium compounds
Chromogenic materials
Cinnamic acid, cinnamaldehyde, and cinnamyl alcohol
Citric acid
Clathration
Clays
Coal
Coal conversion processes
Coated fabrics
Coating processes
Coatings, industrial
Coatings, marine
Coatings, resistant
Cobalt and cobalt alloys
Cobalt compounds
Coffee
Color
Color photography
Color photography, instant
Colorants for ceramics
Colorants for foods, drugs, and cosmetics
Colorants for plastics
Composite materials
Computers
Contact lenses
Contraceptive drugs
Coordination compounds
Copolymers
Copper
Copper alloys
Copper compounds
Cork
Corrosion and corrosion inhibitors
Cosmetics
Cotton
Coumarin
Crotonaldehyde
Crotonic acid
Cryogenics
Crystallization
Cumene
Cyanamides
Cyanides
Cyanine dyes
Cyanocarbons
Cyanoethylation
Cyanohydrins
Cyanuric and isocyanuric acids
Cyclohexanol and cyclohexanone
Cyclopentadiene and dicyclopentadiene
Defoamers
Deformation recording media
Dental materials

Dentifrices
Design of experiments
Deuterium and tritium
Dialysis
Diamines and higher amines, aliphatic
Diatomite
Dicarboxylic acids
Dietary fiber
Diffusion separation methods
Digital displays
Dimensional analysis
Dimer acids
Diphenyl and terphenyls
Disinfectants and antiseptics
Dispersants
Distillation
Diuretics
Driers and metallic soaps
Drycleaning and laundering
Drying
Drying agents
Drying oils
Dye carriers
Dyes and dye intermediates
Dyes, anthraquinone
Dyes, application and evaluation
Dyes, natural
Dyes, reactive
Dyes, sensitizing
Economic evaluation
Eggs
Elastomers, synthetic
Electrical connectors
Electrochemical processing
Electrodecentration
Electrodialysis
Electroless plating
Electrolytic machining methods
Electromigration
Electrophotography
Electroplating
Electrostatic sealing
Embedding
Emulsions
Enamels, porcelain or vitreous
Energy management
Engineering and chemical data correlation
Engineering plastics
Enzyme detergents
Enzymes, immobilized
Enzymes, industrial
Enzymes, therapeutic
Epinephrine and norepinephrine
Epoxidation
Epoxy resins
Esterification
Esters, organic
Ethanol
Ethers
Ethylene oxide
Ethylene
Evaporation
Exhaust control, automotive
Exhaust control, industrial

Expectorants, antitussives, and related agents
Explosives and propellants
Extraction, liquid—liquid
Extraction, liquid—solid
Extractive metallurgy
Fans and blowers
Fats and fatty oils
Feedstocks
Felts
Fermentation
Ferrites
Ferroelectrics
Fertilizers
Fiber optics
Fibers, chemical
Fibers, elastomeric
Fibers, vegetable
Fillers
Film and sheeting materials
Film deposition techniques
Filtration
Fine chemicals
Flame retardants for textiles
Flame retardants
Flavor characterization
Flavors and spices
Flocculating agents
Flotation
Fluid mechanics
Fluidization
Fluorine compounds, inorganic
Fluorine compounds, organic
Fluorine
Foamed plastics
Foams
Food additives
Food processing
Food toxicants, naturally occurring
Foods, nonconventional
Forensic chemistry
Formaldehyde
Formic acid and derivatives
Friedel-Crafts reactions
Fruit juices
Fuels from biomass
Fuels from waste
Fuels, survey
Fuels, synthetic
Fungicides, agricultural
Furan derivatives
Furnaces, electric
Furnaces, fuel-fired
Furs, synthetic
Fusion energy
Gallium and gallium compounds
Gas cleaning
Gas, natural
Gasoline and other motor fuels
Gastrointestinal agents
Gelatin
Gems, synthetic
Genetic engineering
Geothermal energy
Germanium and germanium compounds

Gilsonite
Glass
Glass-ceramics
Glassy metals
Glue
Glycerol
Glycols
Gold and gold compounds
Gravity concentration
Grignard reaction
Gums
Hafnium and hafnium compounds
Hair preparations
Hardness
Heat exchange technology
Heat stabilizers
Heat-resistant polymers
Helium-group gases
Helium-group gases, compounds
Herbicides
High pressure technology
High temperature alloys
High temperature composites
Histamine and histamine antagonists
Hollow-fiber membranes
Holography
Hormones
Hydantoin and derivatives
Hydraulic fluids
Hydrazine and its derivatives
Hydrides
Hydroboration
Hydrocarbon oxidation
Hydrocarbon resins
Hydrocarbons
Hydrogen
Hydrogen chloride
Hydrogen energy
Hydrogen peroxide
Hydrogen-ion activity
Hydroquinone, resorcinol, and catechol
Hydroxy carboxylic acids
Hydroxy dicarboxylic acids
Hydroxybenzaldehydes
Hypnotics, sedatives, and anticonvulsants
Imines, cyclic
Immunotherapeutic agents
Incinerators
Indium and indium compounds
Indole
Industrial antimicrobial agents
Industrial hygiene and toxicology
Information retrieval
Infrared technology
Initiators
Inks
Inorganic high polymers
Insect control technology
Instrumentation and control
Insulation, acoustic
Insulation, electric
Insulation, thermal
Insulin and other antidiabetic drugs
Integrated circuits

Iodine and iodine compounds
Ion exchange
Ion implantation
Ion-selective electrodes
Iron by direct reduction
Iron compounds
Iron
Isocyanates, organic
Isoprene
Isotopes
Ketenes and other related substances
Ketones
Laminated and reinforced metals
Laminated and reinforced plastics
Laminated materials, glass
Laminated wood-based composites
Lasers
Latex technology
Lead alloys
Lead compounds
Lead
Leather
Leatherlike materials
Lecithin
Light-emitting diodes and semiconductor lasers
Lignin
Lignite and brown coal
Lime and limestone
Liquefied petroleum gas
Liquid crystals
Liquid-level measurement
Lithium and lithium compounds
Itaconic acid
Lubrication and lubricants
Luminescent materials
Magnesium and magnesium alloys
Magnesium compounds
Magnetic materials, bulk
Magnetic materials, thin film
Magnetic separation
Magnetic tape
Maintenance
Maleic anhydride, maleic acid, and fumaric acid
Malonic acid and derivatives
Malts and malting
Manganese and manganese alloys
Manganese compounds
Market and marketing research
Mass transfer
Matches
Materials reliability
Materials standards and specifications
Meat products
Medical diagnostic reagents
Membrane technology
Memory-enhancing agents and antiaging drugs
Mercury compounds
Mercury
Metal anodes
Metal fibers
Metal surface treatments
Metal treatments
Metal-containing polymers
Metallic coatings

Methacrylic acid and derivatives
Methacrylic polymers
Methanol
Micas, natural and synthetic
Microbial polysaccharides
Microbial transformations
Microencapsulation
Microwave technology
Milk and milk products
Mineral nutrients
Mixing and blending
Molecular sieves
Molybdenum and molybdenum alloys
Molybdenum compounds
Naphthalene derivatives
Naphthalene
Naphthenic acids
Neuroregulators
Nickel and nickel alloys
Nickel compounds
Niobium and niobium compounds
Nitration
Nitric acid
Nitrides
Nitriles
Nitro alcohols
Nitrobenzene and nitrotoluenes
Nitrogen fixation
Nitrogen
Nitroparaffins
N-Nitrosamines
Noise pollution
Nomenclature
Nondestructive testing
Nonwoven textile fabrics
Novoloid fibers
Nuclear reactors
Nuts
Ocean raw materials
Odor modification
Oil shale
Oils, essential
Olefin fibers
Olefin polymers
Olefins, higher
Operations planning
Optical filters
Organometallics, metal p complexes
Organometallics, o-bonded alkyls and aryls
Oxalic acid
Oxo process
Oxygen
Oxygen-generating systems
Ozone
Packaging materials, industrial products
Packing materials
Paint and varnish removers
Paint
Paper
Papermaking additives
Particle-track etching
Patents
Perfumes
Peroxides and peroxy compounds, inorganic

Peroxides and peroxy compounds, organic
Pet and livestock feeds
Petroleum
Pharmaceuticals
Pharmaceuticals, controlled release
Pharmaceuticals, optically active
Pharmacodynamics
Phenol
Phenolic resins
Phosgene
Phosphoric acid and the phosphates
Phosphorus and the phosphides
Phosphorus compounds
Photochemical technology
Photodetectors
Photography
Photomultiplier tubes
Photoreactive polymers
Photovoltaic cells
Phthalic acid and other benzenepolycarboxylic acids
Phthalocyanine compounds
Pigments
Pilot plants and microplants
Pipelines
Piping systems
Plant layout
Plant location
Plant safety
Plant-growth substances
Plastic building products
Plasticizers
Plastics processing
Plastics testing
Platinum-group metals
Platinum-group metals, compounds
Plutonium and plutonium compounds
Poisons, economic
Poly(biscycloheptene) and related polymers
Polishes
Polyamides
Polyblends
Polycarbonates
Polyelectrolytes
Polyester fibers
Polyesters, thermoplastic
Polyesters, unsaturated
Polyethers
(Polyhydroxy)benzenes
Polyimides
Polymerization mechanisms and processes
Polymers containing sulfur
Polymers
Polymers, conductive
Polymethine dyes
Polymethylbenzenes
Polypeptides
Potassium compounds
Potassium
Powder coatings
Powder metallurgy
Power generation
Pressure measurement
Printing processes
Process research and development

Programmable pocket computers
Propyl alcohols
Propylene oxide
Propylene
Prosthetic and biomedical devices
Proteins
Psychopharmacological agents
Pulp
Pulp, synthetic
Pyrazoles, pyrazolines, pyrazolones
Pyridine and pyridine derivatives
Pyrotechnics
Pyrrole and pyrrole derivatives
Quaternary ammonium compounds
Quinoline and isoquinolines
Quinones
Radiation curing
Radioactive drugs
Radioactive tracers
Radioactivity, natural
Radioisotopes
Radiopaques
Radioprotective agents
Rare-earth elements
Rayon
Reactor technology
Recording disks
Recreational surfaces
Recycling
Refractories
Refractory coatings
Refractory fibers
Refrigeration
Regulatory agencies
Reprography
Research management
Resins, natural
Resins, water-soluble
Reverse osmosis
Rhenium and rhenium compounds
Rheological measurements
Roofing materials
Rubber chemicals
Rubber compounding
Rubber, natural
Rubidium and rubidium compounds
Salicylic acid and related compounds
Sampling
Sealants
Sedimentation
Selenium and selenium compounds
Semiconductors
Separation systems synthesis
Shape-memory alloys
Shellac
Silica
Silicon and silicon alloys
Silicon compounds
Silk
Silver and silver alloys
Silver compounds
Simulation and process design
Simultaneous heat and mass transfer
Size enlargement

Size measurement of particles
Size reduction
Soap
Sodium and sodium alloys
Sodium compounds
Soil chemistry of pesticides
Solar energy
Solders and brazing alloys
Solvent recovery
Solvents, industrial
Sorbic acid
Soybeans and other oilseeds
Space chemistry
Sprays
Stains, industrial
Starch
Steam
Steel
Sterilization techniques
Steroids
Stilbene dyes
Stimulants
Strontium and strontium compounds
Styrene plastics
Styrene
Succinic acid and succinic anhydride
Sugar
Sulfamic acid and sulfamates
Sulfolanes and sulfones
Sulfonation and sulfation
Sulfonic acids
Sulfoxides
Sulfur compounds
Sulfur dyes
Sulfur recovery
Sulfur
Sulfuric acid and sulfur trioxide
Sulfuric and sulfurous esters
Sulfurization and sulfurchlorination
Superconducting materials
Surfactants and deterative systems
Sutures
Sweeteners
Synthetic and imitation dairy products
Syrups
Talc
Tall oil
Tantalum and tantalum compounds
Tar and pitch
Tar sands
Tea
Technical service
Tellurium and tellurium compounds
Temperature measurement
Terpenoids
Textiles
Thallium and thallium compounds
Thermal pollution by power plants
Thermodynamics
Thermoelectric energy conversion
Thiazole dyes
Thioglycolic acid
Thiols
Thiophene

Thiosulfates
Thorium and thorium compounds
Thyroid and antithyroid preparations
Tin and tin alloys
Tin compounds
Tire cords
Titanium and titanium alloys
Titanium compounds
Toluene
Tool materials
Trace and residue analysis
Trademarks and copyrights
Transportation
Triphenylmethane and related dyes
Tungsten and tungsten alloys
Tungsten compounds
Ultrafiltration
Ultrasonics
Units and conversion factors
Uranium and uranium compounds
Urea
Urethane polymers
Uric acid
UV stabilizers
Vaccine technology
Vacuum technology
Vanadium and vanadium alloys
Vanadium compounds
Vanillin
Vegetable oils
Veterinary drugs
Vinegar
Vinyl polymers
Vinylidene chloride and poly(vinylidene chloride)
Vitamins
Wastes, industrial
Water
Waterproofing and water/oil repellency
Waxes
Weighing and proportioning
Welding
Wheat and other cereal grains
Wine
Wood
Wool
Xanthates
Xanthene dyes
X-ray technology
Xylenes and ethylbenzene
Xylylene polymers
Yeasts
Zinc and zinc alloys
Zinc compounds
Zirconium and zirconium compounds
Zone refining

Reviews - Synopsis - Dust Jacket

VOLUME 3 IS MISSING!

—

FROM THE DUST JACKET:

The Third Edition of the Encyclopedia of Chemical Technology is built on the solid foundation of the previous editions. All of the articles have been rewritten and updated and many new subjects have been added reflecting changes in chemical

technology through the 1970s. The new edition, however, will be familiar to users of the earlier editions: comprehensive, authoritative, accessible, lucid. The Encyclopedia remains an indispensable information source for all producers and users of chemical products and materials.

In the Third Edition emphasis is given to major present-day topics of concern to all chemists, scientists, and engineers — energy, health, safety, toxicology, and new materials. New subjects have been added especially to polymer and plastics technology, fuels and energy, inorganic and solid-state chemistry, composite materials, coating, fermentation and enzymes, pharmaceuticals surfactant technology, fibers and textiles.

New features include the use of SI units as well as English units, Chemical Abstracts Service's Registry Numbers, and complete indexing based on automated retrieval from a machine-readable composition system.

Once again this classic serves as an unrivaled library of information for the chemical and allied industries. Some comments about Kirk-Othmer —

The First Edition: "No reference library worthy of the name will be without this series. It is simply a must for the chemist and chemical engineer." — Chemical and Engineering News

The Second Edition: "A necessity for any technical library." — Choice

PREFACE:

The Third Edition of the Encyclopedia of Chemical Technology is built on the solid foundation of the previous editions. The First Edition published between 1949 and 1956 demonstrated the enormous progress the American chemical industry made during World War II and the post war period. The Second Edition published between 1963 and 1972 reflected the chemical industry as an international enterprise with the interchange of experience and know-how on a global scale.

The Third Edition is in many ways an entirely new encyclopedia in a format familiar to those acquainted with the earlier editions. Emphasis has been given to important present-day topics of concern to all chemists, scientists, and engineers — energy, health, safety, toxicology, and new materials; and the process technologies described represent the best worldwide practices.

All of the articles in this new edition have been rewritten and updated and many new subjects have been added reflecting changes in chemical technology since the Second Edition. The results, however, will be familiar to the users of the earlier editions: comprehensive, authoritative, accessible, lucid. The Encyclopedia is an indispensable information source for all producers and users of chemical products and materials.

New features include the use of SI units as well as English units, Chemical Abstracts Services Registry Numbers, and complete indexing based on automated retrieval from a machine-readable composition system.

New subjects have been added especially to polymer and plastics technology, fuels and energy, inorganic and solid state chemistry, composite materials, coatings, fermentation and enzymes, pharmaceuticals, surfactant technology, fibers and textiles. As in the Second Edition, authors are acknowledged and the editors have striven for accuracy and objectivity by relying on the advice of expert reviewers for every article.

INTRODUCTION:

The main subject of the Encyclopedia is chemical technology, and about one half of all the articles deal with chemical substances, either single substances, such as Sulfuric acid, or groups of substances, such as Aluminum compounds. There are also articles on industrial processes, such as Amines by reduction; on uses, such as Abherents; Adhesives; on pharmaceuticals, dyes, fibers; on foods and other human uses, such as Cosmetics. There are articles on the unit operations and unit processes of chemical engineering; on fundamentals, such as Thermodynamics, Absorption, Mass transfer; and on scientific and technological subjects, such as Catalysis, Color, Electrochemical processing, Magnetic materials, and Ultrasonics. Still other articles deal with such general subjects as Computers, Information retrieval, Patents, Regulatory agencies, Technical service, and Transportation.

In general, the properties and manufacture of any substance are given in one article, which makes cross reference to one or more articles where the uses of that substance are described. Thus, the manufacture of fused alumina is described under Aluminum compounds, but for its uses the reader will be directed to such articles as Abrasives and Refractories.

For inorganic compounds, in some cases it is the anion, in others the cation that has the greater industrial significance. Thus, calcium phosphate, sodium phosphate, and ammonium phosphate are important primarily as phosphates and are discussed under Phosphoric acid and phosphates. Similarly, chromates and borates are under Chromium compounds and Boron compounds, respectively, and salts of organic acids (except acetates and formates) are discussed with the acids. On the other hand, barium chloride, barium nitrate, and barium sulfate would be thought of together and are therefore described in Barium compounds. In general, compounds of the following anions are dealt with in articles such as Aluminum compounds and Calcium compounds: acetates; carbonates; formates; chlorides, bromides and iodides (under halides); nitrates; nitrites; oxides (including hydroxides and oxygen acids and their salts, but excluding true peroxides); sulfates; sulfites; and sulfides. The organic compounds of a metal, containing a metal-to-carbon bond, are also discussed with the compounds of that metal or under Organometallics. However, fluorine, in its industrial applications, is so different from the other halogens that the metallic fluorides are usually grouped together under Fluorine compounds, inorganic.

Organic compounds containing fluorine (with or without other halogens) are discussed under Fluorine compounds, organic, and there are articles on Bromine compounds, organic, and Iodine compounds, organic. Chlorine is treated somewhat differently. The article 'Chlorocarbons and chlorohydrocarbons' covers a large number of industrially important compounds; compounds containing other elements as well as carbon, hydrogen, and chlorine are sometimes grouped together (as, Chlorophenols; Chlorohydrins), sometimes treated as derivatives under a parent compound (thus chloroanilines appear as derivatives under Amines, aromatic, aniline).

In general, the treatment of a compound will be found either under its own name, or under a group of substances (for example, ethyl acetate under Esters, organic), or as a derivative under a parent compound (for example, ethyl acrylate under Acrylic acid and derivatives). The cross references provided will, it is hoped, in almost all cases direct the reader to the appropriate part of the Encyclopedia.



Title	Location	Edition / Series / Misc.
87 LASCT Bibliography 2004 Author: City of Commerce (California) Public Library Publish.: City of Commerce Public Library - place: City of Commerce, CA - date: 2004 Subject: Coating technology Desc: 854 p., 28 cm.	Dynix: 58625 Call No.: 016.5 Ci 2004 ISBN: Shelf Reference	Edition: November 2004 Series: LASCT Bibliography Year: 2004 Price: \$50.00

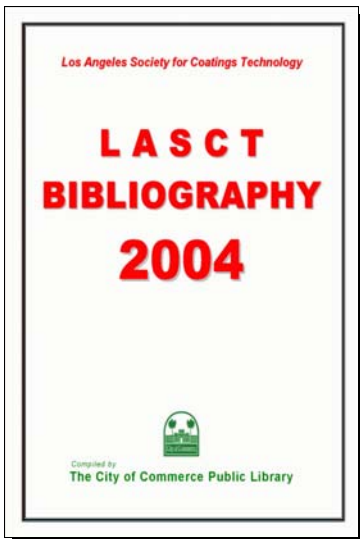


Table of Contents

Reviews - Synopsis - Dust Jacket

Subjects

238 .	Coating Technology
239 .	Coatings



Title	Location	Edition / Series / Misc.
923 License Your Invention Author: Stim, Richard Publish.: Nolo Press - place: Berkeley, CA - date: ©2002 Subject: License agreements -- United States -- Popular works Desc: [Various pagings], illus., forms, 28 cm., + 1 CD-ROM (4¾")	Dynix: 105688 Call No.: 346.730 St ISBN: 0873378571 Shelf Adult Non-Fiction	Edition: 3rd edition Series: Year: 2002 Price: \$28.50

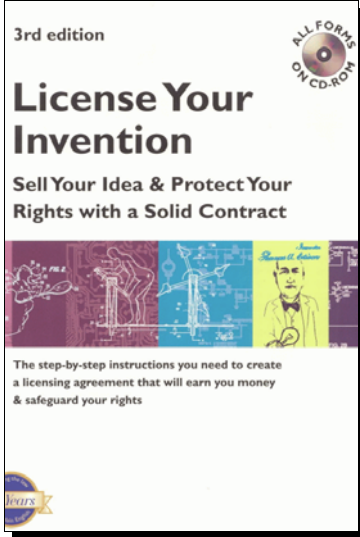


Table of Contents

How to Use This Book

1. Gearing Up to License Your Invention
 - A. Licenses
 - B. Assignments
 - C. The Licensing Process
 - D. Avoiding Conflicts Among Multiple Agreements
 - E. Challenges to Your Ownership
 - F. Disclosing Information About Your Invention
 - G. Keeping Your Records
 - H. No False Hopes! Reviewing Your Invention's Commercial Potential
2. Intellectual Property Protection
 - A. General Rules for Legal Protection of Inventions
 - B. Utility Patents
 - C. Trade Secrets
 - D. Trademarks
 - E. Design Patents
 - F. Copyright Law
 - G. Sorting Out Nonfunctional Features: Design Patents, Product Configurations & Copyright
3. Ownership Issues for Inventor Employees
 - A. What Type of Intellectual Property Is Involved?
 - B. Employer/Employee: Patent and Trade Secret Ownership
 - C. Inventions Covered by Copyright
 - D. Special Employment Situations
 - E. Working Out Ownership Issues With Your Employer
4. Joint Ownership of Your Invention
 - A. Joint Ownership
 - B. How Payments, Loans or Investments Can Create Joint Ownership
 - C. Transferring Ownership of Your Invention to Your Business
5. Licensing Agents and Representatives
 - A. Agents
 - B. Completing the Agent Agreement
 - C. Attorneys as Agents
 - D. Invention Marketing Scams
6. Soliciting Potential Licensees
 - A. Before You Begin Your Search
 - B. How to Find Potential Licensees
 - C. How to Overcome a Licensee's Bias Against Submissions
 - D. What's the Best Way to Solicit a Potential Licensee?
 - E. Product Presentations
7. Protecting Confidential Information
 - A. Confidential Information and Nondisclosure Agreements
 - B. Proceeding Without an Agreement
 - C. Waiver Agreements
 - D. When You Have Sufficient Bargaining Power

Subjects

581 .	License agreements -- United States -- Popular Works
582 .	Patent laws and legislation -- United States -- Popular Works



- E. Disclosing to Employees and Contractors
- F. Disclosing to an Attorney

- 8. The Key Elements of Your Agreement
 - A. From Handshake to License
 - B. Identifying the Parties
 - C. Describing Your Invention and the Licensed Products
 - D. Specifying Which Rights Are Granted
 - E. Defining the Territory
 - F. Setting the Length (Term) of the Agreement

- 9. Money: It Matters
 - A. Some Basic Royalty Definitions
 - B. Ways to Get Paid
 - C. The Mysteries of Net Sales and Deductions
 - D. How Much Do You Get?
 - E. Royalty Provisions

- 10. Negotiating Your Agreement
 - A. What, Me Negotiate?
 - B. Documenting the Important Contract Elements
 - C. Letter of Intent
 - D. Option Agreements
 - E. What If the Licensee Wants to Proceed Without a Written License Agreement?

- 11. Sample Agreement
 - A. License Agreement
 - B. Optional License Agreement Provisions
 - C. Modifying the Sample Agreement for Your Needs

- 12. Warranties, Indemnification and Proprietary Rights Provisions
 - A. Promises, Promises... Warranties, Representations and Covenants
 - B. Indemnity — The "Hold Harmless" Provision
 - C. Licensee Warranties and Indemnity
 - D. Proprietary Rights
 - E. Commercialization and Exploitation
 - F. Samples and Quality Control
 - G. Insurance

- 13. Termination and Post-Termination
 - A. Termination and Post-Termination
 - B. Termination Based Upon a Fixed Term
 - C. Termination at Will
 - D. Termination Based on Contract Problems
 - E. Termination and Bankruptcy
 - F. Post-Termination: What Happens Afterwards?
 - G. Survival of the Fittest

- 14. Boilerplate and Standard Provisions
 - A. Paying the Lawyer's Bills
 - B. Dispute Resolution
 - C. Governing Law
 - D. Jurisdiction
 - E. Waiver
 - F. Invalidity
 - G. Entire Understanding
 - H. Attachments and Exhibits
 - I. Notices
 - J. No Joint Venture
 - K. Assignments
 - L. Force Majeure
 - M. Headings
 - N. Establishing Escrow Accounts



- 15. Service Provisions
 - A. Service Provisions vs. Separate Service Agreements
 - B. Training the Licensee's Personnel
 - C. Installation of Equipment
 - D. Technical Support for the Licensee or for End Users
 - E. Improving, Modifying and Delivering the Invention
- 16. Handling the Licensee's Agreement
 - A. Dealing With Suggested Changes
 - B. Evaluating an Agreement Presented to You
 - C. Evaluating the Provisions and Suggesting Changes
- 17. After You've Signed the Agreement
 - A. Create Your Contract Calendar
 - B. Dealing With Royalty Statements
 - C. Resolving Licensing Disputes
 - D. Avoiding Patent Misuse and Illegal Agreements
 - E. The Taxman Cometh
 - F. Quality Control
- 18. Help Beyond This Book
 - A. Licensing and Intellectual Property Resources
 - B. Working With an Attorney

Appendices

- A: How to Use the CD-ROM
- B: Forms
 - Agreement Worksheet
 - Letter Confirming Employee's Ownership of Copyright
 - Joint Ownership Agreement
 - Assignment of Rights: Patent
 - Assignment of Rights: Patent Application
 - Assignment of Rights: No Patent Issued or Application Filed
 - Agent Letter Agreement
 - One-Way Nondisclosure Agreement
 - Mutual Nondisclosure Agreement
 - Contract Worksheet
 - Option Agreement
 - License Agreement
 - Escrow Agreement
 - Checklist for Reviewing a License Agreement
 - License Dates Chart

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Don't Let Anyone Rip Off Your Invention...Create a Bulletproof Contract!

Like most inventors, you dream of striking it rich—finding a company you can trust, hashing out a fair licensing deal, watching your idea hit the marketplace and then raking in the profits.

But where do you find the right company? And how do you draft an agreement that will protect your interests?

License Your Invention provides both the practical marketing advice and the legal licensing language you need to turn your invention into a moneymaker. Step by step, this book explains the key elements in a licensing agreement, from advances and royalties to the length of an agreement. It also explains complex c such as warranties, indemnity and reservation of rights—all in plain English.

License Your Invention will help you:

- understand the licensing process
- determine your ownership rights
- work with agents effectively
- find potential licensors



- show your invention while protecting your work
- negotiate a fair licensing deal
- draft your own comprehensive licensing agreement
- understand, review and negotiate changes

The completely updated 3rd edition includes the latest patent laws and rules, new marketing resources, new Web resources—including patent exchange and licensing sites—and information on how the Bayh-Dole Act affects you.

INTRODUCTION:

A. What Is a License?

A license is an agreement that allows someone else to use or sell your invention for a limited period of time. In return you receive a one-time payment or continuing payments called royalties.

B. Who This Book Is For

This book is for inventors who want to license their inventions (“licensors”). Our primary goals in writing this book are to protect your invention, reduce your risks and save you money. By streamlining the licensing process and offering a layperson’s guide to licensing deals, we hope you will be able to make a smooth transition from inventor to licensor.

C. Who This Book Is Not For

This book is not for people who wish to manufacture and market their inventions themselves (some times known as venturers). For example, if you invented a new mousetrap and created a company to make and sell your product, then this would not be the proper book for you.

D. How This Book Is Organized

This book is designed to guide you through the licensing process. There are basically four parts:

- Ownership Rights. Chapters 1 through 4 are geared at sorting out your ownership rights. You will learn how to determine your legal rights and how to protect your rights under patent, trade secret or copyright laws.
- Soliciting Licensees. Chapters 5 through 7 explain how to deal with licensing agents, how to find and solicit prospective licensees (those who wish to license your invention from you) and how to protect your trade secrets during this process.
- The License Agreement. Chapters 8 through 15 provide information about every aspect of the license agreement, from the key elements (including royalties, geographic boundaries and length) to the boilerplate (or more secondary terms). These chapters further discuss how to keep information confidential, the negotiating process and drafting the licensing agreement yourself.
- Dealing With Licensees. Chapter 16 shows you how to deal with licensee changes to your agreement (or how to deal with the licensee’s proposed agreement). Chapter 17 discusses issues that may arise after you sign the license agreement.

E. Readers With a Specific Question

It’s possible that you chose this book because you have a specific question. For example, you’re unsure whether you or your employer has the right to license your invention. If you have a specific question, look for a chapter title that is relevant to your question and review the section headings in that chapter, or use the index in the back of the book for words or terms that are related to your question.

F. Sample Agreements and the CD-ROM

You will find sample agreements with detailed explanations throughout this book. Selected full-length agreements are located in the Appendix in the back of the book and on the attached CD-ROM. Instructions on how to use the CD-ROM are also located in the Appendix and in a read me file on the CD-ROM.

Title	Location	Edition / Series / Misc.
<p>928 Macromolecular Symposia: Quo Vadis -- Coatings?</p> <p><i>Author:</i> Meisel, I. (editor)</p> <p><i>Publish.:</i> Wiley - VCH, Verlag GmbH & Co.</p> <p><i>- place:</i> Weinheim, Germany</p> <p><i>- date:</i> ©2002</p> <p><i>Subject:</i> Macromolecules</p> <p><i>Desc:</i> 958 p., illus., 24 cm.</p>	<p><i>Dynix:</i> 105719</p> <p><i>Call No.:</i> 547.7 Ma</p> <p><i>ISBN:</i> 3527304770</p> <p><i>Shelf:</i> Adult Non-Fiction</p>	<p><i>Edition:</i></p> <p><i>Series:</i> Macromolecular Symposia: Vol. 187</p> <p><i>Year:</i> 2002</p> <p><i>Price:</i> \$348.50</p>

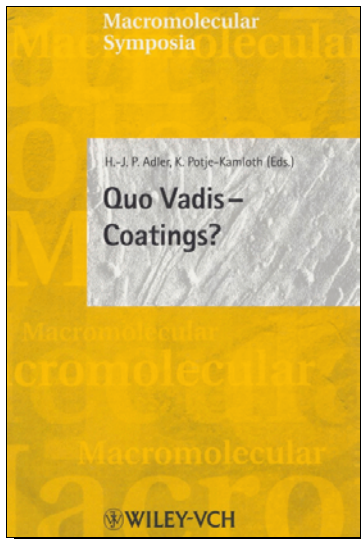


Table of Contents

Contents of Macromolecular Symposium 187: XXVI FATIPEC Congress, "Quo Vadis — Coatings", Dresden, Germany, 2002

Preface

Markets & Trends

1. Meeting the Challenge of Radical Change: Coatings R&D as We Enter the 21st Century
2. Powder and Waterborne Coatings 2000-2010 — Is Past Growth Sustainable? New Technological Developments and the Impact on Future Markets, A World Overview
3. Coating Systems for Infra Structural Works

New Substrates & Pretreatments

4. From Molecular Aspects of Delamination to New Polymeric Coatings
5. New Trends in the Chemical Pretreatment of Metal Surfaces
6. Reactive Dispersions for Corrosion Inhibition
7. Novel Protective Coatings for Steel Based on a Combination of Self- Assembled Monolayers and Conducting Polymers
8. Pretreatments of Wood to Enhance the Performance of Outdoor Coatings
9. Performance of Primers Containing Polyphosphate-Based Ion-Exchange Pigments for the Protection of Galvanised Steel
10. Anticorrosive Pigments for Chemically and Thermally Resistant Coatings
11. Corrosion Inhibited Metal Pigments
12. Investigation of Filiform Corrosion of Coated Aluminium
13. Corrosion Processes below Organic Coatings
14. Sugar Latexes as a New Type of Binder for Water-Based Paint and Coating
15. Forecasting and Optimisation of the Waterborne Anticorrosive Paint Composition with Non-Toxic Pigments
16. Application of Peroxide Macroinitiators in Core-Shell Technology for Coating Improvements

Advanced Technologies

17. Synthesis and Surface Properties of Microphase Separated or Nanostructured Coatings Based on Hybrid and Fluorinated Acrylic Copolymers
18. Studies for a New Generation of Acrylic Binders for Exterior Wood Coatings
19. New Generation Decorative Paint Technology
20. The Use of Nonionic Polymerizable Surfactants in Latexes and Paints
21. Binders for Exterior Coatings Exhibiting Low Soiling Tendency
22. Modified Ureas: An Interesting Opportunity to Control Rheology of Liquid Coatings
23. Clearcoats Based on Maleimide/Vinyl Ether Combinations — Investigations into Their Properties and Curing Behaviour
24. New Epoxy-Siloxane Hybrid Binder for High Performance Coatings
25. Epoxypolyesters as Film-Forming Materials
26. Climate Independent Painting: Is Infrared Heating a Solution for Professional Painters?
27. New Developments in Catalysis
28. Tailor-made Crosslinkers for High Performance PUR Coatings — Hyperbranched Polyisocyanates
29. New Low Viscous Polyisocyanates for VOC Compliant Systems
30. 2 K Clearcoats Based on Silane and Urethane Technology
31. What Can Nano-Chemistry Offer to the Paint Industry?
32. Nano-Scaled Titanium Dioxide — Properties and Use in Coatings with Special Functionality
33. Features of Reaction Amino-cyclocarbonate for Production of New Type Nonisocyanate Polyurethane Coatings
34. Additives for UV-Curable Coatings and Inks

Subjects

313 .	Polymers
402 .	Polymerization
584 .	Macromolecules

35. UV Stabilisation of Powder Clear Coats
36. Hydroplasticization Effect in Structured Latex Particles Film Formation
37. Behaviour of Surface-Treated Mica and Other Pigments with Lamellar Particles in Anticorrosive Coatings
38. Possibilities of Affecting the Corrosion-Inhibition Efficiency of the Coatings by Means of the Zinc Powder Particle Sizes and Shapes
39. Study of the Resistances of Organic Coatings to Filiform Corrosion
40. Efficiency of Anticorrosive Pigments Based on Modified Phosphates
41. UV-Curing under Oxygen-Deficient Conditions
42. Tribo Charging Powder Coatings
43. New Materials with High p Conjugation by Reaction of 2-Oxazoline Containing Phenols with Polyamides and Inorganic Base
44. Waxes for Powder Coatings

Special Functions

45. How to Control Dirt Pick-Up of Exterior Coatings
46. Coatings with Self-Cleaning Properties
47. The Effect of Fluoropolymer Architecture on the Exterior Weathering of Coatings
48. Preparation of Coatings via Cationic Photopolymerisation: Influence of Alcoholic Additives
49. 3-Dimensional Epoxy Binder Structures for Water Damp Permeable and Breathable Coating and Flooring Systems
50. High Scratch and Etch Resistance by Optimized Crosslinking Chemistry and Density
51. Acid and Scratch Resistant Coatings for Melamine Based OEM Applications
52. Scratch Resistance and Weatherfastness of UV-Curable Clearcoats
53. CellFacts II — Single Cell Analysis in Real Time
54. Dual-Cure Processes: Towards Deformable Crosslinked Coatings
55. Physical-Chemical Conditions for Production of Combined Alkyd-Acrylic Dispersion
56. Fumed Silica — Rheological Additive for Adhesives, Resins, and Paints

Higher Speed

57. A Model for the Drying Process During Film Formation in Waterborne Acrylic Coatings
58. Tailor-Made UV-Curable Powder Clear Coatings for Metal Applications
59. UV Curable Electrodeposition Systems

More Color & Appearance

60. 20 Years of DPP Pigments — Future Perspectives
61. Pigments With Improved Properties — Microreaction Technology as a New Approach for Synthesis of Pigments
62. Impact of the Dispersion Quality of TiO₂ Pigments in Coatings on Their Optical Properties and Weathering Resistance
63. Pigment Encapsulation by Emulsion Polymerisation, Redispersible in Water
64. The Influence of Selected Synthetic Aluminium Silicates on Physicochemical Properties of Emulsion Paints
65. Lotus-Effect — Surfaces
66. Hyperbranched Polymers as a Novel Class of Pigment Dispersants
67. Stabilization of Carbon Black with Ionic-Hydrophobic Polyelectrolytes
68. The Effect of TiO₂ Pigment on the Performance of Paratoluene Sulphonic Acid Catalysed Paint Systems
69. CFD Modelling of a Spray Deposition Process of Paint
70. 100% Electrostatic Application of Metallic Basecoats
71. Effects on the Pigment Distribution in Paint Formulations

Better Eco-Efficiency

72. Air Quality Legislation in the European Union
73. High Performance — Low VOC-Content: Innovative and trend-setting coating systems for industrial applications
74. The Challenge of Achieving Traditional Exterior Durability Performance in Low VOC Architectural Coatings
75. Powder Coatings for Corrosion Protection
76. Lead Replacement in the Molybdate Orange Colour Space
77. Mass and Energy Flow Management in the Sector of Surface Treatment
78. Progress in the Development of Cobalt-free Drier Systems

Modern Characterization

79. Effect of Weathering on Scratch/Mar and Mechanical Behaviour of Clearcoats
80. Stabilizers in Automotive Coatings under Acid Attack
81. Durability Prediction of p-Urethane Clearcoats Using Infrared P(hoto) A(coustic) S(pectroscopy)
82. Evaluation of the Scratch Resistance with Nano- and Multiple Scratching Methods

- 83. Quantitative Use of Ultraviolet Spectroscopy to Calculate the Effective Irradiation Dosage During Weathering
- 84. Thermo-Analytical Characterization of Pigmented Waterborne Basecoats
- 85. Analysis of the Environmental Parameters for Aircraft Coatings
- 86. Influence of Raw Materials on the Formulation of Interior Emulsion Paints from the Point of View of EN 13300
- 87. Time-Temperature Effects in Polymer Coatings for Corrosion Protection as Analyzed by EIS
- 88. Thickening Mechanism of Associative Polymers
- 89. Electrochemical Impedance Spectroscopy for Characterization of Coatings with Intrinsically Conducting Polymers
- 90. Studies on the Thermal Ageing of Organic Coatings
- 91. On Large Color Differences in Non-Euclidean Color Spaces

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The requirements of low cost, high quality and environmental/social compliance are pushing the coatings industry to develop new technologies. The XXVI FATIPEC congress, held in Dresden, Germany, September 9-11, 2002 addressed the important issues facing the paint industry.

- Markets & Trends
- New Substrates & Pretreatments
- Advanced Technologies
- Special Functions
- Higher Speed
- More Color & Appearance
- Better Eco-Efficiency
- Modern Characterization

This volume of "Macromolecular Symposia" gathers 90 of the presentations from the congress, giving a comprehensive overview of the challenges facing the paint industry and possible solutions: "Quo Vadis ? Coatings?" Coatings ? Where to now?

PREFACE:

The XXVI FATIPEC congress was held in Dresden from September 9-11, 2002. FATIPEC (Fédération d'Associations des Techniciens des Industries des Peintures, Vernis, Emaux et Encres d'Imprimerie de l'Europe Continentale), the European Organization of Paint Scientists and Engineers, has delegated the organization of the XXVI FATIPEC congress to the special branch "Coatings and Pigments" (Anstrichstoffe und Pigmente — API) of the German Chemical Society (Gesellschaft Deutscher Chemiker — GDCh) together with the Association of the Paint Engineers and Technicians (Verband der Ingenieure des Lack- und Farbenfaches e. V. — VILF).

The main topic of the congress: "Quo Vadis — Coatings?" reflects the actual challenges and opportunities in the broad field of the international coating technology.

Coatings are under permanent stress of cost, quality and environmental compliance. In spite of strong efforts to fulfill the regulatory requirements as well as own commitments the coating industry still has to fight for social acceptance. This results in even further investments in innovative technologies, where the aspects of product development, application techniques, film properties and environmental aspects have to be considered right from the start of customer demands. Consequently, an increased responsibility of the paint suppliers for the final result of the coating process is emerging.

Therefore this congress will give the participants a comprehensive overview, not only of new products and raw materials, but also of the driving forces of the market as well as of improved processes to meet the social requirements. The two basic functions of coatings "protection" and "color" in the triangle of cost, quality, and social responsibility are covered by eight sections representing the basic areas of activities in all different paint segments:

- Market & Trends
- New Substrates & Pretreatments
- Advanced Technologies
- Special Functions
- Higher Speed
- More Color & Appearance
- Better Eco-Efficiency
- Modern Characterization

We thank all who contributed to the success of the meeting and to its organization. In this place our special thanks to those who handed in their manuscripts for publication in this volume. The XX VII FATIPEC congress will be held in France in 2004.

Title	Location	Edition / Series / Misc.
<p>794 Marine Coatings <i>Author:</i> Bleile, Henry R. and Stephen Rodgers <i>Publish.:</i> Federation of Societies for Coatings Technology <i>- place:</i> Philadelphia, PA <i>- date:</i> ©1989 <i>Subject:</i> Coatings -- Periodicals <i>Desc:</i> 28 p., illus., 28 cm.</p>	<p><i>Dynix:</i> 55947-12 <i>Call No.:</i> 667.9 Fe <i>ISBN:</i> 0934010293 <i>Shelf:</i> Reference</p>	<p><i>Edition:</i> <i>Series:</i> Federation Series on Coatings Technology: No. FS12 <i>Year:</i> 1989 <i>Price:</i> \$50.00</p>

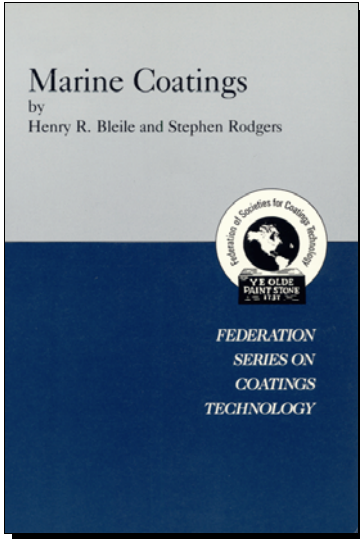


Table of Contents

- I. INTRODUCTION
 - A. Cost of Preservation
 - B. Navy Coatings
 - C. Functions of Marine Coatings
 - D. The Marine Environment
 - E. What Are Marine Coatings
- II. TERMINOLOGY
 - A. Marine Terms
 - B. Coating Related Terms
- III. CORROSION CONTROL COATINGS
 - A. Principles of Corrosion Control by Coatings
 - B. Barrier Coatings
 - C. Chemically Active Coatings
 - 1. Cathodic (Zinc Rich) Coatings
 - 2. Corrosion Inhibition Coatings
- IV. ANTIFOULING COATINGS
 - A. Principles of Fouling Control by Coatings
 - B. Copper Based Coatings
 - C. Organotin Based Coatings
- V. GENERAL CHEMICAL TYPES OF COATINGS
 - A. Alkyd Coatings
 - B. Chlorinated Rubber
 - C. Coal Tar
 - D. Coal Tar Epoxy
 - E. Epoxy
 - F. Inorganic Zinc
 - G. Organic Zinc
 - H. Polyurethane
 - I. Spray Metallized Coatings
 - J. Vinyl
 - K. Vinyl Antifouling Coatings
 - L. Water-Borne Coatings
- VI. SURFACE PREPARATION AND APPLICATION
 - A. Abrasive Blast Cleaning
 - B. Abrasive Blasting Media
 - C. High Pressure Water Cleaning
 - D. Other Methods
 - E. Application
- VII. SELECTION OF COATINGS SYSTEMS
- VIII. PROBLEMS
 - A. Environmental and Occupational Health Issues
 - B. Quality Assurance of Materials
 - C. Quality Assurance of Surface Preparation and Application

Subjects

239 . Coatings

IX. TESTING

- A. Hot Water Immersion Tests
- B. Cathodic Disbondment Tests
- C. Accelerated Weathering Tests
- D. Fouling Resistance Tests
- E. Field Tests

X. SUMMARY

XI. REFERENCES

XII. BIBLIOGRAPHY

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

This monograph is written for people who have a need to understand marine coatings (but are not coatings technologists) as well as coatings technologists who become involved with the marine industry. It provides information on coatings technology as it is applied to the severe, and unique, demands of the marine environment. The emphasis in this monograph is on coatings which are primarily used by the marine industry, i.e., shipbuilding and repair, oil drilling platforms, and so forth. In the marine industry, compatibility with the engineering and construction phases, and economic functionality are the primary interests.

Marine coatings are the key material used to obtain the full design service life from ships, structures, and equipment exposed to the marine environment. They differ from similar types of coatings used in general inland service by the use of higher durability (and higher cost) ingredients, formulations that often have higher percentages of active ingredients, and extensive testing (laboratory and field) prior to customer acceptance. Ships and seagoing platforms also differ from shore-based structures in that the most critical areas (bilges, tanks, underwater hull) are not accessible for maintenance painting without costly drydocking.

Marine coatings are the single most important—and most cost-effective—technology for the control of corrosion in the marine environment. They are the only effective way of preventing the growth of marine organisms (i.e., marine fouling) on large submerged surfaces. The economic importance of marine anticorrosion coatings is demonstrated by the impact they have had on the oil tanker industry. Historically, it has been reported that the use of marine coatings doubled the effective service life of tankers used to transport refined oil products:

"In the 1930's and 40's tankers were built with an expected life of approximately 15 to 20 years. The first part of this life (approximately seven years) was in refined oil service. By the end of this service, the bulkheads in the tanker were corroded to one-half the original steel thickness. Any additional corrosion would have reduced the bulkhead below the point of minimum safety. Thus, the ships were usually transferred for the remainder of their existence to black oil service, which for the most part is much less corrosive than the refined products. Today, however, the life of the tanker is considered 28 to 30 years with no allowance for interior corrosion. This has been accomplished through the use of...coatings which have proven that with proper application they can maintain the bulkheads of a refined oil tanker without loss of metal for 20 years."

Marine antifouling coatings have a major influence on the economics of operating ships. The attachment and growth of marine organisms (e.g., barnacles) on a ship's hull can increase the fuel consumption by 20% or more above the consumption level it would have with a clean hull. For the U.S. Navy, it has been reported that this increases the cost of operations by \$100-\$200 million dollars per year. For each year that an antifouling paint extends a ship's fouling free operations, it saves the owner money.

Title	Location	Edition / Series / Misc.
1014 Materials Science of Polymers for Engineers <i>Author:</i> Osswald, Tim A. and Georg Menges <i>Publish.:</i> Hanser Gardner Publications, Inc. <i>- place:</i> Cincinnati, OH <i>- date:</i> ©2003 <i>Subject:</i> Polymers <i>Desc:</i> xviii, 622 p., illus., 23 cm.	<i>Dynix:</i> 111665 <i>Call No.:</i> 620.1 Os <i>ISBN:</i> 1569903484 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> <i>Year:</i> 2003 <i>Price:</i> \$73.50

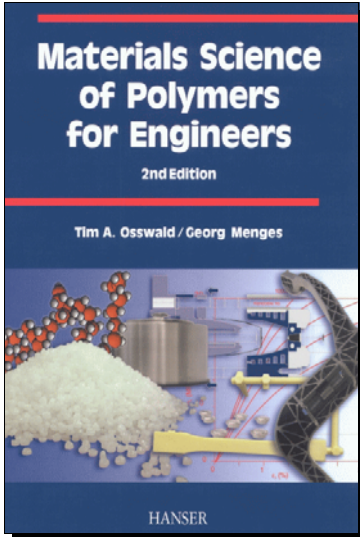


Table of Contents

Part I: Basic Principles

1. Introduction to Polymers
 - 1.1 General Properties
 - 1.2 Identification of Polymers
 - Problems
 - References
2. Historical Background
 - 2.1 From Natural to Synthetic Rubber
 - 2.2 Cellulose and the \$10,000 Idea
 - 2.3 Galalith - The Milk Stone
 - 2.4 Leo Baekeland and the Plastic Industry
 - 2.5 Herman Mark and the American Polymer Education
 - 2.6 Wallace Hume Carothers and Synthetic Polymers
 - 2.7 Polyethylene - A Product of Brain and Brawn
 - 2.8 The Super Fiber and the Woman who Invented it
 - 2.9 One last Word - Plastics
 - References
3. Structure of Polymers
 - 3.1 Macromolecular Structure of Polymers
 - 3.2 Molecular Bonds and Inter-Molecular Attraction
 - 3.3 Molecular Weight
 - 3.4 Conformation and Configuration of Polymer Molecules
 - 3.5 Arrangement of Polymer Molecules
 - 3.5.1 Thermoplastic Polymers
 - 3.5.2 Amorphous Thermoplastics
 - 3.5.3 Semi-Crystalline Thermoplastics
 - 3.5.4 Thermosets and Cross-Linked Elastomers
 - 3.6 Copolymers and Polymer Blends
 - 3.7 Polymer Additives
 - 3.7.1 Flame Retardants
 - 3.7.2 Stabilizers
 - 3.7.3 Antistatic Agents
 - 3.7.4 Fillers
 - 3.7.5 Blowing Agents
 - 3.8 Viscoelastic Behavior of Polymers
 - 3.8.1 Stress Relaxation Test
 - 3.8.2 Time-Temperature Superposition (WLF-Equationa)
 - 3.8.3 The Boltzmann Superposition Principle
 - 3.8.4 Applying Linear Viscoelasticity to Describe the behavior of Polymers
 - Examples
 - Problems
 - References
4. Thermal Properties of Polymers
 - 4.1 Material Properties
 - 4.1.1 Thermal Conductivity
 - 4.1.2 Specific Heat
 - 4.1.3 Density

Subjects

304 .	Plastics
313 .	Polymers

- 4.1.4 Thermal Diffusivity
- 4.1.5 Linear Coefficient of Thermal Expansion
- 4.1.6 Thermal Penetration
- 4.1.7 Glass Transition Temperature
- 4.1.8 Melting Temperature
- 4.2 Measuring Thermal Data
 - 4.2.1 Differential Thermal Analysis (DTA)
 - 4.2.2 Differential Scanning Calorimeter (DSC)
 - 4.2.3 Thermomechanical Analysis (TMA)
 - 4.2.4 Thermogravimetry (TGA)
 - 4.2.5 Density Measurements
- Examples
- Problems
- References

5. Rheology of Polymer Melts

- 5.1 Introduction
 - 5.1.1 Continuum Mechanics
 - 5.1.2 The Generalized Newtonian Fluid
 - 5.1.3 Normal Stresses in Shear Flow
 - 5.1.4 Deborah Number
- 5.2 Viscous Flow Models
 - 5.2.1 The Power Law Model
 - 5.2.2 The Bird-Carreau-Yasuda Model
 - 5.2.3 The Bingham Fluid
 - 5.2.4 Elongational Viscosity
 - 5.2.5 Rheology of Curing Thermosets
 - 5.2.6 Suspension Rheology
- 5.3 Simplified Flow Models Common in Polymer Processing
 - 5.3.1 Simple Shear Flow
 - 5.3.2 Pressure Flow Through a Slit
 - 5.3.3 Pressure Flow Through a Tube – Hagen-Poiseuille Flow
 - 5.3.4 Couette Flow
- 5.4 Viscoelastic Flow Models
 - 5.4.1 Differential Viscoelastic Models
 - 5.4.2 Integral Viscoelastic Models
- 5.5 Rheometry
 - 5.5.1 The Melt Flow Indexer
 - 5.5.2 The Capillary Viscometer
 - 5.5.3 Computing Viscosity Using the Bagley and Weissenberg-Rabinowitsch Equations
 - 5.5.4 Viscosity Approximation Using the Representative Viscosity Method
 - 5.5.5 The Cone-Plate Rheometer
 - 5.5.6 The Couette Rheometer
 - 5.5.7 Extensional Rheometry
- 5.6 Surface Tension
- Examples
- Problems
- References

Part II: Influence of Processing on Properties

6. Introduction to Processing

- 6.1 Extrusion
 - 6.1.1 The Plasticating Extruder
 - 6.1.1.1 The Solids Conveying Zone
 - 6.1.1.2 The Melting Zone
 - 6.1.1.3 The Metering Zone
 - 6.1.2 Extrusion Dies
 - 6.1.2.1 Sheetting Dies
 - 6.1.2.2 Tubular Dies
- 6.2 Mixing Processes
 - 6.2.1 Distributive Mixing
 - 6.2.1.1 Effect of Orientation
 - 6.2.2 Dispersive Mixing

- 6.2.2.1 Break-Up of Particulate Agglomerates
 - 6.2.2.2 Break-Up of Fluid Droplets
 - 6.2.3 Mixing Devices
 - 6.2.3.1 Static Mixers
 - 6.2.3.2 Banbury Mixer
 - 6.2.3.3 Mixing in Single Screw Extruders
 - 6.2.3.4 Cokneader
 - 6.2.3.5 Twin Screw Extruders
 - 6.2.4 Energy Consumption During Mixing
 - 6.2.5 Mixing Quality and Efficiency
 - 6.2.6 Plasticization
 - 6.3 Injection Molding
 - 6.3.1 The Injection Molding Cycle
 - 6.3.2 The Injection Molding Machine
 - 6.3.2.1 The Plasticating and Injection Unit
 - 6.3.2.2 The Clamping Unit
 - 6.3.2.3 The Mold Cavity
 - 6.3.3 Related Injection Molding Processes
 - 6.4 Secondary Shaping
 - 6.4.1 Fiber Spinning
 - 6.4.2 Film Production
 - 6.4.2.1 Cast Film Extrusion
 - 6.4.2.2 Film Blowing
 - 6.4.3 Blow Molding
 - 6.4.3.1 Extrusion Blow Molding
 - 6.4.3.2 Injection Blow Molding
 - 6.4.3.3 Thermoforming
 - 6.5 Calendering
 - 6.6 Coating
 - 6.7 Compression Molding
 - 6.8 Foaming
 - 6.9 Rotational Molding
 - Examples
 - Problems
 - References
7. Anisotropy Development During Processing
- 7.1 Orientation in the Final Part
 - 7.1.1 Processing Thermoplastic Polymers
 - 7.1.2 Processing Thermoset Polymers
 - 7.2 Predicting Orientation in the Final Part
 - 7.2.1 Planar Orientation Distribution Function
 - 7.2.2 Single Particle Motion
 - 7.2.3 Jeffery's Model
 - 7.2.4 Folgar-Tucker Model
 - 7.2.5 Tensor Representation of Fiber Orientation
 - 7.2.5.1 Predicting Orientation in Complex Parts Using Computer Simulation
 - 7.3 Fiber Damage
 - Examples
 - Problems
 - References
8. Solidification of Polymers
- 8.1 Solidification of Thermoplastics
 - 8.1.1 Thermodynamics During Cooling
 - 8.1.2 Morphological Structure
 - 8.1.3 Crystallization
 - 8.1.4 Heat Transfer During Solidification
 - 8.2 Solidification of Thermosets
 - 8.2.1 Curing Reaction
 - 8.2.2 Cure Kinetics
 - 8.2.3 Heat Transfer During Cure
 - 8.3 Residual Stresses and Warpage of Polymeric Parts
 - 8.3.1 Residual Stress Models

- 8.3.1.1 Residual Stress Model Without Phase Change Effects
- 8.3.1.2 Model to Predict Residual Stresses with Phase Change Effects
- 8.3.2 Other Simple Models to Predict Residual Stresses and Warpage
 - 8.3.2.1 Uneven Mold Temperature
 - 8.3.2.2 Residual Stress in a Thin Thermoset Part
 - 8.3.2.3 Anisotropy Induced Curvature Change
- 8.3.3 Predicting Warpage in Actual Parts
- Examples
- Problems
- References

Part III Engineering Design Properties

9. Mechanical Behavior of Polymers

- 9.1 Basic Concepts of Stress and Strain
 - 9.1.1 Plane Stress
 - 9.1.2 Plane Strain
- 9.2 The Short-Term Tensile Test
 - 9.2.1 Rubber Elasticity
 - 9.2.2 The Tensile Test and Thermoplastic Polymers
- 9.3 Long-Term Tests
 - 9.3.1 Isochronous and Isometric Creep Plots
- 9.4 Dynamic Mechanical Tests
 - 9.4.1 Torsion Pendulum
 - 9.4.2 Sinusoidal Oscillatory Test
- 9.5 Viscoelastic Behavior of Polymers
 - 9.5.1 Kelvin Model
 - 9.5.1.1 Kelvin Model Creep Response
 - 9.5.1.2 Kelvin Model Stress Relaxation
 - 9.5.1.3 Kelvin Model Strain Recovery
 - 9.5.1.4 Kelvin Model Dynamic Response
 - 9.5.2 Jeffrey Model
 - 9.5.2.1 Jeffrey Model Creep Response
 - 9.5.2.2 Jeffrey Model Stress Relaxation
 - 9.5.2.3 Jeffrey Model Strain Recovery
 - 9.5.3 Standard Linear Solid Model
 - 9.5.3.1 Standard Linear Solid Model Creep Response
 - 9.5.3.2 Standard Linear Solid Model Stress Relaxation
 - 9.5.4 Maxwell-Wiechert Model
 - 9.5.4.1 Maxwell-Wiechert Model Stress Relaxation
 - 9.5.4.2 Maxwell-Wiechert Model Dynamic Response
- 9.6 Effects of Structure and Composition on Mechanical Properties
 - 9.6.1 Amorphous Thermoplastics
 - 9.6.2 Semi-Crystalline Thermoplastics
 - 9.6.3 Oriented Thermoplastics
 - 9.6.4 Cross-Linked Polymers
- 9.7 Mechanical Behavior of Filled and Reinforced Polymers
 - 9.7.1 Anisotropic Strain-Stress Relation
 - 9.7.2 Aligned Fiber Reinforced Composite Laminates
 - 9.7.3 Transformation of Fiber Reinforced Composite Laminate Properties
 - 9.7.4 Reinforced Composite Laminates with a Fiber Orientation Distribution Function
- 9.8 Strength Stability Under Heat
- Examples
- Problems
- References

10. Failure and Damage of Polymers

- 10.1 Fracture Mechanics
 - 10.1.1 Fracture Predictions Based on the Stress Intensity Factor
 - 10.1.2 Fracture Predictions Based on an Energy Balance
 - 10.1.3 Linear Viscoelastic Fracture Predictions Based on J-Integrals
- 10.2 Short-Term Tensile Strength
 - 10.2.1 Brittle Failure
 - 10.2.2 Ductile Failure

- 10.2.3 Failure of Highly Filled Systems or Composites
- 10.3 Impact Strength
 - 10.3.1 Impact Test Methods
 - 10.3.2 Fracture Mechanics Analysis of Impact Failure
- 10.4 Creep Rupture
 - 10.4.1 Creep Rupture Tests
 - 10.4.2 Fracture Mechanics Analysis of Creep Rupture
- 10.5 Fatigue
 - 10.5.1 Fatigue Test Methods
 - 10.5.2 Fracture Mechanics Analysis of Fatigue Failure
- 10.6 Friction and Wear
- 10.7 Stability of Polymer Structures
- 10.8 Environmental Effects on Polymer Failure
 - 10.8.1 Weathering
 - 10.8.2 Chemical Degradation
 - 10.8.3 Thermal Degradation of Polymers
- Examples
- Problems
- References

- 11. Electrical Properties of Polymers
 - 11.1 Dielectric Behavior
 - 11.1.1 Dielectric Coefficient
 - 11.1.2 Mechanisms of Dielectrical Polarization
 - 11.1.3 Dielectric Dissipation Factor
 - 11.1.4 Implications of Electrical and Thermal Loss in a Dielectric
 - 11.2 Electric Conductivity
 - 11.2.1 Electric Resistance
 - 11.2.2 Physical Causes of Volume Conductivity
 - 11.3 Application Problems
 - 11.3.1 Electric Breakdown
 - 11.3.2 Electrostatic Charge
 - 11.3.3 Electrets
 - 11.3.4 Electromagnetic Interference Shielding (EMI Shielding)
 - 11.4 Magnetic Properties
 - 11.4.1 Magnetizability
 - 11.4.2 Magnetic Resonance
- References

- 12. Optical Properties of Polymers
 - 12.1 Index of Refraction
 - 12.2 Photoelasticity and Birefringence
 - 12.3 Transparency, Reflection, Absorption, and Transmittance
 - 12.4 Gloss
 - 12.5 Color
 - 12.6 Infrared Spectroscopy
 - 12.7 Infrared Pyrometry
 - 12.8 Heating with Infrared Radiation
- References

- 13. Permeability Properties of Polymers
 - 13.1 Sorption
 - 13.2 Diffusion and Permeation
 - 13.3 Measuring S, D and P
 - 13.4 Corrosion of Polymers and Cracking
 - 13.5 Diffusion of Polymer Molecules and Self-Diffusion
- References

- 14. Acoustic Properties of Polymers
 - 14.1 Speed of Sound
 - 14.2 Sound Reflection
 - 14.3 Sound Absorption

References

Appendix

Subject Index

Author Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This unified approach to polymer materials science is divided in three major sections:

- Basic Principles — covering historical background, basic material properties, molecular structure, and thermal properties of polymers
- Influence of Processing on Properties — tying processing and design by discussing rheology of polymer melts, mixing and processing, the development of anisotropy, and solidification processes.
- Engineering Design Properties — covering the different properties that need to be considered when designing a polymer component — from mechanical properties to failure mechanisms, electrical properties, acoustic properties, and permeability of polymers.

A new chapter introducing polymers from a historical perspective not only makes the topic less dry, but also sheds light on the role polymers played, for better and for worse, in shaping today's industrial world.

The first edition was praised for the vast number of graphs and data that can be used as a reference. A new table in the appendix containing material property graphs for several polymers further strengthens this attribute.

The most important change made to this edition is the introduction of real-world examples and a variety of problems at the end of each chapter.

Target Audience: Engineers, technicians, and engineering students interested in how the materials science and processing of polymers affect the design process.

—

PREFACE TO THE SECOND EDITION:

The first edition of this book was adopted by several universities in North and South America, Europe, and Asia as a textbook to introduce engineering students to the materials science of polymers. The book was also translated into Japanese in 1998. The professors who taught with the first edition as well as their students liked the unified approach we took. Furthermore, it has become a reference for many practicing engineers, most of whom were introduced to the book as students. The changes and additions that were introduced in this edition are based on suggestions from these professors and their students, as well as from our own experience using it as a class textbook.

One major change that we made to this edition is the introduction of examples and problems at the end of each chapter. A new chapter containing the history of polymers replaced a few pages in the first edition. From a polymers course taught at the University of Wisconsin-Madison, we found that introducing polymers from a historical perspective not only made the topic less dry, but it also gave us a chance to show the role polymers have played, for better and for worse, while shaping today's industrial world. The mixing chapter in the first edition was replaced with a comprehensive polymer processing chapter. The first edition was praised because of the vast number of graphs and data that can be used as a reference. We have further strengthened this attribute by adding a table in the appendix that contains material property graphs for several polymers.

Title	Location	Edition / Series / Misc.
1583 McCutcheon's Volume 1: Emulsifiers & Detergents		Edition: North American edition
Author: McCutcheon's Division, Manufacturing Confectioner Publishing Co.	Dynix: 92041	Series:
- place: Glen Rock, NJ	Call No.: 668.108 Mc	
- date: ©2004	ISBN: 094425473X	Year: 2004
Subject: Detergents -- Catalogs -- Periodicals	Shelf Reference	Price: \$75.00
Desc: v.; 28 cm.		

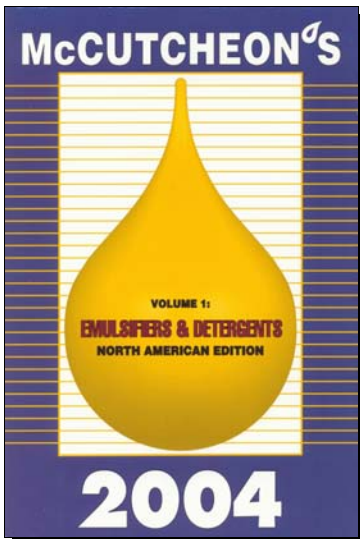


Table of Contents

- Company Index
- Food Emulsifier Index
- Textile Surfactant Index
- Surfactants
- Formulate Detergent/Shampoo Concentrated Bases
- Intermediates
- HLB Index of Materials
- CAS Number Index
- Ionic Type Classification
- Chemical Classification

Reviews - Synopsis - Dust Jacket

The North American Edition has been published since 1947 for purchasers and users of surfactant materials. Two volumes cover over 10,000 products by trade name, chemical description, manufacturer, form, concentration, ionic type, CAS Number, HLB and application.

McCutcheon's editions are now available in Adobe Acrobat® format for Windows or Macintosh. McCutcheon's Directories have been produced electronically using the standard in electronic document exchange format — Adobe Acrobat.

Subjects

728 .	Detergents -- Catalogs -- Periodicals
729 .	Surface active agents -- Catalogs -- Periodicals
730 .	Intermediates (Chemistry) -- Catalogs -- Periodicals
731 .	Chemical industry -- Catalogs -- Periodicals

With this version you can:

Locate any property, word or condition in the entire reference in seconds using boolean searching techniques and full text search.

Instantly jump to referenced sections and indexes and back again using hyperlinking and bookmarks.

All electronic editions include one copy of the printed directory.

The CD can be viewed in any of the following systems: Macintosh, Windows, DOS or UNIX. Full enhanced searching capabilities are only available under Windows or Macintosh environments.

Volumes

Vol 1: Emulsifiers & Detergents
Vol 2: Functional Materials

Title	Location	Edition / Series / Misc.
1584 McCutcheon's Volume 2: Functional Materials		Edition: North American edition
Author: McCutcheon's Division, Manufacturing Confectioner Publishing Co.	Dynix: 2528	Series:
- place: Glen Rock, NJ	Call No.: 668.108 Mc	
- date: ©2004	ISBN: 0944254977	Year: 2004
Subject: Chemicals -- Catalogs -- Periodicals	Shelf Reference	Price: \$75.00
Desc: v.; 28 cm.		

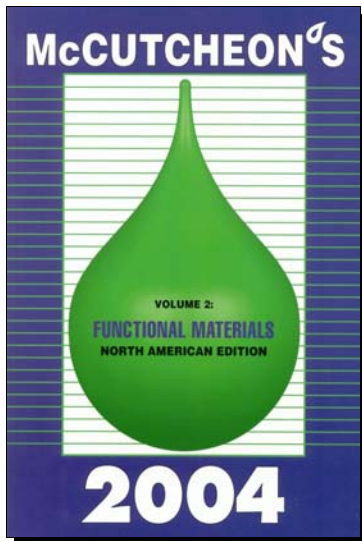


Table of Contents

INDEX OF FUNCTIONS:

- Absorbent/Adsorbents
- Algicides/Antimicrobials/Bactericides
- Disinfectants/Fungicides
- Anticaking Agents
- Antioxidants
- Antiperspirants
- Antisoils/Soil Antiredeposition Agents
- Antistats
- Binders
- Carriers
- Chelating/Sequestering Agents
- Colorants & Pearlescents
- Conditioners — Fabric Softeners
- Conditioners — Hair & Skin
- Corrosion Inhibitors
- Coupling Agents/Hydrotropes
- Defoamers
- Detergent Builders
- Dispersants
- Emollients
- Enzymes
- Fillers
- Film Formers
- Flocculants
- Fluorescent Whitening Agents
- Formulated Bases (For Cosmetic & Pharmaceutical Products)
- Hair Fixatives
- Humectants
- Lubricants — Cosmetic, Pharmaceutical, Food
- Lubricants — Household, Industrial, & Institutional
- Opacifiers
- Plasticizers
- Polishing Powders
- Preservatives
- Release Agents
- Scale Inhibitors
- Solubilizers
- Solvents
- Stabilizers
- Suspending Agents
- Thickeners
- UV Absorbers/UV Light Stabilizers
- Water Repellents
- Waxes & Polishes

Subjects

732 . Chemicals -- Catalogs -- Periodicals

Volumes

Vol 1: Emulsifiers & Detergents
 Vol 2: Functional Materials

COMPANY INDEX

TRADE NAMES BY FUNCTION

PRODUCT INDEX

Reviews - Synopsis - Dust Jacket

McCutcheon's Functional Materials - North American Edition :

Comprehensive formulator's guide to over 4000 products used in conjunction with surface active agents which are categorized by trade name, identity, physical characteristics and product application.

The North American Edition has been published since 1947 for purchasers and users of surfactant materials. Two volumes cover over 10,000 products by trade name, chemical description, manufacturer, form, concentration, ionic type, CAS Number, HLB and application.

McCutcheon's editions are now available in Adobe Acrobat® format for Windows or Macintosh. McCutcheon's Directories have been produced electronically using the standard in electronic document exchange format — Adobe Acrobat.

With this version you can:

Locate any property, word or condition in the entire reference in seconds using boolean searching techniques and full text search.

Instantly jump to referenced sections and indexes and back again using hyperlinking and bookmarks.

All electronic editions include one copy of the printed directory.

The CD can be viewed in any of the following systems: Macintosh, Windows, DOS or UNIX. Full enhanced searching capabilities are only available under Windows or Macintosh environments.

Title	Location	Edition / Series / Misc.
<p>169 Measurement of Colour Author: Wright, W. D. (William David), 1906- Publish.: D. Van Nostrand Company, Inc. - place: Princeton, NJ - date: [1964] Subject: Color Desc: x, 291 p., illus. (part color), 22 cm.</p>	<p>Dynix: 44136 Call No.: 535.6 Wr ISBN: Shelf Adult Non-Fiction</p>	<p>Edition: 3rd edition Series: Year: 1964 Price: \$25.00</p>

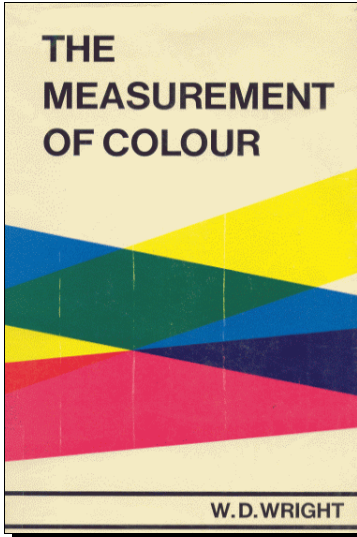


Table of Contents

1. RADIATION IN THE VISIBLE SPECTRUM: ITS EMISSION, ABSORPTION, AND REFLECTION
 - The nature of light
 - Light sources in colorimetry
 - The absorption of light
 - The reflection of light
2. RADIATION IN THE VISIBLE SPECTRUM: ITS RECEPTION IN THE EYE
 - The functions of the eye
 - The optical system of the eye
 - The retina
 - The relation between spectral composition and visual sensation
 - The geometrical representation of surface colours
 - Adaptation and contrast
 - Variation of colour perception across the retina and among individuals
 - Defective colour vision
3. THE PRINCIPLES OF PHOTOMETRY AND COLORIMETRY
 - The concepts and conventions of photometry
 - Light flux, luminance, and luminance factor
 - The experimental basis of trichromatic colorimetry
 - The algebra and geometry of colorimetry
4. THE C.I.E. SYSTEM OF COLOUR MEASUREMENT
 - The definition of the 1931 standard observer
 - The definition of a 10° standard observer
 - The 1931 C.I.E. co-ordinates, chromaticity chart, and distribution curves
 - A 10° co-ordinate system
 - The calculation of tristimulus specifications from spectrophotometric data
 - Colour specification in terms of dominant wave-length and purity
5. COLORIMETERS AND SPECTROPHOTOMETERS
 - Practical methods of colour measurement
 - Additive colorimeters
 - Subtractive colorimeters
 - Photoelectric colorimeters
 - Visual spectrophotometers
 - Photoelectric spectrophotometers
6. COLOUR SPACING AND THE COLOUR ATLAS
 - Subjective judgements of colour appearance and colour difference
 - The just noticeable difference in colour
 - Colour discrimination in the chromaticity chart
 - The construction of a colour atlas
 - Colour atlases-Uniform colour scales and colour tolerances
7. COLOUR MIXTURE DATA APPLIED TO THREE-COLOUR REPRODUCTION
 - The principles of three-colour reproduction
 - Subtractive colour photography and printing
 - Colour television-The assessment of a colour picture
8. PRACTICAL APPLICATIONS OF COLORIMETRY
 - The classification of colour problems
 - Colour standards in industry
 - The colouring power of chemicals and their mixture
 - Lighting
 - Agriculture and food
 - Chemical tests: Indicators
 - The pulp and paper industry

Subjects

244 .	Color
362 .	Colorimetry

The paint industry
Signal glasses
The analysis of optical phenomena
Meteorology and astronomy
Dichronism

APPENDIXES

- I Illuminants: Tables of energy distributions of SA, SB and SC; tables of spectral transmission factors of SB and So filters.
II The 1931 C.I.E. system of colour specification: tables of the chromaticity co-ordinates of the spectrum and of the distribution coefficients
III Condensed tables for the 1931 C.I.E. system
IV Wavelength tables for the calculation of tristimulus values by the selected ordinate method
V A system of colour specification for large fields: tables of the chromaticity co-ordinates of the spectrum and of the distribution coefficients

NAME INDEX

SUBJECT INDEX

Reviews - Synopsis - Dust Jacket

PREFACE TO THE THIRD EDITION

The main purpose of this book is to describe the principles, methods and applications of the trichromatic system of colour measurement. Not all colour measurement needs to be referred to this system, but since 1931, when the Commission Internationale de l'Eclairage first adopted a set of tables to define the colour-matching characteristics of a standard observer and establish a reference framework for the specification of colours, the tri-chromatic method has become fundamental to all others.

The most important development in colorimetry since the second edition of this book was published in 1958 has been the preparation by the Colorimetry Committee of the C.I.E. of tables to represent the colour-matching functions of a standard observer for large-field viewing conditions. The 1931 standard observer was based on colour-matching experiments using a field of view subtending 2° observed by foveal vision. The large-field functions are based on the researches of Dr W. S. Stiles at the National Physical Laboratory, London, and of Dr N. I. Speranskaya at the State Optical Institute, Leningrad, in which the external diameter of the matching field subtended 10° while a central area of the field, subtending some 2° or 3° and covering the fovea, was not used. The functions therefore refer to an annular zone of the retina surrounding the fovea.

At the time of writing, these functions have not been officially approved by the C.I.E. as standard observer data. They were tabulated in 1959 and the delay in reaching agreement has arisen primarily because of doubts about the extension of the additivity principle to large-field conditions, in which rod intrusion in the extrafoveal retina is a disturbing influence. Field tests have not given unequivocal confirmation of the validity of the large-field data, but I personally feel that it is essential that these new functions should be described and included in this book. They may in any case receive international approval quite shortly for use under appropriate conditions, but even if approval is delayed their inclusion here will encourage their use on an experimental basis for industrial colour-match prediction.

Other recent developments have included the measurement of the spectral composition of various phases of daylight, for both the ultra-violet and the visible regions of the spectrum and it is expected that this will lead to the specification of new standard illuminants for colorimetry. The C.I.E. have also recommended a particular transformation of the (XYZ) system into a co-ordinate system giving a more uniform spacing of surface colours. On the instrumental side, the drive for more sophisticated recording instruments has continued and this has been illustrated here by reference to a new Japanese spectrophotometer.

Colorimetry continues to provide the basic framework around which the principles of colour television have been erected, and a more adequate account of these principles has been given in Chapter 7. The launching of a public service of colour television is clearly not to be lightly undertaken, but when it does arrive we must anticipate a major awakening of interest in the phenomena of three-colour mixture. Some new applications of spectrophotometry and colorimetry have been included and it seems likely that in the biological field a major area for study is opening up. All in all, colour physics can be said to be in a very lively and healthy state of activity.

Title	Location	Edition / Series / Misc.
88 Measuring Colour Author: Hunt, R. W. G. (Robert William Gainer), 1923- Publish.: Ellis Horwood, Ltd.; John Wiley & Sons - place: Chichester, [West Sussex], UK / New York, NY - date: ©1987 Subject: Color Desc: 221 p., [8] p. of plates, illus. (some color);, 25 cm.	Dynix: 06130 Call No.: 535.6 Hu ISBN: 0745801250 Shelf Adult Non-Fiction	Edition: Series: Year: 1987 Price: \$25.00

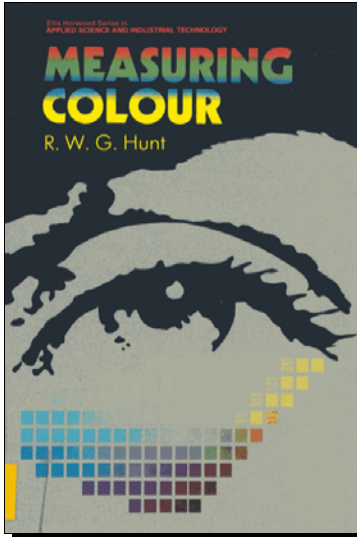


Table of Contents

- Preface
- Acknowledgements
- 1. Colour vision
- 2. Spectral weighting functions
- 3. Relations between colour stimuli
- 4. Colour order systems
- 5. Obtaining tristimulus values
- 6. RGB Colorimetry
- 7. Miscellaneous topics
- 8. Model of colour vision for predicting colour appearance
- Appendix 1. Radiometric and photometric terms and units
- Appendix 2. Spectral luminous efficiency functions
- Appendix 3. CIE colour-matching functions
- Appendix 4. CIE spectral chromaticity co-ordinates
- Appendix 5. Relative spectral power distributions of illuminants
- Appendix 6. Colorimetric formulae
- Appendix 7. CIE colour rendering index
- Appendix 8. Glossary of terms
- Index

Reviews - Synopsis - Dust Jacket

Preface

This book is intended to provide the reader with the basic facts needed to measure colour. It is a book about principles, rather than a guide to instruments. With the continual advances in technology, instruments are being improved all the time, so that any description of particular colorimeters or spectrophotometers is likely to become out of date very quickly. For such information, manufacturers' catalogues are a better source of information than books. But the principles of measuring colour are not subject to rapid change, and are therefore appropriate for treatment in the more permanent format offered by books.

Recommendations about the precise way in which the basic principles of colour measurement should be applied have for over 50 years been the province of the International Commission on Illumination (CIE). The second edition of its Publication No. 15, Colorimetry, made available in 1986, includes several new practices, and it is therefore timely to restate the principles of colorimetry together with these latest international recommendations. on their application; this is the aim of Measuring Colour.

Colour is, of course, primarily a sensation experienced by the individual. For this reason, the material has been set in the context of the colour vision properties of the human observer: the first chapter is a review of our current knowledge of colour vision; and the last chapter provides a description of a model of colour vision that can be used to extend colour measurement, beyond the territory covered by the CIE at present, to the field of colour appearance.

Subjects

244 . Color

Title	Location	Edition / Series / Misc.
756 Mechanical Properties of Coatings Author: Hill, Loren W. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1987 Subject: Coatings -- Periodicals Desc: 25 p., illus., 28 cm.	Dynix: 55947-06 Call No.: 667.9 Fe ISBN: 0934010315 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS6 Year: 1987 Price: \$50.00

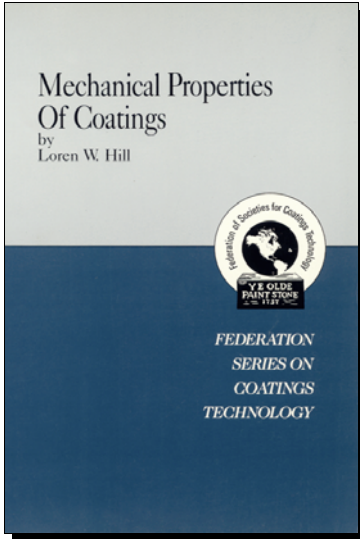


Table of Contents

- I. INTRODUCTION
- II. BASIC CONCEPTS
 - A. The Glass Transition
 - B. Structure and Crosslinking
 - C. Viscoelasticity
- III. PHYSICAL PROPERTY DETERMINATIONS
 - A. Stress-Strain Curves (General)
 - B. Sample Preparation
 - C. Stress-Strain Behavior of Coatings
 - D. Transient Property Determinations
 - E. Dynamic Property Determinations
- IV. MECHANICAL TESTS
 - A. Purposes and Limitations
 - B. Test Methods
 - 1. Hardness
 - 2. Flexibility
 - 3. Impact Resistance
 - 4. Solvent Resistance
 - 5. Abrasion Resistance
 - 6. Post-formability
 - 7. Adhesion
- V. SUMMARY
- VI. REFERENCES
- VII. APPENDIX

Subjects

239 . Coatings

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Organic coatings are used primarily for two purposes, to improve appearance and to protect substrates. To perform these functions effectively, coatings must have certain mechanical properties. In the discussion that follows, "mechanical property" will be used as a general term to encompass results of both mechanical tests and physical property determinations. A variety of mechanical tests have been developed to measure such properties as hardness, flexibility, impact resistance, abrasion resistance, and scratch resistance. The tests are normally carried out with the coating intact on the substrate. In a well designed test, conditions are carefully selected to simulate in-service conditions. Accurate simulation of in-service conditions is not a simple matter, and reproducibility of test conditions can be difficult. The major efforts that are exerted in development of ASTM test methods attest to these problems. Many mechanical tests are described in Gardner and Sward's manual on paint testing. Although the most recent edition of this manual was published in 1972, many of the tests described therein are still heavily used.

Most mechanical tests can be carried out quickly with inexpensive apparatus and most tests yield a single number. In some cases, a quality rating is used in place of a number. Frequently, the purpose of carrying out such tests is to rank the performance of coatings prepared from a series of quite similar formulations, or to rank the performance of coatings prepared from the same formulation with a series of different cure conditions. Usually the results of such mechanical tests are useful for comparing similar coatings, but the numerical values obtained do not relate to a general body of knowledge beyond the coatings field.

In contrast, physical property determinations are carried out in all branches of materials science, and therefore a broad, general body of knowledge exists. The coatings scientist who carries out physical property determinations has the opportunity to make use of previously established relationships between properties and polymer structure. Establishment of relationships between properties and structure is very desirable because such relationships make it possible to design coating structures which will result in improved performance. It is much more difficult to establish relationships between properties and structure based on mechanical tests alone.

Although physical property determinations offer very significant advantages, there are also disadvantages. Normally these determinations require free films, and obtaining free films is time consuming. Instrumentation used in physical property determinations is expensive and frequently requires greater operator skill. To obtain full benefit from physical property values and their variations, one must have considerable knowledge of the broader field of polymers. Another disadvantage of free-film data is that actual coatings performance frequently depends on coating-substrate interactions. For these reasons, it does not appear to be desirable to replace mechanical tests by physical property determinations in all cases. Rather, the selection of a mechanical property method should be based on the specific objective of the coatings scientist on a given project. Mechanical tests may be adequate for optimization of coatings systems that are already pretty close to being acceptable. Such tests may also be adequate for quality control or for specifications. However, if a major change is to be made in the type of coating, such as conventional to water-borne or conventional to high solids, it is likely that the more basic approach of using physical property determinations will be desirable. Another worthwhile use of physical property determinations is to understand more fully the significance of mechanical test results.

Title	Location	Edition / Series / Misc.
89 Mechanical Properties of Polymers Author: Nielsen, Lawrence E. Publish.: Van Nostrand Reinhold Company - place: New York, NY - date: ©1962 Subject: Polymers and polymerization Desc: ix, 274 p., illus., 24 cm.	Dynix: 43968 Call No.: 547.84 Ni ISBN: Shelf Adult Non-Fiction	Edition: Series: Year: 1962 Price: \$25.00

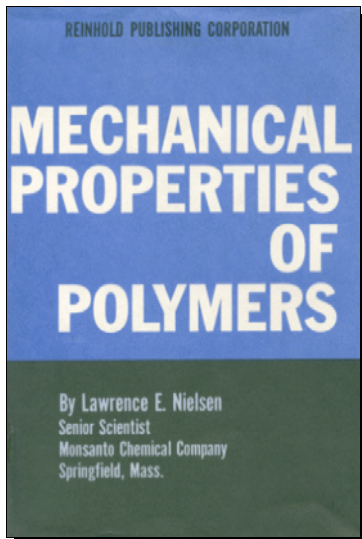


Table of Contents

Preface
 Chapter 1. Introduction to Mechanical Behavior
 Chapter 2. Transitions in High Polymers
 Chapter 3. Creep
 Chapter 4. Stress Relaxation
 Chapter 5. Stress-Strain Measurements
 Chapter 6. Impact Strength and Theories of Strength of Polymers
 Chapter 7. Dynamic Mechanical Testing
 Chapter 8. Interrelations Between Various Properties
 Chapter 9. Miscellaneous Mechanical Properties
 Chapter 10. Effects of Orientation and Thermal Treatments on Mechanical Properties
 Symbols
 Index

Reviews - Synopsis - Dust Jacket

FROM THE BOOK JACKET:

Here is a concise, authoritative book that fills a long-standing need for literature on the subject of the mechanical properties of polymers. This comprehensive, well-detailed book is virtually a handbook that enables the specialist to find important material on polymers that is not readily available elsewhere.

Research workers, plastics technologists, college students and others who need information on polymers for use in their interrelated fields may also find that this book is their most important "discovery" of the year.

Featuring new information, it covers such important topics as: the effects of molecular orientation on mechanical properties (important from a practical standpoint); the mechanical properties of polyblends and filled polymer systems; stress-strain curves, impact strength, theories of strength, hardness, fatigue, heat distortion tests and friction; and a complete discussion of the relations between dynamic mechanical properties and the chemical and physical structure of polymers.

Other outstanding features include: emphasis on how glass transitions, secondary transitions and crystallinity are basic in determining the mechanical properties to structure. Theory is discussed at an intermediate to elementary level; most mathematical derivations are omitted, and only the final important equations are given and their use is illustrated. Special emphasis is placed on practical relations between mechanical and electrical properties.

Not since the advent of plastics and their wide use in business and industry has such a detailed and thorough book been published on the subject of the mechanical properties of polymers.

PREFACE:

It is the purpose of this book to present a concise review of a wide variety of mechanical properties of high polymers from both the theoretical and experimental viewpoints. Emphasis is placed upon general principles and useful empirical generalizations. This is the first time that many of these generalizations on mechanical behavior and structure have been collected in one place. Certainly some of the theoretical advances of the future will be based upon these empirical generalizations and rules of thumb; in the meantime, practical use may be made of them. These rules are not always strictly correct or extremely accurate, but they are of great practical value, and they enable one to readily understand many of the mechanical proper- ties of polymers and to bring order out of the chaotic mass of data on mechanical behavior.

This book differs from most other books on mechanical behavior in that it covers a much wider field of mechanical tests. In addition to the usual tests discussed in connection with viscoelastic theory such as creep, stress relaxation, and dynamic behavior, this book also devotes considerable space to stress-strain behavior, impact strength, hardness tests, heat distortion tests, fatigue behavior, and frictional properties. In addition, a chapter is devoted to orientation phenomena and to heat and solvent treatments which are so important in the processing of polymers and which have a tremendous effect on the use properties of plastics and fibers.

Extensive references to published literature enable the reader to find important sources of information on numerous topics easily and quickly. Emphasis is placed on the most important articles on the various fields of mechanical properties and polymeric transitions. Mathematical derivations are avoided for the most part; only the final practical

Subjects

316 . Polymers and polymerization

equations are listed, and numerous illustrative examples are given.

It is apparent, therefore, that this book is not primarily for the specialist in the field of mechanical properties of high polymers. Rather, it is written at an elementary or intermediate level to fit the needs of:

- (1) The industrial polymer research scientist who should have some background information on mechanical properties and their relation to molecular structure.
- (2) The design engineer who needs to know the significance of the various mechanical tests and how plastics and rubbers differ from other structural materials.
- (3) The fabricator of polymeric materials who is interested in knowing how processing variables affect mechanical behavior and who wants to choose the correct polymer to fulfill the mechanical requirements of a given finished product.
- (4) Those students who have an interest in high polymers and who wish to learn something of the physics and mechanical properties of such materials

I am especially indebted to Drs. R. L. Miller, S. Newman, and F. D. Stockton who painstakingly studied the manuscript and offered numerous suggestions for its improvement. Many other of my colleagues, too numerous to mention individually here, have also read the manuscript and have been kind enough to point out mistakes and to make helpful suggestions. I also wish to acknowledge the help of my wife in arranging the literature references and in proofreading the manuscript several times during the various stages of this book. I am also indebted to the typists, headed by Mrs. Janet Webster, who had to decipher my handwriting and convert it to a legible form. Many of the graphs were made for me by Mr. R. Keeney. Finally, I wish to acknowledge the help and encouragement given me by the management of the Monsanto Chemical Company during the month required to write this book.

LAWRENCE E. NIELSEN

Springfield, Mass. June, 1962

Title	Location	Edition / Series / Misc.
90 Metal Cleaning Author: Spring, S. (Samuel), 1916- Publish.: Reinhold Publishing Corporation - place: New York, NY - date: [1963] Subject: Metal cleaning Desc: 234 p., illus., 24 cm.	Dynix: 29240 Call No.: 671.7 Sp ISBN: Shelf Adult Non-Fiction	Edition: Series: Year: 1963 Price: \$25.00

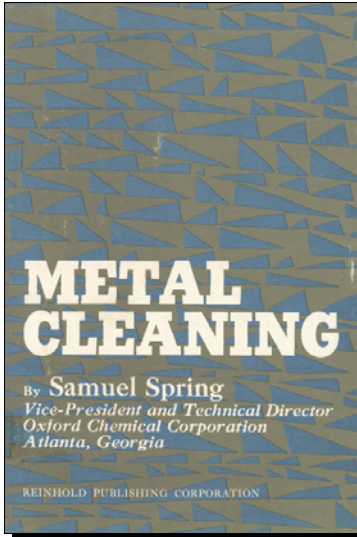


Table of Contents

1. INTRODUCTION
2. COMPOSITIONS USED IN METAL CLEANING
3. GENERAL METHODS OF CLEANING
4. SPECIAL METHODS OF CLEANING
5. FOAM AND ITS CONTROL
6. TYPES OF SOIL AND TECHNIQUES FOR THEIR REMOVAL
7. EFFECTS OF METAL SURFACE ON SELECTION OF CLEANERS
8. ENGINEERING AND ECONOMIC FACTORS IN CLEANER SELECTION
9. MULTI-PURPOSE CLEANING
10. EVALUATION OF CLEANLINESS
11. EVALUATION OF METAL CLEANERS
12. RINSING, WATER SUPPLY, DRYING
13. SAFE HANDLING OF CLEANING MATERIALS
14. PRODUCTION HINTS
15. CHECK LIST FOR COST REDUCTION
- INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Anyone interested or actively engaged in the field of metal cleaning, and such related subjects as preparation for painting, plating, welding, adhesive joining and others, will find this book extraordinarily useful. Metal Cleaning presents a moderate theoretical treatment of the topic with major emphasis on practical application. The areas of control cleaning baths and methods for cleaner selection are thoroughly covered. Recommendations for materials, procedures, and equipment for cleaning abound. General and specific chapters are devoted to production suggestions for improved cleaning with reduced costs. The author has written for more than forty publications on the subject, and has seven patents to his credit. Another highlight of the book is a summary of the results of a dozen research investigations that have never been published any where. A supplementary list of literature is also included. Metal Cleaning is of paramount importance to process and sales engineers, laboratory personnel, plant superintendents and line operators.

Subjects

274 . Metal cleaning

INTRODUCTION:

Soil is unwanted matter which must be removed from the surface of a metal. Selection of the best and most economical cleaners and procedures for doing this and determination of the residue that can be tolerated in any specific application are the over-all objectives of this book. Soils may be removed in one or more of the following ways:

- (1) Detergency
- (2) Solvency
- (3) Chemical reaction
- (4) Mechanical action

These methods are not mutually exclusive and are often used in combination; especially important is the use of mechanical action with types (1) and (2).

The mechanical aids to detergency are important enough to merit extended treatment. Mechanical cleaning without the use of chemicals is sometimes quite important and is discussed briefly. After the soil has been removed, it must be prevented from redepositing on the work being cleaned, while means must be provided for its accumulation and eventual disposal. Excess cleaner must also be removed from the part by rinsing or evaporation.

Each of the types of cleaning can be carried out in a variety of ways and with a multitude of materials. Hence the selection of the best cleaner for a set of operating conditions is based on many factors. Sometimes one of these factors is so important that the decision is relatively simple; all other considerations become secondary. Selection of the cleaner

may be dictated by the soil, the metal, the nature of the part and economics, e.g., a large volume of low-priced parts would justify a different procedure from a small volume of intricate parts on which considerable labor has been expended. The selection is made less difficult by knowledge of the important factors, each of which will be treated in a section of this book.

The nature of the soil is so closely related to the cleaning procedure as to require separate discussion. The properties of the metal are often significant from a negative viewpoint, i.e., by excluding certain effective procedures and chemicals in the cleaning of sensitive metals.

The engineering aspects include: design of the part with respect to intricacy of shape, blind holes, easily damaged surfaces; prevention of corrosion during processing or storage periods; and methods of handling and equipment. The equipment used in cleaning is often of greater importance than the cleaner. Selection of the cleaning method is dependent on the space available, cost, and production load. Of increasing importance is disposal of wastes from cleaning operations; this may become a limiting factor in selection of cleaning materials and may necessitate expensive cartage of chemicals, or equipment to render the wastes innocuous.

We shall not consider removal of oxide scales or corrosion products to be within the province of cleaning except in outline and for alkaline removal of oxides or rusts together with organic soils. This also applies to paint stripping. Cleaning of non-metallic surfaces is omitted from this volume, even though many factors relating to metal cleaning are of equal importance in cleaning other surfaces.

Title	Location	Edition / Series / Misc.
757 Metal Surface Characteristics Affecting Organic Coatings		<i>Edition:</i>
<i>Author:</i> Perfetti, Bruno M.	<i>Dynix:</i> 55947-21	<i>Series:</i> Federation Series on Coatings
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Fe	Technology: No. FS21
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0934010323	
<i>- date:</i> ©1994	<i>Shelf</i> Reference	<i>Year:</i> 1994
<i>Subject:</i> Surface chemistry		<i>Price:</i> \$50.00
<i>Desc:</i> 70 p., illus., 28 cm.		

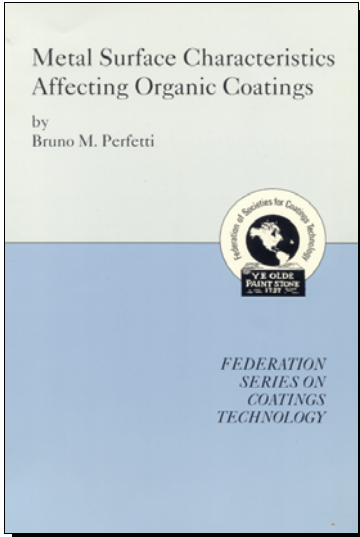


Table of Contents

- I. INTRODUCTION AND PURPOSE
 - A. General Considerations Related to Substrate Characteristics
 - B. Significance of Surface Variables and Determinants of Performance
 - C. Effects of Chemical and Physical Attributes of Metals
 - D. Constraints on Preparative Methods Imposed by Technical, Economic, and Practical Factors
 - E. Effects of Surface Aging and Storage Conditions on Preparative Processes
 - F. Priority of Mechanical Performance Over Surface Requirements
- II. SOME THEORETICAL AND TECHNOLOGICAL CONSIDERATIONS OF METAL SURFACES
 - A. Characteristics of Metals Affecting Surfaces
 - B. Effects of Surface Energy, Adsorption, Wetting and Liquid Spreading Factors
 - C. Effects of Adsorption Phenomena on Metal Surfaces
 - D. Variables of Surfaces Related to the Chemistry of Metals
 - E. Elemental Compositional Factors Affecting Surface Variables and Processing Responses of Steels
 - F. Alterations of Surfaces Affected by Variations in Thermal Processing Conditions
 - G. Surface Geometry and Texture Effects on Surface Preparation
 - H. Effects of Surface Passivation and Corrosion on Cleaning and Treatment Processes
- III. VARIOUS TYPES OF METAL SUBSTRATES AND THEIR UNIQUE CHARACTERISTICS
 - A. Ferrous Metal and Ferrous-based Metal Substrates
 - 1. Introductory Comments Regarding Steel Substrates
 - 2. Carbon Steel Substrates, Uncoated
 - a. Hot-Rolled and Hot-Formed Steel Products
 - b. Cold-Rolled Steel Products
 - 3. High Strength-Low Alloy Steel Products
 - 4. Stainless Steel Products
 - 5. Electrical Steel Products
 - B. Carbon Steel Ferrous Substrates, Coated
 - 1. Introduction to Coated Sheets
 - 2. Zinc-Coated (Galvanized) Hot-Dipped Steel Products
 - 3. Zinc-Coated (Electrogalvanized) Electrocoated Steel Sheets
 - 4. Iron-Zinc Alloy-Coated Electrocoated Steel Sheets
 - 5. Nickel-Zinc Alloy-Coated Electrocoated Steel Sheets
 - 6. Aluminum-Zinc Alloy-Coated Hot-Dipped Steel Sheets
 - 7. Aluminum-Coated Steel Sheets
 - 8. Terne-Coated Steel Sheets
 - 9. Electrolytically Tin-Coated Steel Sheets
 - 10. Cr/CrOx-Coated Steel Sheets
 - C. Steel Sheet for Special-Purpose Applications
 - 1. Tin-Mill Products
 - 2. Prepainted Sheet Products, Coated and Uncoated
 - D. Nonferrous Metal Substrates
 - 1. Aluminum and Aluminum Alloy Products
 - 2. Other Nonferrous Metals
 - a. Magnesium and Magnesium Alloy Products
 - b. Copper and Copper Alloy Products
- IV. CLEANING AND TREATMENT PROCESSES FOR THE PREPARATION OF METAL SURFACES FOR ORGANIC COATING AND PAINTING
 - A. Cleaning Processes for Metals
 - 1. Mechanical and Thermal Action

Subjects

333 . Surface chemistry

- a. Abrasive-Blast Cleaning, Wet and Dry
- b. Power and Manual Brushing and Impacting
- c. Flame Cleaning Methods
- d. Ultrasonic, Vibratory, and Tumbling Methods
- 2. Chemical and Electrolytic Cleaning Action
 - a. Solvent Cleaning
 - b. Pickling and Acidic Deoxidation
 - c. Alkaline Deoxidation
 - d. Electrolytic Cleaning in Ionic Media
 - e. Detergent Solution Cleaning Action
 - f. Other Cleaning Method Options
- B. Preparative Treatment Processes for Metal
 - 1. Phosphate and Related Pretreatments and Coatings
 - a. Iron Phosphate-Oxide (Amorphous) Coatings
 - b. Crystalline Zinc Phosphate Coatings
 - 2. Chromate Pretreatments and Coatings
 - 3. Complex Oxide Pretreatments and Coatings
 - 4. Anodizing Treatments (Oxidation Treatments)
 - 5. Other Electrolytic and Chemical Deposition Treatments
 - a. Autophoretic Deposition
 - b. Chrome/Chrome Oxide Electrocoatings
 - c. Metallic Flash-Coat Electrodeposits
 - 6. Some Reflections on the Toxicity Problem
- V. PROCESSING OPERATIONS AND EQUIPMENT
 - A. Immersion Cleaning and Treatment Factors
 - B. Spray Cleaning and Treatment Factors
 - C. Roller Coater-Applied, Non-Rinse Treatments
- VI. CHARACTERIZATION TESTS FOR CLEANED AND TREATED METAL SURFACES
 - A. Tests for Surface Cleanliness
 - 1. Water-Break Test
 - 2. Surface Carbon Test for Steel
 - 3. Fluorescence Test for Mineral Oils
 - 4. Surface Extraction and Infrared Analyses
 - 5. Ion Chromatography Analyses
 - B. Tests for Surface Pretreatments and Coatings
 - 1. Coating Weight Determinations
 - 2. Element and Structure Analyses
 - 3. Accelerated Performance Tests
- VII. SUMMARY
- VIII. ACKNOWLEDGMENTS
- IX. REFERENCES
- X. BIBLIOGRAPHY
- XI. APPENDIX—GLOSSARY OF TERMS

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

There have been many procedures, manuals, specifications, standards and related documents written and issued over the years intended to firmly establish numerous authoritative methods for the proper treatment and preparation of metallic surfaces for subsequent coating with a variety of organic coatings and paints. These publications have been, and continue to be, very valuable sources of information for those concerned with any of the many aspects of coating technology and the protective and decorative coating sciences. Most of the literature covering these subjects is rather specific and focused on a particular class of materials or a particular end use. For example, Department of Defense documents deal with coating systems applicable to military equipment or installations, aircraft, naval vessels, armaments, ordnance, tanks, trucks, etc., all of which have very specific performance requirements and conformance demands. This literature involves prescribed or recommended practices for handling a wide range of metal substrates, such as steel, aluminum, zinc, copper, and their corresponding alloys.

Trade associations and industrial research institutes publish similar reports on effective methods of metal preparation and provide recommendations for the products of particular concern to them. Likewise, the Steel Structures Painting Council issues instructive manuals on the preparation of steels for coating as used in the construction of buildings, bridges, tanks, and similar structures. The American Society for Metals International (ASM) publishes a comprehensive handbook relative to the properties and treatment of all the major nonferrous metals and their alloys. The Aluminum Association provides reports dealing with the proper handling of aluminum products in preparation for coating and the National Coil Coaters Association issues technical recommendations applicable to the treatment and preparation of aluminum and steel sheet in the form of continuous coils. A further excellent source of authoritative information on metal preparation for coating is the ASTM Book of Standards, published by the American Society for Testing and Materials.

The preceding listing is illustrative of numerous sources for appropriate surface preparations for the different metals available for materials of construction and likely to be encountered by coatings chemists, engineers, and technologists in the course of their work.

With all the currently available literature on the subject, one may question the need and value of yet another discourse dealing with the preparative techniques and associated information ultimately concerned with the coating of metal substrates. As has been noted previously, most of the information on this subject is very product specific and narrowly focused on the methodology of the preparative processes and the analytical determination of the quality of the end results. Most of the existing literature deals with specific questions of how each type of metal and coating regimen functions in particular circumstances or conditions of use. Consequently, it would seem appropriate to address the subject from a different perspective, namely, that of the coatings scientist and the metals technologist.

The coatings scientist must understand something of the nature of the surfaces to which specifically chosen coatings are to be applied for their protection and/or decoration. The coatings scientist must also know how to best satisfy the requirements for treatment of these surfaces to optimize the utility and performance of the coating systems, and must devote a considerable effort in laboratory studies to attain this end. The metals technologist must in turn recognize and appreciate the constraints imposed by the various choices of treatment options offered by the particular metallurgy and processing variables of the metals involved. Thus, a general overview of the essential factors associated with the preparation of the variety of metals in common use for coating and painting would seem to be a worthwhile undertaking. The presentation to follow is intended to serve this purpose and will hopefully be of some value to those concerned with the implementation of organic coating technology.

Title	Location	Edition / Series / Misc.
758 Methodologies for Predicting the Service Lives of Coating Systems		<i>Edition:</i>
<i>Author:</i> Martin, Jonathan W., Sam C.Saunders, F. Louis Floyd and John P.	<i>Dynix:</i> 55947-24	<i>Series:</i> Federation Series on Coatings Technology: No. FS24
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Fe	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0934010331	<i>Year:</i> 1996
<i>- date:</i> ©1996	<i>Shelf</i> Reference	<i>Price:</i> \$50.00
<i>Subject:</i> Coatings -- Periodicals		
<i>Desc:</i> 34 p., illus., 28 cm.		

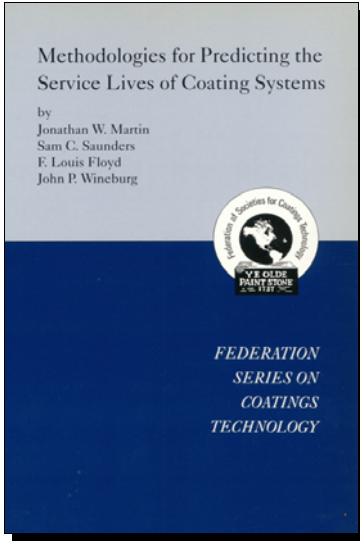


Table of Contents

- I. INTRODUCTION
- II. GENERAL ATTRIBUTES OF THE SERVICE LIFE PREDICTION PROBLEM
 - A. Sources of Service Life Data
 - B. Fault Trees
 - C. Service Life Data Attributes
 - D. Characterization of Weathering Environments
 - E. Storage, Retrieval, and Analysis of Data
 - F. Criteria for Judging the Adequacy of Any Proposed Service Life Prediction Methodology
- III. CURRENT DURABILITY METHODOLOGY
 - A. Description of Methodology
 - B. Underlying Premises
 - C. Assessment of Current Durability Methodology
- IV. RELIABILITY-BASED METHODOLOGY
 - A. Reliability Theory and Life Testing Analyses
 - 1. Basic Concepts
 - a. Time-to-Failure for a Single Failure Mode
 - b. Life Distributions
 - c. Service Life Estimates for a Coating System
 - 2. Estimation of the Parameters of a Life Distribution for a Coating System Failing by a Single Failure Mode
 - 3. Estimation of the Parameters of a Life Distribution in the Presence of Competing Failure Modes
 - 4. Estimation of the Parameters of a Life Distribution Containing Concomitant Variables
 - 5. Estimation for Short-Term Laboratory-Based Aging Experiments
 - 6. Cumulative Damage Models
 - B. Proposed Changes in the Current Data Collection Procedures
 - 1. Quantification of Initial Property Measurements
 - 2. Quantification of In-Service Exposure Environments
 - 3. Quantification of Coating System Degradation
 - 4. Experimental Designs
 - 5. Databases
 - C. Assessment of Reliability-Based Service Life Prediction Methodology
- V. ACKNOWLEDGMENTS
- VI. REFERENCES

Subjects

239 . Coatings

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Over the last two decades, the organic coatings industry has undergone rapid technological and structural changes. These changes have been induced by legislative actions such as restrictions pertaining to hazardous chemicals, toxic effluents, and volatile organic compounds. Further changes have been induced by competitive and consumer pressures to produce environmentally and user friendly coatings without sacrificing ease of application, initial appearance, or most importantly, without significantly reducing the expected service life of the coating systems. The consequence of these changes has been the displacement of almost all previously commercially-important, well-established coatings (largely high-solvent coatings) by newer systems, the formulation and application of which are based on different chemistries and technologies.

Unlike the coatings which are being displaced, the new coatings do not have well-established performance histories. At present, generating a reliable performance history for a new coating requires an extensive in-service or outdoor

exposure program. Attempts at avoiding this task, by employing various forms of short-term laboratory-based aging tests, have had limited success, largely because of confounded causal effects in the current durability protocols. Alternatively, creating a performance history from results of in-service exposures requires long exposure times and yields results which have limited reproducibility since the weather never exactly repeats itself.

Therefore, the coatings industry is faced with a dilemma. On one hand, the coatings industry needs a method for generating performance data rapidly with assured reliability. On the other hand, the results from laboratory-based experiments, the most promising method for acquiring service life data in the shortest time, have historically been viewed with suspicion by the coatings industry.

However, a lack of confidence in results from short-term laboratory tests is not found in all industries. The electronics, medical, aeronautical, and nuclear industries have long since made the transition from an overwhelming dependence on long-term in-service tests to reliance on short-term laboratory tests. This change has greatly reduced the time required to introduce new products and helped improve the competitive status of these industries. The service life prediction methodology used by these industries, however, is quite different from the one used in the coatings and other building industries. It is based on reliability theory and life testing analysis (see Section IV); henceforth, this will be termed the reliability-based methodology. Because of the success of the reliability-based methodology, it seems worth comparing it with the current durability methodology used in the coatings industry to determine if it is indeed superior.

The goals of this monograph, therefore, are to:

1. Compare the current durability methodology used in the coatings industry with the reliability-based methodology used in other industries;
2. Identify the elements of each methodology and their underlying assumptions;
3. Identify the interrelationships between these elements; and
4. Identify technical barriers, including deficiencies in standards, and critical research areas which need to be addressed to improve the ability to predict the service lives of coatings.

Although the scope of this monograph is broad, it is not a definitive treatise on the service life prediction problem. Instead, it is a review of important issues and difficulties in predicting the service life of a coating system with suggestions as to how to proceed. It is hoped that this presentation will foster discussion within the coatings community and serve to alleviate doubts about the feasibility of implementing a successful quantitative service life prediction methodology.

Title	Location	Edition / Series / Misc.
91 Microstructure and Microtribology of Polymer Surfaces		<i>Edition:</i>
<i>Author:</i> Tsukruk, Vladimir V. and Kathryn J. Wahl (editors)	<i>Dynix:</i> 89758	<i>Series:</i> ACS Symposium Series: No. 741
<i>Publish.:</i> American Chemical Society [Distributed by Oxford University Press]	<i>Call No.:</i> 547.7 Mi	
<i>- place:</i> Washington, DC / New York, NY	<i>ISBN:</i> 0841236828	
<i>- date:</i> ©2000	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 2000
<i>Subject:</i> Polymers -- Surfaces		<i>Price:</i> \$105.00
<i>Desc:</i> xiv, 526 p., illus., 24 cm.		

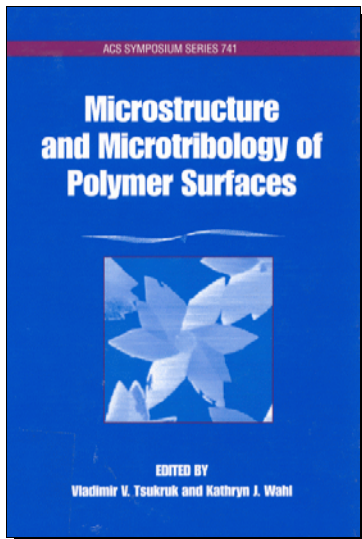


Table of Contents

Preface
Introduction
1. Tribology of Polymers: A Perspective, B. J. Briscoe

Contact Mechanics of Polymeric Materials
2. Contact Mechanics and Adhesion of Viscoelastic Spheres, K. L. Johnson
3. Surface and Bulk Properties in Adherence of Elastic-Viscoelastic Solids, J. C. Charmet, D. Vallet, and M. Barquins
4. Creep Effects in Nanometer-Scale Contacts to Linear Viscoelastic Materials, W. N. Unertl
5. The Role of Interfacial Slippage in Adhesive Release, K. Vorvolakos and M. K. Chaudhury
6. Response of Thin Oligomer Films to Steady and Transient Shear, Mark O. Robbins and Arlette R. C. Baljon

Micromechanics and Microtribology
7. Micromechanics and Microtribology of Polymer Films, F. Oulevey et al.
8. Physics and Physical Chemistry at the Nanotip Scale: Fundamental Investigation of the Mechanical Response of Soft Materials with an Atomic Force Microscope, S. Kopp-Marsaudon et al.
9. Disentanglement in Ultrathin Polymer Films, Surface Strain, and Auto-dewetting, R. M. Overney et al.
10. Scanning Force Microscopy Probing of Micromechanical Properties of Polymers, Z. Huang et al.
11. Probing Adhesive, Mechanical, and Thermal Properties of Polymer Surfaces Using Scanning Probe Microscopy, Gregory F. Meyers et al.
12. Temperature-Dependant Surface Properties of Thin Polystyrene Films Determined by Scanning Force Microscopy, Othmar Marti and Sabine Hild
13. Viscoelastic Measurements in Thin Polystyrene Melts as Derived from Scanning Force Microscopy-Induced Nanoflow Patterns, Ronald H. Schmidt, Wayne L. Gladfelter, and Greg Haugstad
14. Experimental Study of the Friction Regimes on Viscoelastic Materials, C. Basire and C. Fretigny
15. Micro- and Nano-Wear of Polymeric Materials, G. S. Blackman, L. Lin, and R. R. Matheson

Surface Microstructures of Various Polymers
16. Surface Nanochemical Studies of Polymers and Other Organic Surfaces by Scanning Force Microscopy, Kirill Feldman, Georg Hähner, and Nicholas D. Spencer
17. Molecular Relaxations in Polymer Films Studied by Temperature-Controlled Friction-Force Microscopy, Jon A. Hammerschmidt, Greg Haugstad, and Wayne L. Gladfelter
18. Polypropylene/(Ethylene-Propylene) Copolymer Blends: Surface Morphology and Elasticity as Measured by AFM and FMM, B. Nysten, C. Meerman, and E. Tomasetti
19. Molecular Alignment and Nanotribology of Polymeric Solids Studied by Lateral Force Microscopy, G. Julius Vancso and Holger Schönherr
20. Scanning Force Microscopy Study of Polyethylene Single Crystals Prepared by a Self-Seeding Method, Tomokazu Fujii, Atsushi Takahara, and Tisato Kajiyama
21. Sparse Coatings by Disperse Adsorption of Cylindrical Brushes, Sergei S. Sheiko et al.
22. Microphase Separation and Morphological Transitions at the Surface of Block Copolymers, Ph. Leclère et al.
23. Modeling the Interactions between Polymers and Clay Surfaces through Self-Consistent Field Theory, Anna C. Balazs, Chandralekha Singh, and Ekaterina Zhulina

Industrial Applications
24. Use of Wear Tests for Plastics, Kenneth G. Budinski
25. Nanotribology of Polymer Surfaces for Disk Drive Applications, C. Mathew Mate and Junhua Wu
26. The Effect of Surface Texture on the Friction of Automotive Interior Plastics, Norman S. Eiss, Jr., and Edward Lee
27. Micromechanical Characterization of Scratch and Mar Behavior of Automotive Topcoats, L. Lin, G. S. Blackman, and R. R. Matheson
28. Investigation of Tribological Properties of Polymeric Surface Coatings with Scanning Probe Microscope, Weidian Shen and Frank N. Jones
29. Friction and Durability of Chemisorbed Organic Lubricants for Microelectromechanical Systems, M. T. Dugger, D. C.

Subjects

314 .	Polymers -- Surfaces
363 .	Contact mechanics -- Congresses
466 .	Tribology
478 .	Contact mechanics

Senft, and G. C. Nelson
30. Physics of Friction Applied to Medical Devices, Andrea Liebmann-Vinson

Indexes
Author Index
Subject Index

Reviews - Synopsis - Dust Jacket

Microstructure and Microtribology of Polymer Surfaces is a 30-chapter book focused on the study of polymer surfaces and interfaces from the perspective of polymer scientists, tribologists, and mechanical engineers. The book is divided into four sections that address a range of problems, from contact mechanics of viscoelastic materials to relationships between polymer microstructures and surface properties.

This volume is a study of polymer surfaces and interfaces from the the perspective of polymer scientists, tribologists, and mechanical engineers. The book is divided into four sections that address a range of problems, from contact mechanics of viscoelastic materials to relationships between polymer microstructures and surface properties. Special attention is paid to micromechanical and microtribological properties and composites, with an emphasis on scanning probe-based microscopy studies. Industrial applications of the work are discussed, including automotive coatings, computer hard discs, medical devices, and microelectromechanical systems.

Provides a first collection of chapters dealing with tribological studies of polymeric materials, both on a macroscopic and at the microscopic scale. DLC: Polymers--Surfaces.

Title	Location	Edition / Series / Misc.
92 Modern Electroplating Author: Lowenheim, Frederick A. (editor) Publish.: John Wiley & Sons - place: New York, NY - date: [©1963] Subject: Electroplating Desc: xvi, 769 p., illus., diagrams, tables, 24 cm.	Dynix: 14902 Call No.: 671.732 EI ISBN: Shelf Adult Non-Fiction	Edition: 2nd edition Series: Electrochemical Society Series Year: 1963 Price: \$25.00

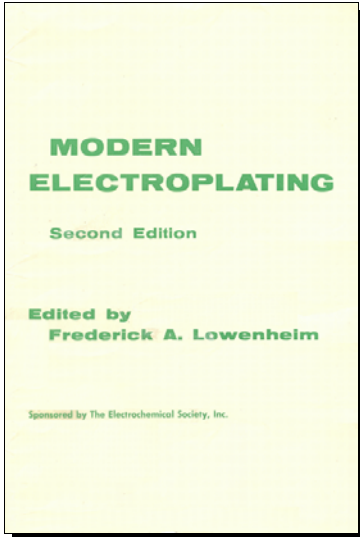


Table of Contents

PART I: GENERAL

1. Fundamental Principles
2. Metallurgical Principles

PART II: THE PLATING METALS

3. Aluminum
4. Cadmium
5. Chromium
6. Cobalt and Cobalt Alloys
7. Copper
 - 7a. Copper Plating from Cyanide Baths
 - 7b. Acid Copper Electroplating and Electroforming
 - 7c. Pyrophosphate Copper
8. Gold
9. Indium
10. Iron
11. Lead
12. Nickel
13. Platinum Metals
14. Silver
15. Tin
 - 15a. Stannate Tin
 - 15b. Acid Tin
- 15c. Immersion Tinning
16. Zinc
 - 16a. Acid Zinc
 - 16b. Cyanide Zinc Plating
17. Uncommon Metals

ART III: ALLOY PLATING

18. Principles of Alloy Plating
19. Brass
20. Bronze and Other Tin Alloys
21. Other Alloys

PART IV: SPECIAL TOPICS

22. Methods of Control
23. Cleaning before Plating
24. Plating on Aluminum
25. Plating on Magnesium
26. Plating on Zinc Base Die Castings
27. Plating on Less Common Metals
28. Preparing Nonconductors for Electroplating
29. Chromate Conversion Coatings
30. Anodizing
31. Selection of Coatings
32. Methods of Testing
33. Electroless Plating
34. Electrophoretic Coatings

Appendix

Subjects

254 . Electroplating

Index to Alloys
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Sponsored by The Electrochemical Society and an Editorial Advisory Board of recognized authorities, this is a new, completely revised edition of the standard comprehensive survey of the chemistry of plating. The book gives detailed directions for making up and operating solutions for the plating of all important metals and alloys. Chapters are included on fundamental principles, methods of testing and control, and various special topics, such as electrophoretic deposition, conversion coating, and others. Each plating process is discussed by an expert on that process.

The material presented falls into four parts:

I. FUNDAMENTAL PRINCIPLES. Two introductory chapters discuss fundamental electrochemistry and metallurgy as they relate to electroplating.

II. THE PLATING METALS. Twelve metals are commercially plated, in addition to members of the platinum group and, recently, aluminum. Each of these is considered separately and in detail.

III. ALLOY PLATING. This subject is treated in four chapters: principles, brass, bronze and other tin alloys, and other alloys.

IV. SPECIAL TOPICS. The book is rounded out by chapters on preparing substrates for plating and on post-treatments; on special techniques such as electroless plating and electrophoretic deposition; and on control of plating solutions, testing the deposits, and selecting the right plating for a given service.

PREFACE:

The Electrochemical Society, through its Electrodeposition Division, herewith offers the Second Edition of Modern Electroplating, although the present book might with equal justice be numbered the fourth edition rather than the second. In 1913 the Society held its first symposium on the subject of electroplating, which was duly published in Volume 23 of its Transactions; this volume remains an invaluable bibliographic source, and for most purposes it is unnecessary to search further for references to the older literature. After the formal organization of the Electrodeposition Division in 1922, papers and symposia on electroplating appeared more and more frequently, and in 1941 the Division organized a symposium, held at the Chicago meeting, in which recognized experts in their respective fields contributed authoritative reviews of the best practice in electrodepositing all the commercially important plating metals. This symposium in due course formed part of Volume 80 of the Transactions, and later the Society reprinted it as a separate book under the title Modern Electroplating. It became a best seller in its field.

By the time revision was clearly called for, the Society initiated its series with the first edition of Modern Electroplating as a book, rather than a symposium reprint; under the editorship of Allen G. Gray it appeared over the imprint of John Wiley and Sons.

In the ten years since its appearance, Modern Electroplating has enjoyed a success which has been gratifying to the Electrochemical Society as a whole and to all those individuals who made it possible; it has been one of the two or three basic texts in that ill-defined area of science and technology which is commonly called "electroplating." In offering this new and completely revised edition, I can only hope that the book will continue to prove as useful and informative as its predecessor.

Electroplating was referred to as an "ill-defined" area: One of the most difficult problems that faced me and the editorial advisory board as we planned this edition was its scope, always bearing in mind that inevitable critic who would object that a book claiming to cover Modern Electroplating should include all aspects of its subject. The emphasis in this book, as in its predecessor, remains on the chemical aspects of the electroplater's art—the composition and characteristics of the electrolytes which he employs to produce electrodeposited coatings. As before, the heart of the book consists of the chapters in Part II on the plating solutions for the individual metals.

There is a new chapter on Metallurgical Principles. In recognition of the expanding interests of the electroplater, chapters have been added on Anodizing, Electrophoretic Coatings, and Electroless Plating; and in recognition of the problems presented by some of the newer and more exotic substrates he is called on to finish, there are new chapters on Plating on Unusual Metals, Plating on Nonconductors, and Plating on Zinc Base Die Castings. The new material is rounded out by added chapters on Cleaning, Conversion Coatings, Selection of Coatings, and Methods of Testing. Aluminum plating has a chapter to itself—it is no longer an "uncommon metal"—and the subject of Alloy Plating has been expanded to four chapters. Practically all the chapters have been extensively revised, so that this can truly be called a new book.

The purely mechanical and engineering aspects of electroplating technology have been deliberately excluded. There is

no material on polishing and buffing; on design of tanks, machines, or barrels; on rectifiers and generators; on racks, stop-offs, and robbers. A book has to stop somewhere, and these subjects are adequately covered in other publications.

The addition of this new material made necessary some sacrifice of other sections for the book to be produced at a practical cost, and it was decided to delete analytical methods and to condense the historical introductions. Analytical methods are widely available, from supply houses, in standard analytical texts, and in a book published since the previous edition; history can usually be reconstructed by reference to the bibliographical citations.

A word must be said about units. After "much debate internal" the editorial board decided that a scientific society should do its part to promote the adoption of the metric system; current densities, there fore, are in amperes per square decimeter, concentrations in grams per liter, and temperatures in degrees centigrade. The "practical" plater will find the conversion tables in the endpapers helpful. Even here complete consistency was sacrificed to expediency: thickness of deposit is usually in mils rather than microns, and there are other instances where I have adopted the principle that "a foolish consistency is the hobgoblin of little minds."

A book written by forty or so contributors will inevitably be uneven in style and in merit. I have attempted to iron out wide divergences in style suppressing individuality; and the technical accuracy of the chapters should be insured by the recognized competence of the authors, plus careful review by members of the advisory board and many other referees. It should be added that where differences of opinion developed between authors and referees or me, the authors had the last word. Statements of fact in this book are the responsibility of the authors, not of mine or of the Society.

I gratefully acknowledge the cooperation of all the authors and members of the Editorial Advisory Board, as well as of those anonymous referees. The Electrodeposition Division and the Electrochemical Society are glad to present this new edition as a contribution to the extension of scientific knowledge in electroplating.

Title	Location	Edition / Series / Misc.
1528 Modern Styrenic Polymers: Polystyrenes and Styrenic Copolymers		<i>Edition:</i>
<i>Author:</i> Scheirs, John and Duane B. Priddy (editors)	<i>Dynix:</i> 111664	<i>Series:</i> Wiley Series in Polymer Science
<i>Publish.:</i> John Wiley & Sons, Ltd.	<i>Call No.:</i> 668.4 Mo	
<i>- place:</i> Chichester, [West Sussex], UK	<i>ISBN:</i> 0471497525	
<i>- date:</i> ©2003	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 2003
<i>Subject:</i> Polystyrene		<i>Price:</i> \$285.00
<i>Desc:</i> xxxi, 757 p., illus., 24 cm.		

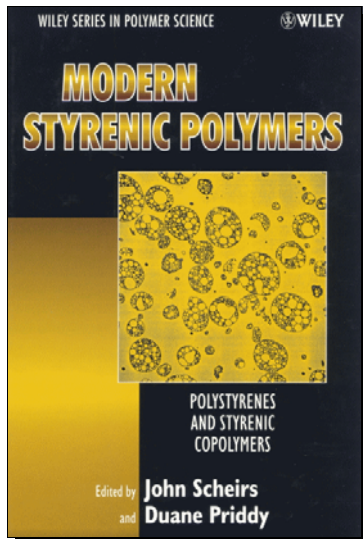


Table of Contents

Contributors

Series Preface

Preface

About the Editors

I. INTRODUCTION TO STYRENIC POLYMERS

1. Historical Overview of Styrenic Polymers -- John Scheirs

1 Introduction

2 General-purpose Polystyrene

3 Foamed Polystyrene

4 Rubber-modified Polystyrene

5 ABS

6 ASA

7 Early Styrene Copolymers

8 Styrenic Block Copolymers

9 Syndiotactic Polystyrene

10 Modern Polystyrene Production

11 The Future

References

2. Polystyrene and Styrene Copolymers — An Overview -- Norbert Niessner and Hermann Gausepohl

1 Introduction

2 Polymerization

3 Processes

4 Structure and Morphologies

5 Properties

6 Properties, Range and Applications of MABS Products

References

II. PREPARATION OF STYRENIC POLYMERS

3. Commercial Processes for the Manufacture of Polystyrene -- Bernard J. Meister and Clark J. Cummings

1 Introduction

2 Technical Constraints that Influence Reactor Selection

2.1 Temperature Control

2.2 Chemistry-related Constraints

2.3 Constraints Due to Reactor Mixing

2.4 Constraints Related to the Rubber Modification of Polystyrene

2.5 Reactor Requirements for Producing Copolymers

3 Polystyrene Devolatilization

3.1 Devolatilization Concepts

3.2 Devolatilization Equipment

3.3 Steam Stripping

4 Current Polystyrene Polymerization Processes

5 Process Simulation and Control

References

Subjects

719 . Polystyrene

4. Approaches to Low Residual Polystyrene -- Duane B. Priddy
 - 1 Introduction
 - 2 Summary of R&D Approaches
 - 2.1 Devolatilizer Design
 - 2.2 Assisted Devolatilization
 - 2.3 Scavengers
 - 2.4 Absorbers
 - 2.5 High Monomer Conversion Polymerization
 - 2.6 Solid Polymer Treatment
 - 3 Friedel-Crafts Catalyst
 - 3.1 Addition of Friedel-Crafts Catalyst to Monomer
 - 4 Latent Acid Catalysts
 - 4.1 Tosylates
 - 5 Monomer Regeneration Upon Heating
 - 6 Epilog
 - References

5. Process Modelling and Optimization of Styrene Polymerization -- J. Gao, K. D. Hungenberg and A. Penlidis
 - 1 Introduction
 - 1.1 General Kinetic Scheme of Styrene Homopolymerization
 - 1.2 Treatment of Gel Effect
 - 2 Process Simulation and Optimization of Styrene Homopolymerization
 - 2.1 Using Initiator Combinations with Designed Temperature Profile
 - 2.2 Using Bifunctional Initiators
 - 2.3 Using Reactor Combinations
 - 3 Conclusion
 - 4 Symbols
 - References

6. Living Free Radical Polymerization of Styrene -- Alessandro Butté, Giuseppe Storti and Massimo Morbidelli
 - 1 Introduction
 - 2 LRP Overview
 - 2.1 Nitroxide-mediated Polymerization (NMP)
 - 2.2 LRP by ATRP
 - 2.3 LRP by Degenerative Transfer
 - 2.4 LRP by RAFT
 - 3 Kinetics of LRP
 - 3.1 Main Features of the Different LRP Processes
 - 3.2 Homogeneous vs. Heterogeneous LRP Processes
 - 4 Applications to Styrenic Polymers
 - References

7. Increasing Production Rates of High MW Polystyrene -- Bryan Matthews and Duane B. Priddy
 - 1 Introduction
 - 2 Speeding Up the Rate of Polystyrene Production Using Chemical Initiators
 - 3 Speeding Up the Rate of Polystyrene Production Using Acid Mediation
 - 4 Use of Acid to Tailor the Molecular Weight Distribution
 - 5 Modeling Acid-mediated Styrene Polymerization
 - 5.1 Styrene Auto-initiation Model
 - 5.2 Acid Model Development
 - 5.3 Model Results
 - 6 Conclusions
 - References

8. Preparation of Styrene Block Copolymers Using Nitroxide Mediated Polymerization -- Duane B. Priddy
 - 1 Introduction
 - 2 Mechanism and Limitations
 - 3 How Living is NMRP? The Results of Model Studies
 - 4 Block Copolymers via the Macroinitiator Approach
 - 5 Preparation of Block Copolymers Using Alkoxyamines as Chain-stoppers in Step-growth Polymerization
 - 6 Preparation of Block Copolymers via Sequential Addition of Monomers (SAM)
 - 7 Preparation of Block Copolymers Using Multiple-headed Initiators
 - References

III. MAJOR CLASSES OF STYRENIC POLYMERS

- 9. Particle Foam Based on Expandable Polystyrene (EPS) -- Rolf-Dieter Klodt and Brad Gougeon
 - 1 Introduction
 - 2 EPS Based on Suspension Polymerization
 - 2.1 Production of EPS Raw Material
 - 2.2 From Raw Material to Foam
 - 2.3 Physical and Mechanical Properties
 - 2.4 Applications
 - 3 EPS Based on Extrusion Process
 - 3.1 Extrusion
 - 3.2 Post Extrusion
 - 3.3 Steam Expansion of EPS Loose-fill Resin: Theory and Practice
 - References

- 10. Rigid Polystyrene Foams and Alternative Blowing Agents -- Kyung Won Suh and Andrew N. Paquet
 - 1 Introduction and General Description
 - 2 Nomenclature
 - 3 Theory of the Expansion Process
 - 3.1 Bubble Initiation
 - 3.2 Bubble Growth
 - 3.3 Bubble Stabilization
 - 4 Properties and Their Relation to Structure
 - 4.1 Test Methods
 - 4.2 Properties of Commercial Products
 - 4.3 Cells
 - 4.4 Gas Composition
 - 4.5 Rigid Cellular Polymers
 - 4.6 Creep
 - 4.7 Structural Foams
 - 5 Thermal Properties
 - 5.1 Thermal Conductivity
 - 5.2 Coefficient of Linear Thermal Expansion
 - 5.3 Maximum Service Temperature
 - 5.4 Moisture Resistance
 - 5.5 Environmental Aging
 - 5.6 Other Properties
 - 6 Commercial Production and Processing
 - 6.1 Manufacturing Process
 - 6.2 Decompression Expansion Processes, Physical Stabilization
 - 7 Applications
 - 7.1 Thermal Insulation
 - 7.2 Refrigeration
 - 7.3 Construction
 - 7.4 Structural Components
 - 7.5 Marine Applications
 - 7.6 Other Uses
 - 7.7 Energy Considerations in Foam Insulation
 - 8 Environmental, Health and Safety Considerations
 - 8.1 Flammability
 - 8.2 Blowing Agents and Environmental Issues
 - References

- 11. Polystyrene Packaging Applications: Foam Sheet and Oriented Sheet -- Gary C. Welsh
 - 1 Introduction
 - 2 Oriented Polystyrene Sheet
 - 3 Extruded Polystyrene Foam Sheet
 - References

- 12. Preparation, Properties and Applications of High-impact Polystyrene -- M. F. Martin, J. P. Viola and J. R. Wuensch
 - 1 Introduction
 - 2 Properties
 - 2.1 General Properties
 - 2.2 Mechanical Properties

- 2.3 Impact Properties
 - 2.4 Thermal Properties
 - 2.5 Electrical Properties
 - 2.6 Rheological Properties
 - 2.7 Resistance to Solvents
 - 3 Basic Chemistry
 - 3.1 Matrix Molecular Weight
 - 3.2 Elastomer Considerations
 - 3.3 Environmental Stress Crack Resistance (ESCR)
 - 3.4 Thermal and Oxidative Stability
 - 4 Manufacture
 - 4.1 Process Evolution
 - 4.2 Modern Commercial Process
 - 5 Fabrication
 - 5.1 Fabrication Process and Part Properties
 - 6 Application
 - 7 Acknowledgements
 - References
13. Key Structural Features Impacting SAN Copolymer Performance -- R. P. Dion and R. L. Sammler
- 1 Introduction
 - 2 Characterization
 - 2.1 Chromophores
 - 2.2 Sequence Distributions
 - 2.3 AN Levels
 - 2.4 MWD
 - 2.5 Composition Distribution
 - 2.6 Multidimensional Analysis
 - 3 Fabrication Performance
 - 3.1 Shear Flow
 - 3.2 Entangled Chains
 - 3.3 Time-Temperature Superposition
 - 3.4 Cross Model
 - 3.5 Nonlinear Shear Flows
 - 3.6 Relaxation Spectra
 - 3.7 Extensional Flow
 - 3.8 Break Points
 - 3.9 Brittle Breaks
 - 3.10 Flow Birefringence
 - 4 Multiphase Systems
 - 5 Solid-phase Behavior
 - 6 Conclusion
 - References
14. Rubber Particle Formation in Mass ABS -- Gilbert Bouquet
- 1 Manufacture of ABS
 - 1.1 Emulsion Process
 - 1.2 Mass Process
 - 2 Phase Separation
 - 3 Phase Inversion
 - 4 Phase Diagram
 - 5 Rubber Particle Sizing
 - 5.1 Shear
 - 5.2 Viscosity
 - 5.3 Interfacial Tension
 - 6 Grafting
 - 6.1 Graft Analysis
 - 6.2 Effect of Process Parameters
 - 6.3 Master Curve
 - 6.4 Graft Model
 - 7 Crosslinking
 - 8 Sizing Window
 - 9 Rubber Particle Morphology
 - References

15. High Heat Resistant ABS Technology -- Rony Vanspeybroeck, Robert P. Dion and Joseph M. Ceraso
 - 1 Introduction
 - 2 Substituted Styrenes
 - 3 Imides
 - 4 Maleic Anhydride
 - 5 Modified Nitriles
 - 6 Various High Heat-resistant ABS Grades
 - References

16. Synthesis, Properties and Applications of Acrylonitrile-Styrene-Acrylate Polymers -- G. E. McKee, A. Kistenmacher, H. Goerissen and M. Breulmann
 - 1 Introduction
 - 2 ASA Market
 - 3 Production of ASA
 - 3.1 Early Developments
 - 3.2 Emulsion Polymerization Process
 - 3.3 Bulk Polymerization Process
 - 3.4 Microsuspension Polymerization Process
 - 4 Properties of ASA
 - 4.1 Ageing Properties
 - 4.2 Impact Behaviour
 - 5 Additional Areas of Investigation
 - 6 ASA Blends
 - 7 Applications of ASA
 - 7.1 General
 - 7.2 Solar Technology
 - 7.3 Safety in the House and in the Office
 - 7.4 ASA for Automotive Body Panels with PFM Technology
 - 8 Future Perspectives
 - References

IV. SYNDIOTACTIC POLYSTYRENE

17. Synthesis of Syndiotactic Polystyrene -- Norio Tomotsu, Michael Malanga and Juergen Schellenberg
 - 1 Introduction
 - 2 Catalytic Systems for SPS
 - 2.1 Transition Metal Complexes
 - 2.2 Co-catalysts
 - 3 Copolymerization
 - 3.1 Polymerization of Substituted Styrenes
 - 3.2 Copolymerization of Styrene and Ethylene
 - 3.3 Copolymerization of Styrene and Dienes
 - 4 Mechanisms of Polymerization of Styrene
 - 4.1 Active Site Species
 - 4.2 Kinetic Analysis of Styrene Polymerization
 - 4.3 Effects of Hydrogen
 - 5 Conclusion
 - References

18. Characterization, Properties and Applications of Syndiotactic Polystyrene -- Komei Yamasaki, Norio Tomotsu and Michael Malanga
 - 1 Introduction
 - 2 Characterization
 - 2.1 Structure
 - 2.2 Crystal Form
 - 3 Physical Properties
 - 3.1 Thermal Properties
 - 3.2 Crystallization Behavior of SPS
 - 3.3 Comparison of Crystallization Properties of SPS with IPS
 - 3.4 Solvent Resistance
 - 3.5 Rheological Properties
 - 3.6 Mechanical Properties of Neat SPS
 - 4 Properties of Commercialized SPS and Its Applications

- 4.1 Mechanical and Flow Properties
- 4.2 Electrical Properties
- 4.3 Chemical Resistance
- 4.4 Improvement of Polystyrene by Blending SPS

5 Summary
References

19. Rubber Modification of Syndiotactic Polystyrene -- G. E. McKee, F. Ramsteiner and W. Heckmann

- 1 Introduction
- 2 Energy Dissipation in Polystyrene Polymers
- 3 Impact Behavior of Rubber-modified sPS
- 4 Rubber Modification
 - 4.1 Styrene Block Copolymers as Impact Modifiers
 - 4.2 Core-Shell Impact Modifiers
 - 4.3 Preparation of sPS in the Presence of a Rubber

5 Present Situation and Future Perspectives
References

20. Polymeric Blends Based on Syndiotactic Polystyrene -- L. Abis, R. Braglia, G. Giannotta and R. Pò

- 1 Introduction
- 2 Overview of sPS Properties
- 3 Patent Literature on sPS Blends
- 4 Microscopic, Thermal and Mechanical Properties of sPS Blends
 - 4.1 Miscible Blends
 - 4.2 Immiscible Blends

5 Conclusions
6 List of Abbreviations
References

V. STYRENIC BLOCK COPOLYMERS

21. Styrenic Block Copolymer Elastomers -- R. C. Bening, W. H. Korcz and D. L. Handlin, Jr

- 1 Introduction
- 2 Synthesis of Styrenic Block Copolymer Elastomers
- 3 Properties of Styrenic Block Copolymer Elastomers
- 4 Applications of Styrenic Block Copolymer Elastomers
 - 4.1 Commercial Styrenic Block Copolymers
 - 4.2 Adhesives and Sealants
 - 4.3 Bitumen Modification
 - 4.4 Footwear
 - 4.5 Polymer Modification
 - 4.6 Viscosity Index Improvers and Other Applications

References

22. Preparation, Properties and Applications of High Styrene Content Styrene-Butadiene Copolymers -- David L. Hartsock and Nathan E. Stacy

- 1 History
- 2 SBC Synthesis and Manufacture
- 3 Key Features, Properties and Grades
- 4 Current Commercial Applications
 - 4.1 Major Markets
 - 4.2 Single Service
 - 4.3 Rigid Packaging
 - 4.4 Garment Hangers
 - 4.5 Flexible Packaging
 - 4.6 Medical
 - 4.7 Consumer Goods
 - 4.8 Toys
 - 4.9 Displays
- 5 SBC Blends
 - 5.1 Clear Blends
 - 5.2 Opaque Blends
 - 5.3 Others
- 6 Future Applications

References

VI. NOVEL POLYSTYRENES

23. Hydrogenated Polystyrene: Preparation and Properties -- Stephen F. Hahn

- 1 Introduction
- 2 Synthesis of Polycyclohexylethylene (PCHE)
- 3 Catalytic Hydrogenation
 - 3.1 Catalysis and Conditions
 - 3.2 Hydrogenation Mechanism
- 4 Polymerization of Vinylcyclohexane to PCHE
- 5 Characterization of PCHE
 - 5.1 Atactic PCHE
 - 5.2 Isotactic PCHE
 - 5.3 Syndiotactic PCHE
- 6 Copolymers Containing PCHE
 - 6.1 Random Copolymers
 - 6.2 Block and Graft Copolymers
 - 6.3 Graft Copolymers
- 7 Proposed Applications of PCHE-based Materials
- 8 Acknowledgment
- References

24. Branched Polystyrene -- Kurt A. Koppi and Duane B. Priddy

- 1 Introduction
- 2 Preparation of Branched Polystyrene
 - 2.1 Radical Polymerization
 - 2.2 Anionic Polymerization
- 3 Rheology of Branched Polystyrenes
 - 3.1 Star Branched Polymers
 - 3.2 Comb Branched Polymers
 - 3.3 Randomly Branched Polymers
 - 3.4 Extensional Rheology
- 4 Conclusions
- References

25. 'Super Polystyrene' — Styrene-Diphenylethylene Copolymers -- G. E. McKee, F. Ramsteiner, W. Heckmann and H. Gausepohl

- 1 Introduction
- 2 Preparation of DPE Monomers and Polymers
 - 2.1 1,1-Diphenylethylene Monomer Synthesis
 - 2.2 S/DPE Polymer Synthesis
- 3 Properties of Styrene-Diphenylethylene Polymers
- 4 Blends of S/DPE Polymers
- 5 Rubber Modification of S/DPE Polymers
 - 5.1 Modified High-impact Polystyrene (HIPS) Process
 - 5.2 Core-Shell Impact Modifiers
 - 5.3 Tri-block Copolymer of Styrene-Hydrogenated Butadiene-Styrene [S—B(H)—S]
 - 5.4 Tri-block Copolymers of S/DPE-Hydrogenated Butadiene-S/DPE
- 6 Thermoplastic Elastomers
- 7 Summary
- References

26. Ethylene-Styrene Copolymers -- Y. W. Cheung and M. J. Guest

- 1 Introduction to Ethylene-Styrene Copolymers
- 2 Copolymerizations of Ethylene and Vinyl Aromatic Monomers
- 3 Structure—Property Relationships for Ethylene-Styrene Interpolymers
 - 3.1 Thermal Transitions/Viscoelastic Behavior
 - 3.2 Mechanical Properties
 - 3.3 Melt Rheology and Processability
- 4 Materials Engineering Aspects
 - 4.1 Interpolymer Blends
 - 4.2 Blends of Ethylene-Styrene Interpolymers: Miscibility Considerations
 - 4.3 Filler Composites

- 4.4 Terpolymers
- 5 Attributes and Applications
- 6 Summary
- 7 Acknowledgments
- References

VII. PROPERTIES OF STYRENIC POLYMERS

- 27. Fracture Behavior of High-impact Polystyrene and Acrylonitrile-Butadiene-Styrene -- T. Vu-Khanh
 - 1 Introduction
 - 2 Quantitative Characterization of Fracture
 - 2.1 Brittle Fracture
 - 2.2 Semi-ductile Fracture
 - 2.3 Ductile Fracture
 - 3 High-impact Polystyrene
 - 3.1 Effect of Temperature
 - 3.2 Effects of Loading Rate
 - 3.3 Dynamic Effect and Adiabatic Heating
 - 4 Acrylonitrile-Butadiene-Styrene
 - 5 Conclusion
 - References
- 28. Dynamic Mechanical Behavior of Atactic Polystyrene, High-impact Polystyrene and Other Styrenic Polymers -- S. N. Goyanes and G. H. Rubiolo
 - 1 Introduction
 - 2 Polystyrene
 - 2.1 Effect of Polymer Structure and Additives on the Dynamic Mechanical Spectroscopy of Polystyrene
 - 3 Copolymers of Styrene
 - 4 Rubber-modified Polystyrene (HIPS) and SAN Copolymers (ABS)
 - References
- 29. Flame-retardant Polystyrene: Theory and Practice -- Bruce King
 - 1 Introduction
 - 2 Applications of Flame-retardant Styrenic Polymers
 - 3 Flammability Requirements and Tests
 - 3.1 Regulatory Test Methods
 - 3.2 Research Methods
 - 4 Mechanisms of Flame Retardation
 - 4.1 Vapor-phase Mechanisms
 - 4.2 Condensed-phase Mechanisms
 - 5 Halogen-based Flame Retardants for Styrenics
 - 6 Styrenic Blends
 - 7 Environmental Concerns
 - 8 Summary
 - References
- 30. Photochemical Degradation of Styrenic Polymers -- B. Mailhot, A. Rivaton and J. L. Gardette
 - 1 Introduction
 - 2 Photooxidation of the Homopolymer Polystyrene (PS) Under Irradiation at $\lambda_{\text{irradiation}} > 300 \text{ nm}$
 - 2.1 Experimental Results
 - 2.2 Discussion
 - 3 Photooxidation of Poly(styrene-coacrylonitrile) (SAN)
 - 3.1 Experimental Results
 - 3.2 Discussion
 - 4 Photooxidation of Acrylonitrile-Butadiene-Styrene (ABS)
 - 4.1 Analysis of the Photooxidation
 - 4.2 Photooxidation Rate
 - 4.3 Discussion
 - 5 Photooxidation of a Blend of SAN and EPDM (AES)
 - 5.1 FTIR Analysis of AES Films During the First Stages of Photooxidation
 - 5.2 FTIR Analysis of AES Films for Longer Irradiation Periods
 - 5.3 Discussion
 - 6 Photooxidation of Blends of Polystyrene and Poly(vinyl methyl ether) (PVME-PS)
 - 6.1 Introduction

6.2 Experimental Results
6.3 Surface Analysis
6.4 Discussion
7 Conclusion
References

31. Analysis and Levels of Styrene Dimers and Trimers in Polystyrene Food Containers -- Hiromi Sakamoto
1 Introduction
2 Structure and Analysis of Styrene Dimers and Trimers
3 Content of SDs and STs in PS Food Containers
4 Migration of SDs and STs from PS Food Containers
5 Biological Evaluation of SDs and STs
6 Conclusion
References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Styrenic polymers encompass a broad range of types from commodity plastics to engineering polymers. Early polystyrenes whilst having many favorable attributes such as outstanding clarity, high gloss, ease of processability and low cost also suffered from brittleness and poor chemical resistance. Today there exist a variety of new polymers, copolymers and blends that enable styrenic polymers to be used in ever growing and more demanding applications.

Styrenic polymers now find widespread use in areas from packaging materials right through to structural components for domestic and automotive applications.

This book serves as the first comprehensive reference to systematically cover the preparation, properties and applications of this important class of polymers. Major end-use consideration of styrenic polymers such as fracture properties, flammability and photodegradation are covered in detail. This book also describes the latest advances from new polymerization technologies to novel polymer architectures.

The book is truly international in scope with 31 contributions from leading experts in North America, South America, Europe, Japan and Australia.

With over 15 chapters written by The Dow Chemical Company and some five chapters by BASF, this book provides an authoritative and comprehensive treatment by contemporary experts from the leading companies engaged in the commercial manufacture, research and development of styrenic polymers.

Target Audience: Basic and applied researchers, technologists, polymer scientists, physical chemists, and upper-level students concerned with the production, properties, and applications of styrenes and styrenic copolymers.

SERIES PREFACE:

The Wiley Series in Polymer Science aims to cover topics in polymer science where significant advances have been made over the past decade. Key features of the series will be developing areas and new frontiers in polymer science and technology. Emerging fields with strong growth potential for the twenty-first century such as nanotechnology, photopolymers, electro-optic polymers, etc., will be covered. Additionally, those polymer classes in which important new members have appeared in recent years will be revisited to provide a comprehensive update.

Written by foremost experts in the field from industry and academia, these books have particular emphasis on structure-property relationships of polymers and manufacturing technologies as well as their practical and novel applications. The aim of each book in the series is to provide readers with an in-depth treatment of the state-of-the-art in that field of polymer technology. Collectively, the series will provide a definitive library of the latest advances in the major polymer families as well as significant new fields of development in polymer science.

This approach will lead to a better understanding and improve the cross fertilization of ideas between scientists and engineers of many disciplines. The series will be of interest to all polymer scientists and engineers, providing excellent up-to-date coverage of diverse topics in polymer science, and thus will serve as an invaluable ongoing reference collection for any technical library.

PREFACE FOR 'MODERN STYRENIC POLYMERS':

Polystyrene was the first synthetic polymer to be prepared. In fact there are reports of its existence as early as 1839.

(see Chapter 1) Polystyrene was first produced for commercial sale in 1931 by BASF and in the US by Dow in 1938. It is well known that polystyrene is a glassy, amorphous polymer with outstanding clarity, gloss and processability. Unfortunately it is also inherently brittle and suffers from poor chemical resistance. (see Chapter 2) These deficiencies were remedied early on by the development of high-impact polystyrene (see Chapter 12 on HIPS) and styrene—acrylonitrile copolymers. (see Chapter 13 on SAN copolymers and Chapters 14 and 15 on ABS terpolymers, as well as Chapter 16 on ASA terpolymers) Styrenic block copolymers have also considerably widened the scope of these polymers from elastomeric materials (Chapter 21) to high-clarity, high-impact strength resins. (Chapter 22) These latter durable copolymers offer a balance of performance and economics that bridges the gap between high cost, clear engineering polymers and low cost, brittle plastics like general purpose polystyrene.

Since polystyrene is one of the oldest commercial polymers with over 9 million tons/year of sales, there have been thousands of patents issued covering all aspects of its manufacture and property enhancement. The styrene monomer readily polymerizes to polystyrene either thermally or with free-radical initiators. (see Chapter 6 on free-radical polymerization and Chapter 8 on nitroxidemediated polymerization) Commercial processes for the manufacture of polystyrene are described in Chapter 3 while process modeling and optimization of styrene polymerization is examined in Chapter 5. Styrene also can be polymerized via anionic and Ziegler—Natta chemistries using organometallic initiators. Using free radical and anionic polymerization chemistries, the specific position of the benzene ring in the monomer units of regular polystyrene is somewhat random and hence inhibits crystallization. Advances in the development of new metallocene polymerization catalyst technology however has enabled the development of syndiotactic polystyrene which is semi-crystalline, has a melting point of 270°C and has excellent environmental stress crack resistance. (see Chapters 17—20) New metallocene catalyst technology has also enabled the development of novel ethylene-styrene interpolymers. (see Chapter 26)

Modified variants of polystyrene have also been developed with the advent of hydrogenated PS (Chapter 23), branched PS (Chapter 24) and 'super' PS (Chapter 25). Since the strength, flammability and photodegradation of styrenic polymers have major end-use implications, these properties are covered in detail in Chapters 27, 28, 29 and 30 respectively. The high melt strength of polystyrene enables it to be easily foamed (see Chapters 9 and 10 on PS foam), blown into films, and drawn into sheets. (see Chapter 11 on OPS) Polystyrene foams find a variety of uses including insulation and packaging. The family of styrenic polymers now spans the breadth from commodity plastics to high-grade engineering polymers.

Ongoing advances in new catalyst technology and 'controlled radical polymerization' will undoubtedly yield new styrenic polymers with well-defined architecture. (as we have recently seen with the introduction of syndiotactic PS and ethylene-styrene interpolymers) Advances in the synthesis of dendritic and hyperbranched styrenic polymers will also contribute to the state of new polystyrenic products.

The key attribute of polystyrene that has led to its huge commercial success is its low cost. Resistance of polystyrene fabricators to pay extra for improved performance and intense competition of polystyrene producers for increased market share have led to highly optimized and huge polystyrene production facilities. (a typical 'world-scale' polystyrene plant produces about 230,000 tons/year of product) The costs associated with the introduction of new and improved polystyrene products must be low enough that profit can be realized by the manufacturer without raising the sales price. This limitation, and the ongoing effort of the chemical industry to scrutinize/justify R&D budgets, places an intense challenge on industrial polystyrene researchers. Other pressures on the polystyrene industry include environmental and regulatory issues (i.e., litter, migration of residual small molecules into food products, evolution of volatile organics during manufacture and processing, etc.) — see Chapters 4 and 31. These issues will undoubtedly dominate much of the research efforts devoted to polystyrene. Academic researchers are not under such focused cost constraints and therefore they will likely continue working on the development of new chemistries for making new styrenic polymers having novel controlled architectures.

The future direction of polystyrene R&D efforts is uncertain but it is likely that it will continue focusing on lowering manufacturing costs, improving product performance/properties (especially flow/strength balance), reducing the level of residual small molecules left in the product, and developing new applications.

This book provides the reader with comprehensive information about polystyrene, and a historical overview of its development, as well as reviews describing the latest new technological developments.

Title	Location	Edition / Series / Misc.
1360 Molecular Adhesion and Its Applications: The Sticky Universe Author: Kendall, Kevin Publish.: Kluwer Academic / Plenum Publishers - place: New York, NY - date: ©2001 Subject: Adhesion Desc: xix, 429 p., illus., 24 cm.	Dynix: 111663 Call No.: 541.3 Ke ISBN: 0306465205 Shelf Adult Non-Fiction	Edition: Series: Year: 2001 Price: \$98.50

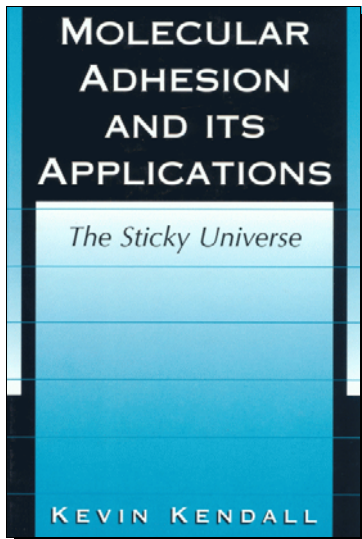


Table of Contents

Part I: BACKGROUND AND FUNDAMENTALS

1. Introduction to Molecular Adhesion and Fracture: the Adhesion Paradox
 - 1.1. The Adhesion Paradox
 - 1.2. Adhesion at the Molecular Level
 - 1.3. Theory of Adhesion
 - 1.4. Adhesive Technologies
 - 1.5. Adhesion in Nature
 - 1.6. Interdisciplinary Nature of Adhesion; Purpose of this Book
 - 1.7. Review of Adhesion Literature
 - 1.8. References
2. Phenomenology of Adhesion Effects: Fracture Stranger than Friction
 - 2.1. Adhesion Phenomena
 - 2.2. Friction
 - 2.3. Gravitational Attraction
 - 2.4. Electrostatic and Magnetic Attractions
 - 2.5. Adhesion between Nuclear Particles
 - 2.6. Demonstration of the Molecular Adhesion Force
 - 2.7. Probing Molecular Adhesion: the Range of Molecular Attractions
 - 2.8. Definition of Molecular Adhesion
 - 2.9. References
3. Theories and Laws of Molecular Adhesion: All Molecules Adhere
 - 3.1. Three Adhesion Fallacies
 - 3.2. Critical Observations of Adhesion
 - 3.3. The Laws of Molecular Adhesion
 - 3.4. From Molecules, through Mechanisms, to Mechanics
 - 3.5. Jumping into Contact
 - 3.6. Cracking Molecules Apart
 - 3.7. Adhesion Is Really Three Things: Making, Equilibrium, and Breaking
 - 3.8. Adhesion in the Scanning Probe Microscope
 - 3.9. The Atomic Force Microscope
 - 3.10. References

PART II: LAWS AND MECHANISMS

4. Evidence for the First Law of Adhesion: Surfaces Leap into Contact
 - 4.1. The Problem of Obtaining Reliable Adhesion
 - 4.2. Obreimoff's Experiment
 - 4.3. Tabor and Winterton's Experiment
 - 4.4. Extension by Israelachvili and Tabor
 - 4.5. Finer Means Smoother
 - 4.6. Bradley's Adhesion Rule
 - 4.7. The Significance of Bradley's Rule
 - 4.8. The New Science of Atomic Force Microscopy (AFM)
 - 4.9. How Smooth Is an Atom
 - 4.10. References
5. Intermolecular Forces: the New Geometry of Computer Modeling
 - 5.1. The Two Parameter Model of Atomic Forces

Subjects

333 .	Surface chemistry
343 .	Adhesion

- 5.2. Experimental Evidence for Models of Molecular Forces
- 5.3. Direct Measurement of Molecular Forces
- 5.4. Intermolecular Forces from Bulk Properties
- 5.5. The New Geometry of Computer Modeling
- 5.6. Structuring of Hard Spheres
- 5.7. Experiments on Spherical Polymer Particles
- 5.8. Computer Model of the Crystallization Process
- 5.9. Effect of Adhesion on the Structuring Process
- 5.10. References

- 6. Evidence for the Second Law of Adhesion: Contamination Reduces Adhesion
 - 6.1. Experiments to Show that Adhesion Is Reduced by Contamination
 - 6.2. Polymer Adhesion Affected by Contaminants
 - 6.3. Studies of Surface Species by the Adhesion Method
 - 6.4. Surface Forces Measured in Liquids
 - 6.5. Jumping in Steps as Molecules are Squeezed Out
 - 6.6. Adhesion with Water Present at Surfaces
 - 6.7. Adhesion of Wet Surfaces in the Atomic Force Microscope
 - 6.8. Influence of Polymers on Wet Adhesion
 - 6.9. Restructuring of Surfaces and Interfaces
 - 6.10. The Nanoscale Fountain Pen
 - 6.11. References

- 7. Influence of the Adhesion and Fracture Mechanism: The Third Law
 - 7.1. Problem of the Wide Range of Adhesion Energy Values
 - 7.2. Hierarchy of Mechanisms Controlling Adhesion
 - 7.3. The Simplest Failure of Adhesion
 - 7.4. Chemical Breakage of Adhesive Joints
 - 7.5. Brownian Adhesion
 - 7.6. The Cracking Mechanism
 - 7.7. Fracture Mechanics: Thermodynamic Theory of Cracking
 - 7.8. Experimental Proof that Stress does not Cause Cracking of Adhesive Joints
 - 7.9. Consistency of the Brownian Mechanism with Fracture Mechanics
 - 7.10. Elasticity in the Adhesion Mechanism
 - 7.11. Roughness as a Strong Mechanism
 - 7.12. References

- 8. More Intricate Mechanisms: Raising and Lowering Adhesion
 - 8.1. Roughness and Contamination as Hysteresis Mechanisms
 - 8.2. Dwell-time Effect
 - 8.3. Adhesive Drag
 - 8.4. Adhesive Drag and Hysteresis Measurements
 - 8.5. Crack Stopping
 - 8.6. Rolling, Tack and Adhesive Hysteresis
 - 8.7. Adhesive Dislocations
 - 8.8. Stringing or Crazing
 - 8.9. Aggregation Mechanisms
 - 8.10. Charge Separation and Electrical Effects
 - 8.11. References

- PART III: APPLICATIONS AND BENEFITS
 - 9. Adhesion of Particles: Deformation, Friction, and Sintering
 - 9.1. Contact of Spheres
 - 9.2. The JKR Contribution
 - 9.3. The Nature of Adhesive Contact
 - 9.4. Roughening the Surfaces
 - 9.5. Effect of Roughness on Particle Adhesion
 - 9.6. Friction of Fine Particles
 - 9.7. Elastic Sintering of Fine Particles
 - 9.8. Hysteresis and Drag in the Contact of Spheres
 - 9.9. Plastic Contact of Particles
 - 9.10. Sintering of Particles by Diffusion Mechanisms
 - 9.11. References

- 10. Adhesion of Colloids: Dispersion, Aggregation, and Flocculation
 - 10.1. Ubiquity of Colloids
 - 10.2. Colloids as Adhesion Sensors
 - 10.3. Electrical Stabilization of Particle Dispersions
 - 10.4. Point of Zero Charge; Adhesion Dominates
 - 10.5. Secondary Minimum and Further Complex Interactions
 - 10.6. Effect of Dissolved Polymer on Colloid Adhesion
 - 10.7. Particles with Strongly Bonded Polymer
 - 10.8. Growing Crystals
 - 10.9. Comminution of Colloids
 - 10.10. Growing Uniform Colloidal Particles
 - 10.11. References

- 11. Pastes and Gels: Effects of Adhesion on Structure and Behavior
 - 11.1. Importance of Pastes and Gels
 - 11.2. Different Structures of Sols, Pastes, and Gels
 - 11.3. Structure and Properties of a Gel
 - 11.4. Elastic Modulus of Silica Gels
 - 11.5. Shrinkage of Gels
 - 11.6. Ultimate Structure of a Gel Product
 - 11.7. Origin of Defects in Pastes
 - 11.8. Fracture of Gels, Especially Cements
 - 11.9. Paste Structure and Rheology
 - 11.10. Controlling the Sol Gel Transition
 - 11.11. References

- 12. Adhesion of Biological Cells: the Nature of Slime
 - 12.1. Introduction and Importance
 - 12.2. Models of Cell Contact: The Polymer Coating
 - 12.3. Cell Membrane and Cytoplasm: Effects on Contact Spot
 - 12.4. Roughness and Cell Surfaces
 - 12.5. Cell Adhesion by Probe Methods
 - 12.6. Cell Adhesion by Flow Methods
 - 12.7. Cell Counting Methods
 - 12.8. New Approach to Cell Adhesion
 - 12.9. Experimental Results
 - 12.10. Application to Practice
 - 12.11. Problematic Theories of Cell Adhesion
 - 12.12. References

- 13. Nano-adhesion: Joining Materials for Electronic Applications
 - 13.1. The Size Effect in Adhesion: Small Is Beautiful
 - 13.2. Adhesion of Plastic Contacts
 - 13.3. Adhesion of Single Atoms
 - 13.4. Stretching Single Molecules in the Atomic Force Microscope
 - 13.5. Adhesion Strength of Small Features
 - 13.6. Cleaning Particles from Wafers
 - 13.7. Adhesion in Electrophotography
 - 13.8. Polymer Synthesis for Coating Silicon Wafers
 - 13.9. Molecular Control of Nano-adhesion
 - 13.10. Visualizing Adhesion Using Micro-focus X-rays
 - 13.11. References

- 14. Films and Layers: Adhesion of Coatings
 - 14.1. Complexity of Films and Coatings
 - 14.2. Ideal Experimental Arrangement
 - 14.3. Testing Methods for Adhesion of Films
 - 14.4. Wedging of Films: Direct Linkage with Zero Friction
 - 14.5. Elastic Linkage during Wedging
 - 14.6. Change in Elastic Linkage as the Crack Progresses
 - 14.7. Elastic Linkages Easing Failure of Film Adhesion
 - 14.8. Ultimate Adhesion: Pull-off and Indentation
 - 14.9. Deforming the Substrate: Pull-off, Stretching, and Indentation; Elastic, Plastic

14.10. Amplifying Mechanisms: Roughness, Elastic Arrest, Deflection, Losses
14.11. References

15. Fracture and Toughness of Engineering Adhesive Joints

15.1. Importance of Bonded Structures
15.2. A Model of Bridge Collapse
15.3. Definition of Joint Toughness
15.4. History of the Failure of Lap Joint Theory
15.5. The Correct Theory of Lap Joint Strength
15.6. Consequences of this Theory of Lap Joint Failure
15.7. Strengthening of a Lap Joint by Prestressing
15.8. More Complex Overlapping Joints
15.9. Various Adhesive Joint Geometries
15.10. Summary of Engineering Adhesive Joints
15.11. References

16. Composite Materials: Held Together by Adhesion at Interfaces

16.1. Particulate Composites
16.2. Effect of Interfaces
16.3. A Crack Meeting an Interface
16.4. Delamination at the Interface
16.5. Tough Laminates
16.6. Healing the Interface Crack: Interfacial Dislocations
16.7. The Overall Picture: Crack Stopping, Deflection and Healing
16.8. The Problem with Composites: Bending and Compression
16.9. Adhesion of Fibers in Composites
16.10. Adjusting the Interface Adhesion in Fiber Composites
16.11. References

17. The Future of Molecular Adhesion and the Sticky Universe

17.1. Adhesion Problems Solved
17.2. Interesting Mechanisms
17.3. Does Adhesive Strength Exist?
17.4. Adhesion at the Nanometer Level and Molecular Scale
17.5. Improved Theory of Adhesion by Computer Calculation
17.6. New Adhesion Applications
17.7. References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book sets out to describe the importance of adhesion in our universe. To understand the strong interactions that matter manifests, we must consider the idea of molecular adhesion — the fact that all molecules attract each other with a considerable force. This idea at first seems paradoxical because we can identify situations where adhesion is very strong, for example when paint sticks to a surface, but we can also see cases where adhesion is very weak, such as when sand flows through an hour glass. The objective is to provide explanations for these apparently perverse effects.

"Target Audience: Chemists, engineers, biologists, materials and surface scientists, and any other readers who are fascinated by adhesive effects.

FOREWORD:

At the beginning of the twentieth century, engineers and technologists would have recognized the importance of adhesion in two main aspects: First, in the display of friction between surfaces — at the time a topic of growing importance to engineers; the second in crafts requiring the joining of materials — principally wood — to form engineering structures. While physical scientists would have admitted the adhesive properties of glues, gels, and certain pastes, they regarded them as materials of uncertain formulation, too impure to be amenable to precise experiment. Biological scientists were aware also of adhesive phenomena, but the science was supported by documentation rather than understanding.

By the end of the century, adhesion and adhesives were playing a crucial and deliberate role in the formulation of materials, in the design and manufacture of engineering structures without weakening rivets or pins, and in the use of thin sections and intricate shapes. Miniaturization down to the micro- and now to the nano-level of mechanical, electrical, electronic, and optical devices relied heavily on the understanding and the technology of adhesion. For most of the century, physical scientists were aware that the states of matter, whether gas, liquid, or solid, were determined by the competition between thermal energy and intermolecular binding forces. Then the solid state had to be differentiated into crystals, amorphous glasses, metals, etc., so the importance of the molecular attractions in determining stiffness and strength became clearer. Cross-linked rubbers and composites designed at the macro- and micro-level were developed to extend the range of materials available for engineering purposes. Adhesion at the molecular scale, at surfaces and interfaces, was recognized to be a vital factor determining performance.

Biological sciences were not excluded from this explosion of knowledge. The study of cell structure and cell behavior, including material transport across membranes, cell division, and cell adhesion, raised aspects of adhesion already familiar in physical colloid systems. Then the rise of molecular biology in the last 30 years has brought adhesion into prominence at all levels of organization in biological systems.

Certainly there is a vast literature, and especially a voluminous research canon, associated with the science of adhesion. However, the literature is fragmented and diffuse because adhesion is involved in all areas of endeavor. The engineering literature is somewhat more ordered because of the need to agree good practice and safety protocol. It is nevertheless compartmentalized. Even so, it is not easy to align scientific knowledge with engineering practice in many fields of application. One possible exception is computer modeling, which is at the cutting edge of advances both in science and engineering though the emphasis is rather different. No doubt, in the future, we shall see adhesion modeled at the molecular level and tracked through to engineering practice with the aid of computers.

Remarkably, there is no scientific monograph covering the state and current knowledge of adhesion. Nor is there an engineering treatise to take the reader onto a representative range of applications. This is not because we have lacked leading scientists or engineers or gifted teachers in the twentieth century. Presumably, they have been too busy in a field of rapid progress. Now the challenge of promoting a unified account of molecular adhesion, extending it to basic laws and technical practice and onto applications has been taken up by Kevin Kendall. His enthusiasm for the subject and his experience in academe and industry shines through this comprehensive treatise. It is a book that can be read from cover to cover, or a laboratory and design manual to be dipped into as work demands. It benefits enormously from the distillation of a vast subject through a single mind.

PREFACE:

Molecular adhesion is one of the most fundamental concepts in science. Molecules tend to be stuck together to form crystals, liquids, composite materials, assembled structures, colloids, rocks, pastes, living cellular creatures, and so forth. Our universe may be expanding against the force of gravity, but each local bit of the universe is firmly stuck together by molecular adhesion. Explaining this across the interdisciplinary boundaries of chemistry, physics, engineering, and bioscience is the objective of this book. The argument is at undergraduate teaching level, but the specific examples and references are geared for research specialists.

The laws we remember from school are the laws of motion. Movement is interesting whereas stasis is boring. Newton made the gravitational law of adhesion exciting by using it to explain the movement of planets and satellites. Yet our Earth is largely static; stuck together by molecular adhesion. Our bodies lie in the tenuous skin of mobile material at the Earth's surface, which explains our fascination with movement, leading to Newton's Laws of Motion. To suggest laws of adhesion is almost a joke, rather like one of those Andy Warhol movies where nothing happens. But molecular adhesion is interesting precisely because it limits the movement we want; the movement of a car on a road, the movement of cornflakes onto our plates. Laws of adhesion must exist and should be revealed. Four centuries ago, Galileo famously said "It moves"; this century we are saying "It sticks".

Previously, we could only detect adhesion by this limit of movement. The single way to test for adhesion was by breaking the bond. Now nondestructive tests are becoming possible using the new technique of atomic force microscopy at the molecular level. Thus adhesion can be distinguished from, then related to, fracture. We have to understand both making the joint and breaking it to obtain a rational picture of adhesion as a whole. A second major advance is in computer modeling which enables us to describe the interactions of the many thousands of atoms which participate in adhesion events. Adhesion is cooperative; the adhesion of 1000 atoms is different from the adhesion of 1 atom.

Roughly 6000 articles are written each year on adhesion but these are in widely varying disciplines which may not be immediately accessible. This book cannot quote all these papers, nor can it present a comprehensive critique of the documents, but it can provide a skeleton of logic and a common agreed language for describing adhesion phenomena in those different areas, together with an assessment of the pivotal contributions in the literature. Individual researchers should find, in the framework provided here, a place to fit their own observations.

Many books on surface chemistry contain a short chapter on adhesion. But such accounts are seldom satisfactory. Clearly, adhesion stems from the strong attractive forces between molecules. However, the connections between molecular forces and phenomena seen in soiling, cements, adhesives, corrosion, catalysis, or slime mold reproduction are not normally made explicit. Similarly, there are several texts on adhesion for engineers, though most engineers, following Coulomb and Hertz, have ignored adhesion. In a typical book on Contact Mechanics, only 1% deals with adhesion. Engineering books tend to be dominated by mathematical derivations and hardly acknowledge that molecules exist. But without molecular force, there is no adhesion. In this book I have emphasized the observations of phenomena based on adhesion, keeping the mathematical description to a minimum, concentrating on useful results rather than analytical manipulations, trying to show the connection between molecules and mechanics.

The book is in three parts. The first introduces the background and lays the fundamental tenets of the subject which really go back to Isaac Newton. He experimented on the contact of glass lenses, trying to interpret the results in terms of molecular adhesion long before the idea of molecules existed. The second part of the book seeks to establish the laws and mechanisms of adhesion, and the third to explain the applications and benefits of molecular adhesion in the practical world.

In the first part, the aim is to unravel the many ideas and theories which have been proposed to account for adhesion phenomena, to pin down the key observations which have led to our current state of thinking, and to establish three "laws of adhesion" which account for the phenomenology. The second part then goes on to establish the three laws on a more quantitative and theoretical level which can be tested by new theories of computer modeling and by new measurements such as Atomic Force Microscopy. Finally, in the third part, this theory of molecular adhesion is applied to eight important areas of technology, where the effects of intermolecular forces are dominant. These areas will be familiar in most industries. They include adhesion of particles, colloids, pastes, gels and cells, the adhesion of nanomaterials, of films and coatings, the fracture of adhesive joints, and composite materials. A concluding chapter points to the future of molecular adhesion science.

My hope is that the adhesive gulf between chemists, engineers, and biologists can be joined, while simultaneously helping those materials scientists, dentists, powder technologists, cancer specialists, etc., who are fascinated by adhesion effects. If so, thanks are due to my wife for her constant support, to Professor Mai for allowing me to work in his department on a sabbatical in 1997, to Professor Tabor who gave me the stimulus to think about the issues in this book, and to many colleagues who have debated, theorized and experimented on this subject with me over the past 30 years.

Title	Location	Edition / Series / Misc.
170 Natural Pigments Author: Bentley, K. W. (Kenneth Walter) Publish.: Interscience Publishers, Inc. - place: New York, NY - date: ©1960 Subject: Pigments Desc: vii, 306 p., 24 cm.	Dynix: 12997 Call No.: 667.623 Be ISBN: Shelf Adult Non-Fiction	Edition: Series: Chemistry of Natural Products: Vol. 4 -- Texts on the Constitution of Natural Products Year: 1960 Price: \$25.00

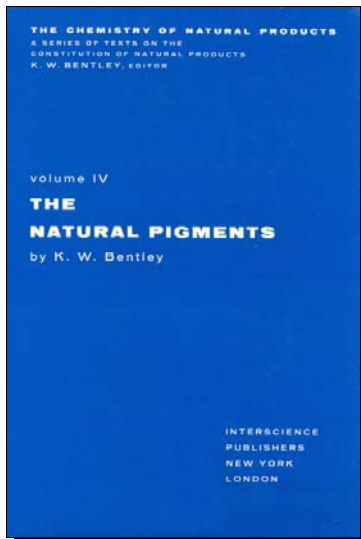


Table of Contents

1. Pyran Pigments: I. Flavones and Flavonols
2. Pyran Pigments: II. Anthocyanins and Anthocyanidins
3. Pyran Pigments: III. Xanthones
4. Pyran Pigments: IV. Rottlerin
5. Pyran Pigments: V. Brazilin and Hematoxylin
6. Pyrrole Pigments: I. The Porphyrins
7. Pyrrole Pigments: II. Chlorophylls
8. Pyrrole Pigments: III. The Bile Pigments
9. Pyrrole Pigments: IV. Prodigiosin
10. Pyrimidine Pigments: The Pterins
11. Quinonoid Pigments
12. Polyene Pigments
- Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

THE CHEMISTRY OF NATURAL PRODUCTS -- A Series of Texts on the Constitution of Natural Products
edited by K.W. BENTLEY, University of Aberdeen

The general purpose of this series is to provide volumes which bridge the gap existing between conventional textbooks of organic chemistry, which are often too general in their treatment, and the exhaustive monographs, which are often too expensive and specialized for the student or mature organic chemist. Every right-hand page throughout each book is devoted to structural formulas, which clearly illustrate the authoritative and concise text on the facing pages. The formulas are hand-drawn for a "blackboard" quality which seeks to reproduce the intimate atmosphere and lucid presentation of the lecture room.

PREFACE

In preparing this volume on the structures of natural pigments the author has followed the same pattern as in his previous volume in this series, The Alkaloids. Evidence for the structures of representative members of each general group of pigments is presented as concisely as possible, together with an outline of the synthesis of the pigment concerned, where this has been achieved. A considerable number of references to the original literature is given to facilitate further more detailed study of the individual pigments should this be required.

It is hoped that the liberal use of formulas will help the student to understand the reactions involved and their structural implications.

Subjects

293 . Pigments

Title	Location	Edition / Series / Misc.
93 Natural Resins Handbook Author: Mantell, C. L. (editor) Publish.: American Gum Importers' Association, Inc. - place: Brooklyn, NY - date: [©1939] Subject: Gums and resins Desc: 96 p. (incl. tables, diagrams), 29x22 cm.	Dynix: 44587 Call No.: 553.29 Na ISBN: Shelf Reference	Edition: Series: Year: 1939 Price: \$50.00

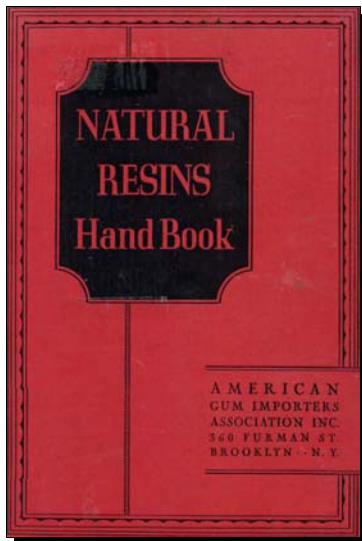


Table of Contents

Reviews - Synopsis - Dust Jacket

FORWARD:

This Natural Resins Handbook is the result of a number of years of investigative work assembling dependable and authoritative basic data on the natural resins their physical and chemical properties, their solubilities in a wide range of paint, varnish, and lacquer solvents and thinners; the compatibility of the natural resins with other resinous products, cellulose derivatives, waxes, pitches, asphalts, drying and non-drying oils; the applications of the resins alone and in combination with other materials in both their original and thermally processed forms.

This Natural Resins Handbook includes all of the fundamental information reported in Natural Resins 1937-1938 and Natural Resins 1938-1939, extended by further laboratory activities.

In reference to questions whose answers are not found in this Handbook, quotations, as well as greater detail, the reader is requested to consult the individual members of the American Gum Importers Association, Inc.

PREFACE:

For a number of years the American Gum Importers Association has been carrying on a research and development program on the properties and applications of natural resins. The results of this work have been periodically reported to the Paint and Varnish Production Clubs, with resultant publication in the Official Digest, as well as through the medium of distribution of the Natural Resin Research booklets and pamphlets, and articles in the technical journals.

Subjects

265 .	Gums and resins
423 .	Varnish and varnishing

Here are summarized tables of the origin and application of natural resins in the paint, varnish, lacquer, finishing compositions, inks, enamels, floor coverings, adhesives, sizings, decorative coatings, and plastic fields. As basic information for these applications, there are tables showing the physical and chemical properties of all of the commercial grades of natural resins, and the solubility of representative grades of each class in a wide range of solvents employed in the fields mentioned, and the viscosities and colors of the resultant solutions from these solubility tests. The solubilities were determined on the basis of 100 grams of resin and 100 grams of solvent, a condition giving 50 per cent solids. In some solvents the resins do not show such solubility, but do show solubility at lower concentrations. A study of the solubility charts will indicate this. Compatibilities of the resins in their original and run conditions with a wide variety of materials are tabulated.

Collection, grading, sorting, distribution, preparation for marketing, warehousing, and the commerce of natural resins is a coordinated and systematic business, worldwide in its ramifications, connections, and operation.

The natural resin business is as old as the varnish art and practice itself. The natural resins are exudations of trees of many different genera and species. The products of different species appear on the market as different resins. These secretions or exudations may be those of living trees or may be the fossilized products of trees long dead. From the botanical and forest viewpoint, the trees and their resins have been thoroughly and competently studied over long time periods. The natural resins are not subject to vanishing supplies of raw material. Being the products of trees which themselves are capable of infinite renewal and increase, the resins from the trees are continuously produced.

From the viewpoint of terminology, natural resins do not include rosin or shellac. This is perhaps an artificial classification, in that rosin, being a product of tree exudations, is a natural resin.

The varnish trade usually refers to the natural resins as "gums". In strict terminology, however, the gums are related to the sugars and carbohydrates. They are soluble in water, forming viscous solutions, and insoluble in drying oils and organic solvents. On heating, they decompose completely without melting. In contradistinction, the resins are insoluble in water, more or less soluble in organic substances and vegetable oils, and are chemically related to the terpenes or the essential oils. On heating the resins melt with the distillation of volatile oils terpenic in nature. The residue, termed "run" gum or resin by the varnish maker, is soluble in hot vegetable oils. Some of the softer resins are directly soluble in

solvents or oils, but in all cases are totally insoluble in water.

In general, the natural resins are divided from the point of use into those which are spirit soluble — the "spirit" originally meaning alcohol but now embracing a large variety of solvents — and those which are oil soluble. The first class is generally soluble directly, while the second needs to be processed by thermal methods. The spirit soluble resins are in general of the soft variety, while the oil soluble are usually hard. The resins are known under names which are indicative either of their source of origin, or of a distinguishing characteristic of the resin, or of the port at which they enter commerce. They are further classified into four major types: the damars, which include those known under the name of Damar; the East Indias which are semi-fossil damars; the copals, including the Manilas with their range of hardness from the soft Melengket through stages of hardness and fossilization to the hard Boea, as well as the Congos which are the hardest of the natural resins, and the Kauris; and the fourth group which are in a miscellaneous class including the very soft Elemi, the Accroides, Mastic, and Sandarac. There is a practically continuous series as regards solubility and hardness, from the hardest copals of the fossil type to the softest damars obtained from fresh tappings of living trees.

The natural resins in general originate in the Congo district of Africa, from which the resin is named, New Zealand, the Netherlands East Indies, Malaya, the Philippine Islands, and adjacent territory. They are obtained from definite species of trees in a systematic manner, generally under governmental supervision.

The natural resins are imported into the United States in various types of containers such as boxes or cases, bags or basket bags. In the description of the commercial grades, the term Bold refers to sizes of pieces, — that is, they are large and clean. The Nubs are smaller, being of the order of 2 to 4 cm. in largest dimension. Chips, Seeds, and Dust are size classifications primarily, but decreasing size usually carries with it increasing amounts of impurities. The term Scraped refers to an operation which removes surface coatings, crusty material or oxidized resin, while the term Unscraped means that this step in grading has not taken place.

In the case of the Batavia Damar, the letter designations refer to screen sizes, A material being that retained on the A screen, and B passing through the A screen and retained on B. Cuttings are large chips resulting from cleaning or breaking down Bold pieces. In the Kauris, the Pale designation refers to lack of color, while in the X Kauris the higher the number of crosses the closer the approach to white and the greater the freedom from impurities. In the Manilas, the WS, HA, and MB designations are soft resins, the Lobas are half-hard. For further classifications and descriptions of commercial grades, reference should be made to the members of the American Gum Importers Association, Inc.

**New Concepts for Coating Protection of Steel Structures:
ASTM Symposium, Lake Buena Vista, FL**

LASCT Holdings -
maximum detail by Title

N

Title	Location	Edition / Series / Misc.
94 New Concepts for Coating Protection of Steel Structures: ASTM Symposium, Lake Buena Vista, FL		<i>Edition:</i>
<i>Author:</i> Symposium on Paint and Related Coatings and Materials and Steel Str	<i>Dynix:</i> 01990	<i>Series:</i> ASTM Special Technical Publication: No. 841
<i>Publish.:</i> American Society for Testing and Materials	<i>Call No.:</i> 667.9 Ne	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0484100014	
<i>- date:</i> ©1984	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1984
<i>Subject:</i> Protective coatings		<i>Price:</i> \$25.00
<i>Desc:</i> 135 p., illus., 23 cm.		

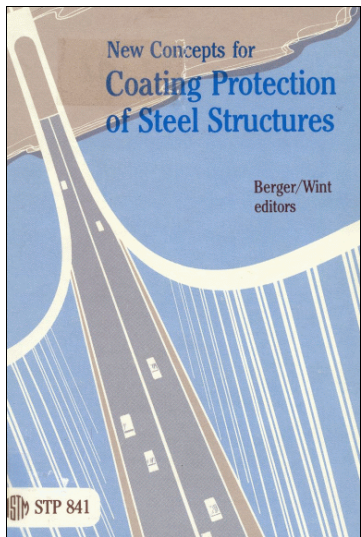


Table of Contents

Introduction

KEYNOTE ADDRESS
Evolution of Steel Protection: A Personal View — S. L. Lopata

SURFACE TECHNOLOGY CONCEPTS
Quantitative Evaluation of Blistering and Corrosion in Organic Coating Systems — M. E. McKnight and J. W. Martin

Blast Cleaning with Zinc-Coated Abrasives — K. W. Lowrey

Detrimental Materials at the Steel/Paint Interface — W. C. Johnson

Effects of Rotary Peening Surface-Conditioning Products on Structural Steel — J. J. Claus

APPLIED COATING SYSTEMS AND SAFETY PRACTICES
Zinc-Plus-Paint System for Corrosion Protection of a Steel Bridge — M. M. Lwin

Spray-Applied Fluoroelastomers for Protection of Carbon Steel Structures in Flue Gas Desulfurization Service — C. A. McClain and T. Dolan

Perspectives on 100% Solid Spray-Applied Polyurethane Elastomers — S. John Oechsle III

Precision Reactivation of Antifouling Paints — I. Poretz

Minimum Film Thickness for Protection of Hot-Rolled Steel: Results after 23 Years of Exposure at Kure Beach, North Carolina — M. Morcillo

Paint Research Institute Paint Corrosion Inhibitor Research — C. M. Hendry

ASTM Safety Alert System — S. John Oechsle III

SUMMARY
INDEX

Subjects

324 . Protective coatings

Reviews - Synopsis - Dust Jacket

FOREWARD

The Symposium on New Concepts for Coating Protection of Steel Structures was held in Lake Buena Vista, Florida, on 26 January 1983. Sponsors were ASTM Committee D-1 on Paint and Related Coatings and Materials and the Steel Structures Painting Council. D. M. Berger, Gilbert/Commonwealth, and R. F. Wint, Hercules Incorporated, served as symposium chairmen and have edited this publication.

INTRODUCTION

The Symposium on New Concepts for Coating Protection of Steel Structures was sponsored by ASTM Committee D-1 on Paint and Related Coatings and Materials and the Steel Structures Painting Council (SSPC). ASTM Subcommittee D-01.46 on Industrial Protective Painting directly relates to the work of SSPC. This meeting, held in Lake Buena Vista, Florida, represented the first time SSPC met anywhere other than in Pittsburgh, Pennsylvania. The meeting also represented the first time Committee D-1 met in joint session with SSPC. The success of the meeting was attributed to the fact that one could attend Committee D-1 meetings in the beginning of the week, the joint symposium on

***New Concepts for Coating Protection of Steel Structures:
ASTM Symposium, Lake Buena Vista, FL***

LASCT Holdings - 
maximum detail by Title

Wednesday, and the SSPC meeting later in the week. Over 180 members attended the ASTM meetings and over 220 attended the SSPC meetings. This joint venture is of particular value when air travel and other expenses are considered, because it allowed the individual members to attend both meetings under one travel expense. It is expected that future symposia and joint meetings will be held by these two organizations. Owing to the presence of SSPC, representatives of 15 other organizations were present.

This symposium was the first sponsored by SSPC. The selection of Stan Lopata as keynote speaker set the tone of the subject, Protection of Steel Structures. Mr. Lopata, Chairman of the Board, Carboline Company, St. Louis, Missouri, inventor of alkyl silicate inorganic zinc-rich primers, has contributed significantly to the technology of protection of steel structures.

Sidney B. Levinson, Chairman of ASTM Committee D-1, and John D. Keane, Director of the Steel Structures Painting Council, welcomed the attendees. The speakers were introduced by Dean Berger and Rufus Wint, who served as symposium chairmen and who have edited this publication.

The Summary at the end of this volume reviews the presented papers and highlights the important issues raised by the speakers.

Title	Location	Edition / Series / Misc.
1529 New Product Development: From Initial Idea to Product Management		<i>Edition:</i>
<i>Author:</i> Annacchino, Marc A.	<i>Dynix:</i> 111662	<i>Series:</i>
<i>Publish.:</i> Elsevier / Butterworth-Heinemann	<i>Call No.:</i> 658.5 An	
<i>- place:</i> Amsterdam, The Netherlands	<i>ISBN:</i> 0750677325	
<i>- date:</i> ©2003	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2003
<i>Subject:</i> New products -- Planning		<i>Price:</i> \$71.50
<i>Desc:</i> xxxi, 567 p., illus., 24 cm. + CD-ROM (4¾")		

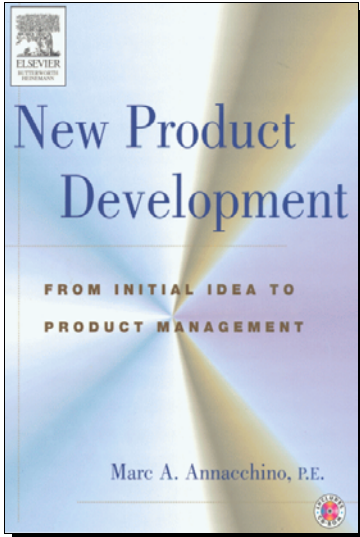


Table of Contents

Dedication
 Preface
 Introduction

1. THE BUSINESS OBJECTIVE
 The Fit
 The Strategy
 Consistency
 Differentiating Research and Development
 Leverage
 Continuity
 Flow
 Symbiosis
 Pursuit
 Singularity versus Plurality
 Market Investigation
 Understanding the Marketplace
 Global Product and Business Development
 Defining the Marketplace
 Summary

2. THE MARKET OPPORTUNITY
 The Business Concept Embodied in the New Product Idea
 Solving the Customer's Problem in the Product
 The Product as a Business
 The Competitive Game
 Idea Evaluation within the Framework of the Business
 Playing the Game Well
 It's a Faster, Changing World
 Winning the Game
 New Product Development as a Competitive Weapon
 The Strategic Difference between Large and Small Companies
 The Product Evolution Flowchart
 Business Capabilities
 Partnering for Capabilities
 Model for Brand Labels, Joint Ventures, and Acquisitions
 Benefits of Short-Term and Long-Term Tradeoffs
 Summary

3. REFINEMENT OF THE PRODUCT CONCEPT INTO A NEW PRODUCT AND BUSINESS
 The Idea
 Competitive Analysis—Structuring the Advantage
 The Route to Market
 Strategy and Tactics in Operational Planning
 Background/Format
 Agreement of Principles
 Reducing the Risk of New Product Failure
 The Assignment
 The Configuration
 Mass Customization and Generic Platforms
 Creeping Functionalism

Subjects

720 .	New products -- Planning
721 .	Product management

Designing to Cost
Development Engineer's Influence on Factory Cost
Manufacturing
Global Marketing
Requirements Specification
The Interrelationship of the Specs
Summary

4. THE PRODUCT AND BUSINESS PLAN

The Plan
Program Timing
Structuring the Business Plan
Product Mix/Offering
Pricing Policy
Facilitating Change in the Business to Execute the Plan
Management Focus
The Importance of the Accounting Function
When to Save a Program and When to Kill It
Testing the Market
Confirming the Technological Fit
Trading Time Saved for Technology
The Customer Is Part of the Plan
Selling the Plan
Summary

5. JUSTIFYING A PROGRAM: THE ACCOUNTING VIEWPOINT

Background
Accounting and Finance as Partners, Not Adversaries
Financial and Economic Analysis
Timing and Lost Opportunity Costs
Critical Unit Volume During Amortization
Generating Cash and Profit
Profit in Backlog
Cost, Volume, and Profit-Breakeven
Financial Models for the Sales Transactions
Financial Impact of Lack of Continuity
Impact of Halfway Efforts
Strategic Impact of Halfway Efforts on the Business
Getting the Appropriation Request Approved
Summary

6. STARTING OUT

A Statement About Teamwork
Identifying the Requirements
Assembling the Team Members
Organizational Form
Apprenticeship and Mentoring
Management of the Team
Culture of the Group
Incentives for the Development Group
Management Reporting
Communications Systems
The Program Initiation
Summary

7. EXECUTING THE PLAN

Mechanics of Product Development
Managing People
Executing The Product Development Plan
Product Development Phases
Tracking Performance
Obstacle Removal
Key Players and Backup
Dealing with Shifting Linking Objectives

Problem Solving
Issues Review
Cause Assessment
Decision Management
Planning Architecture
Decision Management
Contingencies
Recovery Skills
Documentation
Planning for Product Liability
Requirements for Testing and Qualification
Quality Management Systems
Intellectual Property Protection
Summary

8. MANUFACTURING DEVELOPMENT

Concurrency of Development Phases
Integration of Multiple Disciplines into the Development Process
Design for Manufacturing
Manufacturing, Process, Layout
Product Configuration
Changes to the Product Line: Development versus Production
Manufacturing Process Control
Certification of Manufacturing Personnel
Procurement and Parts Configuration
Certification of Vendors
Information Retention and Recordkeeping
Field Problems and Event Status Monitoring
Forecasting
Cycle Time Management
Synchronization
Summary

9. THE PRELAUNCH CHECKLIST: SETTING UP THE ORGANIZATION

Preflight Checklist
Confirming Agency Certifications
Pilot Run Manufacturing
Beta Testing Program
Literature
Setting up the Infrastructure
Training for Personnel
Applications Support
Field Organization Set-Up
Final Pricing
Sales Order Entry Systems
Materials Procurement
Summary

10. THE LAUNCH

The Product Rollout
Initial Monitoring of Results
Early Modifications for Success
The Myth of the Hockey Stick Forecast
Forecasting and Building Inventory
Product Promotion and Customer Visits
Tools
Measurements
The Sales Channel and Launch Objectives
Communication, Agreement, and Commitment to Objectives
Summary

11. THE PURSUIT

Product Management
Learning Curve Cost Reduction

Quality System
Managing Product Change
Recalls: A New Product Nightmare
Market Development
Application Development
Market Feedback and Product Modifications
Continuing the Product Evolution Flowchart
Price Pressures and Market Share
Growth Strategy
Life Cycle Management of a Product
Summary

12. NEW PRODUCT DEVELOPMENT RECORDS FORMAT

Organizational Format
Perspectives on the Continuity of the Development

APPENDIX A: Selected Product Development Efforts

Famous Product Development Efforts
New Product Flops
Major Causes of New Product Failure
Lessons for Future Programs

APPENDIX B: The Faster Changing World

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

New product development is the last frontier in gaining a competitive edge. While other factors such as functionality, quality and reliability, availability and shipment performance are now entry level requirements. New Product Development is now the competitive weapon of necessity.

This comprehensive and detailed book is a practical guide to the entire process of New Product Development from initial concept and corporate goals assessment through marketing, planning, development, manufacturing and product management. It contains over 200 illustrations and the accompanying CD-ROM demonstrates the use of 52 specific software tools used to implement new product development programs, allowing the user to apply the information presented in the book to their own programs. A complete roadmap for new product development — recommended.

—

"Target Audience: Industrial managers, product and R&D engineers, designers, upper-level students in these disciplines, and senior executives who oversee new product development.

—

PREFACE:

The purpose of this book is to create understanding of the new product development process in order to maximize the corporate investment. Another purpose of this book is to promote and encourage new product development as a vocation, as well as a means for rounding out the executive. This book can help the reader get an appreciation for the planning execution, timing, and problem-solving skills required to prosecute a program. Another purpose is to create an understanding at the executive level about the process, expectations, pitfalls, and recovery moves to maximize results.

UNDERSTANDING THE NEW PRODUCT DEVELOPMENT PROCESS

This book will attempt to provide the reader with a complete understanding of the new product development process. In order to be an effective influence in this field, the manager's understanding must be significantly wide in scope in order to navigate the new product development process.

From the corporate view, the book's purpose is to maximize the Development results of the investment that the corporation makes.

INTERDEPENDENCY OF FACTORS

In any program there are multiple factors that must be understood. There are technological factors that may remain uncertain initially, there are people dynamics that need to be coalesced, and there are corporation infrastructure issues that need to be addressed. For example, the project may have technological hurdles that must be overcome, with a team that is not yet functioning as a team, working within a system that may not be sufficient to produce the product. Add to this, the need to demonstrate early results to maintain management's enthusiasm! All of these elements must be

orchestrated into a functioning program with momentum.

THE EXECUTIVE MUST HAVE A REALISTIC APPROACH

The executive must have a good background in new product development in order to be effective in growing the business. Generally, long-term sustainable growth will come from product and market development. It is therefore imperative that the executive have a realistic grasp of the process, the dynamics, and the expectations for results.

EXECUTIVES NEED GOOD PEOPLE AND NEED TO KNOW THE BUSINESS

There is a common misconception that an "executive" need not know the ins and outs of every job under their domain, they just need to hire "good" people. The misconception exists on two levels. First: even good people need to be integrated into the executive's organization and be coached and counseled through the integration. In new product development the integration process is not one or two months, it is rather one or two product cycles. Consequently to save time and prevent false starts, the executive should have intimate knowledge of the process to ensure their people are kept on track. Secondly: in order to, simply, select "good" people that will integrate into the organization, one must know the process, in order to conduct a performance based interview to a depth sufficient for the organizations needs.

HOW NEW PRODUCT DEVELOPMENT CAN ALLOW YOU TO CHART YOUR COURSE IN THE ORGANIZATION

One of the most appealing aspects of the new product development arena is that it allows you to effectively chart your course through the corporation. You become the expert of the product and business development and it is in demand. The fundamental aspects and elements of the activity require your cutting across the organization and develop relationships and experience in all areas of the organization.

Like it or not the area of product development can contribute positively or negatively to one's career. Therefore, this book can serve as a guide for keeping your programs on track. It can serve as a means for determining completeness in the investigation, planning and execution phases of a program and serve as checklists for comparison to your individual situation.

PLANNING, TIMING, AND PROBLEM-SOLVING SKILLS

Unlike the orchestra, however, where one is dealing with little uncertainty in the equation (music), new product development, has a great deal of uncertainty, which must be overcome while still keeping overall timing and a quality result.

Since navigating this course requires a diverse set of skills, many times acquired through numerous product development cycles, this book presents a comprehensive look at those skills, thus enabling the manager not necessarily well versed in all of them to have a resource to refer to.

BRINGING THE SHIP IN

As with most elements in business, few people are interested in how many storms a product development team had to transcend; most are concerned only if the "ship" was brought into port. So, too, with product development: executives do not care about the obstacles, just the results. That is why they are giving you the funds to accomplish the task. There is no credit for getting "lost at sea."

STUDY AND APPLY PRINCIPLES

The reader is to study and apply the principles presented, gain an appreciation for the effort required in prosecuting a program, and then establish realistic expectations for new programs.

NEW PRODUCT DEVELOPMENT AS A VOCATION

Another objective for this book is to encourage new product development from a vocational perspective. It can be a very rewarding career for a creative individual by allowing their creativity to assist the growth of a business. With most vocation, one must always be aware of the danger of falling behind in skill sets, technology, procedures, and the business dynamics. With new product development, one is always at the forefront of each of these. It is required as part of the activity.

EXECUTIVES OF TOMORROW

The executives of tomorrow must know these elements in order to develop sensitivity to the pressure and pinch points of a program. Failure to have an intimate grasp of how the activity interfaces with the management, the dynamics of the organization, and how the product development result should contribute to the business can result in a career oversight.

GEARED TO THE EXECUTIVE

This book is a mandatory review for the executive newly assigned from a field commission or new to the organization. It will attempt to augment a lack of product development experience by presenting a format and worksheets for the various stages of analysis.

This book encourages the executive to establish realistic expectations in the development arena, and discourage over

commitment on the part of the executive to the organization management or the team members to the executive.

The key to any program and most corporate initiatives is to carefully establish the course and stick to it. By establishing the course, and maintaining its direction, one can gain momentum and start to leverage the effort.

THE EXECUTIVE RESPONSIBILITY

The executive's role is one of championing the process through completion with a minimum amount of distraction. When the team's enthusiasm wanes, the executive/manager needs to spark interest and excitement into the team. When the organization becomes disenchanted or looks for greener pastures, the executive/manager must rekindle the interest, excitement and all of the organization's commitment to see the program through.

This book is also helpful when reviewing the executive's relationship with the product people. By creating the understanding and examining the driving forces amongst the team members, the executive can better understand how one must interface with creative people, and establish long term trust. It is imperative to prevent adversarial relationships within the process, while still maintaining control and a sense of urgency.

Depending on organizational management and the technical ability of the executives involved there may be misunderstanding created as to who the customer is. Since the executive holds the funds, sometimes, there is a hazard to yield to opinions or whims that are internally generated. This can cause functional creep and added expense at the best, and at the worst, cause the organization to miss the market in terms of both functionality/price matrix and time. Hopefully, this book will serve as a means for introspection for both the executive and the organization.

As with most things in life, the opportunities exist, how you engage them and respond to them determines general success levels. The executive and management and the product team must respond to the market opportunity together to bring a salable package of values.

HOW THIS BOOK IS STRUCTURED

The information in this book is structured in the general chronological order in which information is required in prosecuting a program. There are breakouts to more detailed explanations on individual topics.

It is also structured to allow random access to specific subjects by use of a detailed outline. Another valuable resource included as part of the CD version is the interactive graphs and charts. These software tools are presented initially for instructional purposes (within the framework of the text proper) and can subsequently be used by the reader for their particular development program. The Toolbox is accessed by hyperlinks embedded in the text of the book. After the reader covers a specific example in the text, a hyperlink can direct them to the Toolbox where they can apply it to their program.

Title	Location	Edition / Series / Misc.
1119 Novel Surfactants: Preparation, Applications, and Biodegradability Author: Holmberg, I. Krister (editor) Publish.: Marcel Dekker, Inc. - place: New York, NY - date: ©2003 Subject: Surface active agents Desc: 643 p., illus., 24 cm.	Dynix: 111661 Call No.: 668 No ISBN: 0824743008 Shelf Adult Non-Fiction	Edition: 2nd edition, Revised and expanded Series: Surfactant Science Series: Vol. 114 Year: 2003 Price: \$168.50

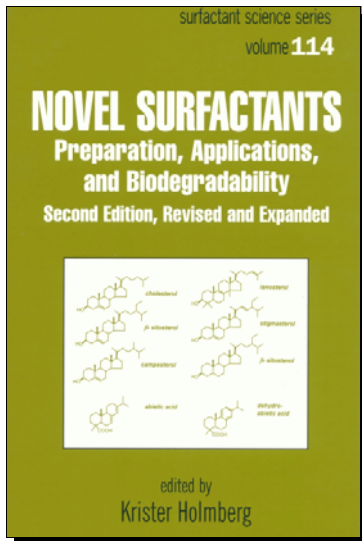


Table of Contents

- Preface
- Contributors
- 1. N-Alkanoyl-N-Alkyl-1-Glycamines
- 2. Alkyl Polyglycosides
- 3. Sugar Fatty Acid Esters
- 4. Novel Saccharide-Based Surfactants
- 5. Amino Acid-Based Surfactants
- 6. Surfactants Based on Sterols and Other Alicyclic Compounds
- 7. Fatty Acid Monoethanol Amide Ethoxylates
- 8. Enzymatic Synthesis of Surfactants
- 9. Surfactants Produced by Microorganisms
- 10. Cleavable Surfactants
- 11. Esterquats
- 12. Gemini Surfactants
- 13. Alpha-Sulfomonocarboxylic Esters
- 14. Methyl Ester Ethoxylates
- 15. Polymerizable Surfactants
- 16. Polymeric Surfactants
- 17. Silicone Surfactants

Subjects

332 . Surface active agents

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

about the first edition...

"...a useful snapshot of the current state of surfactant science and technology." —European Journal of Pharmaceutics and Biopharmaceutics

About the second edition...

Extensively revised and expanded, this timely reference discusses the synthesis, properties, and potential applications of popular and emerging surfactant compounds and systems — reflecting current research trends in green surfactants, the production of surfactants using biotechnological methods, and surfactants based on natural building blocks.

Contains five new chapters analyzing aspects of natural surfactants — examining surfactants produced by microorganisms, surfactant types based on sugar as hydrophilic building blocks, and surfactant classes based on fatty acids as hydrophobic building blocks.

Placing researchers at the forefront of surfactant technology, the Second Edition considers surfactants produced by enzymes and microorganisms...the environmental impact of surfactants...the use of renewable raw materials as surfactant building blocks...the preparation, biodegradation, toxicology, single- and multi-component phase behavior, and dilute solution properties of various surfactants...and recent developments in the pharmaceutical, manufacturing, cosmetic, and food industries.

"Target Audience: Physical, analytical, surface, colloid, organic, polymer, oil, and medicinal chemists and biochemists; and upper-level students in these disciplines.

PREFACE:

The first edition of Novel Surfactants, published in 1998, contained 11 chapters, written by leading experts in surfactants. Each chapter covered one class of surfactant and was written as an overview of the respective area with emphasis on recent development.

In this new edition the majority of the chapters from the first edition have been updated. Many topics have been expanded to include recent advances and many recent references have been included. The substantial amount of new material included in the second edition is indicative of the rapid development currently taking place in the areas chosen as topics for the first edition.

Besides updating of the original chapters, the second edition contains six new chapters. Five of these are in some way related to the concept of natural surfactants. Two chapters deal with surfactant types based on sugar as a hydrophilic building block, two describe surfactant classes based on fatty acids as a hydrophobic building block, and one covers surfactants produced by microorganisms. Together with chapters from the previous edition on glucamides, alkyl polyglycosides, amino acid-based surfactants, and sterol-based surfactants, as well as a chapter on surfactants produced by enzymes, 10 of the 17 chapters relate to surfactants based on natural building blocks or produced by biotechnological methods. This emphasis on green surfactants is in accordance with the present research focus in the surfactant field. Environmental aspects are the single most important driving force for surfactant development today, and there is a clear trend to move toward renewable raw materials as surfactant building blocks. The new edition also contains a chapter on Polymeric surfactants, which is a topic of growing importance.

The authors of the previous edition were from both academia and industry, six from the former category and five from the latter. Of the six new chapter authors, three are from academia and three from industry. All six are well-known experts in their fields. The relatively large percentage of industrial contributions ensures that the surfactant types chosen for reviews are of commercial relevance. As in the first edition of the book, the intention has been to select surfactants that are not yet well established on the market but are not just research curiosities. Considering the amount of ongoing research in the surfactants field, it is reasonable to assume that many of the product classes described in this edition will be in large-scale use within a decade or two.



Title	Location	Edition / Series / Misc.
96 Organic Coating Technology: Pigments and Pigmented Coatings Author: Payne, Henry Fleming Publish.: John Wiley & Sons - place: New York, NY - date: ©1961 Subject: Protective coatings Desc: viii, pp. 675-1399, illus., 24 cm.	Dynix: 34097 Call No.: 667.6 Pa v.2 ISBN: Shelf Adult Non-Fiction	Edition: Series: Year: 1961 Price: \$25.00

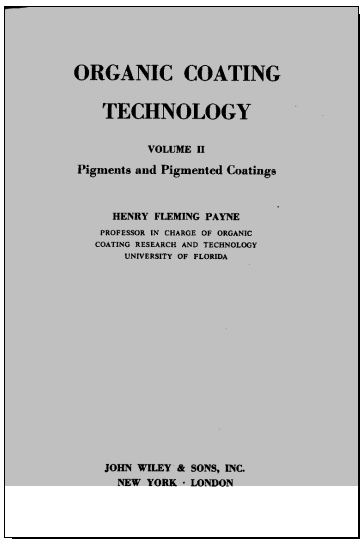


Table of Contents

- 16. Fundamentals of Pigmented Coatings
- 17. White Pigments
- 18. Extender Pigments
- 19. Inorganic Color Pigments
- 20. Organic Color Pigments
- 21. Black Pigments
- 22. Metal Pigments and Metallic Stearates
- 23. Principles of Formulation and Production
- 24. Preparation of Surfaces and Methods of Application
- 25. Architectural Paints
- 26. Industrial Finishes
- 27. Corrosion-Resistant and Chemical-Resistant Paint Systems
- Index

Reviews - Synopsis - Dust Jacket

PREFACE

This book is intended to be used with Volume I; therefore the chapters and pages of both books are numbered consecutively, and a combined index has been provided in this volume.

I am deeply appreciative of the favorable responses I have received regarding Volume I from readers not only in the United States but also in many other parts of the world. I trust that Volume II will serve equally well the needs of students in paint courses and neophytes in the paint and related industries. It also may serve to broaden the view of experienced personnel in these days of inevitable specialization. To facilitate reading, information is repeated to some extent in this book, but I have tried to keep repetition at a minimum. I also hope that errors have been eliminated by diligent reviewing, but I shall welcome correspondence regarding any that are found.

The original plan has been continued to outline in compact form the current theory and practice regarding organic coatings. Periodic revision will keep the two volumes as current as possible. In this connection I am most happy to announce that Sidney Lauren has consented to be coauthor of the eventual revision of Volume I, and I am confident that the entire work will be carried on faithfully in his capable hands.

It is expected that readers will have available the publications: Official Digest of the Federation of Societies for Paint Technology, Journal of the Oil and Colour Chemists' Association, and Industrial and Engineering Chemistry, in addition to trade magazines such as American Paint Journal, Paint and Varnish Production, and Industrial Finishing. I have drawn much information from them and have referred to them extensively for more detailed study. I greatly appreciate the permission to use material from these sources.

In most cases references to the work of the Paint and Varnish Production Clubs are given under this name. The manuscript for this book was finished shortly before the name was changed to Societies for Paint Technology and I did not consider it desirable to change the references accordingly.

In response to a general request I have continued to use suggested formulas based on specific trade name products. Please understand that the products referred to are representative only; similar products made by other manufacturers frequently serve equally well. In all cases the formulas provide only a basis for experiment and are not necessarily the best which may be developed. The patent situation always should be checked carefully to avoid unintentional violation.

I take this opportunity to express my deep appreciation to the many technical men in the paint and chemical industries who not only provided technical bulletins but also gave of their time and experience to review and make suggestions regarding this work. The book could not have been as comprehensive without their contributions, and I have enjoyed the privilege of making available in compact form some of the results of their experiments and experience.

Subjects

324 . Protective coatings



My sincere appreciation is due the University of Florida for providing facilities and encouragement for this book. To make the book reason ably current in these times of almost continuous change in products has posed an exasperating problem, and there are limits to human patience and endurance. When it appeared that these limits had been reached, my devoted wife came to the rescue, and I was able to continue with renewed determination.

My indulgence in the philosophical through the random thoughts in Volume I has returned a rich harvest in correspondence and friendship throughout the world. It has demonstrated again that there is more to man than the sum, of his physical parts, and that a balance of physical and non-physical is essential for truly successful living.

INTRODUCTION

This volume contains an outline of the general chemistry, physical properties, manufacture, application, and use of pigments and pigmented coatings. Volume I describes the oils, resins, varnishes, and polymers which constitute the film-forming materials for both clear and pigmented coatings. In order to encompass the raw materials, manufacturing processes, and applications for the products of the paint industry in these two volumes it has been necessary to omit much interesting detail and to confine the discussion chiefly to fundamentals. Many details either are unnecessary or may be derived readily if the fundamentals are understood. Literature references are included which provide additional information on specific phases of the subject. Extensive use has been made of the technical literature of raw material suppliers, and specific trade names and materials are cited. This practice, followed in Volume I, was considered highly desirable by most of the readers.

The products of the paint industry are essential for the protection and decoration of the majority of manufactured goods and architectural and industrial structures which characterize our complex material civilization. Paint coatings are very diversified, but despite this wide variety they may be classified into two general groups, architectural coatings and industrial coatings. Architectural coatings, including varnishes, paints, and enamels for both interior and exterior of dwellings, are sometimes referred to as "trade sales" products. Maintenance paints which are used on industrial buildings and steel structures such as bridges may be considered as a highly specialized form of architectural coatings. They range from the protective and decorative coatings for factories to the corrosion- and chemical-resistant coatings for chemical plants and equipment.

Industrial coatings are used on a very wide range of materials including metal, wood, paper, textiles, leather, glass, and plastics. Industrial coatings are essential to the efficient functioning of our many industrial operations. Motors, radios, and other electrical apparatus produced each year require millions of miles of wire, paper, and cloth covered with insulating coatings. Steel automobile bodies without paint would rust beyond use in about a year. Modern ships depend on paint to prevent marine organisms from fouling their bottoms and salt water from converting them into unsafe, rusty hulks. Beer in tin cans was not practical until a special coating was developed to protect the beer from the can and the can from the beer. Bakers' pans no longer need greasing after each baking because a unique coating prevents the bread from sticking. Many other illustrations could be used to show the importance of industrial coatings.

Paint has become so commonplace that few people realize what a remarkable commodity it is. Paint in the can remains liquid almost indefinitely, but when spread on a surface it is transformed in a few hours into a hard, durable coating which protects and beautifies for many years. Although no thicker than a few sheets of paper, paint coatings are more durable than some metals at equal thickness, and paint protects billions of dollars in wood and steel structures and metal goods from decay and corrosion.

There are about 1400 manufacturers of organic coatings in the United States, 680 of whom report their production to the Bureau of Census. It is believed that these represent about 87 % of the total production. Note that the yearly value of the products of the paint, varnish, and lacquer industry has passed the billion dollar mark.

Title	Location	Edition / Series / Misc.
97 Organic Coatings for Corrosion Control		<i>Edition:</i>
<i>Author:</i> Bierwagen, Gordon P. (editor)	<i>Dynix:</i> 73388	<i>Series:</i> ACS Symposium Series: No. 689
<i>Publish.:</i> American Chemical Society	<i>Call No.:</i> 620.1 Or	
<i>- place:</i> Washington, DC	<i>ISBN:</i> 084123549X	
<i>- date:</i> ©1998	<i>Shelf:</i> Reference	<i>Year:</i> 1998
<i>Subject:</i> Protective coatings		<i>Price:</i> \$144.95
<i>Desc:</i> xiii, 448 p., illus. (some color), 24 cm.		

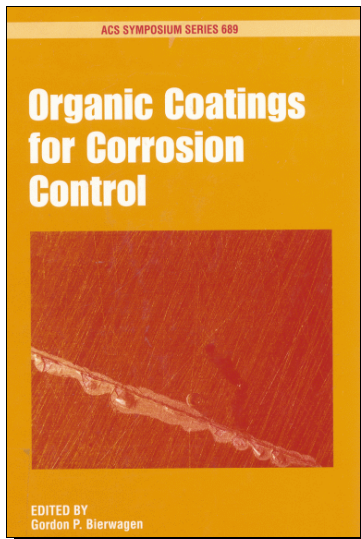


Table of Contents

Preface

COATINGS CHARACTERIZATION STUDIES-IMPEDANCE

1. Corrosion and Its Control by Coatings
2. Long-Term Electrochemical Impedance Spectroscopy and Electrochemical Evaluations of Five Distinct Types of Navy Coats
3. Application of Localized Electrochemical Impedance Spectroscopy to the Study of the Degradation of Organic Coatings
4. Electrochemical Impedance Analysis of Anticorrosive Latex Paint Films
5. Application of Impedance Spectroscopy During the Lifetime of Organic Coatings
6. Using Reliability Statistics To Estimate Metal-Container Failure Levels from Censored Tests
7. Quantification of Coating Aging Using Impedance Measurements

COATINGS PROPERTIES AND CORROSION CONTROL

8. Study of the Water Barrier Properties of Paints After Natural and Accelerated Photooxidative Degradation
9. Studies of Adhesion and Disbonding of Coatings by Scanning Acoustic Microscopy
10. Defects and Heterogeneities in Corrosion Protective Organic Coatings Films and Their Effects on Film Performance
11. Prediction of Blistering in Coating Systems
12. Initial Studies of Electrochemical Comparison of Coating Performance in Flowing versus Stationary Electrolyte
13. Transport Properties of Waterborne Polymeric Coatings

COATINGS TESTING FOR SPECIFIC ENVIROMENTS

14. Degradation of Polymer Coatings on Steel Exposed to Seawater
15. Failure Mode Prediction of Organic Coating-Metallic Substrate Systems
16. Biodegradation of Polyimide-Coated Chromium Substrates
17. Quantitative Methods of Predicting Relative Effectiveness of Corrosion-Inhibiting Coatings on Aircraft Aluminum
18. Inhibition Properties of Some Aircraft Corrosion Protective Coatings.
19. Testing of Coating Materials in Industrial Practice
20. Realistic Performance Testing of Internal Coatings for Oilfield Production

COATINGS FOR UNIQUE SUBSTRATES AND ENVIROMENTS

21. An Aspect of Concrete Protection by Surface Coating
22. Formulations and Field Performance of Fluorinated Polyurethane Coatings
23. Electrochemical Studies of Vinyl Ester Coatings for Fuel Tanks
24. Control of the Protective Properties of Polyethylene Coatings Using Molybdenum Disulphide Filling
25. Defect Area Calculated from Electrochemical Noise and Impedance Measurements

INHIBITORS, PIGMENTS AND PRETREATMENT

26. Novel Pretreatments of Metals for Corrosion Protection by Coatings: Part I, Plasma Polymerized Hexamethyldisiloxane on Cold-Rolled Steel
27. Novel Pretreatments of Metals for Corrosion Protection by Coatings: Part II, Plasma Polymerized Hexamethyldisiloxane Films on Galvalume
28. Improvement of Wet-Adhesion on Stainless Steels by Electrolytic Polymerization Treatment with Triazine Thiol Compounds
29. The Replacement of Chromate- and Lead-Based Inhibitors in Protective Coatings
30. Nontoxic Spinel-Type Pigments in Anticorrosive Coatings

NEW MATERIALS FOR CORROSION CONTROL

31. Anticorrosion Organic Coatings Prepared from Aniline Oligomers and Their Epoxy-Cured Derivatives

Subjects

295 .	Plastic coating
313 .	Polymers
324 .	Protective coatings
387 .	Organic compounds



- 32. Polyaniline in Corrosion-Resistant Coatings
- 33. Corrosion Inhibition Using Self-Assembled Monolayers of Alkanethiols on Copper
- 34. Corrosion Protection with Organic Acid Sealants for Anodized Aluminum
- 35. Electrochemical Properties of Coatings from Renewable Natural Products

INDEXES

Author Index
Subject Index

Reviews - Synopsis - Dust Jacket

This book discusses new experimental methods and instrumental techniques that can provide a numerical assessment of the corrosion resistant properties of organic coatings. It explores new materials for corrosion protection, including conductive polymers. It also looks at the performance of organic coatings under various environmental conditions and investigates organic coatings for aluminum alloys.

PREFACE:

This book resulted from a request from Dr. George Pilcher, then Program Chair of the Polymeric Materials: Science and Engineering (PMSE) division, that I organize a symposium on coatings and corrosion for the Spring 1996 ACS National Meeting in New Orleans. PMSE had not held a symposium on this topic for several years, and George thought it appropriate to again hold such a symposium. When I sent our announcements and contacted workers seeking papers in this area of research and development, we received many positive replies. At this time, I contacted ACS Books concerning the possibility of publishing the papers of this symposium, and received encouragement to plan for publication. This book is the result of much hard work by the authors, reviewers, and secretaries, plus the help of the ACS Books staff.

Research on organic coatings for corrosion control has always been important to the area of coatings science, but is receiving renewed interest in university, government, and corporate laboratories. Several driving forces are causing this renewal. The first is imminent legislation that will require removal of chromates from coating formulae and the coating production workplace, due to toxicity and hazardous materials handling issues. No longer can corrosion-control coatings systems be based on chromate metal treatments and chromate pigments. This removal has been impending for quite a few years, but is now required. Further, all government agencies, including the Department of Defense (DOD), are under this removal mandate. Why chromates act in such a unique manner is not yet fully understood, and much work is in progress to achieve such an understanding.

The second driving force is the bevy of new experimental methods and instrumentation for numerically characterizing organic coatings in their corrosion protective mode. Far too much emphasis has been placed on qualitative, subjective test methods for the corrosion-control properties of organic coatings. Combining new and old techniques with new computer hardware and software has led to many easy-to-use methods that are being rapidly incorporated into laboratory practice. Examples are new electrochemical methods, new microscopic probes (scanning probe microscopies, et al.), and new application of the tools of materials science, such as thermal, spectroscopic and acoustic methods.

The third driving force is the design of new materials and systems for corrosion control coatings. Conductive polymers offer an ecologically viable option over chromate protection, with a potential increase in efficiency over chromate replacement systems. Microscopic engineering of the metal-pretreatment-coating interfaces is under extensive examination, as all corrosion failures occur at these loci.

These driving forces, and the renewed understanding that false economic judgments of the value and need for long-term, effective protection of objects with high capital value (e.g. aircraft, bridges, automobiles), have resulted in renewed R&D that will lead to the better design and testing of organic coatings for corrosion protection. No longer is the development of a new alloy the solution to a corrosion problem. There is a large investment in objects and structures already in place, and it is cost effective to lower their maintenance costs and extend their lifetimes. The proper use of organic coatings, pretreatments, and coating application methods of high performance and high quality that provide predictable, consistent corrosion control is still the most cost effective way of protecting our infrastructure, and the objects and systems that are integral parts of our lives.

This book includes papers coauthored by some of the leaders in the field described by the book title. The reader will find extensive coverage of electrochemical methods, especially electrochemical impedance spectroscopy and electrochemical noise methods of assessing the quality and lifetime of corrosion protection provided by organic coatings. The reader will also learn about corrosion protection under various environmental exposure conditions, ranging from underground pipelines to microbial-induced corrosion, and substrates ranging from steel to aerospace Al alloys. Two papers offer insight into the corrosion protection provided by polyaniline as a coating material. Several papers cover new pigments and pretreatment materials as substitutes for chromates. The book is truly an international endeavor, with



contributing authors from Sweden, Germany, England, South Africa, Italy, the Netherlands, Japan, Ukraine, and the Czech Republic.

This book was developed from a symposium sponsored by the Division of Polymeric Materials: Science and Engineering at the 211th National Meeting of the American Chemical Society, New Orleans, Louisiana, March 24-28, 1996.

FORWARD:

The ACS Symposium Series was first published in 1974 to provide a mechanism for publishing symposia quickly in book form. The purpose of the series is to publish timely, comprehensive books developed from ACS sponsored symposia based on current scientific research. Occasionally, books are developed from symposia sponsored by other organizations when the topic is of keen interest to the chemistry audience.

Before agreeing to publish a book, the proposed table of contents is reviewed for appropriate and comprehensive coverage and for interest to the audience. Some papers may be excluded in order to better focus the book; others may be added to provide comprehensiveness. When appropriate, overview or introductory chapters are added. Drafts of chapters are peer-reviewed prior to final acceptance or rejection, and manuscripts are prepared in camera-ready format.

As a rule, only original research papers and original review papers are included in the volumes. Verbatim reproductions of previously published papers are not accepted.

Title	Location	Edition / Series / Misc.
98 Organic Coatings: Science and Technology		<i>Edition:</i> 2nd edition
<i>Author:</i> Wicks, Zeno W., Jr.	<i>Dynix:</i> 78749	<i>Series:</i> SPE (Society of Plastics Engineers) Monographs
<i>Publish.:</i> Wiley - Interscience Publishers	<i>Call No.:</i> 667 Wi	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0471245070	
<i>- date:</i> ©1999	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1999
<i>Subject:</i> Plastic coatings		<i>Price:</i> \$125.00
<i>Desc:</i> xxi, 630 p., illus., 26 cm.		

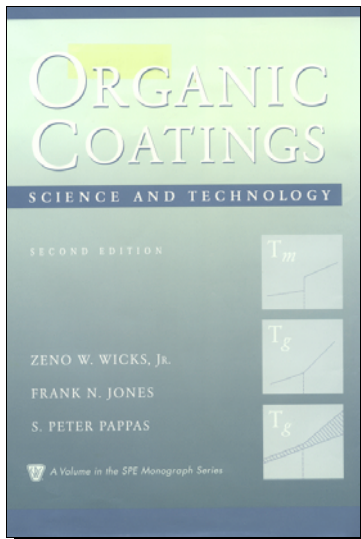


Table of Contents

- Foreward
- Preface
- Symbols
- 1. What Are Coatings?
- 2. Polymerization and Film Formation
- 3. Flow
- 4. Mechanical Properties
- 5. Exterior Durability
- 6. Adhesion
- 7. Corrosion Protection By Coatings
- 8. Latexes
- 9. Amino Resins
- 10. Binders Based on Isocyanates: Polyurethanes
- 11. Epoxy and Phenolic Resins
- 12. Acrylic Resins
- 13. Polyester Resins
- 14. Drying Oils
- 15. Alkyd Resins
- 16. Other Resins and Cross-Linkers
- 17. Solvents
- 18. Color and Appearance
- 19. Pigments
- 20. Pigment Dispersion
- 21. Pigment volume Relationship
- 22. Application Methods
- 23. Film Defects
- 24. Solvent-Borne and High Solids Coatings
- 25. Water-Borne Coatings
- 26. Electrodeposition Coatings
- 27. Powder Coatings
- 28. Radiation Cure Coatings
- 29. Product Coatings for Metal Substrates
- 30. Product Coatings for Nonmetallic Substrates
- 31. Architectural Coatings
- 32. Special Purpose Coatings
- 33. Perspectives on Coatings Design
- Appendix: Sources
- Index

Subjects

239 .	Coatings
297 .	Plastic coatings

Reviews - Synopsis - Dust Jacket

From Book News, Inc.
 Surveys the principles underlying the production and use of organic coatings and paints. The authors introduce the key properties of coatings, then proceed to cover raw materials, physical concepts, formulations, and applications. They include definitions of industry terminology and troubleshooting guidance. The second edition has been updated and rewritten as one volume instead of two. Book News, Inc.®, Portland, OR

Book Description
 Now in one easily accessible volume, this second edition of a highly-successful desk reference presents a thoroughly-updated treatment of coatings technology and its numerous applications. Providing extensive references to sources of detailed information, Organic Coatings: Science and Technology, Second Edition helps scientists, engineers, and paint formulators in all branches of the coatings industry to better understand the principles underlying the technology, and

use them effectively in the production and application of various types of coatings.

FROM THE DUST JACKET:

The Second Edition of this highly successful reference presents a thoroughly updated, systematic survey of organic coatings technology and its numerous applications. Written by three industry experts, this self-contained volume painstakingly revises and condenses the material from the previous, two-part edition -- making it more useful for scientists and engineers first entering the field, as well as for students in coatings courses.

Incorporating recent developments, *Organic Coatings: Science and Technology, Second Edition* helps scientists, engineers, and paint formulators to better understand the principles underlying the technology and use them effectively in the development, production, and application of various types of coatings. It correlates the technology to the current state of knowledge in the field, addressing the complexities inherent in the formulation process which are often overlooked in the professional literature.

The authors introduce readers to the subject with seven chapters on key properties of coatings, then proceed to cover raw materials (binders, solvents, pigments), physical concepts, formulations, and applications. Each topic is carefully summarized and accompanied by extensive references to sources of detailed information -- particularly useful in self-study.

In addition to clearly defining industry terms, the book includes hundreds of figures as well as troubleshooting advice for organic, surface, polymer, and coatings scientists, engineers, and paint formulators in all branches of the coatings industry. The material is also applicable to the related areas of printing inks, adhesives, and parts of the plastics industry.

PREFACE:

In the time since the publication of the first edition of *Organic Coatings: Science and Technology*, there have been many major developments. The text has been completely updated and rewritten as one volume instead of two. The change to one volume reduced duplication, and room for new material was made by condensing topics of mainly historical interest. In rewriting, we have changed the order of presentation, addressing key properties of coatings in the first seven chapters. In the first edition, we started with the raw materials used in coatings instead. There is no "correct" order in which to present the subject, but we believe the new chapter order can best help readers understand the scientific foundation.

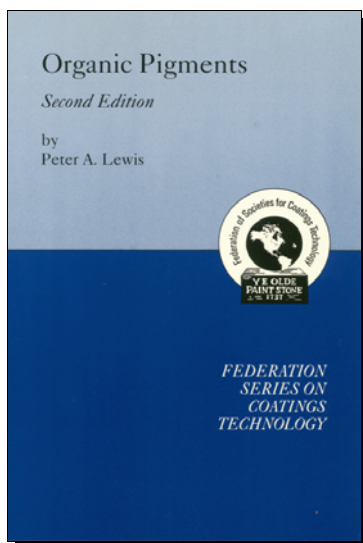
Our purpose is still the same. It is to provide a text and reference book that summarizes coatings technology and relates it to current scientific understanding. We have taken care to define the jargon of coatings to help newcomers to the field understand its specialized language.

Entire books could be written about the subject of each chapter, and many have been. To be as comprehensive as possible in the limited space available, we have summarized each topic and selected references for readers seeking more detailed information. Each chapter includes references we believe to be reliable, and we have included an appendix that lists sources we have found to be broadly useful. We do not claim to provide a complete literature review on each topic, and many valuable sources are not cited. Readers are cautioned that the quality of the literature in the coatings field is uneven. Many published papers and monographs are excellent, but some are not; unfortunately, some authors did not fully understand the complexity of the field.

Coatings technology evolved empirically, by trial and error. The last few decades have seen a marked increase in scientific understanding of the applicable principles, but the complexities of the field are such that the formulator's art is still essential in developing and using coatings. The need to reduce air pollution while simultaneously maintaining and, preferably, improving coating performance requires radically new formulations on a short time scale. Our conviction is that increased understanding of the underlying science can help formulators work more effectively and that an appreciation of a formulator's craft is essential for scientists working in the field.

Like the first edition, this volume can be used as a textbook for a course on coatings science. As such, it is written for students who have had college-level chemistry courses at least through organic chemistry, but no coursework in polymer science is assumed. We are told that the first edition found wider use as a reference book and as a self-teaching text than as a classroom text. We tried to increase the reference value of this edition by increasing the number of literature citations. Almost half of the references cited are more recent than those in the first edition. While this book is written specifically about coatings, many of the principles involved apply to the related fields of printing inks, adhesives, and parts of the plastics industry.

Title	Location	Edition / Series / Misc.
759 Organic Pigments Author: Lewis, Peter A. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1995 Subject: Pigments -- Periodicals Desc: 43 p., illus., 28 cm.	Dynix: 55947-10 Call No.: 667.9 Fe ISBN: 0934010358 Shelf Reference	Edition: 2nd edition Series: Federation Series on Coatings Technology: No. FS10R95 Year: 1995 Price: \$50.00



Subjects

293 . Pigments

Table of Contents

- I. INTRODUCTION
 - A. International Nomenclature — the CI System
 - B. Pigment Selection
- II. PHYSICAL FORMS
- III. CLASSIFICATION OF ORGANIC PIGMENTS BY CHEMICAL COMPOSITION
- IV. CLASSIFICATION OF ORGANIC PIGMENTS BY COLOR
 - A. Organic Reds
 - 1. Metallized Azo Reds
 - 2. Nonmetallized Azo Reds
 - 3. High Performance Reds
 - 4. Novel High Performance Reds
 - B. Organic Blues
 - 1. Copper Phthalocyanine Blue
 - 2. Miscellaneous Blues
 - C. Organic Yellows
 - 1. Monoarylide Yellows
 - 2. Diarylide Yellows
 - 3. Benzimidazolone Yellows
 - 4. Heterocyclic Yellows
 - D. Organic Oranges
 - 1. Azo Based Organic Oranges
 - 2. Benzimidazolone Derived Oranges
 - 3. Miscellaneous Oranges
 - E. Organic Greens
 - 1. Copper Phthalocyanine Green
 - 2. Miscellaneous Greens
- V. THE DISPERSION PROCESS
- VI. TESTING PIGMENTS FOR USE IN COATINGS
- VII. SUMMARY
- VIII. REFERENCES
- IX. BIBLIOGRAPHY
- X. APPENDIX

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Significant progress in the technology associated with the chemistry of organic pigments has been made within the relatively recent past that has resulted in the introduction of new pigment forms offering increased value in use and, in a few cases, new pigment types offering new, improved properties from new color chemistry.

In 1856, an accomplishment took place that many at that time thought was impossible. A color that did not occur in nature was synthesized under laboratory conditions by William Henry Perkin. This 17-year-old Englishman, working in a basement laboratory at his home, was trying to oxidize aniline to produce guanine. Perkin combined aniline, containing



toluidine as an impurity, with potassium dichromate and sulfuric acid. The resultant mauve dyestuff must have come as a considerable surprise to this young chemist.

Perkin's achievement ushered in a period of discovery often referred to as the "Dyestuffs Era," since the time between Perkin's synthesis and the start of the 20th Century saw both the invention and development of numerous dyestuffs based upon coal tar. In these early days of synthetic color chemistry, organic pigments were often produced as spin-offs from the major projects concerning the practical synthesis of dyestuffs.

Notable developments of this period are chronicled in Table 1, where pigments that have found use in the coatings industry are listed alongside the date of their discovery.

Less than 20 pigment types account for the major proportion of colors reported by specific Colour Index Name to the U.S. International Tariff Commission. Of these specific pigments, few find major use within the coatings industry, most being key colors within both the paste ink and the fluid ink industries.

In addition to these specifically reported organic pigments, closely related colors are also used, although in considerably less volume, to supplement and complement the color palette provided by the major pigments and reported under the "other" category. Examples of such organic pigments are those based upon indanthrone, flavanthrone, anthosines, quinacridones, anthraquinone, and other similar, high priced, heterocyclic, high performance pigments. It is only in recent years that phthalocyanine blue is no longer reported specifically, rather it is listed under the generic heading of "organic blue toners."

Students of chemistry will notice that few, if any, organic pigments exist that are not associated with a benzenoid ring structure. In fact, it is the mobile cloud of pi electrons associated with this benzenoid structure that accounts for much of the coloristic features of the chemical. Other terms such as "chromophore," "auxochrome," "heterocyclic," and "azo," occur all too frequently in any in-depth discussion concerning organic pigments.

Additionally, terms are encountered such as "presscake," "toner," and "lake" that refer to the physical form in which the pigment is manufactured for sale. The aim behind this monograph is to present an understanding of the chemistry, manufacture, and properties associated with the major classes of organic pigments as used within the coatings industry. In dealing with the complex world of organic pigments, an explanation of each of the previously mentioned terms will be offered. Further, the reader should be advised that certain of the classes discussed, while being major products within the pigment industry, find little use within the coatings industry and are produced primarily to fulfill the less demanding requirements of the printing ink marketplace. Many of the pigments used by the ink industry offer seductively attractive shades and economics; however, they fall far short when it comes to meeting the durability and weathering requirements of the coatings industry.

Before entering into any discussion relating to pigments, it is first necessary to clearly define what is meant by a pigment as opposed to a dyestuff since in many earlier texts on color the terms "pigment" and "dyestuff" are used almost interchangeably.

A definition of a pigment has been proposed by the Color Pigments Manufacturers Association (CPMA), formerly known as the Dry Color Manufacturers Association (DCMA), in response to a request from the Toxic Substances Interagency Testing Committee. This definition was developed specifically to enable differentiation between a dyestuff and a pigment with the intention of forever ending the confusion surrounding these two terms. As such, it is worthwhile reproducing this definition in its entirety:

"Pigments are colored, black, white or fluorescent particulate organic and inorganic solids which usually are INSOLUBLE in, and essentially physically and chemically UNAFFECTED by, the vehicle or substrate in which they are incorporated. They alter appearance by selective absorption and/or by scattering of light.

Pigments are usually DISPERSED in vehicles or substrates for application, as for instance in inks, paints, plastics or other polymeric materials. Pigments RETAIN a crystal or particulate structure throughout the coloration process.

As a result of the physical and chemical characteristics of pigments, pigments and dyes differ in their application; when a dye is applied, it penetrates the substrate in a SOLUBLE form after which it may or may not become insoluble. When a pigment is used to color or opacity a substrate, the finely divided INSOLUBLE solid remains throughout the coloration process."

Differences occur between American and European terminology that may also cause confusion when pigments are classified as either toners or lakes. American terminology, as applied to pigments, defines a toner as an organic pigment that is free of inorganic extender pigments or carriers; as such, the pigment is unadulterated and exhibits maximum tinting capacity for the pigment type. A lake, conversely, is an organic colorant that has been combined with an inorganic substrate or extender such as barium sulfate (Blanc Fixe) or alumina. In European terminology, toners are considered to



be water soluble acid or basic dyestuffs that are converted to insoluble pigmentary forms by appropriate precipitation with an inorganic compound. As such, Red Lake C (PR 53:1) and the PTMA based Rhodamine (PV 1) are considered toners. In the coatings industry the term toner may be used to refer to a secondary color that is added to alter the hue of the paint. The term lake now has an accepted definition as that used in America.

A most confusing European term which should be discouraged from use is "pigment dyestuff." This term is meant to refer to insoluble organic pigments devoid of salt forming groups, for example, DNA Orange, Pigment Orange 5.

Table 1 — Milestones in Pigment Synthesis

Year	Pigment Name
1858	Discovery of synthetic Mauveine
1872	Phioxine
1876	Persian Orange
1884	Tetrazine Yellow
1885	Para Red
1886	Alkali Blue
1896	Peacock Blue (Erioglaucine)
1899	Lithol Red
1901	Indanthrone Blue
1902	Pigment Scarlet
1903	Red Lake C
1903	Lithol Rubine
1905	Toluidine Red
1907	BON Maroon
1909	Hansa Yellows
1909	Pyrazolones
1910	BON Red
1911	Diarylide Yellows
1911	Diarylide Oranges
1911	Dianisidine Blue
1921	Pigment Green B
1924	Perinone Orange
1925	Basic Dye Complexes
1931	Permanent Red 2B
1935	Phthalocyanine Blue
1938	Phthalocyanine Green
1947	Nickel Azo Yellow
1949	Red Lake C Homolog
1954	Azo Condensates
1955	Quinacridones
1956	Perylenes
1958	Salicyloyl Yellow
1960	Benzimidazolones
1964	Isoindolinones
1964	BON Red Homolog
1973	Azomethines
1974	Quinophthalones
1986	Pyrrolo-pyrrole Red

Title	Location	Edition / Series / Misc.
99 Organophosphorus Monomers and Polymers		<i>Edition:</i> Authorized edition
<i>Author:</i> Gefter, Eugenii Leonidovich	<i>Dynix:</i> 43965	<i>Series:</i> International Series of Monographs on Organic Chemistry: No. 6
<i>Publish.:</i> Pergamon Press, Ltd.	<i>Call No.:</i> 547.84 Ge	
<i>- place:</i> Oxford, UK / New York, NY	<i>ISBN:</i>	
<i>- date:</i> ©1962	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1962
<i>Subject:</i> Phosphorus organic compounds		<i>Price:</i> \$25.00
<i>Desc:</i> vii, 302 p., illus., 26 cm.		

ORGANOPHOSPHORUS
MONOMERS AND POLYMERS

by
Ye. L. GEFTER
*Institute of Element-Organic Compounds,
Academy of Sciences of the U.S.S.R.*

TRANSLATED FROM THE RUSSIAN
by
J. BURDON, Ph. D.

Authorized Edition

PERGAMON PRESS
OXFORD · LONDON · NEW YORK · PARIS
1962

Table of Contents

1. Unsaturated Organophosphorus Compounds
 2. Saturated Organophosphorus Compounds. Di-hydroxy-compounds
 3. Refractivities of Certain Atomic Groups in Organophosphorus Compounds
 4. Carbon-chain and Hetero-chain High Molecular Weight Compounds Containing Phosphorus in the Side Chains
 5. Heterochain High Molecular Weight Compounds Containing Phosphorus in the Main Chain
 6. Other Organophosphorus Polymers
 7. Uses of High Molecular Weight Phosphorus Containing Compounds
- References
List of Tables
Subject Index

Reviews - Synopsis - Dust Jacket

PREFACE

In the last ten years the chemistry of high molecular weight compounds has stood out as one of the most important branches of organic chemistry. These compounds are of great theoretical interest and have an important practical significance.

Various types of rubbers, plastics, artificial glass and synthetic fibres have found wide application in industry and everyday life.

Subjects

292 . Phosphorus organic
compounds

316 . Polymers and
polymerization

Everyday demands are being made of industry for new synthetic materials with improved mechanical strength, chemical resistance, thermal stability, etc. Already, many of these requirements cannot be met by compounds whose molecules consist only of carbon, hydrogen and oxygen, and it is hence necessary to produce polymers from monomers of more complex structure. Therefore, alongside the development of methods of synthesis and manipulation of purely organic high molecular weight compounds - made from unsaturated hydrocarbons, unsaturated ethers, and esters, polyesters etc. - chemical science and industry have also turned to substances containing nitrogen, the halogens, silicon, phosphorus, titanium, boron and other elements. Polyamides, polyvinyl chloride, fluorine-containing plastics, polysiloxanes, etc., have found particularly wide application. Rapid growth of the branches of chemistry concerned with such high molecular weight compounds is urgently required so that the multiplicity of experimental results and theoretical investigations can be generalized.

The solution of these problems is essential today, especially in view of the statement of the May meeting (1958) of the Central Committee of the Communist Party of the U.S.S.R. and of the twenty-first meeting of the Communist Party of the U.S.S.R. about the necessity for the widespread development of chemical science and industry based on high molecular weight compounds.

The general methods of synthesizing and manipulating purely organic nitrogen- and silicon-containing resins have been described in detail in monographs by Korshak, Ellis, Losev and Petrov, Shorygin, Andrianov and Sobolevski, Barg and other authors; however, so far there have been no similar books on other organo-element high molecular weight compounds.

An important place among such substances is occupied by phosphorus-containing high molecular weight compounds, the chemistry of which has developed rapidly in recent years. It has been shown that many phosphorus-containing resins possess a range of useful properties (high temperature stability, non-inflammability, sometimes even non-combustibility, inertness to many chemical reagents, etc.); it is hardly surprising, therefore, that these compounds have been extensively investigated. In the last few years a great deal of experimental material on the synthesis of high molecular weight organophosphorus compounds has accumulated. Studies of the properties of these polymers have shown the basic ways in which they can be used in various branches of industry and technology. The increased interest in such compounds has led to a number of reports on them in conferences on high molecular weight compounds in England (1955), East Germany (1956), the U.S.S.R. (1957), and in other countries.



The books by Pletz and Kosolopoff (up till now there have been no other books on organophosphorus compounds) are mainly concerned with the formation of low molecular weight compounds.

This book is the first attempt at a generalization and systemization of existent knowledge of the methods of synthesis and the basic properties of monomers and polymers of organophosphorus compounds, and also of their fields of application.

This book contains valuable reference material, collated in tables (physical constants of the monomers, properties of the polymers and copolymers, etc.). The literature used by the author has covered journals, patents and books up to 1958, and in some cases more recent results are included.

The book is intended for scientists, research workers, engineers and technologists working on the preparation, manipulation and investigation of monomers and high molecular weight compounds, and also for students studying related branches of chemistry. Because of the newness and occasional inconsistency of the literature results, this monograph may well contain an insufficiently critical approach to some questions, as well as other faults. Any comments will be gratefully received by the author.

The author thanks Academician M. I. Kabachnik and corresponding member of the Academy of Science of the U.S.S.R. V.V. Korshak for the valuable advice and information given to him during the preparation of this book.

YE. GEFTER

Title	Location	Edition / Series / Misc.
<p>667 Outlines of Paint Technology <i>Author:</i> Morgans, W. M. (Wilfred Morley), 1907- <i>Publish.:</i> Halstead Press <i>- place:</i> New York, NY <i>- date:</i> ©1990 <i>Subject:</i> Paint <i>Desc:</i> xv, 503 p., illus., 24 cm.</p>	<p><i>Dynix:</i> 07925 <i>Call No.:</i> 667.62 Mo <i>ISBN:</i> 0470216549 <i>Shelf:</i> Adult Non-Fiction</p>	<p><i>Edition:</i> 3rd edition <i>Series:</i> <i>Year:</i> 1990 <i>Price:</i> \$25.00</p>

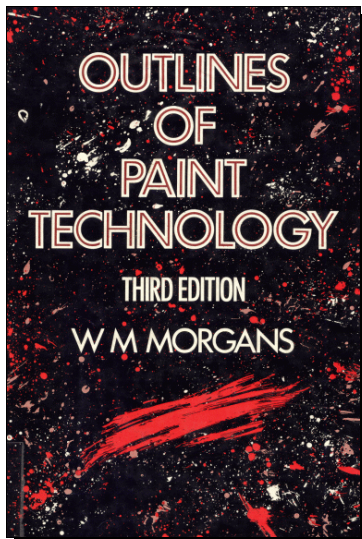


Table of Contents

1. Introduction
 The nature of paint
 Pigments
 Binder (or film-former)
 Classification of paints
 Pigment volume concentration
 Solvents (or thinners)
 References
2. Pigments: general physical properties
 Colour
 Colour measurement
 Colour systems and Atlases
 Opacity
 Characteristics of pigment particles
 Toxicity of pigments
 References
3. The processing of Pigments
 Mineral Pigments and extenders
 Manufactured pigments
 References
4. White Pigments and extenders
 Titanium Dioxide (CI pigment white 6)
 Zinc Oxide (CI pigment white 4)
 Zinc Phosphate (CI pigment white 32)
 Antimony Oxide (CI pigment white 11)
 White Lead (CI pigment 1)
 Basic Lead Sulphate (CI pigment white 2)
 Extenders
 Barium compounds
 Calcium compounds
 Compounds of aluminium
 Compounds of magnesium
 Silica
 References
5. Coloured inorganic pigments
 The chrome pigments
 Cadmium colours (CI pigment yellow 37, pigment red 108)
 Titanium nickel yellow
 Yellow and red oxides of iron
 Red lead (CI pigment red 105)
 Lead cyanamide
 Inorganic blue pigments
 Green pigments
 References
6. Black, metallic and miscellaneous pigments
 Black pigments

Subjects

276 . Paint



Metallic pigments
Miscellaneous pigments
Luminous pigments
References

7. Organic pigments
Chemical classification of organic pigments
AZO group
AZO toners and lakes
Phthalocyanine pigments
VAT pigments
Quinacridone pigments (CI pigment violet 19)
Dioxazine pigments
DPP (1, 4-diketopyrrolo—pyrrole) pigments
Pigments from basic dyes
Pigments from acid dyestuffs
Bases for lakes
References

8. Solvents and Plasticizers
Solvents
Classes of solvents
Plasticizers
References

9. Drying oils, Driers and Drying
Constitution of drying oils
Chemical examination of drying oils
Physical properties of drying oils
The drying process
Extraction of oils
Linseed oil
Tung oil
Dehydrated castor oil
Semi-drying oils
Modified drying oils
References

10. Rubbers, Bitumens, Pitches, Gums and Glues
Rubber derivatives
Bituminous materials
Bituminous paints
Pitches
Glues
References

11. Synthetic resins
Polymerization
Alkyd resins
Polyester resins
Amino resins
Epoxy resins
Polyamide resins
Polyurethane resins
Vinyl resins
Polystyrene resins
Acrylic resins
Silicone resins
References

12. Cellulose Ester and Ether products
Cellulose ethers
Cellulose lacquers
Cellulose esters



References

13. Hard resins and varnishes

A* Natural resins
Properties and identification
Rosin or colophony
Lac (shellac)
A* Synthetic hard resins
Phenolic resins
Maleic resins
Coumarone-indene resins
Polyimide resins
Petroleum resins
Varnishes
References

14. The process of pigmentation

Non-aqueous paints
References

15. Methods of pigment dispersion

Types of machines: plastic milling pug mixers
Types of machines: fluid milling
Straining
References

16. The protection of metals

Ferrous metals
Corrosion of ferrous metals
Prevention of corrosion of ferrous metals
Treatment of non-ferrous metals
References

17. Primers for metals

Iron and steel
Other corrosion inhibitors for iron and steel
Water-borne primers for steel
Rust converters or stabilisers
Non-ferrous metals
References

18. Decorative and building paints

Sealers
Preservatives for wood
The painting of wood
Primers for wall surfaces
Stoppers and fillers
Undercoats
Finishing coats
References

19. Water-borne coatings

Polymer emulsions
Vinyl emulsion paints
Acrylic emulsions and paints
Water-soluble binders
References

20. Methods of application and cure

Methods of cure
References

21. Paints for industrial structures and industrial buildings

Finishing paints: Non-convertible coatings



Finishing paints: Convertible coatings
Painting specifications
Maintenance painting
Painting of concrete
References

22. Industrial finishes
Air-drying types
Storing types
Powder coatings
References

23. Marine paints and compositions
Ships' paint
Dock and harbour installations
Off-shore structures
References

24. Miscellaneous coatings and ancillary materials
References

25. Testing and evaluation
Application and wet films
Tests on dry films
References

26. Performance and weathering
Performance of primers
Natural weathering
Weathering tests
References

27. Common faults and remedies
References

Appendices

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book presents a general framework for the manufacture and use of paints and pigments. The first half of the book covers the materials used in paint manufacture while the second half deals with the technology of the finished products and their application.

The book has been thoroughly revised and updated, and is now available again as a single volume. Latest developments discussed include better measurement of colour; an increase in the range of pigments available following chemical developments; changes in solvents due to tightened health standards, including more water-borne coatings to avoid atmospheric pollution; and an increase in cathodic deposition of paint.

PREFACE TO THE THIRD EDITION:

At the time of publication of the Second Edition there were valid reasons for presenting the work in two volumes but in preparing this Third Edition serious consideration has, of necessity, been given to changes in the structure of the industry as well as to escalating costs of book production. The outcome was a decision to revert to a single volume which, it is hoped, readers will find more convenient.

The object of the work remains essentially the same as that of earlier editions, namely, to present a general framework which can be filled in, if desired, by a study of more specialised works or original papers. The text is illustrated, wherever possible, with typical examples of coatings for various end uses but the book is not claimed to be a comprehensive treatise nor are the examples quoted necessarily the best for any particular application. Paint formulation allows considerable latitude in the selection and proportioning of ingredients and the formulations are put forward in good faith

but without liability since conditions of manufacture and use are not within the author's control.

The general structure of the work follows that of earlier editions. Chapters 1—13 discuss materials and 14—27 are concerned with finished products, application, substrates and uses. The following comments are of general interest.

In the field of pigments, particle size distribution and surface characteristics are more closely controlled resulting in easier dispersion and improved dispersion stability. Refinements in the measurement of colour, particularly parameters associated with colour space, are reflected in a selection of instruments capable not only of measuring very small colour differences but also of providing correction figures.

The decline in use and therefore of interest in lead and chromate pigments on toxicity grounds together with the increased use of organics has reduced the space devoted to coloured inorganic pigments. These are discussed in Chapter 5.

Among the organic pigments there are many improved versions of pigments based on established chromophores and new developments in polycyclic and heterocyclic types have extended the range of pigments possessing outstanding lightfastness and durability.

Changes in the pattern of use of certain types of solvents have resulted from studies of health hazards. Threshold Limit Values (TLV) have been replaced by the similarly time-weighted Occupational Exposure Limits (OEL). New and very low OEL values have been assigned to certain solvents including ethers and ether-esters of ethylene glycol. These have been replaced in paint formulations by the relatively less toxic propylene glycol derivatives. OEL values are published annually by the Health and Safety Executive in Guidance Note No. 40 so that users can be kept informed annually of all alterations and additions to the list. For this reason OEL values are not quoted in the text.

The reduction of atmospheric pollution caused by organic solvents, mainly in the paint-using industries, has stimulated interest in water-borne and other types of coating. Water-borne coatings are now of sufficient importance to justify a separate chapter (19). Other types are the high-solids and solvent-free coatings. Powder coatings are, of course, solvent free and have made serious inroads in the field of industrial finishes.

Although natural vegetable oils are the main source of fatty acids for resin manufacture, very little oil is used in paint manufacture. Both linseed and tung oils continue to be used with hard resins in varnish manufacture and so are treated in this context.

In paint media, alkyd resins continue to hold pride of place in terms of quantity used. Improvements in drying characteristics have resulted from the introduction of 'chain stopped' alkyds whilst new long-oil types compete with the widely-used silicone/alkyd co-polymers for use in 'long life' coatings. A wide variety of stoving finishes is available by cross linking reactions involving modifications of basic types such as epoxies, hydroxylated acrylics and polyesters with amino resins and isocyanate derivatives.

A notable change in the industrial application field has been the replacement of anodic electrodeposition by the cathodic system. The latter offers many advantages in terms of film integrity and protection against corrosion. Many other interesting developments, not the least being the use of 'anti carbonation' coatings for the protection of reinforced concrete, are described in the text and it is hoped that the work will present a realistic outline of present day paint technology.

Title	Location	Edition / Series / Misc.
816 Paint and Coating Testing Manual Author: Koleske, Joseph V. (editor) Publish.: American Society for Testing and Materials - place: Philadelphia, PA - date: ©1995 Subject: Paint materials -- Testing Desc: xvii, 925 p., illus., 29 cm.	Dynix: 100254 Call No.: 667.6 Pa ISBN: 0803120605 Shelf Adult Non-Fiction	Edition: 14th edition Series: ASTM Manual Series: MNL 17 (ASTM Publ Code No: 28-017095-14) Year: 1995 Price: \$220.00

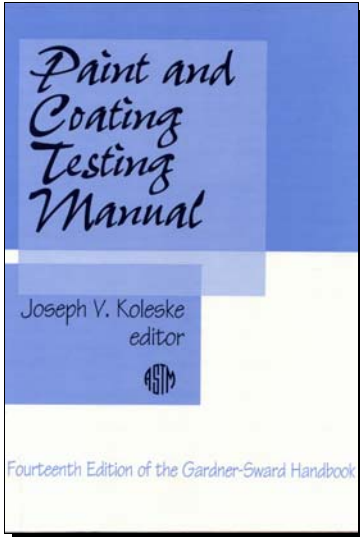


Table of Contents

Preface
 Introduction

PART I: REGULATIONS
 Ch 1-Regulation of Volatile Organic Compound Emissions from Paints and Coatings

PART 2: NATURALLY OCCURRING MATERIALS
 Ch 2-Bituminous Coatings
 Ch 3-Cellulose Esters
 Ch 4-Drying Oils
 Ch 5-Driers and Metallic Soaps

PART 3: SYNTHETIC MATERIALS
 Ch 6-Acrylic Polymers as Coatings Binders
 Ch 7-Alkyd and Polyesters
 Ch 8-Amino Resins (Reaction Products of Melamine, Urea, etc. with Formaldehyde and Alcohols)
 Ch 9-Ceramic Coatings
 Ch 10-Epoxy Resins in Coatings
 Ch 11-Phenolics
 Ch 12-Polyamides
 Ch 13-Polyurethane Coatings
 Ch 14-Silicone Coatings
 Ch 15-Vinyl Resins for Coatings
 Ch 16-Miscellaneous Materials and Coatings

PART 4: PLASTICIZERS
 Ch 17-Plasticizers

PART 5: SOLVENTS
 Ch 18-Solvents

PART 6: PIGMENTS
 Ch 19-White Pigments
 Ch 20- Black Pigments
 Ch 21-Colored Organic Pigments
 Ch 22-Inorganic Colored Pigments
 Ch 23-Ceramic Pigments
 Ch 24-Extender Pigments
 Ch 25-Metallic Pigments
 Ch 26-Pearlescent Pigments
 Ch 27-Inorganic Anti-Corrosive Pigments
 Ch 28-oil Absorption of Pigments

PART 7: ADDITIVES
 Ch 29-Bactericides, Fungicides, and Algicides
 Ch 30-Thickeners and Rheology Modifiers

PART 8: PHYSICAL CHARACTERISTICS OF LIQUID PAINTS AND COATINGS
 Ch 31-Density and Specific Gravity
 Ch 32-Particle-Size Measurements
 Ch 33-Rheology and Viscometry

Subjects

284 .	Paint materials -- Testing
393 .	Paint materials -- Analysis

Ch 34-Surface Energetics
Ch 35-Solubility Parameters
Ch 36-Cure: The Process and Its Measurement
Ch 37-Film Preparation for Coating Tests
Ch 38-Measurement of Film Thickness
Ch 39-Drying Time

PART 10: OPTICAL PROPERTIES

Ch 40-Color and Light
Ch 41-Gloss
Ch 42-Hiding Power
Ch 43- Mass Color and Tinting Strength of Pigments

PART 11: PHYSICAL AND MECHANICAL PROPERTIES

Ch 44-Adhesion
Ch 45-Abrasion Resistance
Ch 46-Dynamic Mechanical and Tensile Properties
Ch 47-Flexibility and Toughness
Ch 48-Hardness
Ch 49-Stress Phenomena in Organic Coatings
Ch 50-Slip Resistance

PART 12: ENVIRONMENTAL RESISTANCE

Ch 51-Prevention of Metal Corrosion with Protective Overlays
Ch 52-Natural Weathering
Ch 53-Accelerated Weathering
Ch 54-Biological Deterioration of Paint Films
Ch 55-Chemical Resistance
Ch 56-Testing Coatings for Heat Resistance and Flame Retardance
Ch 57-Water-Resistance Testing of Coatings

PART 13: SPECIFIC PRODUCT TESTING

Ch 58-Aerospace and Aircraft Coatings
Ch 59-Architectural Coatings
Ch 60-Artists' Paints
Ch 61-Automotive Product Tests
Ch 62-Can Coatings
Ch 63-Masonry
Ch 64-Pipeline Coatings
Ch 65-Sealants
Ch 66-Traffic Marking Materials
Ch 67-Water-Repellent Coatings

PART 14: ANALYSIS OF PAINTS AND PAINT DEFECTS

Ch 68-Analysis of Paint
Ch 69-The Analysis of Coatings Failures

PART 15: INSTRUMENTAL ANALYSIS

Ch 70-Atomic Absorption, Emission, and Inductively Coupled Plasma Spectroscopy
Ch 71-Chromatography
Ch 72-Electron Microscopy
Ch 73-Infrared Spectroscopy
Ch 74- Methods for Polymer Molecular Weight Measurement
Ch 75-Coatings Characterization by Thermal Analysis
Ch 76-Ultraviolet-Visible Spectroscopy
Ch 77-X-Ray Analysis

PART 16: SPECIFICATIONS

Ch 78-Paint and Coatings Specifications and Other Standards

Appendix

Reviews - Synopsis - Dust Jacket

Preface

At a January 1967 meeting of ASTM Committee D-1 held in Washington, DC, ASTM (American Society for Testing and Materials) accepted ownership of the Gardner-Sward Handbook from the Gardner Laboratory. It was through this laboratory that Dr. Henry A. Gardner published the previous twelve editions of the manual. Acceptance of this ownership gave ASTM an assumed responsibility for revising, editing, and publishing future editions of this well-known, respected manual. The undertaking was assigned to Committee D-1 on Paint and Related Coatings, Materials, and Applications. This committee established a permanent subcommittee, DO 1.19 on Gardner-Sward Handbook, chaired by John C. Weaver, to provide technical, editorial, and general policy guidance for preparation of the 13th and subsequent editions of the Gardner-Sward Handbook. The 13th edition was published in 1972 as the Paint Testing Manual (STP 500) with Mr. G. G. Sward as editor. The manual has served the industry well for the past two decades; it contains useful information that cannot be found elsewhere. However, the passage of more than 20 years since its publication is readily apparent in many and perhaps most chapters of the manual.

Although updating the manual was discussed through the years, a variety of reasons prevented this task from being accomplished. Feasibility of updating the manual was not realized until mid-1989 when Dr. John J. Brezinski, Union Carbide (retired), and Mrs. Kathleen A. Dernoga, Manager of Acquisitions and Review of ASTM Technical Books and Journals, discussed the matter and the 14th edition was conceived. Between then and the spring of 1990 an outline for the 14th edition was developed and was approved by members of Subcommittee DO 1.19. Almost five years later the manual was completed—no wonder such a long period elapsed between editions!

The scope of the new edition is in keeping with the stated scope of Subcommittee DO 1.19:

"To provide technical, editorial, and general policy guidance for preparation of the Fourteenth and subsequent editions of the Gardner-Sward Handbook. The hand book is intended for review of both new and experienced paint technologists and the past, present, and foreseeable trends in all kinds of testing within the scope of Committee D- 1. It supplements, but does not replace, the pertinent parts of the Society's Book of Standards. It describes briefly and critically all Test Methods believed to have significance in the world of paint technology, whether or not these tests have been adopted officially by the society."

In this new edition, ASTM standard methods are described by minimal detail with the various volumes of the ASTM Book of Standards remaining the primary source of such information. An effort was made to include references in the absence of ASTM information concerning industrial, other society, national, and international test methods. For the most part, the manual contains either new chapters or the old topics/chapters in rewritten form. In a few cases, the old manual was merely updated, attesting to either the quality of the earlier writing, the lack of development in the area, or the apparent waning of interest in the topic. A variety of modern topics has been included. Individual authors, experts in their various fields, were given a great deal of freedom in expressing information about their topics.

Many things have changed through the years. The chemical emphasis has shifted from natural products to synthetic products, so this edition of the manual contains chapters that deal with a large number of synthetic polymers used in the coating industry. Instrumentation has undergone a marked change with innovative electronics providing the key to many changes. An effort was made to include chapters dealing with a broad variety of instruments.

To the authors, a warm, heart-felt "thank you." You put your talents to work and sacrificed much personal time to make the manual a success. A "thank you" is also due the reviewers, who are a special lot. They must be critical, yet carry out their task in a constructive manner. Because of the customary anonymity accorded reviewers, they should know that some authors made a special effort to express their appreciation for the review comments that they felt strengthened their manuscripts. Those organizations who permitted authors' time, use of support staff, and supplies are truly appreciated. Works such as this manual could not be completed without their generosity—may they prosper. The staff at ASTM is distinctive—they were interested and smilingly helpful to the authors, reviewers, Subcommittee D01.19, and the editor as they guided us through the maze of the publication assembly process (though they may have gritted their teeth at times). A very special thanks to Monica Siperko of ASTM, who worked closely with the editor in dealing with authors, reviewers, ASTM staff, and manuscripts. Her invaluable, cheerful assistance is appreciated. And last, but certainly not least, the contributions of Maureen Quinn and David Jones of the ASTM editing staff are acknowledged. Their able assistance ensured that the manual was uniform in style and grammar.

INTRODUCTION:

Past to Present

More than a score of years has passed since the previous edition of this manual was published, and many changes have taken place in the coating industry and elsewhere since that time. In 1972, the previous publication date, over 90% of all industrial coatings were low-solids, solvent-borne coatings. Total solids ranged from about 5 to 20% by weight. In the early 1970s, solvents were inexpensive, convenient carriers for the binder polymers used in coatings, and there appeared to be little knowledge in the scientific community about the consequences of breathing them, absorbing them through the skin, or placing them either in the atmosphere or in the environment in general. There were exceptions, as when a particular compound was known to be highly toxic. The specific effect of certain solvents as well as other

chemicals on certain segments of the population was unknown in the scientific community. Large quantities of solvent were needed to dilute the high-molecular-weight binders to an appropriate application viscosity. High-molecular-weight binders imparted high-quality characteristics to the final coating. In addition, very dilute solutions allowed application of very thin, but continuous, films. These factors coupled with the low cost of energy used to drive the large ovens associated with coating manufacture were major reasons that kept coating systems low in solids and solvent-borne in nature. Even a large percentage of architectural coatings was oil-based, solvent-borne formulations. In an overall sense, products of the coatings industry worked and did a satisfactory job.

However, new technologies were being talked about, worked on, and even commercialized, albeit in a small way. Terms such as "powder coatings," "radiation-cure coatings," and "water-borne coatings" were beginning to creep into the language of the coating industry. The technologies promised a great deal, were considered mainly by the innovative, and had many difficulties associated with their introduction. Abbreviations such as EPA, MSDS, OSHA, SARA, TSCA, and similar others that are familiar to us today weren't yet in the industry's jargon. In fact, less than two pages (pp. 418—419) in the previous edition of this manual were dedicated to the topic of atmospheric pollution, and therein basically only Rule 66 was briefly discussed. No criticism is meant—such was the nature of the topic in the pre-1972 world. As stated previously, "Times have changed," and this new edition devotes a significantly sized chapter to acquaint readers briefly with the topic of regulation of volatile organic compounds emitted from coatings. This topic and the related topics of health and safety are mentioned a number of times in the manual.

Powder Coatings

Changes other than those of regulation, though related, have taken place in our industry. In 1972, coating journals had discussions about the "powder explosion." Powder coatings were to take over the industry since they were clean, 100% solids systems that could be applied on any substrate that could be either heated for fluid-bed application or made conductive for electrostatic spray application. Although powder coatings had been used in Europe as early as the 1950s, not many powder-coating systems existed in the United States in the 1970s. There was little incentive for large company, raw-material suppliers who sold solvents to get into the powder coating business. A prime obstacle was the fact that there was little one could do to alter a powder coating once it was made. If a fully formulated product such as a powder coating were to be sold by a raw-material supplier, there was a feeling that customers for solvents and other raw materials would be alienated. Also, from the end-user point of view, conversion from in-place, existing application equipment to powder coating equipment required a capital expenditure. This is a factor that always was and still can be a hindrance to conversion from existing to new technology.

It did not take long for the fuse of the powder keg to fizzle—but, more importantly, it did not go out. Epoxide powders were in vogue for pipeline coatings and were used on the Alaskan pipeline. In the early days of powder coatings, small amounts of vinyl chloride homopolymer and copolymer, polyester, and nylon powders were used. Fluid-bed application methods were first to be commercialized. It was relatively easy to melt-mix and grind mixtures of polymers, pigments, plasticizers, and other formulating ingredients to obtain the relatively large particle-size powders used by this method. Electrostatic spray took longer to develop since procedures for manufacture of the fine particle-size powders as well as the sophisticated spray equipment needed for effectively and efficiently handling charged powder particles had to be developed.

Powder coatings not only had problems in manufacture and application, but also in other areas such as: changeover from one color, availability and storage of a number of colored powders, flow and leveling, in developing thermoset coatings 'that would flow and level before cross-linking at an elevated temperature, in blocking during storage and as the powder flowed through the spray-system hoses and gun, in cost coupled with concerns about handling overspray and recovery and disposal. But, something new had been born, and a new industry within the coating industry' was going through the throes of growing up in a competitive environment. Today the powder industry segment is strong and is growing. It has developed to the point where it now has its own organization, The Powder Coating Institute, located in Alexandria, VA. Journals such as the Journal of Coatings Technology, Industrial Paint and Powder, etc. now devote entire issues to the topic. Local, national, and international meetings are held to discuss the topic. The biennial trade show Powder Coating '92, held in Cincinnati, attracted over 4000 people, and 163 companies displayed their products. Powder coatings probably will not take over the coating industry, but they now are and continue to be important factors in the industry for the foreseeable future.

Radiation Curing

Another new technology born in the late 1960s was radiation curing. It also showed great early promise and many problems—there were even unrealized problems at the beginning since no one really understood that some of the chemicals used were human sensitizers and strong irritants. Lack of knowledge in the scientific community about the hazards of acrylates resulted in some people becoming sensitized to these compounds. However, the idea of taking a liquid, low-viscosity, coating formulation, applying it to a substrate with conventional equipment, and having the coating essentially instantly converted into a solid, cross-linked film with very little or nil loss to the atmosphere was attractive.

Radiation curing involved the use of electron-beam or ultraviolet-light radiation. Free radicals were generated with ultraviolet light (photocure), and electrons were generated with electron beams. Acrylates and maleate

polyesters/styrene were very rapidly polymerized in the presence of these active species. Because the reaction took place in thin films, the heat of reaction was readily dissipated and was not a problem to the technology. In the mid-to-late 1970s it was felt that this technology might capture only a percentage or two of the industrial coatings market.

Proponents of these essentially 100% solids systems refined the technology. Adaptation of existing equipment to the technology involved relatively simple, low-cost improvement when ultraviolet-light radiation was involved, and many conventional application techniques could be used. Most potential users insisted on the formulated products having low viscosity so that conventional equipment could be used. Such users were the driving force toward low-molecular-weight, reactive products. Innovators developed products that were quite safe to handle. A new branch of the technology that involved cycloaliphatic epoxides and photoinitiators that generated cationic species when photolyzed was begun at the end of decade.

Today, radiation-cure technology is considered a growth technology that is well established. It has developed to the point where it has its own technical society, RadTech International, located in Northbrook, IL, with large numbers of members and attendees at its meetings and exhibitions, which are held in North America, Europe, and Japan. Again, various journals have issues dedicated to the technology, and meetings or segments of meetings are held in various countries throughout the world. Radiation curing is currently a strong force in the market, and it is widely used to provide coatings for flooring, beverage cans (nonfood contact), electronics, plastics, paper, etc. It surely will also be a force in the future for as far ahead as we can see.

High Solids Coatings

A third technology with its inception in the 1970s is high solids. Three factors provided the impetus for this technology and certainly had an effect on powder and radiation-cure coatings. First, the oil embargo during the mid-1970s caused the price of raw materials—including solvents—to increase significantly, and this was coupled with a significant scarcity of both petroleum-derived chemicals and fuel for energy purposes. Second, there was the energy cost involved in operating the huge ovens required to volatilize safely the large amount of solvent removed during the drying of the coatings. Not only were gas and oil costly, they were not readily available. High-solids, low-energy systems were developed in a feverish manner. Popular words in the industry at this time were “high solids” and “low energy cure.”

Slowly the coating industry was coming to the realization that it might have to change—willingly or otherwise—from low solids and relatively easy to formulate systems to something new, be it powder coatings, radiation-cure coatings, water-borne coatings, or some other new technology. The third factor was related to concern about people and the environment. Everyone was becoming more and more conscious about the environment: in the workplace and the home as well as in a national and global geophysical sense. There was an awareness that solvents were being released into the atmosphere and into other parts of our ecological system, and that those solvents, though certainly not the only nor most important culprits, could have a long-term, deleterious effect on our environment and quality of life.

In addition to these factors, and very importantly, the government became strongly involved in regulation of the industry through the Environmental Protection Agency (EPA). The EPA is an agency that administers federal laws concerned with activities that affect the environment (details about the EPA and similar agencies are dealt with elsewhere in the manual). Governmental requirements, naive as some of them may have been at the outset, were established for the coating industry. For example, coatings were to contain no more than 20% volatile organic solvent. An industry that had been using formulations containing about 80 to 90% organic solvent and about 10 to 20% coating polymer was being asked (told) to change in a “quantum leap” manner. The industry was to develop formulations that significantly reduced the amount of organic solvent used and, of course, maintain ease of application, good protection, and aesthetically pleasing appearance. To term such a requirement “naive” may have been an understatement. The difficulty and impracticality of the requirement were realized, and over the years the standard has been modified. High(er) solids systems that contain more than 1 pound of polymer per pound of solvent are routinely used. Of course, this results in a markedly reduced volume of solvent that enters the atmosphere. Nonetheless, the change has been made and today almost all coatings are of the higher solids or 100% solids variety. Here, too, the industry discusses advances each year at The Water Borne and Higher Solids Coatings Conference that is cosponsored by the University of Southern Mississippi and the Southern Society and is held in the late winter of each year.

Other New Coating Technologies

Adjuncts to high-solids coating technology are the water-borne systems (though they may have predated organic-based systems) that require minimal cosolvent to achieve good appearance and properties, two-package coating systems that have relatively short pot lives, and water-borne emulsion or latex systems. The latter coatings are important to the architectural coatings market, and today oil-base paints represent only a small fraction of the huge market for these commodity items. Latex-based paints have increased their solids, decreased volatile organic components, and are formulated with new thickening agents that have excellent flow characteristics. Even when the paint is applied by amateurs, spattering is almost unknown. This industry segment also is included in the above-mentioned symposium as well as at Lehigh University, which is well known for its efforts in the field of water-borne coating technology.

Solvents

The area of solvent technology has undergone a number of changes during the past quarter of a century. The changes for the most part are associated with reduction of their health-hazard profiles and characteristics. Knowledge was developed or "rediscovered" about many solvents since the previous edition was published. This knowledge has led either to the demise or to "sharply" curtailed or restricted usage of what had been many commonly used solvents.

This same information was also responsible for innovation and has played an important role in development of new solvents that are less harmful to humans, animals, and the environment. The abbreviation MSDS (Material Safety Data Sheet) became well known for solvents and for other chemicals. Today these information sheets with safety data about materials are not only required for chemicals, they are used by people in laboratories and plants. It goes without saying that they should be required reading for anyone handling chemical compounds.

Other Innovations

The advent of new technology to produce functional and decorative coatings involved more than innovative organic chemistry. It also required innovative physical chemistry, material science, polymer science, and engineering. In addition to new chemicals and ways to use them, development of new application equipment and cure equipment was required. Conventional suction-feed spray guns and roll coaters could not be used for many of the new technologies. Powder coatings required development of methods of manufacture, of handling systems that could be quickly cleaned during a color change over, of methods for placing a charge on the powder, of understanding and elimination of cage effects, of getting good wrap-around on other than flat substrates, of ways to remove fused powder from hangers and conveyors, and so on. Radiation-cure coatings required development of electron beam systems with improved safety features, of efficient ultraviolet light systems that could cure in other than line of sight, of low-viscosity chemicals with improved safety and health characteristics, and more. Water-borne systems had to deal with flash rusting, with minimizing cosolvents, with developing latexes that would quickly dry and fuse while maintaining qualities such as hardness, high gloss, and toughness. High solids required balances between molecular-weight, functional groups and their effects and viscosity, as well as between reactivity and shelf or pot life. It also required scientists to obtain high-quality finishes from the small molecules needed to achieve the low viscosity used for reasonable application characteristics at high-solids content.

Electronics also played an important role in the changes in coating technology and in the testing of coatings. During the period we are discussing, there has been a "Buck Rogerish" explosion in this industry. Many concepts and products related to such concepts that were considered amazing and with little likelihood of success in 1970 are realities today. Miniaturization technology has made printed circuit assemblies and semiconductors possible. Today, hand-held calculators are almost as powerful as the room-filling computers were in the early 1970s. Personal computers weren't even thought about in 1972. Robots and various forms of robotics have become useful tools in the 1990s. Application of electronics technology to a host of instruments, some of which are described in this manual, has vastly improved our ability to probe and otherwise examine and understand materials that are currently used, new materials as they are being developed, and final coatings in both an as-made and an aged condition. Both reliability and precision of testing have been improved through new instruments.

Yet within this array of new test equipment that has been enabled through electronics and that allows quantitative results to be obtained in a reliable manner, there is still room for and a need for some of the simple, homey tests used for many years. Tests that are easy to apply and that require no elegant or complicated equipment are still desirable. Quickly drawing a nickel over a coating while applying downward pressure to the stroke almost immediately gives one a feeling for how well the coating is adhering to the substrate and to its toughness and formability. Such a test can be performed "on line" and by essentially anyone. Even interpretation of results is not difficult and is largely intuitive. Pencil hardness testing may vary from operator to operator, but one does not need to be a coatings scientist to quickly grasp what the test is measuring and to have a "feel" for a coating's hardness from the test. Solvent double rubs are easy to do. While the exact number of double rubs obtained may vary from individual to individual, the test still gives a quick understanding of the coating's thermoset character as well as the degree of cross-linking. Sharp impacts on the face or reverse side of a coated metal panel can quickly give an understanding about the impact and adhesion characteristics of the coating. These are four simple tests, but they can yield a great deal of understanding about a particular coating in a very short time. Other simple tests also exist.

Lest one get the wrong impression from the last few sentences, while these tests are useful, they certainly do not lead to the fundamental understanding that is very important to development of knowledge so necessary for new products. Sophisticated testing puts numbers on test results, probes deep into molecular architecture, and allows both comparison of competitive products and the development of improved products. Sophisticated analyses also provide the understanding necessary to develop new chemicals and technology that will lead to improvements in existing products and to new products.

Summary

Within the changed environment that has been described, the 13th edition of the Paint Testing Manual has, for the most part, become outdated—as was expected when it was compiled. Many of the methods described have changed, and the needs of the industry have also changed. The 14th edition reflects these changes. Even its title has been changed—to Paint and Coating Testing Manual. The collective effort of the many authors has resulted in a manual that has

deemphasized, though certainly not eliminated, natural products, that provides a description of the regulations currently in force for the industry, and that discusses the main polymeric species, colorants, special pigments, extenders, and additives used in the industry today. The manual also deals with the analyses used to dissect and analyze a coating, the instruments used in the industry, and the products of the industry as well as how they are used and tested. Testing procedures for the most part are not detailed in the manual. Rather, the manual is a guide that will lead a coatings scientist to more in-depth treatises about the various topics and to test methods, procedures, and standards of ASTM and other national and international organizations.

Title	Location	Edition / Series / Misc.
100 Paint and Surface Coatings: Theory and Practice Author: Lambourne, R. and T. A. Strivens (editors) Publish.: William Andrew Publishing Company - place: Norwich, NY - date: ©1999 Subject: Paint Desc: xii, 784 p., illus., 25 cm.	Dynix: 89751 Call No.: 667.6 Pa ISBN: 1884207731 Shelf Adult Non-Fiction	Edition: 2nd edition Series: Year: 1999 Price: \$25.00

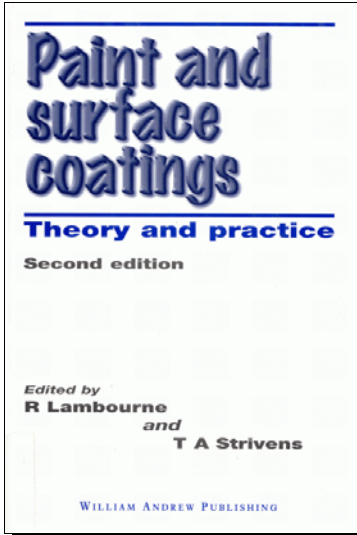


Table of Contents

- List of contributors
- Preface to first edition
- Preface to second edition
- 1 Paint composition and applications -- a general introduction (R Lambourne)
 - 1.1 A Short history of paint
 - 1.2 Paint or surface coating?
 - 1.3 The components of paint
 - 1.4 Paint making
 - 1.5 Methods of application
 - 1.6 Paint markets
- 2 Organic film formers (J Bentley)
 - 2.1 Introduction
 - 2.2 Natural polymers
 - 2.3 Oils and fatty acids
 - 2.4 Oleoresinous media
 - 2.5 Alkyd resins
 - 2.6 Polyester resins
 - 2.7 Acrylic polymers
 - 2.8 Emulsion and dispersion polymers
 - 2.9 Non-aqueous dispersion polymerization
 - 2.10 Amino resins
 - 2.11 Phenol formaldehyde resins
 - 2.12 Epoxy resins
 - 2.13 Isocyanates
 - 2.14 Silicone resins
 - 2.15 Vinyl resins
 - 2.16 Water-borne systems
 - 2.17 Resins for electrodeposition
 - 2.18 High solids coatings
 - 2.19 Radiation-curing polymers
 - 2.20 Powder-coating compositions
 - 2.21 Resin manufacture
- Bibliography
- References
- 3 Pigments for paint (A G Abel)
 - 3.1 Introduction
 - 3.2 Definition
 - 3.3 Required qualities of pigments
 - 3.4 Pigment classification
 - 3.5 Pigment nomenclature
 - 3.6 Further types of Pigments and terms used
 - 3.7 Particulate nature of pigments and the dispersion process
 - 3.8 Manufacture of pigments
 - 3.9 Toxicity and the environment
 - 3.10 Choosing pigments
 - 3.11 Physical forms of pigment
 - 3.12 Notes on families of pigments
- References

Subjects

276 .	Paint
324 .	Protective coatings

4 Solvents, thinners, and diluents (R Lambourne)

- 4.1 Introduction
- 4.2 The market for solvents in the paint industry
- 4.3 Solvent power or solvency
- 4.4 Solvent effects on viscosity
- 4.5 Evaporation of solvents from coatings
- 4.6 Flashpoint
- 4.7 Toxicity and environmental pollution
- Acknowledgement
- References

5 Additives for paint (R A Jeffs and W Jones)

- 5.1 Introduction
- 5.2 Anti-corrosive pigment enhancers
- 5.3 Antifoams
- 5.4 Antiskinning agents
- 5.5 Antiskinning agents
- 5.6 Can-corrosion inhibitors
- 5.7 Dehydrators/antigassing additives
- 5.8 Dispersion aids
- 5.9 Driers
- 5.10 Electrical properties
- 5.11 Flash corrosion inhibitors
- 5.12 Floating and flooding additives
- 5.13 In-can preservatives
- 5.14 In-film preservatives
- 5.15 Insecticidal additives
- 5.16 Optical whiteners
- 5.17 Reodorants
- 5.18 Ultraviolet absorbers
- 5.19 Additive suppliers

6 The physical chemistry of dispersion (A Doroszkowski)

- 6.1 Introduction
- 6.2 Immersion and wetting of the pigment
- 6.3 Deagglomeration (mechanical breakdown of agglomerates)
- 6.4 Dispersion -- colloid stabilization
- 6.5 Steric (or polymer) stabilization
- 6.6 Depletion flocculation and stabilization
- 6.7 Adsorption
- 6.8 Rate of flocculation
- References

7 Particle size and size measurement (A Doroszkowski)

- 7.1 Introduction
- 7.2 Definitions
- 7.3 Sampling
- 7.4 Methods of particle sizing
- 7.5 The best method?
- References

8 The industrial paint-making process (F K Farkas)

- 8.1 Introduction
- 8.2 The use of dispersants
- 8.3 Methods of optimizing millbases for dispersion
- 8.4 The instrumental formulating technique
- 8.5 Methods of dispersion and machinery
- 8.6 Mixing
- 8.7 Control techniques
- Acknowledgements
- References

9 Coatings for buildings (J A Graystone)

9.1 Introduction
9.2 Formulating considerations and constraints
9.3 Pigment-binder-solvent relationships
9.4 The nature of paint binder
9.5 Colour delivery
9.6 Meeting the needs of the substrate
9.7 Masonry and cementitious substrates
9.8 Metallic substrates
9.9 Plastic as a substrate
References

10 Automotive paints (D A Ansdell)
10.1 Introduction
10.2 Pretreatment
10.3 Priming
10.4 Surfacer
10.5 Anti-chip coatings
10.6 Inverted or reverse process
10.7 Automotive topcoats
10.8 In-factory repairs
10.9 Painting of plastic body components
10.10 Spray application
10.11 Stoving procedures
10.12 Performance/testing
10.13 Future developments
Acknowledgements
Bibliography

11 Automotive refinish paints (A H Mawby)
11.1 Introduction
11.2 Topcoat systems
11.3 Colour
11.4 Future developments
Bibliography

12 General industrial paints (G P A Turner)
12.1 Introduction
12.2 Factors governing the selection of industrial painting processes
12.3 Industrial application and curing methods
12.4 Finishing materials and processes in selected industrial painting operations
12.5 Developments and trends in general industrial finishing
References

13 The painting of ships (R Lambourne)
13.1 Introduction
13.2 Corrosion
13.3 Surface preparation
13.4 Blast primers
13.5 Paint systems for ships
13.6 The painting of off-shore structures
References

14 An introduction to rheology (T A Strivens)
14.1 Introduction
14.2 History of viscosity measurements
14.3 Definitions
14.4 Methods of measurement
14.5 Interpretation of results
References

15 The rheology of paints (T A Strivens)
15.1 Introduction
15.2 General consideration on paint rheology -- paint application processes
15.3 Experimental methods for measuring paint rheology for application and flow-out after application

15.4 Paint rheology during manufacture and storage
References

16 Mechanical properties of paints and coatings (T A Strivens)
16.1 Introduction
16.2 Viscoelastic properties of polymers
16.3 Ultimate mechanical properties of polymers
16.4 Experimental methods for determining mechanical properties of coatings
16.5 Discussion of experimental methods
16.6 Technological tests for mechanical properties
16.7 Acoustic emission
16.8 Recent developments
References

17 Appearance qualities of paint -- basic concepts (T R Bullett)
17.1 Introduction
17.2 Physics of reflection by paint/air interfaces
17.3 Light scattering and absorption by paint films
17.4 Colour of pigment mixtures and pigmented films
17.5 Changes in paint films
17.6 Fluorescence and phosphorescence
17.7 Colour appreciation
17.8 Further reading
References

18 Specification and control of appearance (T R Bullett)
18.1 Gloss
18.2 Opacity of paint films
18.3 Specification and control of colour
18.4 Colour control in paint manufacture
Acknowledgements
References

19 Durability testing (R Lambourne)
19.1 Introduction
19.2 Chemical resistance testing
19.3 Testing mechanical properties of paints
19.4 Accelerated weathering
19.5 Natural weathering
19.6 Suppliers of accelerated weathering test equipment
Acknowledgements
References

20 Computers and modelling in paint and resin formulating (J Bentley)
20.1 Introduction
20.2 Software in the laboratory
20.3 Information technology and knowledge-based systems
20.4 Modelling and mathematical techniques
20.5 Molecular modelling
20.6 Resin formulating and processes
20.7 Resin scale-up and manufacture
20.8 Polymer properties, curing, and network properties
20.9 Solvents and solubility properties
20.10 Paint formulation and manufacture, and coating performance
20.11 Experimental analysis, design, and quality control
Bibliography
References

21 Health and safety in the coating industry (G R Hayward)
21.1 Introduction
21.2 Raw materials and intermediates
21.3 Occupational exposure
21.4 Provision of information
21.5 The approved supply list

21.6 Hazard details
21.7 Safety data sheets
21.8 Labelling of substances and preparations
21.9 Classification and labelling for transport (conveyance)
21.10 Control of hazardous substances
21.11 New substances regulations
21.12 Food contact coatings
21.13 Major accident hazards
21.14 Environmental protection
21.15 Conclusions
References

Appendix 1: Risk phrases
Appendix 2: Safety phrases
Index

Reviews - Synopsis - Dust Jacket

Publisher's Description:

Comprehensive and authoritative, this up-to-date exploration of the science and technology of paints and surface coatings covers the theory often missing in other texts and introduces state-of-the-art developments and cutting-edge proposals. Offers an easy-to-read account of the principles involved in the optical properties of paints, covering both the physical and aesthetic aspects of opacity and color, and discussing in detail the physics of paint and the physical chemistry of dispersions. Reviews the polymer chemistry of all common paint binders and the technology of pigment use.

Suggests a totally new approach to building and house paints that looks at the requirements of substrates. Extensive sections on automotive paints and automotive refinish paints address the demands and performance required in these markets. Valuable chapters on the use of computers in the paint industry and health and safety explore their recent influences on coating developments.

This is a completely revised and updated second edition of this very popular book first published in 1987. For all those in the paint industry; paint manufacturers and raw material suppliers; industrial paint users; and students.

FROM THE DUST JACKET:

This second edition of an established and well-received book has been carefully revised, in many instances by the original authors, and enlarged by the addition of two completely new chapters. These deal with the use of computers in the paint industry and with the increasingly important subject of health and safety. It was the editor's intention in the first edition to provide science graduates entering the paint industry with a bridge between academia and the applied science and technology of paints. The great strength and appeal of this book remains that it deals with the technology of paints and surface coatings while also providing a basic understanding of the chemistry and physics of coatings.

This book should provide a comprehensive reference source for all those in the paint industry; paint manufacturers and raw materials suppliers; undergraduate and postgraduate students; and industrial paint users.

Preface to first edition:

For many years I have felt that there has been a need for a book on the science and technology of paints and surface coatings that would provide science graduates entering the paint industry with a bridge between academia and the applied science and technology of paints. Whilst there have been many excellent books dealing with the technology there have not to my knowledge been any that have sought to provide a basic understanding of the chemistry and physics of coatings. Many of the one-time standard technological texts are now out of date (and out of print), so it seemed appropriate to attempt to produce a book that will, I hope, fill a gap. Nevertheless, it was with some trepidation that I undertook the task of editing a book covering such a diverse technology. The diversity of the technology is such that rarely will an acknowledged expert in one aspect of the technology feel confident to claim expertise in another. It therefore seemed to me that a work produced by a single author would not meet the objectives I had in mind, and I sought the help of friends and colleagues in the industry to contribute individual chapters on subjects where I knew them to have the requisite expertise. Fortunately, I was able to persuade sufficient contributions from individuals for whom I have the highest regard in respect of their knowledge and years of experience within the paint industry to satisfy myself of the ultimate authenticity of the book as a whole.

However, because of limitations of space it is impossible for a book of this kind to be completely comprehensive. Thus I have had to make decisions regarding content, and have adopted a framework which gives more space, for example, to

the physics of paint and the physical chemistry of dispersions than most books of this kind. In doing so I have had to reduce the breadth (and in some cases the depth) of treatment of specific technologies. Thus, whilst the chapters on automotive painting and architectural paints are fairly detailed, the treatment of general industrial finishing is less an 'in depth' account of specific technologies, but is intended to illustrate the very wide range of requirements of manufacturing industry and the problems the paint technologist may encounter as a result of this.

In chapters dealing with the fundamental principles underlying the technology authors have been invited to provide critical accounts of the science and technology as it stands today. This is reflected in the extensive lists of references to original work mostly published within the last decade. It is hoped that readers wishing to delve further to increase their understanding will find these references a valuable source of information.

Preface to second edition:

When I was invited to edit the second edition of this book, I took the decision to retain as far as possible the original team of authors. In addition, valuable new chapters (20 and 21) on the use of computers in the paint industry and health and safety have been contributed by Mr. J Bentley and Mr. G R Hayward, respectively. Owing to the unfortunate and untimely death of Miss J F Rolinson, Chapter 3 on pigments has not been revised. Instead, thanks to Dr A G Abel, a completely new chapter on this subject has been provided.

I believe this resulting new edition will provide a useful text for those wishing to explore various aspects of paint technology and its underlying science, whilst its literature references will provide a useful start to the study of any particular aspect of that technology.

I would like to pay tribute to the team of authors, who have provided me with revised or new chapters, and for their support, help and encouragement in producing this second edition.

Title	Location	Edition / Series / Misc.
102 Paint Film Defects: Their Causes and Cure		<i>Edition:</i> 2nd edition
<i>Author:</i> Hess, Manfred (editor)	<i>Dynix:</i> 25331	<i>Series:</i>
<i>Publish.:</i> Reinhold Publishing Corporation	<i>Call No.:</i> 667.6 He	
<i>- place:</i> New York, NY	<i>ISBN:</i>	
<i>- date:</i> ©1965	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1965
<i>Subject:</i> Paint		<i>Price:</i> \$25.00
<i>Desc:</i> xvi, 604 p., illus., 60 plates, tables, 24 cm.		

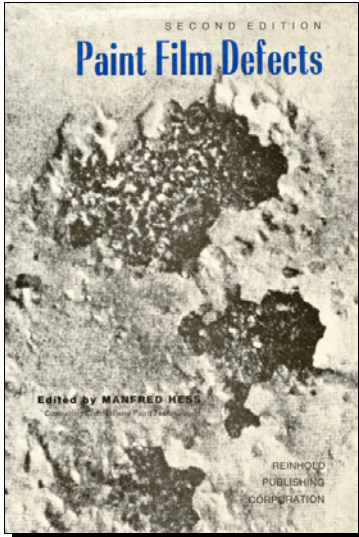


Table of Contents

How to use this book
List of Tables

- A. Faults which develop during Storage—Sections 1—11B
 - 1. Cloudiness, Turbidity, Sedimentation in Transparent Oil and Synthetic Resin Varnishes and Boiled Oils
 - 2. Precipitation and Crystallisation, Thickening and Separation of Oil, Cellulose and Spirit Varnishes, Emulsions, Water-bound Paints and Liquid Driers
 - 3. Separation and Partial Crystallisation, Thickening of Rosin-rich Varnishes resulting in Gritty and Granular Surfaces
 - 4. Separation, Sedimentation, Precipitation, Clouding of Liquid Driers
 - 5. Feeding-up, Livering, Curdling, Gelation and Thickening of Enamels or Paints in Connection with their Pigment Content
 - 6. After-Thickening, Feeding-up, Fattening Gelling, resulting in Ropiness of certain Oil Varnishes, Synthetic Resin and Chlorinated Rubber Varnishes and Paints
 - 7. Changes of Consistency of Bitumen and Pitch Varnishes
 - 7B. The Fall of Viscosity during Storage of Cellulose Lacquers and of Paints including Emulsion Paints
 - 8. Skinning of Rapid-drying Oil Varnishes or Oil Paints, Synthetic Resin Varnishes, Oil Fillers and Oil Putty
 - 9. Drying-up of Paint and Varnish Materials in Containers
 - 10. Deposits, Settling, Sedimentation, Changes of Viscosity, Colour and Finish, mainly of Pigmented Coatings on Storage
 - 10B. Storage Problems of Water-based Paints, Distempers, Water Paints, Emulsion (Latex) Paints: Thickening, Coagulation, Change of Viscosity, Putrefaction, Gassing
 - 11. Leakage of Casks, etc.
 - 11B. Darkening and other Changes of Transparent Varnishes, Light-coloured Enamels and of Thinners on Storage

Subjects

276 . Paint

- B. Faults developed during Application—Sections 12—68
 - I. FAULTS DUE TO THE TOOLS EMPLOYED OR TO THE MODE OF APPLICATION— SECTIONS 12—19B
 - 12. Damage to and Swelling of Rollers of Varnishing Machines
 - 13. Hardening of Brushes
 - 14. Loss of Bristles of Paint Brushes
 - 15. Bad Spraying, Spitting and Blocking of Spraying Guns; with Spraying Table
 - 15B. Electrostatic Spraying Difficulties
 - 16. Dry Spray and Cobwebbing
 - 16B. Formation of Spraying Mist, and Exhaust Faults
 - 17. Dipping and Flowcoating Difficulties (Electrophoresis see p. 449)
 - 18. Faults due to Misleading Thermometer Readings in Stoving Processes
 - 19. Cost of Painting and Excessive Consumption of Material
 - 19B. Sticking together of Enamelled Parts in a Tumbling Machine
 - II. FAULTS CONNECTED MAINLY WITH THE PAINT AND VARNISH MATERIALS EMPLOYED—SECTIONS 20—64
 - (a) General—Sections 20—56
 - 20. Excessively Thin Consistency
 - 21. Failures caused by Thinning or Additives inducing Separation, Flocculation, Coagulation, Gelling and Precipitation, Formation of Pinholes showing the Base, Prolongation of Drying Periods, Loss of Gloss and Covering Power, Curtaining, etc.
 - 22. Flocculation (Bittiness), (Seeding), Granulation of Oleoresinous and Synthetic Paints and Enamels
 - 23. Runners, Curtaining, Sagging, Bad Flow on Vertical Surfaces mainly on Spraying and Brushing
 - 24. Formation of Drops on Dipping of Well-bodied Coatings
 - 25. Excessive Drying Periods—Air Drying
 - 26. Excessive Stoving or Heat Conversion Times
 - 27. Stickiness, Tackiness, Softness, Retackiness, Softening, Smearing, Insufficient Hardening through of Oil-base, including Synthetic Resin Varnishes, Paints, etc., on Air Drying
 - 28. Loss of Gloss, Dulling, Matting, Differences in Gloss of Stoving Coatings

29. Difficulties of Application due to Cold Winter Temperatures
30. Showing of Brush Marks, Bad Brushability, Wet Edge Time
31. Bad Flow, Orange Peel Effect, Wavy, Uneven Surfaces of Quick-drying Varnishes and Lacquers, Roping of Dipping Varnishes and Lacquers
32. Mottled, Morocco Effects, Floating, particularly on Spraying of Pigmented Films
33. Silting, Silking, Striation, Grained Appearance, Streakiness
34. Wrinkling, Rivelling, in some cases Crystalline Effects, Gas-checking of Oil-base Paints, Synthetic Resins and Bituminous Enamels
35. Sandy, Dirty, Granular, Gritty, Pimpled Films, Seeding
36. Pinholing, Pockmarking, Pitting, Crater Formation, Cracked Blisters
37. Cissing, Crawling, Beading, Retrogression of the Film leaving Bare Patches of the Base
38. Formation of Blisters, Blow Holes noticeable in Stopper and Filler Coats or in the Films of Top Coats over such Paints, particularly over Porous Substrates and after Stoving
39. Blistering, Cracked Blisters, Bubbling chiefly in Films of Oil-base and Synthetic Resin Coatings, sometimes followed by Destruction and Lifting
40. Lack of Hiding, Obliterating Power
41. Lack of Filling Power
42. Lifting, Formation of Blisters, Blowholes, Craters, Alligatoring, Cracking, Re-solution of Rapidly Air-drying Films chiefly of Cellulose, Synthetic Resin Lacquers, Chlorinated and other Rubber Lacquers, Spirit Varnishes, and of Emulsion Paints
43. Bleeding of Dyes and Pigments contained in Coloured Coatings
44. Coloured Dots and Spots on Light-coloured Cellulose and other Lacquer Films
45. Patchiness in the Form of Lighter or Duller Areas in Films on newly Finished or Relacquered Motor Cars, etc.
- 45B. Spotted, Cloudy and/or Greyish Wood Lacquer Films
46. Blushing, Milkiness and Dulling, characteristic especially of Clear Spirit Varnish, Vinyl Resin and Cellulose Lacquer, etc., Films
47. Differences of Shade in Paints by comparison with a Standard
48. Yellowing and Discolouration of White or Coloured Coatings, or of Transparent Varnishes during Convection Stoving or through the Action of Elevated Temperatures
49. Iridescence, Rainbow Effects on Films of Transparent Lacquers
50. Deviation of Shade caused by the Use of Dry Pigments
51. Oven Blushing, Blooming of Stoving Enamels (mainly Blacks) in Gas Ovens due to Exterior Causes
- 51B. Grey Blacks and various Degrees of Gloss and Mattness Generally
52. Tearing Out, Grinding through, Scratching of Films, Corning of Abrasives on Rubbing Down of Fillers and Undercoatings
53. The Porosity of Surface Coatings
54. Difficult Polishing of Films, Smearing on Polishing
55. Difficulties encountered in the Forming of Sheets Coated, e.g. with Silver- or Tinplate Varnish, Roller-coating Enamels, etc.
56. Foaming of Coatings
- (b) Dangers Due to Fire and similar Causes—Sections 57—59
57. Prevention of Fires and Explosions
58. Spontaneous Ignition of Varnishes, Lacquers and Paints—Fire Risks
59. Detonation and Spontaneous Ignition of Spraying Dust
- (c) Special Cases—Sections 60—64
60. Faults in Vacuum-evaporated Metal/Lacquer Film Systems
61. Faults characteristic of Metallic, Hammer and Polychromatic Paints
62. Failures experienced in the Application of Crystalline Finishes
63. Defects developed on Ripple, Wrinkle, Shivel or Crinkle Finishes (on Oil Base)
- 63B. Faulty Results on Crackle, Alligatoring Finishes
64. Some Lacquer Defects occurring on Plastic Articles coated by the Silver-Spray Method
- III. DAMAGE TO HEALTH—SECTIONS 65—68
65. Injurious and Toxic Substances (mainly Organic) used in Paints, Varnishes, Lacquers, etc., especially with regard to their Physiological Effects due to Inhaling or Contact with the Skin
- Appendix: The Physiological Effects of Common Solvents, Thinners, Detergents, Mordants, Bleaching Agents, Resins, Plasticisers and their Vapours
66. Toxic Effects induced by Poisonous Pigments and Paint Materials
67. Skin Troubles, Dermatitis, Inflammation, Reddening of the Skin (similar to Second Degree Burns), proceeding until the Loosening of the Epithelium, Itch, Nettlerashes (Urticaria) up to the Upper Arms, Blistering, Pus Formation (Eczema, Ulceration, etc.) caused by Mordants, Cleaners, Detergents, Degreasing Agents, Solvents, Thinners or Lacquers
68. Lead Poisoning caused by the Handling of Lead Pigments and Paints Appendix: The most important Lead Pigments
- C. Failures showing or developing shortly after Application—Sections 69—82
- (a) General—Sections 69—74

- 69. Loss of Gloss, Dulling, Matting, Surface Disturbances of the Films of Air-drying Oil-base including Synthetic Resin Enamels and Varnishes, Oil and Oil-emulsion Paints, and in some cases of Distempers
- 69B. Failures in connection with the Peculiarities of Drying by Infra-Red Radiation
- 69C. Comparison of the various Artificial Drying Methods
- 70. Loss of Gloss, Dulling, Matting of Films of Short Oil Rosin and Spirit Varnishes and Lacquers Drying by Evaporation, such as Cellulose Lacquers
- 70B. Silkiness of Films
- 71. Sweating, Reappearance of Gloss on Films of Rubbed Down Gum- Oil Flattening Varnishes and Enamels
- 72. Faults developing in Paints exposed to Heat, e.g. on Radiators or Fires
- 73. Brittleness, Poor Adhesion, Scaling, Flaking Peeling, Cracking Off, Low Scratch and Shock Resistance, Rapid Embrittlement of Films of Coatings generally, with the exception of Distemper and Casein Paints
- 74. Unsatisfactory Adhesion, Brittleness, Flaking Off, Loosening of Films, Chipping Off due to Shock, Scratch, Engraving, etc., Specific for Metal Coatings
- (b) Special Cases—Sections 75—82
- 75. Difficulties in Coating Plastics or Wood Impregnated or Bonded with Plastics
- 76. Insufficient Adhesion to and Loss of Adhesion on Zinc, Zinc Alloys and Galvanised Sheets, Zinc Corrosion
- 77. Insufficient Adhesion to Smooth, Frequently Polished Surfaces (with the Exception of Wood and Building Material)
- 78. Immediate or Subsequent Disturbances of the Adhesion of Stovings on Brass Surfaces, characterised by Chipping Off, especially on Engraving or Bending
- 79. Matt Patches on Unprinted Areas of Varnished Paper (Labels, etc.)
- 80. Bad Adhesion to Lead or Leaded Surfaces
- 81. Various Difficulties connected with the Varnishing of Paper, Hard-board or Metal
- 82. Various Defects in connection with the Coating of Aircraft

- D. Defects of Coatings on the Finished Objects when in Use—Sections 83—124
- (a) General—Sections 83—110
- 83. Some General Reasons for the Premature Destruction of Paint Films applied, e.g. to the Outside of Building Structures
- 84. Premature Destruction and Loss of Appearance of Paint and Varnish Films on Railway Bridges, Tunnels, Locomotive Sheds, and similar Objects exposed to Steam, Soot and Smoke
- 85. Premature Decay of Coatings, especially on Vehicles
- 86. Corrosion of Painted Iron and Steel
- Appendix: A list of Suitable Pigments as used in Paints for the Protection of Iron and Steel Structures
- 86B. Lack of Effectiveness and Faults exhibited in Chemical Rust Removal (Pickling) and Corrosion Prevention
- 87. Scaling, Flaking and Peeling of Air-drying Coatings on Wood
- 88. Chalking, Washing Off by Rain of Paint Films accompanied by Loss of Gloss, resulting in Erosion
- 89. Peeling Off, Flaking or Scaling of Whitewash, Ceiling White, Soft Distemper, Oil-bound Distemper, Casein Paint, Water Paint, Emulsion or Latex Paint from Building Structures and Behaviour of such Paints as Bases for other Coatings
- 90. Easy Abrasion, Softness and Formation of White Scratches on Transparent Varnishes
- 91. Cracking and Blistering of Spirit Varnishes based on Natural and Phenol Resins, Waterthinnable Paints, etc.
- 92. Cracking, Alligatoring, Checking of mainly Oil-base Varnishes and Paints, Loss of Elasticity
- 93. Cracking and Flaking of Cellulose and Various Other Lacquer Films based on Synthetic Resins
- 94. Pronounced Cracking, Alligatoring or Checking, Staining or Formation of Brown Weathered-out Layers of Bituminous or Tar Paints
- 95. Chipping Off of Cellulose and similar Air-drying Lacquer Films from Articles in Daily Use.
- 96. Breakdown of Distempers, Casein, Water, Emulsion, Oil and Alkyd Paints (Gloss, Flat, etc.) on New or Damp Brickwork, Cement Rendered Surfaces, Asbestos Cement, Lime Plasters, causing Softening, Blistering, Discolouration, Cracking, Flaking, etc.
- 96B. Failures of Painted Surfaces on Calcium Sulphate Plasters
- 97. Fading, Loss of Colour, Lack of Light Fastness of Paints and Coloured Lacquers
- 98. Yellowing and Darkening with Age of Air-drying Oil, Oil-modified and Other Synthetic Resin Varnishes
- 99. Blackening and Greying of Light-coloured Paint Films on Air Drying
- 99B. Mildew (Fungi, Moulds), Algae and Moss Growth, Bacterial and Termite Activity on Paint Films and its Consequences
- 99C. Decay or Rotting of Wood beneath Paint Films
- 100. Blue, Violet, Purple or Reddish Stains on Clear, White and Light-coloured Paint and Varnish Films on Wood, especially in Outside Applications on Windows, Doors, etc.
- 101. Blooming, Hazing and Bronzing of Paints and Varnishes accompanied by Loss of Gloss
- 102. Browning, Yellowing of Cellulose Lacquers (mainly transparent) due to Light
- 103. Softening of Thermoplastic Varnish and Lacquer Films on Increase of Temperature
- 104. Sweating out, Patchiness and Dulling of Various Lacquers due to Oil, Wax, etc.
- 105. Susceptibility of Organic Coats to Heat, Pressure, Use; Film Hardness generally
- 106. Effects of Incorrectly Selected Binder, especially Oil Contents for Outside Application
- 106B. Swelling of Films by the Absorption of Moisture

- 107. Unsatisfactory Resistance, Whitening, Milkiness and Softening of Paint and Varnish Films in Contact with Water or Moist Atmosphere
- 107B. Spotting of Oil-base Varnishes and Paints
- 108. Staining through all kinds of Paint Films
- 109. Tarnishing and other Blemishes of Metals coated with Transparent Lacquers
- 110. Blooming and Hazing on Films of Black Varnishes, particularly on Black Stoving Enamels, American Cloth, etc., made on a Bituminous or Pitch Base caused by the Constituents of the Coatings applied
- (b) Special Cases—Sections 111—124
 - i. Miscellaneous:
 - 111. Lack of Solvent and Lubricating Oil Resistance
 - 112. Removal or Covering of Paint Films in Plating Baths
 - 113. Influence on the Taste of Food of Stoving Canning Lacquers.
 - ii. Electrical Defects Connected with Impregnating Varnishes:
 - 114. Defects caused by Faulty Application of Electrical Insulating Varnishes
 - 114B. Defects on Windings and Electrical Apparatus due to Softening of Wire Enamel
 - 115. Defects of Impregnations with Varnish which develop during Service
 - 115B. Defects in Oil-immersed Windings
 - 116. Open Circuits in High-speed Armatures
 - iii. Non-ferrous Metals:
 - 117. Damage possible by the Stoving of Enamelled Objects, consisting of Pure Aluminium, Aluminium Alloys and Magnesium Alloys
 - 118. Corrosion, Efflorescence followed by Blistering and Lifting of Paint and Lacquer Films on Magnesium and Aluminium Alloys as well as on Refined Aluminium
 - iv. Miscellaneous continued:
 - 119. Photographic Failures due to the Finishes of Cameras, Film Containers, etc.
 - 120. Delayed Loss of Adhesion of Paint Films over some Metals v. Ships' Paints:
 - 121. Destruction of the Hulls of Wooden Ships and of Harbour Constructions by Wood-borer, by Piercing and Perforation
 - 122. Rusting, Fouling and Paint Defects mainly on Steel Ships
 - vi. Various Destructive and Corrosive Agents:
 - 123. The Consequences of Various Destructive Effects on Paint Surfaces
 - 124. Faulty Resistance to Acids, Alkalis, etc.
- POSTSCRIPT with Nomenclature and Definitions
- PLATES: between 304 and
- ADDENDUM to Section 17 Dipping and Flowcoating Difficulties (Electrophoretic technique)
- BIBLIOGRAPHY
- AUTHOR INDEX
- SUBJECT INDEX

Reviews - Synopsis - Dust Jacket

PREFACE TO COMPLETELY REVISED SECOND ENGLISH EDITION

It is gratifying to know that, since it first appeared, about ten thousand copies of this book in English, German or French have gone out to all parts of the globe. Such widespread reliance on its usefulness, however, brings its own burden of responsibility to the editor and his co-authors. To keep up with these fast-moving times, much of the old text had to be discarded; large parts have been rewritten; a great deal has been added.

One man cannot now know intimately all the many possible faults of paint films, so it was natural for me to invite a number of colleagues to contribute.

W. A. Edwards, M.A., F.R.I.C., has concentrated on aspects of metal protection, media, resins and T. W. Wilkinson, A.M.C.T., on aspects of decorative paints, colour and pigment problems.

These two have been the main contributors together with myself—the original sole author. I have discussed primarily the Sections on industrial finishes, and have acted as editor.

In a number of Sections the work of all three is intertwined.

N. A. Bennett has rewritten the Sections on electrical insulating varnishes.

G. N. Hill, F.C.T.C., has revised those parts which relate to aircraft finishes.

W. Phillips undertook to bring up to date the Sections on hazards and toxicity.

E. J. Amies, M.Sc., A.R.C.S., an original member of this team and one who also took some part in the first English edition, has died. Through this sad loss we have been deprived of his contribution.

To those organisations and colleagues mentioned in previous prefaces, and who have given their continued support, must be added the following: The British Cast Iron Research Association, Birmingham, British Standards Institution,

London, Mander Brothers Ltd., Wolverhampton. We are deeply grateful to them all.

Many people, too numerous to mention, although some are named in the text, have also helped. By permitting the use of material from their own publications, by supplying or revising tables and photographs, or by suggesting improvements in the text invaluable help has been rendered.

It has been found advisable to maintain the general make-up of the book, but in a few cases defects connected with manufacturing problems have been included.

The Subject Index has been considerably extended. It was the responsibility of G. Pace, A.C.T., Dip.Tech. Who also contributed the Addendum which deals with the electrophoretic technique.

It is hoped that this new version of Paint Film Defects will be an even better companion to its readers than the predecessors.

HOW TO USE THIS BOOK

A single fault is due in many cases to a number of causes. In other cases several defects occur simultaneously, so that the solution of the trouble is rendered more difficult. The headings of the individual sections indicate the various kinds of faults. Each section sets out first the various causes of these faults; methods of eliminating and preventing them are then suggested.

There are two ways of finding one's way through the labyrinth of possibilities:

(A) In most instances it is advisable:

- (1) to consult the Subject Index at the end of the book for the fault in question (Section numbers are printed in bold type);
- (2) to study the Section concerned thoroughly, omitting nothing (on account of the possible various alternatives);
- (3) to follow up any references given to other Sections.

It has been impossible for technical reasons to number the Sections always strictly in a desired order. Note particularly that a letter, e.g. "B", accompanying a Section number does not necessarily signify a connection with the previous Section.

(B) If, on the other hand, it is desired to determine what faults may be possible, the Table of Contents at the front of the book should be consulted and used as follows:

- (1) look for the suitable groups;
- (2) study the relevant Sections;
- (3) look up all the sub-sections of interest and do not forget to
- (4) refer to any other Sections indicated. See (A/3) above.

The Author Index (pp. 458-463) as well as the Subject Index (pp. 464—604) are located at the end of the book.

The term "coating" is used only for summarising paint, lacquer, enamel and varnish-like products.

Many definitions, mainly relating to failures, have been incorporated into the Nomenclature in the Postscript, which have not specifically been referred to in the text.

Title	Location	Edition / Series / Misc.
944 Paint Film Degradation: Mechanisms and Control		<i>Edition:</i>
<i>Author:</i> Hare, Clive H., 1941-	<i>Dynix:</i> 108664	<i>Series:</i> SSPC Publication: No. 01-14
<i>Publish.:</i> SSPC: The Society for Protective Coatings	<i>Call No.:</i> 667.6 Ha	
<i>- place:</i> Pittsburgh, PA	<i>ISBN:</i> 1889060666	
<i>- date:</i> ©2001	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2001
<i>Subject:</i> Paint		<i>Price:</i> \$195.00
<i>Desc:</i> viii, 631 p., illus., 29 cm.		

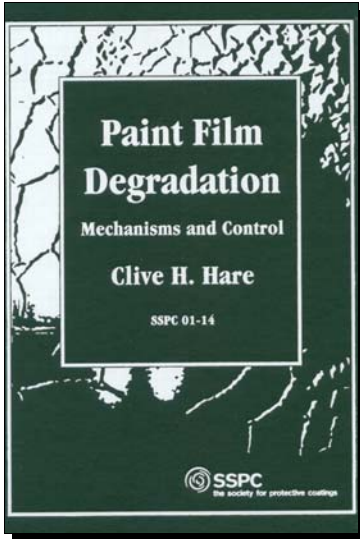


Table of Contents

Author's Preface
Editor's Preface

Part 1: Introduction
1 Introduction

Part 2: Properties of Coatings
2 The Molecular Structure of Polymeric Binders
3 The Glass Transition
4 Free Volume
5 Viscoelasticity
6 The Mechanical Properties of Coating Films and Their Characterization
7 Modulus, Time, and Temperature
8 The Permeability of Coatings to Oxygen, Gases, and Ionic Solutions

Part 3: Formulating Coatings
9 Pigment Dispersion and Flocculation
10 Paint Flow and Rheology
11 Thixotropes and Flow Modifying Additives
12 Paint Flow Defects
13 Foaming and Defoaming

Part 4: Failure Mechanisms

Section A: Weather and Corrosion
14 Effects of Extreme Weather on Paint Application and Cure
15 Metallic Corrosion
16 Specific Forms of Corrosion

Section B: Mechanically-Induced Failures
17 Internal Stress Arising from Film Formation, Solvent Loss and Curing
18 Internal Stress Arising from Pigmentation and Film Thickness
19 Coating System Failures Related to Internal Stress
20 Mechanically-Induced Stress from the Manufacturing Process
21 Service-Induced Stress: Sliding Wear and Abrasion
22 Nonskid and Nonstick Coatings
23 Service-Induced Stress: Impingement Wear and Impact

Section C: Adhesion and Blistering Failures
24 Adhesive and Cohesive Failure: Definitions and Macroscopic Manifestations
25 Hygroscopic Stresses
26 Wetting, Spreading, and Adhesion of Paint
27 Mechanical Aspects of Adhesion
28 Water Permeability in Unpigmented Films
29 Water Permeability in Pigmented Films
30 Osmotic Blistering of Paint Films on Metal
31 Nonosmotic Blistering of Paint Films on Metal

Section D: Chemically-Induced Failures
32 Irreversible Degradation of Paint Films
33 Penetration, Softening and Lifting of Coating Films

Subjects

276 .	Paint
529 .	Paint -- Testing

- 34 Solvent-Induced Bleeding, Blooming, and Flash Rusting
- 35 Dehydrochlorination
- 36 Degradation of Coatings by Acids, Bases and Solvents
- 37 Degradation of Coatings by Solvolysis, Hydrolysis and Oxidation
- 38 Chemical Degradation of Pigments

Section E: Light and Radiation Failures

- 39 Mechanisms of Photolytically-Induced Degradation
- 40 Photolytically-Induced Degradation - Effects of Pigments
- 41 Preventing Photolytic Degradation With Organic Light Stabilizers
- 42 Discoloration and Yellowing in Interior Environments
- 43 Radiation-Induced Degradation of Coatings

Section F: Heat-Induced Failures

- 44 Thermal Stresses
- 45 Thermal Degradation of Binders
- 46 Thermal Degradation of Pigments

Section G: Biologically-Induced Degradation and Failure

- 47 Microbiological Degradation
- 48 Marine Fouling and Antifouling Coatings

Part 5: Failures Related to Particular Substrates

- 49 Problems with Coatings on Zinc Substrates
- 50 Coating Systems for Aluminum Substrates
- 51 Coating Systems for Miscellaneous Non-Ferrous Metal Substrates
- 52 Painting Calcareous and Cementitious Substrates
- 53 Painting Architectural Substrates: Plaster, Drywall and Stucco
- 54 Painting Masonry and Block Filler
- 55 Preparing Structural Concrete for Painting
- 56 Coatings for Structural Concrete
- 57 Wood and Wood Products as Substrates for Paint
- 58 Painting or Repainting Weathered Wood
- 59 Problems with Pigmented Coatings on Exterior Wood
- 60 Clear Coats for Wood

Part 6: Failures of Primers

- 61 Barrier Coatings: Protection Mechanisms and Design Principles
- 62 Inhibitive Primers for Metal: Fundamental Considerations
- 63 Inhibitive Primers for Metal: Practical Formulating and Service Problems
- 64 Principles for the Design of Zinc-Rich Primers
- 65 Single-Coat Zinc-Rich Systems
- 66 Multi-Coat Zinc-Rich Systems

Part 7: In-Can Stability Problems of Topcoats

- 67 Can Stability of Oxidizing and Amino-Crosslinking Systems
- 68 Variables in Polyurethane Formulations and Their Effects on Performance
- 69 Can Stability of Epoxy Systems

Glossary of Acronyms and Abbreviations

Index

Reviews - Synopsis - Dust Jacket

AUTHOR'S PREFACE

My subject in this book is the pathology of paint films; to shed some light on the manner in which they age and the various ills that they are heir to. I feel sure that many will view this interest as rather negative, even morbid. Why a preoccupation with the ragged end of what we produce? Why not another dissertation on the design and fashioning of those bright and shining finishes that do so much to initially dress up the accomplishments of our world, and which themselves provide a bulwark against the inevitable consequences of age and deterioration. Why paint film degradation?

My answer is simple. If we are to learn to design better coatings with longer lasting films, it is essential that we more completely understand what is wrong with those we already have. It becomes necessary to become aware of those mechanisms by which coatings age and degrade. To prevent, to impede, to delay a process we must have a good understanding of the changes that favor the progression of that process and so more appropriately devise measures by which

we may thwart it.

All too often we consider the paint film as a temporary dressing, to be repainted and repainted again as dirt accumulates, as fashions change or as deterioration necessitates. This I feel is an unfortunate mindset. Paint films need be no more temporary than the substrates to which they are applied. Indeed cave paintings remain the earliest handiwork of man, older than the hymns of the Rig-Veda, older than the books of Moses, older than the pyramids of Egypt, as old perhaps as fire. Even where the elements are hostile paint remains intact. I have seen organic paint films still remaining on the steel of the HMS Titanic, immersed these eighty years and more beneath the icy waters of the Atlantic.

Several years ago I had the great fortune to visit the ruined towns of Herculaneum and Pompeii in the shadow of Mount Vesuvius. There on the ancient walls were frescos, barely paints at all, but images still reflective of those bygone times after 2000 years. There were bedroom walls with delicately painted borders, arches dressed in patterned detail, columns still of lively red, and here and there faces, eyes and souls of folks who once had lived there, still staring at me from down the many centuries. I photographed these quiet portraits and now they have pride of place on my own walls at home. I value these paintings not only for their beauty, not just for the odd sense of continuity they evoke, but for the fact that they remind me that, however humble, the things we make are not nearly so ephemeral as our modern world might so persuade us to believe.

In 1973 I had the honor to prepare a coating for part of the equipment package that was left on the moon by Apollo Seventeen. How long will that small film of paint remain intact up there, I wonder. I shall probably never know, but long, long after I have gone, I'd think.

It has become so fashionable today to denigrate most everything man lays his hand to as somehow insalubrious, certainly if it should involve the use of chemicals. Environmentalists, tree huggers, even to some extent the ordinary Joe and Jane in the street, compare the accomplishments of man without much favor among the other wonders of nature. Certainly there is little pride! I can not, and will not, ascribe to this. Man and his doings are no less a wonder of nature than is the redwood or the snowy owl. Indeed, as wonders go, perhaps man is the very apex of the wonders of the natural world. Accordingly, I will make no apologies to anyone when I say that for over forty years I have been a paint chemist. Although much of what I have done has been entirely inconsequential, I have done my small part to protect and beautify the world in which we live. Many have done less.

Returning to the book it is my hope that in some limited way, the rather lugubrious subject matter, let's call it the dark side of the paint film, will in some way point the way to better compositions. It is my hope that something I have said herein will light a light in somebody I do not know, and that he or she will do a little more to preserve and decorate all that we make for longer and for longer. And that may be the sum of a life's endeavor, nothing more. But if it is, then it is enough! And that is most important!

EDITOR'S PREFACE

Beginning in January 1995, readers of the Journal of Protective Coatings and Linings were treated to a monthly article on the performance and degradation of protective coatings. As the number of these articles passed 50 and then 60, the value of assembling, organizing and publishing them in a single collection became indisputable. Paint film degradation has been overlooked in the coatings literature, and thus the need for such a collection was timely and convincing.

Until now there has been no book or collection which describes the degradation of organic coatings over an extended period of time; relates this performance to the precise ingredients, manufacturing methods and application techniques which were employed; and teaches the fundamental physical and chemical principles which underlie the observed behavior. The chemical natures of pigments, resins, solvents, and the various catalysts, thixotropes, defoamers and stabilizers are explained so that the reader may understand in a fundamental way their interactions and predict their behavior. All of this is written from the perspective of a person who has worked as formulator and inspector, in the laboratory and in the field, for more than forty years.

This book will be required reading for inspectors who seek an accurate analysis of the causes of coating failure, formulators who wish to know how their coatings are being used and how they might be improved, applicators who wish to know how best to install a coating to ensure long life, and owners who need to evaluate existing coatings, determine correct maintenance intervals, and select a coating for economical service.

This book comprises all of the articles published in the Journal of Protective Coatings and Linings between January 1995 and December 2000, as well as several articles that did not appear in the Journal. After an introductory chapter, the book begins with seven chapters on the fundamental chemistry and physics of coatings. Formulations of coatings are addressed specifically in the next five chapters and throughout the book in discussions of coatings performance and deterioration. The heart of the book consists of 35 chapters on degradation mechanisms of paint, and considers declines in performance caused by weather and corrosion, mechanical and chemical insults, adhesion failure, light and radiation,

heat, and biological agents. There are 12 chapters which detail the peculiarities of individual substrates including zinc, aluminum, other nonferrous metals, calcareous and cementitious substrates, plaster, drywall and wood. The book concludes with 6 chapters on degradation of primers and 3 chapters on can stability issues. Extensive references to the technical literature are included in each chapter for the reader who wishes to pursue a topic in deeper detail.

The book is principally but not exclusively devoted to industrial and marine coatings for steel, areas which are the chief occupational focus of the author, editor, and readers of the Journal of Protective Coatings and Linings. However, other substrates often encountered such as concrete, wood, and drywall are not overlooked. Thus this book is a comprehensive reference to all coatings and substrates that may conceivably be encountered by professional specifiers, manufacturers, applicators and owners in any type of facility, and will be of value in every coatings project.

The opportunity to collate and edit these articles and organize them into a single volume has been a unique and valued opportunity for me. As editor, I take no credit at all for the breadth of knowledge, depth of insight and clarity of expression found here. But all of the murky constructions, the multiple interpretations of a single sentence, and the yawning voids in coverage result from various "improvements" I have made to the author's text, and these are my responsibility alone.

I join the author in a sincere desire that this book will be consulted frequently as a permanent record of coatings degradation pathways, a path to a deeper understanding of present technology, and a lamp to light the way forward to ever better and longer-lasting coatings.

INTRODUCTION:

There are in southern Europe, in Altamira, Spain, and in the Dordogne and Ardeche regions of France, sketches painted by cro-magnon man some 15-25,000 years ago on cave walls. In Pompei, Italy, frescos in exquisite detail bear testimony to the everyday life of this doomed city. Deep within the rain forests throughout Central America (at Bonampak, in Chiapas, Tikal, Guatemala, and in Honduras at Copan, for example), vestiges of paint remain on Mayan temples and stone slabs, despite the rigors of some 12 centuries of continuous tropical exposure. In museums, churches, and great houses the world over, oils on canvas have continued to enrich our lives these last 500 years.

Contemporary examples of long-lasting coatings that enhance aesthetics and preserve materials include the oleoresinous paint on the HMS Titanic, applied before her loss in 1912 and found intact when portions of steel structure were raised from the seabed in 1999. Red lead based paint systems on bridges in the interior valleys of Oregon have lasted without maintenance for 40 years, and an inorganic zinc-rich silicate is still protecting a pipeline in Woronoro, South Australia, after 50 years of service.

So paint can last.

Why then, we may ask, do paint flakes blow about beneath a bridge in Chattanooga, Tennessee, that was painted less than 18 months ago? Why is it that in Groton, Connecticut, the interior walls (below water) of the submariners' escape training tank begin to corrode within hours of its refilling? Why does a locomotive in the midwest blanch from yellow to a pale gray within 2 years?

What causes so great a divergency of service? No one invites failure, and, in each of the latter coating failures, chemists, manufacturers, specifiers, and applicators probably did their honest best to produce a serviceable coating system. That the collective effort failed might be cynically interpreted as proof of how little we have learned over the last 25,000 years. More accurately, it indicates the exceptional diversity of coating types and the tremendous complexities involved in the design, manufacture, application, and service of an ordinary coating film.

Paint, particularly the modern protective coating, is an extremely complex material, not only in its composition and in the way it is converted from a liquid or powder to a solid film, but also in the manner in which that film works in the field. Let us step back for a moment and reconsider our presumption that the motley chowder of a dozen or more reactive chemicals we call a paint will somehow merge into a homogeneous fluid capable of forming films that will serve for years in an array of austere and abusive environments. Let us stop and consider what we actually do when we design, make, and apply a paint.

Paint An Unlikely Success Story

In its wet state, our material is essentially a thermodynamically unstable, heterogeneous mixture of discrete solid particles suspended in a continuous phase that is made up one or more polymers, oligomers, or even monomers dissolved in a mix of volatile solvents. This bi- or polyphasic system contains as many as half a dozen individual pigments (some of which may be reactive). These pigments are wetted and dispersed, often at temperatures in excess of 130 °F (54 °C), into a solution of equally reactive polymeric binders. All of this happens in the presence of a variety of additives. The additives may range from electrochemically active surfactants to accelerators, inhibitors, and reaction

catalysts. In some cases, such as in latex paints, the binders themselves may be complex biphasic dispersions. The whole is stabilized by a complex system of tenuous steric and electrostatic forces that must maintain a reasonable homogeneity for perhaps months before the paint is eventually used. During storage, the paint is often subjected to temperature extremes that may vary from well below freezing to 150 °F (66 °C).

Afterwards, the paint must be capable of being readily reconstituted and successfully applied by techniques ranging from brush and spray (including electrostatic, high pressure airless, and supercritical CO₂ spray) to dipping and high speed reverse roller coating and curtain coating.

The applied film must wet, cover, and adhere to a variety of substrates, flowing out to produce a smooth, continuous film, but not so completely that it drains and sags from vertical surfaces or requires multiple applications to achieve the necessary film thickness. It must release its solvents efficiently and transform itself from the wet to the dry state in a reasonable time and at a reasonable temperature. The film must do so consistently and without defects and inhomogeneities, so that it is uniform, aesthetically acceptable, and strong enough to satisfy the short-term requirements of handling, recoating, and storage. The coating must be then compatible with the primers or topcoats of the total system, and it must maintain this stability through out its long-term service.

In service, the same material must then fulfill the role for which it was designed, protecting steel from corroding, wood from decaying, or concrete from deteriorating. It must maintain its integrity in the presence of chemical and physical insults that include moisture, oxygen, ultra-violet light, acids, alkalies, and solvents. The film must also resist abrasion, impact, and other physical and mechanical factors, such as those produced by extreme temperature and humidity differentials.

It is small wonder that there are paint failures. There are so many opportunities for them.

In all other paint problems, whether they occur in service or during manufacture, application, or drying, something unexpectedly goes wrong. What is it? The question is asked thousands of times a year in thousands of separate failures. In fact, there are almost as many specific causes and mechanisms of failures as there are failures themselves. Nevertheless, many problems follow set patterns, with similar manifestations of distress, progressions of deterioration, and underlying mechanisms. Because of these similarities, there is ample opportunity for intelligent analysis, understanding, and categorization of failures.

In many investigations, the causes of the problem are not specifically isolated. The problem may be addressed most cost-effectively by side stepping it—abandoning the original system, removing it entirely, and, after repairing the original substrate, replacing the defective system with a different one. In such cases, the causes of the original failure may remain unrecognized. Therefore, they are presumably no less likely to recur with the same system, where the same conditions exist that produced the original problem.

Whether isolated or not, one thing is common to all failures: there is a cause. Some factor, or combination of factors, has brought about the unwanted effect. The challenge is to isolate and define the cause.

The reasons for coating failure are not as simple as many would have us believe. Delamination of bridge paint is not always caused by deviations in surface preparation, corrosion of a tank interior is not always caused by insufficiencies in film thickness; the blistering of house paints is not always caused by water. If we are to avoid repeated failures, there is no room for guesses, sloppy work, or sophistry. It is essential that the cause of failure be accurately identified. This not only requires experience (and this should not be minimized), but shrewd observation (the detection of patterns, the recognition of anomalies) and competent analysis. It also requires an understanding of the underlying physics and chemistry.

Unfortunately, failure has no parent. Paint failures, like others, whether they occur during design, manufacture, application, or service, are undesirable. No owner, specification writer, applicator, or manufacturer wants to own them. There is no pride in failure. We would rather sweep the flaking paint under the rug. Only rarely do we volunteer details of the failure for publication. Often as a condition of the resolution of litigation involving paint failures, particularly resolutions involving settlement, participants and expert witnesses are precluded from discussing the problem. And there's the rub. For the longer such conspiracies of silence last, the more difficult it is to avoid repeating errors and making new ones as the technology becomes more complex and the available coatings multiply.

This book is not limited to the study of catastrophic failures. As we have seen, paint ingredients must also blend together satisfactorily and remain homogeneous in the can. The paint must apply without difficulty, dry and cure to give a film that is decoratively pleasing or has long-term engineering value in service. At each of these three stages, things can and do go wrong.

While perhaps less costly and certainly less litigious than troubles that occur in service, problems that beset the paint chemist in designing the coating are nonetheless very troublesome, as are those difficulties that beset the applicator

trying to get the paint from the can or bag onto the substrate. The problems are not limited to the painting of metal, wood, and concrete, but extend also to plaster, drywall, other materials of construction, plastics, textiles, leather, paper, and even glass.

In this book we review paint problems of all kinds and bring some degree of order to the subject. We discuss failure at all stages of the process from design to service, on various common substrates, and in a wide variety of environments. We review some of the techniques and instruments for failure analysis. Wherever possible, we illustrate the subject with examples.

The Scientific Approach

Before we can discuss paint film deterioration itself or the troubles that can occur in application, curing, and service, some very important aspects of paint and paint binder science must be set forth. These are the keys to the workings of well- and poorly-formulated paint systems.

The few prior attempts to categorize and review paint problems have approached the problem empirically and have treated the various phenomena separately. Most of these attempts are thus based on observation of macroscopic failure phenomena, not on the underlying molecular mechanics of the subject. That is, many treatments of failure often focus on the symptoms of the problem rather than analyze the underlying deficiency. In this book we minimize the empirical approach in favor of one more grounded in the underlying physics and chemistry of coatings.

If paint problems are to be understood on more than an empirical level, we must visualize the coating at the molecular level. This enables us to appreciate the structure and behavior of the film both at rest and under stress, and to interpret macroscopic failure in terms of the changes that occur at the molecular level. In this way, the characterization of the problem, if not the solution, becomes more accurate (certainly more ordered) than is the case from empirical characterizations. Rectification should, therefore, be more likely and require far less trial and error than a purely empirical effort.

Paint system failures are difficult to decipher, and the information in this book will not, of course, resolve every paint failure. However it will allow us to group seemingly diverse and unrelated phenomena and to better ensure that the observed paint film response becomes more understandable and predictable. This understanding will help us avoid repeating the failure and might help us to correct it at a minimal cost.

The challenge will be to present this more scientific approach in an easily understandable form. Some familiarity with the basics of paint technology will be helpful. Towards this end, it is recommended that readers refer to the earlier volume *Protective Coatings: Fundamentals of Chemistry and Composition* or to one of the texts in coatings science and technology listed below. There may well be some material in this book that is as unfamiliar to the seasoned bench chemist and formulator as it is to the layman. However, ease of understanding will remain our goal. This may occasionally require over simplification and repetition and there may be some insufficiencies in the treatment of the more esoteric aspects of the subject, but each chapter includes references for a more complete treatment of its particular subject.

Conclusion

We have all made our mistakes. Even the best of us, chemists, applicators, manufacturers, and specifiers alike have lain awake in the early morning hours and quaked to have been so shortsighted. Rather more often, we and our paint have been the unfortunate innocents caught between the coincidental juxtaposition of several independently benign factors that haplessly have combined and conspired to bring us unanticipated havoc.

This book is dedicated, then, to the chemist with his "bad float," to the manufacturer with his "poor grind," to the applicator with his "frothy film," and to the bridge authority with more paint on the floor than on the bridge. It opens with a consideration of the constitution and properties of the polymers used to make the binders in modern coatings. This is followed by a systematic consideration of failures induced by weather, corrosion, mechanical and chemical insults, light and other forms of radiation, heat, and biological agents. Adhesion failures and blistering are also discussed.

The book then turns to a consideration of important substrates other than steel, including other metals (zinc, aluminum, magnesium, copper, titanium and stainless steel), cement and concrete, and wood. The book concludes with failures specific to primers and with failures resulting from deterioration during storage.

Title	Location	Edition / Series / Misc.
103 Paint Handbook <i>Author:</i> Weismantel, Guy E. (editor) <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> ©1981 <i>Subject:</i> Paint -- Handbooks, manuals, etc. <i>Desc:</i> 754 p. in various pagings, illus., 24 cm.	<i>Dynix:</i> 08387 <i>Call No.:</i> 667 Pa <i>ISBN:</i> 0070690618 <i>Shelf</i> Reference	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1981 <i>Price:</i> \$50.00



Table of Contents

Contributors
Preface

1. PAINT FUNDAMENTALS / Trevellyan V. Whittington
 - 1.1 Introduction
 - 1.2 Paint Properties
 - 1.3 Definition and Classification of Paint
 - 1.4 Essential and Specific Properties
 - 1.5 Elements of a Good Paint Job
 - 1.6 Paint Ingredients
 - 1.7 The Paint Formula
2. PAINT TESTING / Trevellyan V. Whittington
 - 2.1 Purpose of Paint Testing
 - 2.2 Classes of Paint Tests
 - 2.3 Description of Typical Paint Tests
 - 2.4 Pointers for Specifying Paint
3. RAW MATERIALS / Elias Singer
 - 3.1 Introduction
 - 3.2 Oils
 - 3.3 Resins
 - 3.4 Driers
 - 3.5 Additives
 - 3.6 Lacquers
 - 3.7 Water-Based Polymers and Emulsions
 - 3.8 Solvents
 - 3.9 Pigments
4. SELECTING THE PAINT SYSTEM / Paul E. Weaver
 - 4.1 Introduction
 - 4.2 Paint System Selection by Customer Requirements
 - 4.3 Service Requirements
 - 4.4 Nature of Substrate
 - 4.5 Basic Functions of Coatings Systems
 - 4.6 Application Limitations and Costs
 - 4.7 The Coating Specification
5. SURFACE PREPARATION: PART I / Guy E. Weismantel
 - 5.1 Introduction
 - 5.2 General Specifications
 - 5.3 Cleaning Methods
 - 5.4 Masonry Surfaces
 - 5.5 Plaster Surfaces
 - 5.6 Drywall Surfaces
 - 5.7 Plastic Surfaces
 - 5.8 Hardboard, Particle Board, and Compressed Board
 - 5.9 Wood Surfaces
6. SURFACE PREPARATION: PART II / Kenneth B. Tator
 - 6.1 Introduction

Subjects

279 . Paint -- Handbooks, manuals, etc.

- 6.2 Surface-Preparation Methods
- 6.3 Surface-Preparation Standards, Inspection, and Inspection Equipment

- 7. COATINGS FOR STEEL / Jon Rodgers, W. M. McMahon, Guy E. Weismantel
 - 7.1 Elements of the Specification
 - 7.2 Mill Scale
 - 7.3 Surface Preparation
 - 7.4 Selecting the Coatings System
 - 7.5 Coating Materials
 - 7.6 Maintenance Finishes
 - 7.7 Shop Priming
 - 7.8 Field Painting
 - 7.9 Inspection and Testing
 - 7.10 Recoating Previously Painted Surfaces

- 8. COATINGS FOR METALS OTHER THAN STEEL / Donald R. Peshek
 - 8.1 Introduction
 - 8.2 Exterior versus Interior Exposures
 - 8.3 Pigmented or Clear Coating
 - 8.4 New Coating versus Recoating
 - 8.5 Durability
 - 8.6 Surface Preparation
 - 8.7 Coatings
 - 8.8 Painting Metals Other Than Steel
 - 8.9 Testing Methods

- 9. EXTERIOR COATINGS FOR WOOD / Benson G. Brand, Guy E. Weismantel
 - 9.1 Introduction
 - 9.2 Factors in Durability
 - 9.3 Modes of Failure
 - 9.4 Classification According to Use
 - 9.5 Classification According to Composition
 - 9.6 Surface-Preparation Systems and Primers
 - 9.7 Typical Formulations
 - 9.8 Economics
 - 9.9 Troublesome Conditions

- 10. INTERIOR ARCHITECTURAL COATINGS / Howard W. Goetz
 - 10.1 Introduction
 - 10.2 Factors Determining Selection of Coatings
 - 10.3 Wall Coatings
 - 10.4 Wood Surfaces
 - 10.5 Metal Surfaces
 - 10.6 Floor Paints
 - 10.7 Types of Paint
 - 10.8 Computing Coverage and Performance

- 11. EXTERIOR MASONRY SURFACES / Harry M. Herr
 - 11.1 Introduction
 - 11.2 Stucco
 - 11.3 Concrete
 - 11.4 Masonry Block
 - 11.5 Mortar
 - 11.6 Brick
 - 11.7 Concrete Flooring and Decking
 - 11.8 Miscellaneous Masonry Surfaces

- 12. ROOF COATINGS / Eric S. Wormser, Kenneth K. Kaiser
 - 12.1 Evolution of Coatings into a System
 - 12.2 Function of Roof Coatings
 - 12.3 Maintaining Existing Roofs
 - 12.4 Installation of New Roof Systems
 - 12.5 Objectives of This Chapter
 - 12.6 Types of Roofing Substrates

- 12.7 Types of Sidewalls
- 12.8 Functions of Roof Coatings
- 12.9 Criteria in Selecting Coating Systems
- 12.10 Types of Topcoating
- 12.11 Coatings for Applying Cap Sheets
- 12.12 Roof Cements
- 12.13 Types of Liquid Roof Systems
- 12.14 Bonds and Guarantees

- 13. FIREPROOF COATINGS / Seymour I. Kawaller
 - 13.1 Introduction
 - 13.2 Fire-Resistive Coatings
 - 13.3 Fire-Retardant Paints
 - 13.4 Design Approach to Fire-Safe Structural Steel

- 14. MARINE PAINTS / Richard J. Dick
 - 14.1 Introduction
 - 14.2 Surface Preparation and Application
 - 14.3 Coating Systems
 - 14.4 Application of Coating Systems to Specific Service Areas

- 15. SPECIFICATION PRODUCTS / Sidney B. Levinson
 - 15.1 Introduction
 - 15.2 Purpose of Specifications
 - 15.3 Specification Composition
 - 15.4 Types of Specifications
 - 15.5 Products for Surface Repair
 - 15.6 Products for Surface Preparation
 - 15.7 Products for Interior Use
 - 15.8 Products for Exterior Use
 - 15.9 Products for Floors
 - 15.10 Products for Road Marking
 - 15.11 Products for Special Uses or Surfaces
 - 15.12 Miscellaneous Specifications
 - 15.13 Numerical Lists
 - 15.14 Proprietary Specifications

- 16. CLEAR COATINGS / Benjamin Farber
 - 16.1 Introduction
 - 16.2 Application Suggestions
 - 16.3 Alkyd Resins
 - 16.4 Urethanes
 - 16.5 Epoxy Finishes
 - 16.6 Phenol Formaldehyde Varnishes
 - 16.7 Modified Phenolic Varnishes
 - 16.8 Fluorocarbons
 - 16.9 Silicone Finishes
 - 16.10 Acrylic and Nitrocellulose Lacquers
 - 16.11 Miscellaneous Clear Finishes
 - 16.12 Application Specifications

- 17. SPECIALIZED FUNCTIONAL COATINGS / William Lawrence
 - 17.1 Introduction
 - 17.2 Chemical-Resistant Coatings
 - 17.3 Chemical-Resistant Vehicles
 - 17.4 Chemical Resistance
 - 17.5 Heat-Resistant Finishes
 - 17.6 Relatively Impermeable Coatings

- 18. APPLICATION TECHNIQUES / Gary Boyd Charlesworth, Guy E. Weismantel
 - 18.1 Selecting the Contractor
 - 18.2 General Performance
 - 18.3 Job Preparation
 - 18.4 Prepaint Techniques

- 18.5 Application Equipment
- 18.6 Guide to Applying Specific Coatings
- 18.7 Application Problems
- 18.8 Inspecting Paint Applications
- 18.9 Safety Precautions

- 19. TROUBLESHOOTING AND INSPECTION / Neil B. Garlock
 - 19.1 Introduction
 - 19.2 Inspection during Construction
 - 19.3 Maintenance Costs
 - 19.4 Specific Paint Problems

- 20. ECONOMICS / Albert H. Roebuck, Guy E. Weismantel
 - 20.1 Introduction
 - 20.2 System Costs
 - 20.3 Figuring Costs
 - 20.4 Discounted Cash Flow
 - 20.5 Maintenance Costs
 - 20.6 Environmental Costs
 - 20.7 Galvanizing versus Zinc-Rich Coatings
 - 20.8 Economics of Special and General Painting Projects

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Architects, engineers, contractors, construction and operating company executives, paint dealers, specification writers—in fact, all persons involved in the selection and specification of paint and other coatings—will find the Paint Handbook an invaluable tool in doing their jobs.

This is a practical Handbook that shows how to choose specific paints or other finishes best suited for a particular surface exposed to a particular environment. It covers a wide variety of paints, varnishes, lacquers, and other architectural and industrial maintenance coatings used for both interior and exterior surfaces.

Unlike other books on the subject, the Handbook is written from the point of view of the paint user instead of the paint formulator. It provides the nuts-and-bolts information needed (and the reasoning behind it) to choose and specify coatings properly. It tells how to avoid pitfalls and handle the related problems that go with the total paint job from selection through application.

The Handbook is fully authoritative throughout, with each of its sections written by an expert in the specific field. Moreover, the book is organized in a unique and particularly useful manner—on the basis of surfaces rather than coatings—making the answers you need extremely easy to find. A full index and scores of cross-references further simplify research, as does the book's overall logical structure.

The first four chapters deal with the basics... and will serve both as an easy-to-follow guide for the beginner and as a useful refresher course for those already widely experienced in paint specification. They cover paint fundamentals, paint testing, paint raw materials, and selecting the painting system.

The next two chapters offer vital know-how on surface preparation... providing the foundation for all paint specifications and for the choice of a coating.

Chapters 7 through 12 form the heart of the book. They cover coatings for steel, coatings for other metals, interior architectural surfaces, exterior wood and masonry surfaces, and roof coatings.

The following chapters treat special topics, such as fireproofing, marine finishes, clear coatings, and specialized functional coatings.

The Handbook concludes with three important chapters covering application techniques, troubleshooting, and economics—each of them a pragmatic approach to what could easily be serious problem areas.

Throughout, the Handbook stresses practicality. It provides a wealth of down-to-earth guidance and problem-solving help on all aspects of this increasingly important—and economically significant—part of the construction industry today.

On any construction job, the most frequent—and noticeable—problems are often those involving paint and painting.

This unique Handbook shows the architect or engineer responsible for specifying paint, varnish, lacquer, or other coatings just what to do to assure the best possible finish on all kinds of interior and exterior surfaces.

Here is just a sample of the wide range of relevant topics covered by the Handbook:

Paint Fundamentals... Paint Testing... Raw Materials... Selecting the Painting System... Surface Preparation... Coatings for Steel... Coatings for Metals Other Than Steel... Exterior Wood Surfaces... Interior Architectural Surfaces... Exterior Masonry Surfaces... Roof Coatings... Fireproof Coatings... Marine Finishes... Specification Paints... Clear Coatings... Specialized Functional Coatings... Application Techniques... Troubleshooting... Economics

PREFACE:

The Paint Handbook is a compilation of practical information related to specifying paint and coatings. As an integral part of this topic, the book covers surface preparation, testing, and troubleshooting. The main emphasis is on architectural and industrial coatings that are field- or shop-applied. The book is meant to serve as a reference work for architects, corrosion engineers, specification writers, painting contractors, and operating companies' staff engineers who are responsible for the proper choice, application, and life expectancy of paints and coatings.

The editor and contributors have concentrated on paint specifications and not on paint formulation. Emphasis is placed on which finishes are best for a particular surface under varying environmental conditions. The book covers the ways in which these finishes are applied, the kinds of materials and equipment employed in the painting process, and the problems that may be encountered and the means of avoiding them.

This is not a textbook; it does not cover theory. It is intended for experienced and inexperienced practitioners who need a ready reference work for basic specification data. It is meant to serve the specialist in paint specification work and the layman who, of necessity, deals with coatings and must understand basic principles without becoming bogged down in minute details of fundamental paint chemistry.

The editor has tried to bring together a finely balanced collection of material written by experts in their specialized fields. Every attempt has been made to discuss paints and coatings generically, without favoring specific products. The Handbook is not meant to be a substitute for good judgment or for practical, proven field experience for coatings that have been used in the past, but it should act to supplement such pragmatic information. If some material is not included, it is only that practical limitations of space precluded the use of everything available.

The heart of this Handbook is the Index. The editor has made this section extensive so that the user can find a particular piece of information to answer a specific question with minimum effort. The Index is comprehensive and practical and contains numerous cross-references.

Obviously this Handbook is based not only on the practical experience of its editor and contributors but on data provided by numerous paint manufacturers, consultants, architects, engineering firms, painting contractors, and technical associations. The editor gratefully acknowledges their input as well as information from the personal files of the contributors. The latter have exercised extreme patience and understanding in helping the editor prepare and keep up to date this volume of technical information. A similar acknowledgment is appropriate for the publisher, whose staff has built flexibility into the editing and production schedule, facilitating last-minute additions to assure that the Handbook is as timely as possible.

INTRODUCTION:

The purpose of this chapter is to present a simplified and condensed survey of paint technology from the user's point of view. Focus is on the selection and use of paint. The chapter deals with the ingredients of paint so that the reader will understand why paint behaves as it does and why it must be used in certain definite ways. The material is presented as an introduction and a handy reference to the general principles of paint technology that are included in the following chapters.

This chapter is built on three concepts:

First concept. Paint should be defined and discussed in terms of its functions. These functions are decorative, protective, and specialized.

Second concept. Paint should be discussed in terms of its essential properties and its necessary specific properties. The

essential properties are those which all paints must possess. The necessary specific properties are those properties which are needed by paints designed for certain specific end uses but which may not be needed by paints designed for other specific end uses.

Third concept. Paint should be treated as an engineering material. This means that it should be specified in accordance with the performance desired in its end use and that the conditions and techniques of its use should be specified and controlled.

Title	Location	Edition / Series / Misc.
940 Paint Problem Solver		Edition: 7th edition
Author:	Dynix: 106366	Series:
Publish.: Paint & Decorating Retailers Association	Call No.: 667.6 Pa	
- place: St. Louis, MO	ISBN:	
- date: ©2000	Shelf Adult Non-Fiction	Year: 2000
Subject: Painting, Industrial -- Handbooks, manuals, etc.		Price: \$82.00
Desc: 136 p., color illus., 30 cm. + 1 "Exterior/Interior Paint Solutions" booklet		

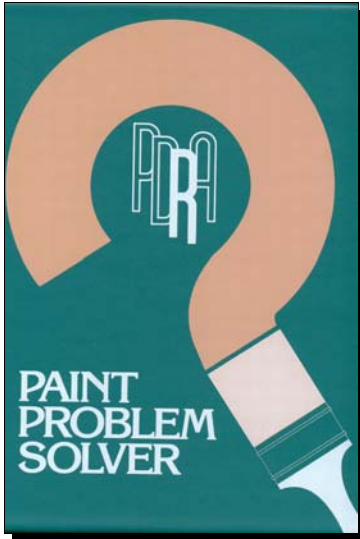


Table of Contents

FORWARD

I. SURFACE PREPARATION/APPLICATOR SELECTION

II. ADHESION

- Alligatoring
- Blistering
- Checking
- Cracking (In Later Stage, Flaking)
- Excessive Chalking
- Intercoat Peeling Under Eaves/Covered Porches (Scaling or Comflaking)
- Peeling From Asbestos Siding Shingles
- Peeling From Galvanized Metal
- Peeling From Hardboard Siding
- Peeling From Masonry and Brick
- Peeling From Metal Doors and Garages
- Peeling From Mill-Glazed Western Red Cedar or Redwood Siding
- Peeling From Wood Due to Moisture
- Peeling From Wooden Window Sills and Frames
- Peeling of Latex Topcoat From Previously Painted Hard, Slick Surfaces

III. APPLICATION

- Applicator Not Holding Enough Coating
- Brush Marks
- Cratering
- Excessive Shedding of Bristles Onto Surface
- Excessive Splatter From Roller Application
- Poor Hiding of Colors
- Sagging
- Uneven Gloss
- Wrinkling

IV. DISCOLORATION

- Algae
- Cedar Stain (Tannic Acid Bleed)
- Fading
- Mildew
- Painting Over Aniline Stains
- Rusty Nail Head Stains
- Staining From Flashing
- Surfactant Leaching
- Wax Bleeding on Hardboard Siding

V. INTERIOR

- Peeling From Ceiling
- Peeling From Concrete Floors
- Peeling From Plaster Walls
- Picture Framing on Drywall (Hatbanding)
- Touch-Up at Different Temperatures

VI. MISCELLANEOUS

- Lap Marks

Subjects

276 .	Paint
594 .	Paint mixing
595 .	Painting, Industrial -- Handbooks, manuals, etc.

Painting Over Areas Where Wailcoverings Have Been Removed
Painting Over Wallpaper and Other Flexible Wallcoverings
Pitch Bleeding From Knots

VII. DEALER COMMENTS

VIII. APPENDIX
PAINT COMPLAINT FORM (Sample)

INDEX
GLOSSARY OF PAINT TERMS
ACKNOWLEDGEMENTS
HEALTH AND SAFETY

Reviews - Synopsis - Dust Jacket

"Exterior/Interior Paint Solutions" ©1998 (23 p.)

EXTERIOR PAINT SOLUTIONS:

This quick reference deck has paint solutions to overcome common situations found on painted surfaces. Each situation has probable causes and recommended paint solutions. If your surface is interior, just flip the deck over for the Interior Paint Solutions.

- Alligatoring
- Blistering
- Chalking
- Checking/Flaking
- Dirt Staining
- Efflorescence
- Fading/Color Retention
- Frosting
- Galvanized Metal Peeling
- Gloss Retention
- Lapping
- Leaching (Surfactant)
- Mildew
- Nailhead Rusting
- Paint Incompatibility
- Peeling: Hardboard/Wood
- Peeling: Masonry/Metal
- Resisting Alkali
- Tannin Wood Staining
- Under Eaves Peeling
- Wax Bleeding
- Wrinkling

SITUATION PHOTOS - If you don't know the technical term for your situation, flip through the photos until you find it.
POWER WASHERS ARE RECOMMENDED - The quick and easy way for the best surface prep. Units are usually for sale or rent at your paint store.

INTERIOR PAINT SOLUTIONS:

This quick reference deck has paint solutions to over come common situations found on painted surfaces. Each situation has probable causes and recommended paint solutions. If your surface is exterior, just flip the deck over for the Exterior Paint Solutions.

- Blocking
- Burnishing
- Caulking Failures
- Coalescence Void
- Cracking/Flaking
- Flashing
- Flow/Leveling Failure
- Foaming/Cratering
- Lapping
- Mildew
- Mud Cracking
- Picture Framing

Poor Hiding
Print Resistance Failure
Roller Marks
Sagging
Scrubbing Failure
Spattering (Roller)
Stain Resistance Failure
Touch-Up Failure
Wrinkling
Yellowing

SITUATION PHOTOS - If you don't know the tech cal term for your situation, flip through the photos until you find it.

FORWARD:

All information presented in the Paint Problem Solver has been checked for accuracy; PDRA disclaims any and all liability and responsibility attendant to its use or misuse and does not guarantee its accuracy or completeness. The book is intended as a guide for dealers, contractors, consumers and other interested parties. It is written in simple language so as to be easily understood by its readers, with photographs of existing paint problems and textual discussion of their causes and solutions. All material in the Paint Problem Solver is based on sound technical opinion from persons and sources believed to be reliable, but no attempt has been made to provide encyclopedic detail.

At this writing, many areas of the United States have regulated VOCs (volatile organic compounds) in architectural coatings in order to improve air quality. Therefore, the recommendations made in this publication may not be applicable in all localities. Your local independent decorating products dealer can tell you how VOC regulations affect the coatings products he or she has available and the recommendations in this book. NOTE: A federal VOC regulation is being considered at the time of publication.

Paint Red Book: Comprehensive Directory of the Formulators & Suppliers to the Paint, Coatings and Ink

LASCT Holdings - maximum detail by Title

P

Title	Location	Edition / Series / Misc.
104 Paint Red Book: Comprehensive Directory of the Formulators & Suppliers to the Paint, Coatings and		<i>Edition:</i> Volume 88, Number 13
<i>Author:</i> D'Amico, Esther (editor)	<i>Dynix:</i> 10571	<i>Series:</i> Modern Paint and Coatings Magazine --
<i>Publish.:</i> Cygnus Publishing Company	<i>Call No.:</i> 667.6 Pa 1999 Dir	ISSN: 0098-7786
<i>- place:</i> Melville, NY	<i>ISBN:</i>	
<i>- date:</i> ©1999	<i>Shelf</i> Reference	<i>Year:</i> 1999
<i>Subject:</i> Paint -- Periodicals		<i>Price:</i> \$89.95
<i>Desc:</i> 284 p., illus., 29 cm.		



Table of Contents

- How to Use
- Preface to the 30th Edition
- Paint and Coatings Formulators:
 - In the United States
 - Outside of the United States
- Ink Manufacturers
- Paint, Coatings and Ink Plants in North America — Geographical
- Paint and Coatings Brand Names
- Independent Sales Agents
- Suppliers to the Paint, Coatings and Ink Industry
- Machinery and Equipment:
 - Production Equipment
 - Laboratory and Testing Equipment
 - Aerosol Machinery and Equipment
- Raw Materials:
 - Additives
 - Catalysts
 - Driers
 - Drying Oils
 - Extenders
 - Ink Production Materials
 - Intermediates
 - Latex Emulsions
 - Pigments — Whites
 - Pigments — Black
 - Pigments — Inorganic
 - Pigments — Organic
 - Pigments — Metallic
 - Pigments — Rust Inhibitive
 - Plasticizers
 - Resins
 - Solvents
 - Testing Chemicals
 - Miscellaneous Raw Materials
 - Raw Materials — Aerosol
- Consultants and Testing Laboratories
- Trade Associations
- Subject Index
- Advertising Index

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

Reviews - Synopsis - Dust Jacket

PREFACE TO THE THIRTIETH EDITION:

The task of updating the 1999 Paint Red Book has been particularly challenging this year in light of the many industry mergers and acquisitions that have occurred and, indeed, are about to become finalized. As you can imagine, keeping abreast of such changes is no small task and we thank those of you who mailed us updates on company name changes and product portfolios.

As in years past, this directory reflects many of the recent changes in the marketplace with updates on more than 1,000 previously listed companies as well as listings of many new firms. Like last year, we received a healthy response to our request for e-mail and/or website addresses. Thus, you will find that this year's Paint Red Book makes it easier than ever

to contact industry firms via the Internet.

If your company is not listed in this edition and would like to be included next year, please take a moment and write us. Include your name, address, phone and fax numbers and mail it to:

Directory Department
Modern Paint and Coatings
445 Broad Hollow Road
Melville, NY 11747

We will add your name to the list when we mail questionnaires for the 2000 update.

As in years past, please note that listings for paint and coating formulators are restricted to only those companies which formulate. Listings for dealers, repackagers and others have been omitted. Raw material as well as machinery and equipment suppliers are limited to direct manufacturers or exclusive sales representatives on a national basis.

Given the size and scope of this directory, we recognize that it may contain errors. We ask that you write to us, calling any mistake to our attention for correction in future issues. Please note, we make no representation that the 1999 Paint Red Book is absolutely accurate or complete, and that nothing presented here should be relied on in any specific instance where there is a possibility of loss or damage resulting from any publication statement, error or omission.

Paint Testing Manual: Physical and Chemical Examination of Paints, Varnishes, Lacquers and Colors

LASCT Holdings - maximum detail by Title

P

Title	Location	Edition / Series / Misc.
105 Paint Testing Manual: Physical and Chemical Examination of Paints, Varnishes, Lacquers and Colors		<i>Edition:</i> 13th edition
<i>Author:</i> Sward, G. G. (editor)	<i>Dynix:</i> 16489	<i>Series:</i> ASTM Special Technical Publication: No. 500
<i>Publish.:</i> American Society for Testing and Materials	<i>Call No.:</i> 667.6 Pa	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i>	
<i>- date:</i> [1972]	<i>Shelf</i> Reference	<i>Year:</i> 1972
<i>Subject:</i> Paint materials -- Testing		<i>Price:</i> \$50.00
<i>Desc:</i> xii, 599 p., illus., 29 cm.		

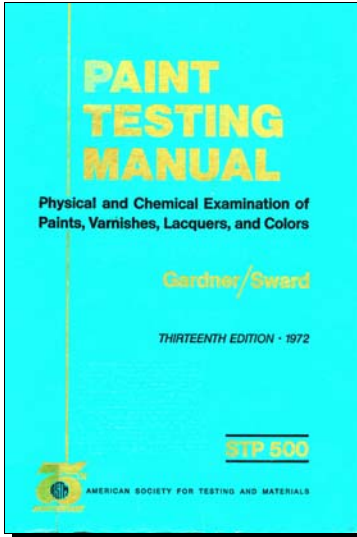


Table of Contents

- Preface
- Biographical Profiles
- Part I: Optical Properties
 - 1.1 Color and Light
 - 1.2 Gloss
 - 1.3 Hiding Power
 - 1.4 Mass Color and Tinting Strength
- Part 2: Raw Materials
 - 2.1 Drying Oils
 - 2.2 Driers and Metallic Soaps
 - 2.3 Natural Resins
 - 2.4 Synthetic Resins
 - 2.5 Cellulosics
 - 2.6 Plasticizers
 - 2.7 Solvents
 - 2.8 Pigments
- Part 3: Physical Properties
 - 3.1 Density, Specific Gravity, and Bulking Values
 - 3.2 Viscosity and Consistency
 - 3.3 Surface Energetics
 - 3.4 Particle Size Measurement
 - 3.5 Oil Absorption of Pigments
- Part 4: Films for Testing
 - 4.1 Preparation of Films for Test
 - 4.2 Measurement of Film Thickness
 - 4.3 Drying Time
- Part 5: Mechanical Properties of Films
 - 5.1 Hardness and Related Properties
 - 5.2 Abrasion Resistance
 - 5.3 Adhesion
 - 5.4 Flexibility
 - 5.5 Tensile Strength and Elongation
- Part 6: Chemical Properties of Films
 - 6.1 Resistance to Water Vapor and Liquid in the Atmosphere
 - 6.2 Chemical Resistance
 - 6.3 Fire Retardance and Heat Resistance
 - 6.4 Biological Deterioration of Paints and Paint Films
- Part 7: Weathering Tests
 - 7.1 Natural Weathering
 - 7.2 Artificial Weathering
 - 7.3 Atmospheric Pollutants
- Part 8: Specific Products
 - 8.1 Tests on Varnishes

Subjects

284 .	Paint materials -- Testing
393 .	Paint materials -- Analysis

- 8.2 Architectural Paint
- 8.3 Cement-Base Paint and the Painting of Masonry
- 8.4 Waxes and Polishes
- 8.5 Putty, Glazing Compounds, Caulking Compounds, and Sealants
- 8.6 Tile-Like Coatings and Seamless Floor Testing
- 8.7 Bituminous Coatings
- 8.8 Traffic Paint
- 8.9 Paint for Marine Environment
- 8.10 Paint for Electrocoating
- 8.11 Printing Ink

Part 9: Analysis of Whole Paint

- 9.1 Sampling, Separations, and Identification of Binder and Solvent
- 9.2 Chemical Analysis of Pigments

Part 10: Instrumental Methods of Analysis

- 10.1 Microscopy
- 10.2 Chromatography
- 10.3 Ultraviolet Spectroscopy
- 10.4 Infrared Spectroscopy
- 10.5 Atomic Absorption and Flam Emission Spectroscopy
- 10.6 Mass Spectrometry
- 10.7 Polarography
- 10.8 Constant-Current Coulometry
- 10.9 Differential Thermal Analysis
- 10.10 Nuclear Magnetic Resonance Spectroscopy

Part 11 Specifications

- 11.1 Sources of Specifications

Index

Reviews - Synopsis - Dust Jacket

PREFACE TO THE THIRTEENTH EDITION:

When the twelfth edition of this book came off the press in 1962, its authors believed that their work was done. Others would henceforth take over—new faces, a new generation, new approaches.

But Dr. John C. Weaver had the idea that the work started by Dr. Henry A. Gardner should live on and grow. All it needed was a permanent sponsor. And this sponsor, he thought, should be the American Society for Testing and Materials, in which Dr. Gardner had been very active. The Society agreed, and in a brief but historic ceremony at the January 1967 meeting of Committee D-1 in Washington, D.C., ownership of the Gardner-Sward Handbook was transferred from the Gardner Laboratory to the American Society for Testing and Materials.

In accepting the gift, the Society assumed responsibility for revising, editing, and publishing future editions of this time-honored work. The project was assigned to Committee D-1 on Paint, Varnish, Lacquer, and Related Materials, who created a permanent subcommittee (Subcommittee 19 on the Gardner-Sward Handbook) to guide the policy and preparation of future editions. A. Gene Roberts was appointed chairman of this working committee which included Harold M. Werner and Mark W. Westgate, with the three officers of Committee D-1, J. C. Moore, J.C. Weaver, and W. A. Gloger, as ex-officio members. George G. Sward who had coauthored most of the previous editions, was selected to be the editor. The thirteenth edition attests to the dedication with which this subcommittee and the contributing authors accomplished their task.

The scope of this book is in keeping with the stated scope of Subcommittee 19: "To provide technical, editorial, and general policy guidance for preparation of the 13th and subsequent editions of the Gardner-Sward Handbook. The Handbook is intended to review for both new and experienced paint technologists the past, present, and foreseeable trends in all kinds of testing within the scope of Committee D-1. It supplements, but does not replace, the pertinent parts (currently parts 20 and 21) of the ASTM Book of Standards. It describes briefly and critically all test methods believed to have significance in the world of paint technology, whether or not these tests have been adopted officially by the Society."

As a general policy, in accordance with the above scope, standard methods that are described in detail in the ASTM Book of Standards are reviewed here only in sufficient detail to indicate the principle of operation, basic techniques and apparatus, area of usefulness, and a critique where appropriate. Test methods of particular merit and importance other than ASTM standard methods are described in greater detail.

Methods of limited usefulness or of largely historical interest are described only briefly. References to original or detailed sources of information are given wherever possible. The overall treatment, while not exhaustive, is sufficiently comprehensive to provide the paint technologist with a broad and critical guide to the selection of appropriate test methods.

A special debt of gratitude is due the authors who, without remuneration and often at a great sacrifice of personal time, contributed the material that made this work possible. Thanks are due also to those organizations that allowed authors to use company time for some of the writing, to contributors of photographs or drawings, and to the reviewers. The editor and the chairman appreciate the helpful interest of the ASTM publications staff.

Title	Location	Edition / Series / Misc.
106 Paint/Coatings Dictionary		<i>Edition:</i>
<i>Author:</i> Federation of Societies for Coatings Technology (Definitions Committee)	<i>Dynix:</i> 16490	<i>Series:</i>
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Fe	
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i>	<i>Year:</i> 1978
<i>- date:</i> ©1978	<i>Shelf</i> Reference	<i>Price:</i> \$50.00
<i>Subject:</i> Paint -- Dictionaries		
<i>Desc:</i> xviii, 613 p., 24 cm.		



Table of Contents

Preface

Abbreviations

Definitions

Thesaurus

- Alphabetical Index of Categories
- Numerical Index of Categories
- Category Listings

Bibliography

- Alphabetical Index of Categories
- Numerical Index of Categories
- References

Temperature Conversion Chart

Periodic Table of the Elements

Subjects

241 .	Coatings -- Dictionaries
278 .	Paint -- Dictionaries

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The technical terms and jargon of the coatings industry and its interfacing technologies are defined in this comprehensive dictionary which contains more than 5500 entries derived through research and consensus by the Definitions Committee of the Federation of Societies for Coatings Technology.

Over 4500 of the terms are defined, and more than 1000 additional entries are synonyms cross-referenced to the defined terms.

SI-approved units and spelling are used throughout.

The broad scope of terms included reveals the obvious usefulness of the dictionary to a wide audience, ranging from the layman, to artists and artisans, to technicians in all the coatings-related fields.

Included are the definitions for approximately 400 color terms, detailing color difference equations, optical phenomena, gloss, hiding, color instrumentation, etc.

Pigment terms have been classified by the Color Index numbers, and pigment synonyms have been extensively cross-referenced to a commonly accepted name.

A unique feature is the classification of all terms into one or more of 73 categories; these have been number coded and appear as superscripts at the end of each definition. The terms are listed in their appropriate categories in the thesaurus, which comprises the second section of the dictionary and serves as a check list for key words, research papers, literature searches, etc.

An extensive bibliography of more than 600 references of dictionaries, glossaries, encyclopedias, and journals of the coatings and allied industries forms the third section of the dictionary.

Several handy reference tables complement the text.

PREFACE:

What began as a concise Glossary for the Paint and Allied Industries, eventually developed into a more encyclopedic Paint/Coatings Dictionary. The "Paint" in the title is for the layman, who will look for a paint dictionary in the library card file, and the "Coatings" caters to the sophisticate. This dictionary, defining the technical terms and jargon of the coatings industry and its interfacing technologies, contains about 5500 entries derived through research and consensus.

In 1965, the Technical Committee of the Philadelphia Society for Paint Technology, searching for an authoritative glossary for the coatings industry, reviewed existing paint dictionaries and glossaries. They were all found to be either out-of-date or insufficiently comprehensive. Consequently, the Committee decided to undertake the ambitious project of compiling a glossary of about 5,000 well-edited, concise definitions. A Glossary Subcommittee was formed to work on this convenient form of information retrieval (a dictionary), which would define the "accepted" vocabulary of the industry. The Philadelphia Society subcommittee, with the addition of Ruth Johnston-Feller, became the Federation's Glossary Committee in 1970 and, finally, the Federation's Definitions Committee in 1974.

The diverse make-up of the committee, with members experienced in paint, varnish, pigment, resin, and color technologies, gave us the range of expertise necessary to take on this task.

Albeit a 13-year effort, it would have taken longer if these dedicated members hadn't traveled long distances (as far as 120 miles) to meet on an average of once every three weeks throughout the year. An average of five members has met 15 times a year over a 12-year period (the last year has been devoted to correcting, polishing, and proofreading). This does not include homework or the work done on color terms by the Inter-Society Color Council Committee. In all, more than 5,000 hours of volunteer effort have been devoted to this project. Often, the intensive decision making and soul searching involved in selecting just the right word or phrase was exhausting — particularly after putting in a full day at work and, for some, journeying a long distance to the meeting site.

Title	Location	Edition / Series / Misc.
760 Painting of Plastics Author: Ryntz, Rose Ann Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1994 Subject: Coatings -- Periodicals Desc: 32 p., illus., 28 cm.	Dynix: 55947-20 Call No.: 667.9 Fe ISBN: 0934010366 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS20 Year: 1994 Price: \$50.00



Table of Contents

- I. INTRODUCTION
 - A. Why Use Plastic?
 - B. Growing Demands for Plastics
- II. PLASTIC TYPES
 - A. Hierarchy of Plastics
 - 1. Thermoplastic
 - a. Commodity
 - b. Intermediate
 - c. Engineering
 - d. Key Engineering and Specialty Plastics
 - e. Advanced
 - 2. Thermoset
 - 3. Alloys and Blends
- III. FACTORS AFFECTING THE SELECTION OF PLASTICS
 - A. Material Requirements
 - 1. Photostability
 - 2. Environmental
 - B. Design Flexibility of Process
- IV. REASONS FOR COATING PLASTIC SUBSTRATES
 - A. Conductivity
 - B. Elimination of Surface Defects
 - C. Prevention of Topcoat/Primer "Strike-in" — Solvent Penetration
- V. ADHESION OF COATINGS TO PLASTICS
 - A. Basic Principles
 - B. Nature of Substrate Surface
 - C. Bonding Conditions
- VI. PLASTIC SURFACE PRETREATMENTS
 - A. Mechanical
 - 1. Plasma
 - 2. CASING
 - 3. Flame
 - B. Chemical
 - C. Solvent
 - D. Summary of Pretreatment Methods
 - E. Adhesion Promoters
- VII. CLEANING PLASTICS
 - A. Pretreatments
 - 1. Aqueous Pretreatment Stages
 - 2. Precleaning
 - 3. Cleaning
 - 4. Rinsing
- VIII. COATING TYPES
 - A. Environmental Constraints (Selecting Compliant Coatings)
 - B. Current Automotive Coating Trends

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

- C. One- and Two-Component Systems
 - 1. Primers
 - 2. Basecoats
 - 3. Clearcoats
 - 4. New Crosslinking Technologies
- D. "Non-Polluting" Coatings
 - 1. Powder Coatings
 - 2. Electron Beam and Ultraviolet Curing Coatings
 - 3. Supercritical Carbon Dioxide Based Coatings

IX. APPLICATION

- A. Selecting Spray Equipment
- B. Cure Processes
- C. QC of Finished Part

X. FUTURE

XI. SUMMARY

XII. REFERENCES

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

"In the year 2050, plastics will be the material of choice in a majority of products. Our homes will be almost totally plastic; modularization will permit relocating rooms, changing floor plans. All-plastic modular automobiles will have composite space frames and will be battery powered, using plastic solar radiation collectors for charging. Highways and city streets will be paved with recycled plastics, with miniature radio transceivers embedded in the roads. In medicine, we will have much greater availability of plastic body components — hearts, kidneys, intestines, and bones. Our world will be dependent upon plastics."

The consumption of plastics in a variety of industries, ranging from electronics to transportation, will continue to rise through the end of the decade and beyond. Plastics in electronic applications are expected to experience the largest growth rate (4.9%) while the transportation and construction industries, which are largely dependent upon economic climates, are expected to experience a decline in growth. Although the state of the economy is believed to have a strong influence on the growth rate of certain industries, and thus consumption of plastic within them, some industries, such as appliances and toys which are usually tied quite closely to economic liquidity of assets, are displaying moderate increases in expected growth rates. By 1996-1997 the use of plastics in appliances and toys will approach a volume of approximately one billion pounds, as opposed to the approximately 800 million pounds utilized today.

A. Why Use Plastic?

The major advantages of choosing plastics as alternatives to metals are numerous:

- 1. Performance and ease of manufacturing
- 2. Cost effectiveness over metal alternatives due to:
 - a. Energy consumption decrease due to decrease in weight,
 - b. Lower cost of tooling, especially for complex shapes and styling, and
 - c. Faster tooling time
- 3. Inherent corrosion resistance properties of plastics
- 4. Styling latitude

B. Growing Demands for Plastics

These advantages have led to the increased use of plastics, particularly in the transportation industry, for both interior and exterior applications. There are a variety of plastics utilized in the transportation industry which range from thermoplastics to thermosets (these terms will be discussed later). In the United States, roughly 20% of the automotive market segment still uses poly(urethane), but with the advent of a greater desire to recycle, poly(olefin), poly(vinyl chloride), and acrylonitrile-butadiene-styrene (ABS) plastics, at estimated usage levels of 29.2%, 10.0%, and 11.6%, respectively, are becoming more popular. Consumption of automotive plastics in the United States is expected to double to a volume of 4.17 billion pounds by 1999. The ten highest growth applications alone will account for an increased 744 million pounds per year. Applications such as pick-up bodies, gas tanks, and interior trim will utilize plastics such as ABS,

nylons, poly(vinyl chloride), and poly(olefin), which are expected to be the plastics most widely consumed.

Recyclability, becoming a key issue in many industries due to the onslaught of governmental regulations in Europe, the U.S., Canada, and many other countries, is a key determinant in the selection of plastics, particularly thermoplastics, because of the solid waste disposal problem. Currently, 73% of municipal waste in the U.S., vs. 30% in Japan, and 80% in Europe, currently gets disposed of in landfills. In the United States alone, it is expected that 85% of the landfills which existed in 1978 will be closed within eight years. The cost of dumping, in many places, is now up to \$100 per ton — and keeps going up.

Post-consumer plastic waste, particularly automobiles, consumer appliances, business machines, and housing and construction materials, is being recycled in Western Europe at a rate of 7.4% annually of its 25.1 billion pounds, and it recovers another 14.7% in the form of energy from incineration. In comparison, about 0.8% of post-consumer plastic waste in the United States was recycled in 1988. A 1990 market study by Find/SVP in New York, however, proposed a rise of 6.5% in 1993.

As a result of recycling mandates, the U. S. demand alone for recycled plastics such as poly(ethylene terephthalate), high and low density poly(ethylenes), poly(propylene), poly(vinyl chloride), and poly(styrene), continues to rise. According to some estimates, the demand for the aforementioned recyclable plastics is expected to rise from roughly 500 million pounds of material utilized today to nearly 1800 million pounds by 1995 to meet post-consumer waste recyclability regulations.

Title	Location	Edition / Series / Misc.
817 Paints, Coatings and Solvents Author: Stoye, Dieter and Werner Freitag (editors) Publish.: Wiley - VCH - place: Weinheim, Germany - date: ©1998 Subject: Paint Desc: xvii, 414 p., illus., 25 cm.	Dynix: 99415 Call No.: 667.6 Pa ISBN: 3527288635 Shelf Adult Non-Fiction	Edition: 2nd edition, Completely revised Series: Year: 1998 Price: \$118.50

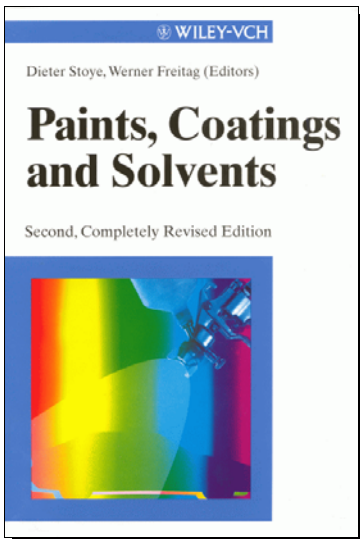


Table of Contents

- 1. Introduction
 - 1.1. Fundamental Concepts
 - 1.2. Historical Development
 - 1.3. Composition of Paints
 - 1.3.1. Binders and Resins
 - 1.3.2. Plasticizers
 - 1.3.3. Pigments and Extenders
 - 1.3.4. Paint Additives
 - 1.3.5. Solvents
 - 1.4. Paint Application
 - 1.5. Drying and Film Formation
 - 1.6. Multicoat Systems
 - 1.7. Economic Aspects
 - 1.8. Future Outlook
- 2. Types of Paints and Coatings (Binders)
 - 2.1. Oil-Based Coatings
 - 2.2. Cellulose-Based Coatings
 - 2.2.1. Nitrocellulose Lacquers
 - 2.2.1.1. Raw Materials
 - 2.2.1.2. Application and Uses
 - 2.2.2. Organic Cellulose Ester Coatings
 - 2.2.2.1. Cellulose Acetate Butyrate
 - 2.2.2.2. Cellulose Acetate Propionate
 - 2.3. Chlorinated Rubber Coatings
 - 2.3.1. Starting Products
 - 2.3.2. Chlorinated Rubber Paints
 - 2.3.3. Chlorinated Rubber Combination Paints
 - 2.4. Vinyl Coatings
 - 2.4.1. General Properties
 - 2.4.2. Coatings Based on Polyolefins and Polyolefin Derivatives
 - 2.4.3. Poly(Vinyl Halides) and Vinyl Halide Copolymers
 - 2.4.3.1. Poly(Vinyl Chloride) and Vinyl Chloride Copolymers
 - 2.4.3.2. Vinylidene Chloride Copolymers
 - 2.4.3.3. Fluoropolymer Coatings
 - 2.4.4. Poly(Vinyl Esters)
 - 2.4.4.1. Solid Resins
 - 2.4.4.2. Dispersions
 - 2.4.5. Poly(Vinyl Alcohol)
 - 2.4.6. Poly(Vinyl Acetals)
 - 2.4.7. Poly(Vinyl Ethers)
 - 2.4.8. Polystyrene and Styrene Copolymers
 - 2.5. Acrylic Coatings
 - 2.6. Alkyd Coatings
 - 2.6.1. Alkyd Resin Binders and Uses
 - 2.6.2. Additional Raw Materials
 - 2.6.3. Production
 - 2.6.4. Environmental and Health Protection Measures
 - 2.7. Saturated Polyester Coatings
 - 2.7.1. Properties
 - 2.7.2. Production of Polyester Resins and Coatings

Subjects

239 .	Coatings
276 .	Paint
330 .	Solvents

- 2.7.3. Cross-Linking of Polyester Resins
- 2.7.4. Uses
- 2.8. Unsaturated Polyester Coatings
 - 2.8.1. Unsaturated Polyester Binders
 - 2.8.2. Other Raw Materials
 - 2.8.3. Formulation, Application, Use,
 - 2.8.4. Storage, Transport, Toxicology
- 2.9. Polyurethane Coatings
 - 2.9.1. Raw Materials
 - 2.9.2. Polyurethane Systems
 - 2.9.2.1. One-Pack Systems
 - 2.9.2.2. Two-Pack Systems
 - 2.9.3. Properties and Uses
- 2.10. Epoxy Coatings
 - 2.10.1. Epoxy Resin Types
 - 2.10.2. Curing Agents
 - 2.10.3. Chemically Modified Epoxy Resins
 - 2.10.4. Uses
 - 2.10.4.1. Curing at Ambient Temperature
 - 2.10.4.2. Curing at Elevated Temperature
 - 2.10.4.3. Radiation Curing
 - 2.10.5. Toxicology
- 2.11. Silicone Coatings
- 2.12. Urea, Benzoguanamine, and Melamine Resins for Coatings
- 2.13. Phenolic Resins for Coatings
 - 2.13.1. Resols
 - 2.13.2. Novolacs
 - 2.13.3. Modified Phenolic Resins
- 2.14. Asphalt, Bitumen, and Pitch Coatings
 - 2.14.1. Asphalt and Asphalt Combination Coatings
 - 2.14.2. Bitumen Coatings
 - 2.14.3. Bitumen Combination Coatings
 - 2.14.4. Pitch Coatings
- 2.15. Silicate Coatings
 - 2.15.1. Water Glass Coatings
 - 2.15.2. Alkyl Silicates
- 3. Paint Systems
 - 3.1. Solventborne Paints
 - 3.1.1. General Information
 - 3.1.2. Properties and Raw Materials
 - 3.1.3. Environmental Protection and Application Technology
 - 3.2. Solvent-Free and Low-Solvent (High-Solids) Paints
 - 3.2.1. Principles
 - 3.2.2. Production and Uses
 - 3.3. Waterborne Paints
 - 3.3.1. Properties
 - 3.3.2. Production and Application
 - 3.3.3. Uses and Environmental Aspects
 - 3.4. Coating Powders
 - 3.4.1. Introduction and Economic Importance
 - 3.4.2. Production
 - 3.4.3. Properties
 - 3.4.4. Testing
 - 3.4.5. Storage and Transportation
 - 3.4.6. Environmental Aspects and Safety
 - 3.4.7. Uses
 - 3.5. Waterborne Dispersion Paints (Emulsion Paints)
 - 3.6. Nonaqueous Dispersion Paints
 - 3.7. Radiation-Curing Systems
 - 3.7.1. Introduction
 - 3.7.2. Radiation-Curable Systems Based on Acrylates
 - 3.7.3. Equipment
 - 3.7.4. Fields of Application

3.8. Electrodeposition Paints

4. Pigments and Extenders

- 4.1. Inorganic Pigments
- 4.2. Organic Pigments
- 4.3. Extenders
 - 4.3.1. Introduction
 - 4.3.2. Properties
 - 4.3.3. Modification of Extenders

5. Paint Additives

- 5.1. Defoamers
- 5.2. Wetting and Dispersing Additives
- 5.3. Surface Additives
- 5.4. Driers and Catalysts
- 5.5. Preservatives
- 5.6. Rheology Additives
- 5.7. Light Stabilizers
- 5.8. Corrosion Inhibitors
- 5.9. Use and Testing of Additives

6. Paint Removal

- 6.1. Paint Removal from Metals
 - 6.1.1. Chemical Paint Removal
 - 6.1.2. Thermal Paint Removal
 - 6.1.3. Mechanical and Low-Temperature Paint Removal
- 6.2. Paint Removal from Wood and Mineral Substrates

7. Production Technology

- 7.1. Principles
- 7.2. Paint-Making Processes
 - 7.2.1. Varnishes
 - 7.2.2. Paints
 - 7.2.3. Coating Powders
- 7.3. Apparatus
 - 7.3.1. Mixers
 - 7.3.2. Dissolvers
 - 7.3.3. Kneaders and Kneader Mixers
 - 7.3.4. Media Mills
 - 7.3.5. Roller Mills
 - 7.3.6. Filter Systems

8. Paint Application

- 8.1. Types of Substrate
- 8.2. Pretreatment of Substrate Surfaces
 - 8.2.1. Pretreatment of Metallic Substrates
 - 8.2.1.1. Cleaning
 - 8.2.1.2. Degreasing
 - 8.2.1.3. Formation of Conversion Layers
 - 8.2.2. Pretreatment of Plastics
 - 8.2.3. Pretreatment of Wood
- 8.3. Application Methods
 - 8.3.1. Spraying (Atomization)
 - 8.3.2. Electrostatic Atomization
 - 8.3.3. Dipping
 - 8.3.4. Miscellaneous Wet Paint Coating Methods
 - 8.3.5. Powder Coating
 - 8.3.6. Coating of Plastics and Wood
- 8.4. Paint Curing Methods

9. Properties and Testing

- 9.1. Properties of Coating Materials
- 9.2. Properties of Coatings
 - 9.2.1. Films for Testing

- 9.2.2. Optical Properties
- 9.2.3. Mechanical Properties
- 9.2.4. Chemical Properties
- 9.2.5. Weathering Tests

- 10. Analysis
 - 10.1. Analysis of Coating Materials
 - 10.1.1. Separation of the Coating Material into Individual Components
 - 10.1.2. Analysis of Binders
 - 10.1.3. Analysis of Pigments and Extenders
 - 10.1.4. Analysis of Solvents
 - 10.1.5. Analysis of Additives
 - 10.2. Analysis of Coatings

- 11. Uses
 - 11.1. Coating Systems for Corrosion Protection of Large Steel Constructions (Heavy-Duty Coatings)
 - 11.2. Automotive Paints
 - 11.2.1. Car Body Paints
 - 11.2.2. Other Automotive Coatings
 - 11.3. Paints Used for Commercial Transport Vehicles
 - 11.3.1. Railroad Rolling Stock
 - 11.3.2. Freight Containers
 - 11.3.3. Road Transport Vehicles
 - 11.3.4. Aircraft Coatings
 - 11.4. Marine Coatings
 - 11.4.1. Substrate, Surface Preparation, and Priming
 - 11.4.2. Ship Paint Systems
 - 11.4.3. Fouling and Antifouling
 - 11.5. Coil Coating
 - 11.6. Coatings for Domestic Appliances
 - 11.7. Coatings for Packaging (Can Coatings)
 - 11.8. Furniture Coatings
 - 11.9. Coatings for Buildings
 - 11.9.1. Exterior-Use Coatings
 - 11.9.2. Interior-Use Coatings

- 12. Environmental Protection and Toxicology
 - 12.1. Clean Air Measures
 - 12.2. Wastewater
 - 12.3. Solid Residues and Waste
 - 12.4. Toxicology

- 13. Economic Aspects

- 14. Solvents
 - 14.1. Definitions
 - 14.2. Physicochemical Principles
 - 14.2.1. Theory of Solutions
 - 14.2.2. Dipole Moment, Polarity, and Polarizability
 - 14.2.3. Hydrogen Bond Parameters
 - 14.2.4. Solvation
 - 14.2.5. Solvents, Latent Solvents, and Non-Solvents
 - 14.2.6. Dilution Ratio and Dilutability
 - 14.2.7. Influence of Molecular Mass on Solubility
 - 14.2.8. Dissolution and Solution Properties
 - 14.3. Physical and Chemical Properties
 - 14.3.1. Evaporation and Vaporization
 - 14.3.2. Hygroscopicity
 - 14.3.3. Density and Refractive Index
 - 14.3.4. Viscosity and Surface Tension
 - 14.3.5. Vapor Density
 - 14.3.6. Thermal and Electrical Data
 - 14.3.7. Flash Point, Ignition Temperature, and Ignition Limits
 - 14.3.8. Heats of Combustion and Calorific Values

- 14.3.9. Chemical Properties
- 14.4. Toxicology and Occupational Health
 - 14.4.1. Toxicology
 - 14.4.2. Occupational Health
- 14.5. Environmental and Legal Aspects
 - 14.5.1. Environmental Protection
 - 14.5.2. Laws Concerning Dangerous Substances
 - 14.5.3. Fire Hazard
 - 14.5.4. Waste
- 14.6. Purification and Analysis
- 14.7. Uses
 - 14.7.1. Solvents in Paints
 - 14.7.2. Solvents in Paint Removers
 - 14.7.3. Solvents in Printing Inks
 - 14.7.4. Extraction
 - 14.7.5. Extractive Distillation
 - 14.7.6. Chromatography
 - 14.7.7. Solvents for Chemical Reactions
 - 14.7.8. Solvents for Recrystallization
 - 14.7.9. Solvents in Film Production
 - 14.7.1G. Solvents for Synthetic Fibers
 - 14.7.11. Solvents for Rubber, Plastics, and Resin Solutions
 - 14.7.12. Solvents for Degreasing
 - 14.7.13. Solvents for Dry Cleaning
 - 14.7.14. Solvents in Aerosol Cans and Dispensers
- 14.8. Economic Aspects
- 14.9. Solvent Groups
 - 14.9.1. Aliphatic Hydrocarbons
 - 14.9.2. Cycloaliphatic Hydrocarbons
 - 14.9.3. Terpene Hydrocarbons and Terpenoids
 - 14.9.4. Aromatic Hydrocarbons
 - 14.9.5. Chlorinated Hydrocarbons
 - 14.9.6. Alcohols
 - 14.9.7. Ketones
 - 14.9.8. Esters
 - 14.9.9. Ethers
 - 14.9.10. Glycol Ethers
 - 14.9.11. Miscellaneous Solvents

15. References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book builds up on the success of the first edition of Paints, Coatings, and Solvents. This completely revised second edition offers an up-to-date overview of the industrial aspects of these materials, including composition, production, processing, uses, and methods of analysis. Special attention is given to toxicology and environmental protection concerns. Chapters have been written by a collection of internationally renowned authors.

Target Audience: Any reader concerned with the paints and coatings industry, from raw material developers, paint chemists and formulators, to quality, research, and purchasing personnel in end-user industries.

Editorial Reviews

From Book News, Inc.

Both a practical guide and a reference for chemists and chemical engineers, presenting the articles "Paints and Coatings" and "Solvents" as published in the fifth edition of Ullmann's Encyclopedia of Industrial Chemistry. An up-to-date overview of the industrial aspects of paints, coatings, and solvents, including composition, production, processing, uses, and methods of analysis. Special attention is given to toxicology and environmental protection matters. Annotation copyright Book News, Inc. Portland, Or. --This text refers to the Hardcover edition.

Book Description

This book offers the combined qualities of a self-contained practical guide and a comprehensive reference work. It is an

essential text for all those working with paints, coatings, and solvents.

Preface to the Second Edition

The work at hand offers a wealth of information about coating materials and coating processes in a form that is clearly laid out. The swift pace of developments in the past few years has made a revised edition seem appropriate. The organization and structure of the work have been maintained, but changes and additions to content have been made where necessary. In particular, attention has been paid to updating economic data and information on standards, laws, and regulations. Commercially available products and their producers have also been subject to clearly recognizable changes, and these changes have been in part caused by the growing tendency of companies to merge and concentrate on their core businesses.

Among products and processes, the trend to environmentally friendly alternatives has also increased, even though the share of solvent-containing coating materials still dominates the market. Therefore, the article on solvents will remain indispensable for some time to come. The second edition will serve to confirm the book in its role as a standard reference for anyone working with coatings.

INTRODUCTION

Paints or coatings are liquid, paste, or powder products which are applied to surfaces by various methods and equipment in layers of given thickness. These form adherent films on the surface of the substrate.

Film formation can occur physically or chemically. Physical film formation from liquid coatings is known as drying, whereas for powder coatings, it is melting process. Drying is always associated with evaporation of organic solvents or water. Physical film formation is only possible if the coating components remaining on the substrate are solid and nontacky. Chemical film formation is necessary if the coating components are liquid, tacky, or pasty; conversion to a solid nontacky film takes place by chemical reaction between the components. The reactive components can be constituents of the coating, and the reaction can be initiated by energy (heat or radiation) after application of the coating. However, it is also possible to add a reaction partner while applying the coating (multipack paints). A special case of chemical film formation is the oxidation of coating component(s) by atmospheric oxygen (air drying). Physical and chemical film formation are often combined, e.g., in solvent-containing stoving paints, where the first stage is solvent evaporation, after which the film is cured by stoving. The properties of a paint are determined by its qualitative and quantitative composition, suitable choice of which enables the viscosity, electrical conductivity, and drying behavior to be matched to the application conditions. Also, the properties of the coating film (luster, elasticity, scratch resistance, hardness, adhesion, and surface structure) are determined by the paint properties. However, the condition of the substrate surface (cleanliness and freedom from dust and grease) is also important.

Coatings must fulfill many requirements. They protect the substrate against corrosion, weathering, and mechanical damage; have a decorative function (automotive coatings, household appliances, furniture); provide information (traffic signs, information signs, advertising); or have other specific properties.

"Coating" is a general term denoting a material that is applied to a surface. "Paint" indicates a pigmented material, while "varnish" refers to a clear lacquer (ISO 4618/1; DIN 55945).

Title	Location	Edition / Series / Misc.
<p>107 Paper Coating Trends in the Worldwide Paper Industry</p> <p><i>Author:</i> Patrick, Ken L. (editor) <i>Publish.:</i> Miller Freeman Publications <i>- place:</i> San Francisco, CA <i>- date:</i> ©1991 <i>Subject:</i> Paper coatings <i>Desc:</i> 164 p., illus., 28 cm.</p>	<p><i>Dynix:</i> 53690 <i>Call No.:</i> 676.235 Pa <i>ISBN:</i> 087930247X <i>Shelf:</i> Adult Non-Fiction</p>	<p><i>Edition:</i> <i>Series:</i> Pulp & Paper Focus Books <i>Year:</i> 1991 <i>Price:</i> \$58.00</p>

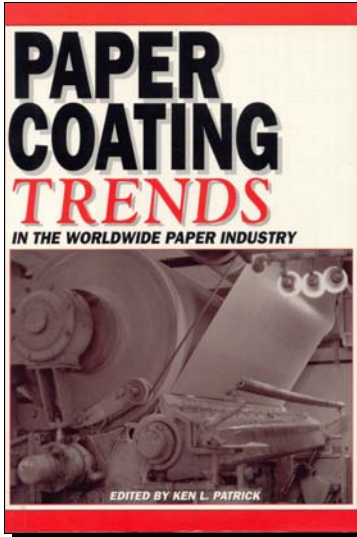


Table of Contents

Foreword

SECTION I. Coated Paper Trends, Markets

1. LWC Technology Shaped by Changing Markets and New Grade Competition
2. Coated Paper Trends: U.S. Producers Boost Quality with New Technology

SECTION II. Pigments, Polymers, Binders

3. Kaolin Clay: Examination of Coating Characteristics by Grade, End Uses
4. Fine Calcined Kaolin Pigments Are Superior for Many Coating Uses
5. Excessive Viscosity Specifications Can Harm Coating Performance
6. Coating Properties Can Be Optimized with "Customized" Blended Clays
7. Consumption of Pigments Continues to Be Driven by Need for Opacity
8. Hollow-Sphere Pigment Improves Gloss, Printability of Paper
9. Coating, Wet End Filling Improved by Using New Structured Pigments
10. Talc Use in Coating Formulas Gains Popularity in European Paper Mills
11. Bacteria Cellulose Has Potential Application as New Paper Coating
12. Kruger Cuts Coating Pigment Losses \$300,000/Year with New Filter System
13. Pigment Suppliers/Customers Set Guidelines for SQC Data Reporting

SECTION III. Mill Coater Installations

14. Blandin Paper's New Coater Features Latest Technology, Control Strategy
15. Gulf States Completes Major Coater Rebuild on No. 1 Paper Machine
16. Watervliet Paper Applies Double Coating Using a Single Operation
17. Gilman Paper Rebuilds Coater and Installs the "Ultimate" Air Knife
18. New Coaters Improve Printability of Folding Combination Boxboard

SECTION IV. North American Coated Paper Machine Expansions

19. Boise Brings Second Rebuilt Machine Online at Rumford Coated Paper Mill
20. Blandin Paper Completes \$350-Million Lightweight Coated Expansion Project
21. Repap Begins Major Coated Free-Sheet Capacity Expansion at Midtec
22. Consolidated Paper's Biron 26 LWC Paper Machine Starts Up Smoothly
23. St. Francisville Modernizations Keep James River Mill a Quality Leader
24. Bowater Carolina Adds Lightweight Coated Paper Machine at Catawba
25. Miramichi Mill is Now Producing LWC with Pulp from Two Canadian Mills

SECTION V. World Coated Paper Machine Expansions

26. Enzo-Gutzeit Rebuilds Kaukopaa PM 6 to Produce New Matt-Finished Papers
27. Raurna Converts Newsprint Machine to Surface Treated and LWC Grades
28. New Caledonian Paper Mill Begins UK's First Domestic LWC Production
29. Haindl Papier Takes Advantage of Lightweight Coated Boom in Europe
30. World's Widest LWC Line Up at UPM's Kaipola Mill in Finland
31. Tenma Expands Coated Board Output as Thailand Domestic Demand Rises
32. Szolnok PM 5 Fills Hungary's Rising Demand for Coated Printing Papers
33. Leykam Chooses High-Tech Flexibility for Ultra-Modern LWC Line in Austria
34. Kymi Gives Birth to New Generation Business Paper at Kuusankoski Mill
35. Tampella Moves into Coated Papers with 5.4-m MFC Machine at Anjala

SECTION VI. Advances in Drying

36. Paper Qualities Influenced by Drying Techniques and Surface Coatings
37. Flotation, Infrared Drying Boosts Efficiency of Paper Coating Stage
38. Surface of Coated Grades Enhanced by High-Intensity Infrared Drying

Subjects

288 . Paper coatings

- SECTION VII. Coating Kitchens and Coater Control
- 39. Gulf States Expands Coating Operation with Automated Kitchen Control System
- 40. Automated System Prepares Coating for World's Largest LWC Machine
- 41. Mead Escanaba Modernizes Coating Make-Down Area for Better Mixing
- 42. Coating Kitchen, Control System Improves Midtec's Grade Capability
- 43. PLC's Maximize Product Quality, Keep Coating Process on Target
- 44. Scotland's Caledonian Paper Mill Boosts Paper Machine Runability
- 45. Sheet Counter Uses a Collimated Light Beam to Ensure Accuracy

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Many coated paper mills put up a "shield" around their coating kitchens to keep competitive color formulations and application methods as secret as possible. The coating process is constantly evolving as pigment engineering and polymer research continue to put more tools in the hands of the coating specialist. Paper Coating Trends explores some of the industry's most carefully protected methodology, focusing on worldwide coating practices, in-use chemistry, and mechanics of modern coating technology.

Forty-five articles have been specially selected by Pulp & Paper editor Ken L. Patrick for mill personnel who make quality and cost reduction decisions every day—and for engineers and managers who make major equipment purchasing decisions.

Seven sections cover: (1) coated paper market trends; (2) pigments, polymers, binders; (3) case studies of new coater installations; (4) North American coated paper machine expansions (5) world coated paper machine expansions (6) advances in drying (7) new approaches to process control in the coater and coating kitchen areas.

FORWARD:

For readers unfamiliar with coated paper classifications and related terminology, the following information should be helpful in reading and appreciating the 45 chapters of this book. First, coated papers can be classified two general ways—coated one side (C1S) or coated two side (C2S). They can then be broadly categorized as groundwood containing or coated free sheet.

CIS demand and capacity has slowly declined world wide in recent years, representing, for example, only about 5% of the total U.S. coated paper market. Most of this grade (about 85%) is used for labels, with the remaining production used for envelopes, business forms, some books, and various other converted paper products. C2S grades are used primarily for magazines, catalogs, and assorted advertising and promotional materials.

Coating base stock papers containing 10% or more mechanical pulp is considered to be groundwood, and those containing less than 10% mechanical pulp fiber are categorized as free sheet. Typically, coated ground- wood papers are referred to as LWC (lightweight coated), although generally speaking, LWC papers are those be low a basis weight of about 40 lb. However, basis weight categorization is constantly changing, and some mills employ liberal grading standards.

Beyond these two general categories (C1S or C2S and groundwood or free sheet), coated papers range from superpremium high quality to No. 5 lower quality, less expensive grades. The superpremium, No. 1, No. 2, and No. 3 coated papers are normally made from free sheet chemical pulps. Approximately half of No. 4 papers contain large amounts of mechanical pulp, and No. 5 grades almost always have very high percentages of mechanical pulp. Some 50% of the total coated paper produced today is No. 5, and the percentage of LWC (No. 5 and No. 4) is increasing as postal rates continue to rise around the world.

Basis weights of premium No. 1 and No. 2 coated pa per grades are generally 60 lb. to 100 lb., while No. 3 and No. 4 "premium" grades generally range from 25 lb. to 90 lb. Coated groundwood paper (No. 4 and No. 5) basis weights have varied from 23 lb. to 50 lb., although these weight ranges are now regularly dipping below 30 lb., and some have risen as high as 70 lb., again depending on the mill and its particular markets.

Normally, LWC groundwood papers are used in magazines, newspaper supplements, books, flyers, etc. Coated free sheets are more typically used in upscale magazines, annual reports, catalogs, and other advertising and promotional materials. As an example of these typical uses, about 12% of No. 3 coated paper production goes to magazine publishers and 65% to 70% goes to commercial printers for higher quality printing jobs.

Coating ingredients for No. 1 to No. 5 grades also differ considerably. Coating formulations for expensive, high basis

weight No. 1 grades, for example, are high in titanium dioxide, premium kaolin coating clays, and synthetic polymers. No. 2 grade coatings are fairly high in titanium dioxide and have some premium coating clays and synthetics. The coating for No. 3 grades is mostly premium to mid-quality clay and some titanium dioxide. The less expensive, lower brightness, No. 4 grade coatings contain lower quality clays and little titanium dioxide. Coatings for No. 5 grade vary considerably, with some containing high percentages of synthetic materials.

Coated paper markets, production capacities, and technologies have evolved significantly in the past quarter century, and particularly during the past decade. As world coated-paper mills entered the 1990s, "runaway" demand for coated grades that had continued through most of the 1980s began to slow. In response, production edged down in almost every grade.

In the U.S., coated mill output peaked in 1988 at some 7.4 million tons, and flattened or fell slightly over the next two to three years. In Western Europe, production increased through 1989 (about 9.5 million total metric tons), then held steady or declined for several years as economic growth cooled in most countries and demand for coated papers fell accordingly.

During this market transition period, coated paper capacity has continued to rise in most countries, including Japan. In the U.S., for example, total coated paper capacity of around 6.7 million tons grew in steady increments to about 8.5 million tons in 1990 and near 9.5 million tons in 1992. Increases were even more dramatic in Canada, jumping almost 40% in 1990 to about 750,000 tons and near 900,000 tons in 1991.

In the U.S., coated free sheet growth has outstripped that for coated groundwood in recent years. In 1985, for example, coated free sheet capacity was almost a million tons less than coated groundwood capacity (2.845 million tons versus 3.820 million tons). In 1991 the gap closed to 4.28 million tons versus 4.62 million tons, and a year later, coated free sheet capacity grew to or even slightly exceeded that of coated groundwood.

Since magazines consume between a half and three fourths of LWC groundwood containing production, trends in this sector obviously track the ups and downs in consumer and trade magazines and catalogs. As previously mentioned, the trend to lower basis weight LWC grades will continue throughout the 1990s to keep publishers' mailing and distribution costs down.

The simultaneous push for lower basis weights and higher opacity, improved printing surface, and better strength characteristics will continue to pressure producers and promote development and implementation of new technology. Improvements in the base sheet have occurred with the refinement and increased use of chemically enhanced groundwood. Coatings have been enhanced by new polymer developments and special engineered pigments, as well as continued quality improvements in both precipitated and extra-fine-ground natural calcium carbonates.

A recent trend touched on in several chapters of this book is neutral or alkaline production of LWC grades in Europe. Some coating experts and industry observers foresee this trend possibly spreading to North America beginning later this decade. As it has in Europe and other parts of the world, neutral LWC groundwood production could open the door to some advantageous uses of various pigments, especially calcium carbonates, in the coatings as well as fillers in the base stocks of these mainly acid-based grades.

Following a Section 1 review of changing LWC markets and a general analysis of recent coated paper technology developments, Section 2 takes an in-depth look at pigments, polymers, and binders. Beginning with an examination of kaolin coating characteristics by grade and end use in Chapter 3, this section assesses current markets and applications for calcined clay, a special "hollow-sphere" pigment, chemically-structured (kaolin-based) pigments, talc, carbonates, latexes, and various "customized" blends of all of these. Chapter 11 reports on a biotechnologically-manufactured cellulose with potential application as a new paper coating.

Section 3 reports on five recent North American mill coater installations, each employing some of the industry's latest technology, including short dwell application units and air knife coaters. The latter units received a new lease on life as mills began using more recycled fibers and unbleached pulps in their base stocks during the late-1980s and early-1990s. Sections 4 and 5 cover seven North American and ten world coated paper machine expansions, respectively. Many of the new or up graded European machines included on-machine coaters.

Advances in coating drying techniques and equipment are examined in Section 6. Recent gains in infrared technology are particularly expanded in these three chapters. The final Section 7 of this book looks at coating kitchen philosophies and practices as well as latest approaches to coater control.

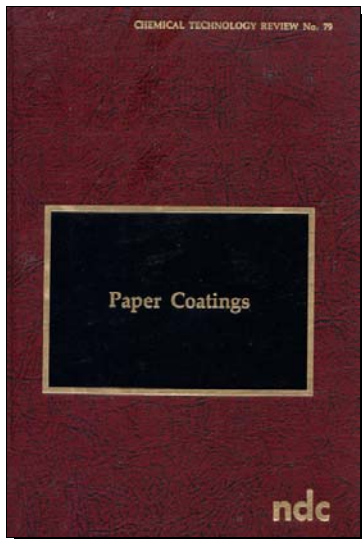
The outlook for coated papers during the remainder of the 1990s and into the twenty first century is generally mixed. Nos. 1, 2, and 3 grades should experience strong growth during the first half of the decade, with some new premium or superpremium No. 1 grades already introduced. These new grades possess better reproduction qualities and have higher prices than the established No. 1 papers.

European producers have made some significant in roads into U.S. superpremium and No. 1 and No. 2 markets, currently supplying almost 10% of the demand for these grades. This trend will likely continue into the near future, at least.

Overall, No. 2 grades should increase their share of the total coated paper market to about 5%. No. 3 grades will grow at near 6% annually because they are mainly produced at kraft mills, providing a distinct cost advantage. For a minor price increase, customers can upgrade from No. 4 grades, which are typically made at mills that have to purchase kraft pulps. Demand for No. 4 free sheet will grow faster than demand for many No. 4 groundwood containing grades. On a worldwide basis, demand for No. 5 LWC papers should continue growing, but at more stable and possibly even flat rates through out this decade.

Articles were selected for inclusion in this book based on specific technologies or approaches used at various mills. They were also chosen to reflect a cross-section of equipment and systems available from the various supplier companies serving the industry. They, by no means, represent all or even the bulk of coverage in regular issues of Pulp & Paper in recent months and years. Together in one volume, these articles are intended to serve as a valuable reading and reference tool for our readers.

Title	Location	Edition / Series / Misc.
108 Paper Coatings		<i>Edition:</i>
<i>Author:</i> Harper, Donald T.	<i>Dynix:</i> 14919	<i>Series:</i> Chemical Technology Review: No. 79
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 676.235 Ha	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815506406	
<i>- date:</i> ©1976	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1976
<i>Subject:</i> Paper coatings -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> xii, 335 p., illus., 24 cm.		

**Table of Contents**

INTRODUCTION
 POLYETHYLENE AND ETHYLENE COPOLYMERS—HOT MELTS
 - Polyethylene
 Hot Melt Coating Process
 Water Resistant Corrugated Paperboard
 Three-Component Blend
 Polyethylene Wax Process
 Amide Antiblocking Agents for Polyethylene and Wax Blends
 Irradiation Process for Wax—Polyethylene Mixtures
 Porous Coated Material for Tea Bags
 Polymerized Terpene Resin-Maleic Anhydride Bonding Agent
 Orthosilicate Ester Primer
 Polar, Hydrophilic Top Coating of Surface Activated Polyolefins
 Calendering Technique for Surface Smoothness
 - Ethylene-Vinyl Acetate Copolymers
 Ceresin Wax Added to Prevent Blushing
 Polyethylene and Resin Esters—Controlled Cooling Rate
 Scuff Resistant Waxes
 Fischer-Tropsch Wax
 Methyl Styrene-Vinyl Toluene Copolymers
 Alpha-Methyl Styrene Copolymers
 Dimethyl-Alpha-Methyl Styrene/Alpha-Methyl Styrene/Styrene Terpolymers
 Polypropylene with Ethylene-Vinyl Acetate Cosolvent
 Polypropylene and Amide Antiblocking Agents
 - Ethylene-Ethyl Acrylate Copolymers
 Polyethylene Blends
 Polyethylene and Polyterpene Blends
 Modified Wax Compositions
 - Other Polyotefin Materials
 Acrylic Acid
 Hydroxyalkyl Vinyl Ether
 Salts of Ethylene-Methacrylic Acid Copolymers
 Polybutene-1 and Wax Blends
 Ethylene Copolymer and Metal Salt of a Sulfonamide

POLYVINYLIDENE CHLORIDE AND FLUOROCARBON COATINGS
 - Vinylidene Chloride Copolymers
 Acrylates—Two-Coat Process
 Methacrylonitrile-Methyl Methacrylate
 Butadiene Sulfone-Acrylate
 Diacrylate Esters Added to Control Blocking
 Acrylate Copolymers and Cation-Active Polymer Dispersions
 Acrylate Copolymers Modified with Alkyd Resins
 Multilayered Coating Composition
 Multicoating Technique
 - Fluorocarbons
 Fluorocarbon Copolymers and Latex
 Chromium Complexes of Fluoroalkoxyalkyl Carboxylic Acids

WATER-SOLUBLE COATINGS
 - Polyvinyl Alcohol

Subjects

289 . Paper coatings --
Patents

Titanic Acid
 Werner Type Chromium Complex
 Boric Acid and Chelating Agent
 Boric Acid Treatment
 Amylosic Compositions
 Aftertreatment with Acidic Curing Agent
 Vinyl Acetate-Dibutyl Maleate Blends
 Pigmented Coatings—Addition of Polyvinyl Pyrrolidone
 Pigmented Coatings—Borax Treatment During Calendering
 Stiff Lightweight Paper Using Urea-Formaldehyde Condensate
 Methylcellulose
 - Maleic Anhydride Copolymers
 Maleated Starch with Quaternary Ammonium Groups
 Styrene Copolymer and Epoxy Resin
 Styrene Copolymer-Starch-Rosin Mixtures
 Styrene Copolymer as Undercoat for Wax Treatment
 Styrene-Maleic Anhydride Half Esters—In Situ Polymerization
 Amide Salts of Styrene-Maleic Anhydride Copolymers and Starch
 Alkyl Vinyl Ether Interpolymers
 Alpha-Olefin Copolymers—Bisulfite Addition
 - Nitrogen-Containing Polymers
 Ethylene-Vinyl Chloride-N-Methylol Acrylamide Terpolymer and Starch
 Polyethyleneimine-Starch-Glyoxal
 Polyalkyleneimine Crosslinked with Formaldehyde
 Starch Binder Containing Polyacrylamide with Glyoxal Insolubilizer
 Acrylamide Polymers
 Curable Thermosetting Resins and Acrylamide Copolymers
 Polyacrylamide and Colloidal Silica
 Nitrogen Derivatives of Acrolein Polymers
 Alpha-Olefin/Maleic Imide-Amine and Epihalohydrin
 Styrene-Methyl Vinyl Pyridine Copolymer Additives
 - Starch and Casein Dispersions
 N,N'-Alkyl-Substituted Aspartimide
 Glyoxal-Urea Insolubilizer
 Trimellitic Acid Polyesters
 Amine-Containing Polymer
 Polybutadiene
 Sugar Extender for Thermosetting Resin
 Clay and Natural Chalk Whiting
 Urea-Formaldehyde Pigment
 Resin-Treated Silicates
 Thermoset Resins for Crosslinking Starch Size—Prevention of Discoloration
 Casein Formulation Modified with Thermoset Resin and Resorcinol
 Casein Coating Gelled by Use of Formic Acid
 Lignosulfonate, Wax and Polysaccharide
 Pullulan
 Fatty Alcohol Emulsions as Lubricants
 - Other Formulations
 Silica Sols, Flocculating Agent and Polyhydric Alcohol
 Urea-Formaldehyde Resins Plasticized with Imidazolines
 Sulfite Derivatives of Acrolein Polymers
 Trimethylolphenol-Polyol Thermosetting Copolymers

 STYRENE-BUTADIENE AND ETHYLENE-PROPYLENE LATEXES
 - Styrene-Butadiene as Binders
 Epoxide Modified Carboxyl-Containing Copolymers
 Butadiene-Styrene-Acrylic Acid-Acrolein Tetrapolymers
 Acrolein Modified Styrene-Butadiene Latex
 Styrene-Maleic Anhydride and Starch
 Carboxylated Polymer
 Hydroxyl and Carboxyl Functional Polymers
 Acrylic Acid Copolymer and Polyphosphate Surfactant
 Acrylic Acid Copolymer
 Acrylamide-Itaconic Acid Copolymers

Gelable Cationic Polymer Coatings
Controlled Polymerization Process
Alkali-Soluble Butadiene Copolymer
Alkali Decomposition Product of Yeast
- Styrene-Butadiene---Other Uses
Specific Emulsifier for Antiblocking
Polyethylene Blends
Dihydrogen Orthophosphate Stabilizers for Styrene-Isobutylene Latexes
Rubber Latex Containing Isocyanate Adduct
pH Adjustment for Acrylic Acid-Containing Copolymers
Ion Exchange Resin Treatment
Glyoxal-Starch Coating Followed by Passage Through Heated Nip
SBR Latex and Wax
- Ethylene-Propylene
Modified by Maleic Anhydride
Blends with Polar Polymers
High Solids Latexes
Paraffinic Wax Followed by Heat Treatment
- Other Polyolefin Latexes
Polyethylene
Polyethylene and Oxygenated Wax
Polystyrene
Styrene-Maleic Anhydride Copolymer and Calcium Sulfoaluminate Pigment
Styrene-Maleic Anhydride Copolymer, Urea and Magnesium Chloride for Flexible Coating
Ethylene-Vinyl Chloride
Oxidized Polybutadiene

VINYL ACETATE LATEXES

- Acrylic Copolymers
Ethyl Acrylate—Pressure Nip Finishing
Acrylic Copolymer and Addition of Glyoxal
Ammonium Salts of Ethyl Acrylate-Itaconic Acid Terpolymers
Crystalline Ethylene-Acrylic Acid Terpolymers
- Other Vinyl Acetate Copolymers
Vinyl Ester Blends and Starch
Maleic Anhydride Half Ester
Ammonium Methyl Maleate
Dibutyl Fumarate Copolymer Blends with Polyethylene
Ethylene-Triallyl Cyanurate
Polyvinyl Acetate Resin Emulsion Top Coated with Wax Composition

ACRYLIC LATEXES

- Styrene-Alkyl Acrylate Copolymers
Acrylic Acid—Two Stage Process
Acrylic Acid-Hydroxyethyl Acrylate
Acrylic Acid with 2-Ethylhexyl Acrylate
Methacrylamide
Maleic Acid Ester and Colloidal Silica
Maleic Anhydride
Alkyl Acrylate Interpolymers
Shellac Combined with Melamine-Formaldehyde Resin
Graft Polymers of Soy Protein
- Other Copolymers
Acrylonitrile-Methacrylic Acid-Butadiene
Acrylate-Acrylonitrile-Methacrylic Acid
Impregnation with Ammonium Salts of Ethyl Acrylate-Maleic Acid Copolymers
Ethyl Acrylate-Acrylonitrile Emulsion Containing Thermoset Resin
Ammonium Salt of Methyl Methacrylate-Acrylic Acid Copolymer
Methyl Methacrylate-Methacrylic Acid Stabilized with Amines
Amine Salts of Ethyl Acrylate-Methacrylamide-Methacrylic Acid
Amide Groups Formed by Hydrolysis of Ethylene-Alkyl Acrylate Copolymers
Vinyl-Acrylic Latex and Use of Lightly Beaten Stock
Mixtures of Vinyl-Acrylic Copolymers
High Gloss Coatings—Thermoplastic Resin Binder

Mixed Thermoplastic and Thermosetting Acrylic Resins

SILICONES AND SOLVENT-BASED COATINGS

- Silicones

Starch and Thermoplastic Binder with Silicone Release Agents

Release Coating over Polyethylene Undercoating

Amino Compound Addition in Polysiloxane Release Coatings

Dimethylpolysiloxane and Methyl Hydrogen Polysiloxane

Silicon Hydride Polysiloxane-Alkenyl Silane Adducts

Vinyl-Containing Polysiloxanes

- Solvent-Based Coatings

Polystyrene

Styrene-Methacrylaldehyde-Methacrylate and Aminoplast Blends

Copolymer of Styrene and Butyl-Maleic Half Ester

Ethyl Acrylate-Methacrylic Copolymer with Thermoset Resin

Ethyl Acrylate and N-Methoxymethyl-4-Pentenamide Copolymers

Allo-Ocimene Diepoxide Polymers

Salts of Ethylene-Aminoalkyl Methacrylate Copolymers and Fluorine-Containing Phosphates

Polyisobutenylsuccinic Anhydride

Cyclicized Rubber, Paraffin Wax and Vinyl Acetate Resin Compositions

Phthalic Anhydride Fatty Acid Ester Resin and Thermosetting Resin

Wax and Thermoset Resin Coating Process for Corrugated Board

C16-34 Alpha-Olefin Polymers

Chlorinated Polyethylene Top Coated with Saran

- Miscellaneous

Polymethyl Methacrylate Microspheres

Treatment with Methyl Cyanoacrylate Vapors

Graft Polymerization of Acrylate Monomers in Presence of Ethylene Dimethacrylate

In Situ Polymerization of Methyl Methacrylate

Electrical-Discharge-Induced Insolubilization of Coatings

Electric Field Polymerization

SPECIALTY COATINGS

- Photographic

Acrylic Acid Copolymer, Polyvinyl Alcohol and Colloidal Silica

Styrene-Maleic Anhydride Copolymer for Stain-Free Photographic Paper

Polyvinyl Acetate Latex-Hydroxyethylcellulose-Chrome Complex

Powdered Polyethylene Coating

Salt-Modified Kaolin-Phenolic Resin Sheet Material

Stabilized Polyolefin Coating

Textured Photographic Base Paper

- Opaque Coatings

Microcapsules of Titanium Dioxide

Casein Base

Water-Resistant Recording Material

- Other Coatings and Processes

Metallic Powder for Thermoplastic Coating

Metalization of Cast-Coated Papers

Transparentized Paper Containing Cotton Linter Fibers

Chemical Watermark Paper

Urea-Formaldehyde Resin for Flameproof Paper

Hydrocarbon-Impregnated Grease-Resistant Paper

Ethylene-Vinyl Acetate and Asphalt Blends for Mulch Sheets

Polyvinyl Acetate and Modified Starch for Erasable Paper

Coated Acrylonitrile Paper for Electrical Insulation

Thermal Paper Coating

Electroconductive Paper

Ultrafine Natural Calcium Carbonates

Thermoset Polymer Coated-Wax Impregnated Stock

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents issued since the early sixties that deal with paper coatings.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of paper coatings as depicted in U.S. patents.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring our new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION

In the 1800s, animal glue was widely used as an adhesive in pigment coatings. Although animal glue was largely replaced by casein around 1900, it is still used in some specialty applications such as playing card paper, wallpaper, and some high gloss specialty paper products. Casein, used initially in the halftone printing process, forms a tough film and can be treated with formaldehyde to provide water resistance. Casein is used in many high quality coatings for offset printing where water resistance, high gloss and toughness of surface is desired.

Starch and particularly the modified starches are used in a wide range of applications for coated paper in the lower cost publication field as, for example, where water resistance is a major requirement. In some applications, starch can be cross-linked using urea or glyoxal to impart waterproofing properties.

Many synthetic water-based systems have been developed in recent years. Poly vinyl alcohol provides strong durable coatings with good optical properties. Much of research and development activity in recent years has been devoted to emulsion type coatings. Emulsions are low viscosity systems affording high solids content, easy handling, and less water to evaporate in the dryers than with the common natural binders. Increased gloss, better ink holdout, improved water resistance and more flexibility are also obtained with these emulsion systems which are commonly used in combination with starch and casein.

Styrene-butadiene, primarily used in publication grade papers, was the first successful emulsion type product used in paper coating. Acrylics are commonly used as coatings on paperboard for food packaging due to their low residual odor. High gloss and good ink holdout are typical properties of the acrylics which contribute to print quality in these relatively expensive coatings. Polyvinyl acetate provides good moisture and grease resistance and responds well to calendaring operations to produce a glossy surface.

For food containers, a number of barrier coatings have been developed, including polyethylene, microcrystalline wax and ethylene-vinyl acetate copolymers. In general, these materials improve the durability and film strength, raise the

softening point and increase the gloss and heat-seal properties. Polyvinylidene chloride emulsion coatings provide high solids systems of minimum viscosity with excellent barrier properties.

The use of water-based coatings, hot melts and for some specialty uses solvent-based vehicles for paper coating continues to be an area of extensive research and development activity as systems are developed to meet the increasingly restrictive demands of pollution control, health regulations and, of course, energy consumption.

This book describes over 216 processes and provides hundreds of paper coating formulations which may be used for barrier coatings, pigment binders and a number of specialty coatings.

Title	Location	Edition / Series / Misc.
1337 Patent Strategy: For Researchers and Research Managers		<i>Edition:</i> 2nd edition
<i>Author:</i> Knight, H. Jackson	<i>Dynix:</i> 111659	<i>Series:</i>
<i>Publish.:</i> John Wiley & Sons	<i>Call No.:</i> 346.730 Kn	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0471492612	<i>Year:</i> 2001
<i>- date:</i> ©2001	<i>Shelf:</i> Adult Non-Fiction	<i>Price:</i> \$56.50
<i>Subject:</i> Patent laws and legislation -- United States -- Popular works		
<i>Desc:</i> xvi, 201 p., illus., 24 cm.		

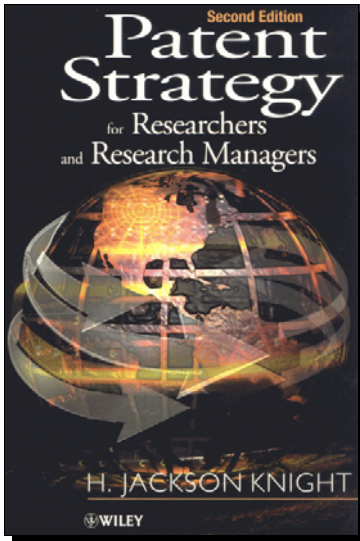


Table of Contents

- Preface
- Preface to the First Edition
- About the Author
- 1. Basic Intellectual Property Concepts
 - Introduction
 - Basic Patent Law Concepts
 - Patent Office Operations
 - Requirements for Obtaining a Patent
 - Types of Patents
 - Parts of a Patent
 - The Term of a Patent
 - Definitions of Commonly Used Terms
 - International Treaties
 - The Paris Convention
 - Inter-American Convention
 - The Patent Cooperation Treaty
 - The European Patent Convention
 - The African Intellectual Property Organization
 - The African Regional Industrial Property Organization
 - Eurasian Patent Convention
 - Copyrights, Trademarks, and Trade Secrets
 - Copyrights
 - Trademarks
 - Trade Secrets
 - Other Resources
- 2. The Value of Patents
 - Exclusivity — The Desired Goal
 - The Mechanics of Achieving Exclusivity in a Technology Area
 - Traps and Misconceptions — What Patents Can't Do
 - The Informational Value of Patents
 - Assigning Value to Patents
 - Licensing of Patents
- 3. Developing a Strategy
 - Professional Help
 - Determining Whether or Not an Invention is Patentable
 - Defining Strategy
 - The Principles Behind the Strategy — The Military Model
 - Developing a Patent Strategy Model
 - Questions for Specific Types of Strategies
 - Developing a Patent Strategy for an Invention
 - Developing a Patent Strategy for a Series of Inventions
 - Developing a Patent Strategy for an Existing Product
 - Developing a Strategy for Licensing Products
 - Developing a Strategy for Handling a Potentially Adverse Patent
 - Developing a Strategy for Oddball Inventions
 - Dealing With Inventors When Patent Applications Are Not Filed
 - Coordination of Other Strategies and Patent Strategy

Subjects

582 . Patent laws and legislation -- United States -- Popular Works

4. Researching With Intellectual Property in Mind
Introduction
Characteristics of Prolific Inventors
Characteristics of Casual Inventors
The Inventive Process
Fostering Inventive Activity
Suggestions On How to Conduct Research for Stronger Patents

5. Infringement and Freedom to Operate
Types of Infringement
Avoiding Patent Infringement
Dealing With Infringers
Research Disclosures and Journal Articles
Published Patent Applications and Provisional Patent Coverage

6. Working With Attorneys, Agents, and Liaisons
Introduction
Preparing for the Legal World
Actions to Take Before Meeting With the Agent
Typical Working Arrangements with Agents
The Researcher's Responsibility for Technical Details
Aloofness
Experimentation For the Patent Application
Patent Liaisons and Other Intellectual Property Professionals

7. Disclosure and Filing Decisions
Introduction
Controlling the Disclosure of Technology
The Filing Decision
Filing Globally
The Cost of Broadly Filed Patent Applications
The Legal Systems of Individual Countries
Techniques for Determining Which Countries Will be of Value
World Growth and Economic Power
Templates
Timing of Application Filings
Global Experts
Agreement With Strategy

8. After the Filing
Introduction
Anticipating the First Response From a Patent Office
Modification of Claims
Research After the Filing
Maintaining Cohesion
Issuance and Maintenance of Patents

9. The Future of Intellectual Property Efforts

References
Further Reading
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

All inventors require a basic understanding of the patenting system if they are to develop successful applications to protect their inventions.

Patent Strategy, Second Edition, introduces researchers to patent applications and patent portfolios. With minimum use of 'legal jargon', it provides the technical professional with the help and advice they require to understand the legal complexities that they may encounter before and during a patent application. It also discusses the responsibilities of the researcher after patent applications have been filed and the role the researcher can play in the maintenance of a global patent estate.

Over the last five years intellectual property has taken center stage around the world as countries realize the value of having a consistent and enforceable patent business. The increase in patent activity has resulted in a number of new laws being created. To reflect these changes this Second Edition of Patent Strategy has been reorganized and completely updated. Additional material includes:

- > an overview of the major changes in patent laws
- > a new chapter on infringement and freedom to operate
- > further concepts on the value of patents
- > new strategy techniques

This new advice will enable all researchers to file the best possible patent and maintain a good portfolio.

—
—
PREFACE:

Since the first publication of this book, the world of intellectual property has taken center stage around the world as countries realize the value of having consistent and enforceable patent systems and as companies and inventors attempt to obtain patents globally which are vital to their business. There have been changes throughout the spectrum of the intellectual property world. The harmonization of patent laws and practices has continued. Countries have had to deal with patent issues concerning such things as software and biotechnology, two fields where much was previously unpatentable. The internet has made the acquisition of technology and copies of patent publications a simple matter; both are available to the most remote and independent type of inventor. Much has been written on maximizing the return from the patents a company owns. Emphasis has been placed on making sure one audits the patents they have, licensing any patents which can provide additional revenue, and finally making sure that one obtains some type of patent protection on their business methods which utilize computers.

Regardless of the technology, all potential inventors need a good foundation of understanding of the patenting system, and this is what this book attempts to provide. This book is not meant to be an advanced text of all the possible strategies available to an inventor or a company. It remains a basic guide for the inventor; a source of information to read and then keep for further reference. College students should find this information very valuable because rarely are they exposed to patents until they have earned their degree. Patent agents and attorneys may find some new ideas in this book, however, the primary use for this book is as a guidebook for their clients.

One issue that was perhaps underemphasized in the first edition was that the information contained in this book applies to all types of inventors. Much of the information will be readily applicable to inventors in corporate technical organizations. Despite the fact that the author also has a background in a corporate technical organization, independent inventors and academic inventors will also obtain benefit from a study of the information in this book. The concepts expressed here are applicable widely across many different types of products and patent types.

My intent with the first edition of this book was to write a book which needed very little updating, and in many respects that was accomplished. However, there has been a constant flux in the patent law over the past few years so some changes are now necessary. The book still retains its general tone; this is not an in-depth guide of all of the quirks of the latest patent law changes, but rather an overview of tools one can use while working with a patent attorney or agent.

Chapter 1 on Basic Intellectual Property Concepts has been updated to include some of the major new changes in patent laws and additional clarifying information on basic concepts and international treaties. New concepts have been added on the informational value of patents in Chapter 2 on The Value of Patents. Some additional strategy techniques have been added to Chapter 3 on Developing a Strategy.

From a book construction standpoint, a major change in this book is a reorganization and streamlining of the remaining chapters to eliminate duplication that was present in the original book. New sections were added throughout these chapters also. Chapter 4 on Researching with Intellectual Property in Mind has been expanded to include more information on how proficient inventors get ideas and invent. A new Chapter 5 on Infringement and Freedom to Operate adds important information to better help one understand this important facet of intellectual property. The remaining chapters were also updated and clarified throughout. Additional information was included in the Reference sections at the end of the book along with a new index.

Title	Location	Edition / Series / Misc.
109 Performance Enhancement in Coatings Author: Orr, Edward W. Publish.: Hanser Gardner Publications, Inc. - place: Cincinnati, OH - date: ©1998 Subject: Coatings -- Additives Desc: xviii, 292 p., illus., 25 cm.	Dynix: 78750 Call No.: 667 Or ISBN: 1569902631 Shelf Adult Non-Fiction	Edition: Series: Year: 1998 Price: \$98.00

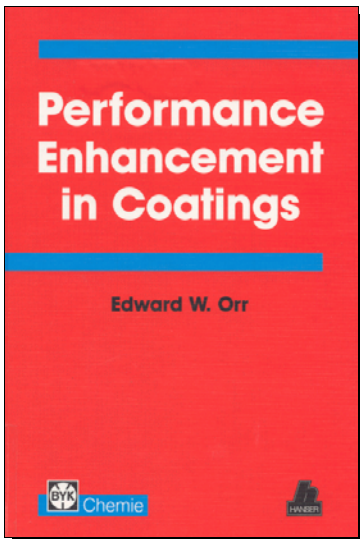


Table of Contents

- PART I: The Common Denominator of Performance Enhancement.
- PART II: Wetting and Dispersing (The Control of Pigment Interfaces).
- PART III: "Classical" Interfacial Tension Control (Flow, Leveling, and Surface Enhancement).
- PART IV: Defoaming (The Removal of Unwanted Interfaces).
- PART V: Integrative Discussions of Performance Synergies and Economics.
- Appendices.
- Index.

Reviews - Synopsis - Dust Jacket

The science of environmentally friendly coatings is a very young, but rapidly growing discipline. As a result, there is a shortage of integrative information that overviews the interrelationships that exist among all the disparate sub-disciplines. This textbook provides the missing link by offering a critical overview of cutting edge, interdisciplinary technology designed to improve performance. It is the first text to describe how additives have evolved to not only take the mystery out of environmentally friendly coatings, but also to meet the challenge of the twenty-first century.

Subjects

240 . Coatings -- Additives

PREFACE:

Over the last fifteen years, I have taught courses and held seminars on surfactants, polymers, and additives for environmentally friendly coatings and allied products. I have searched in vain for a textbook, but to no avail. There is absolutely no shortage of general coatings textbooks and raw material lists dealing with the rather eclectic aspects of pigments, resins, solvents, and additives -- but I felt that a more concerted approach to the study of performance improvement in environmentally friendly coatings was necessary. After all, such coatings have evolved much more rapidly than ever thought possible, and they have consequently risen to clear dominance in the industry; nevertheless, they remain undoubtedly the most difficult to formulate and the least understood of all systems. Why is this? What makes environmentally friendly coatings so enigmatic, unique, and fascinating? And, perhaps the most important question of all -- why is there such a shortage of integrated information?

These questions can be answered quite simply: the science of environmentally friendly coatings is a very young discipline. As a result of the rapid evolution that always accompanies science in its infancy, there is a quite unsurprising shortage of integrative information that overviews the interrelationships that exist among all the disparate subdisciplines. This book was designed to fill this gap, thus providing the missing link by offering a critical overview of cutting edge, interdisciplinary technology designed to improve performance. Furthermore, such technology is most effectively and efficiently described within the special context of additives -- high performance ingredients expressly designed to interact with and enhance the performance of virtually all ingredients in the coating system -- whether such ingredients be pigments, resins, solvents, or otherwise.

Of all the challenges encountered in the coatings industry, performance improvement -- particularly in environmentally friendly coatings -- is consistently ranked as the number one challenge by nearly all industry players -- chemists, formulators, and managers alike. The resultant "reengineering" of performance presents myriads of new variables and just as many new questions. For instance, how can newly patented additive technologies and chemistries dramatically improve wetting and dispersing properties? How can the vast array of interfacial tension parameters be properly aligned and balanced? How can foam be alleviated? This text has been designed to answer these questions within both practical and theoretical frameworks. As such, this book is intended for use in the classroom, in industry, and in governmental/regulatory agencies. By no means whatsoever, though, is it implied that all issues are addressed within a

scant 300 pages. Recent advances have so greatly expanded the realm of newly patented performance enhancement technologies that an encyclopedic twenty- volume series would obviously be required to exhaustively review every topic. As a result, only the most exciting reengineering techniques will be discussed in this introductory volume. This text is divided into five parts -- Part I systematically identifies and describes the "missing link", or the common denominator, that can allow one to properly integrate all performance parameters; Parts II through IV provide detailed coverage of the most critical technologies -- wetting and dispersing, interfacial tension (flow, leveling, and surface parameters), and defoaming. Part V concludes the text with integrative discussions of performance synergies and economics. To facilitate presentation, more than 380 special tables, graphs, flowcharts, formulations, and case studies are provided. Performance enhancement variables, along with concomitant coverage of both technical and economic concerns, are provided in an easy-to-use format equally suitable for use in the classroom, the laboratory, or the boardroom.

All materials in this textbook have been extensively "tried and tested", so to speak, in both classroom and seminar settings. Accordingly, the copious feedback and input received from more than 29,000 international attendees has helped define, channel, and guide the format of this book. Given the complexities of environmentally friendly coatings, selected topics will require explanatory prefaces in which theoretical background material is discussed; nevertheless, such material will be presented in an overview fashion so that adherence to a practical frame of reference can be maintained. Wherever possible -- diagrams, descriptive figures, chemical structures, and practical examples will be presented. In selected cases, the breadth of the subject matter at hand will require the inclusion of special appendices in which important supplementary information is discussed at length.

The intent of this textbook is clarity and integration, so this means that abstruse or marginally useful information is avoided at all costs. Feedback from both industrial and academic reviewers has consistently indicated that core issues should be presented in an unadulterated, yet efficient fashion; as a further corollary, this means that an intentional departure from the possible "monotony" of paragraph after paragraph of text is implemented. For instance, not only are diagrams, flowcharts, and all the accoutrements of graphical presentation methodologies employed -- but a host of additional teaching aids is also included. As an illustration of this point, the special question-and-answer approach utilized in Chapter 4 greatly simplifies the exceedingly complex and challenging subject matter of high molecular-weight wetting and dispersing agents (advanced products which simultaneously contain surface-active groups, basic/acidic structures, linking groups, polymeric building blocks, and pigment adhesion moieties). This textbook is formulated on the precept that technology and learning are active, evolving, and interactive processes, and as such, they should not become mired in the theoretical realm. Questions, answers, and real- life case studies are essential elements in the proper presentation of integrated technological concepts. In a nutshell, theory and practice become one.

The use of additive trade names has been strictly avoided; likewise, there has been absolutely no attempt to include lists of suppliers and their products, nor has there been any attempt to provide superfluous bibliographies and reference lists. (Selected "Guides to Further Reading" are included, however, where necessary and appropriate; experimental data, and concomitant background information -- both theoretical and empirical -- were generated in the author's laboratories. A combined total of more than 174,000 laboratory hours-equivalent to 87 man-years of laboratory time -- is represented by the above.)

Copious student feedback has been highly instrumental in the design of this text. As mentioned at the onset, raw material lists, general textbooks, bibliographies, and related materials of an eclectic, non-integrated nature are quite abundant. It is now time for a change in perspective, so an integrated approach serves as the key focus of this textbook.

A concerted approach to creating and maintaining a healthy environment is precisely what industry, academia, and government expect from all players in the global economy. Environmentally friendly coatings play an important role in ensuring a healthy ecosystem, and additives are high performance products expressly designed to interact with and enhance the performance of virtually all ingredients in the coating system -- whether such ingredients be pigments, resins, solvents, or otherwise. The role of additives is specifically that of bringing together all the individual components, in essence, providing gestalt, or a state of optimal performance and integration. But everyone knows that gestalt, in and of itself, is simply not enough; we live in a competitive world in which performance -- whether integrated or not -- must be translated into profits, so that is precisely why additives for environmentally friendly coatings are even more essential than ever. Additives contribute to "the bottom line". Furthermore, both performance and profits can be optimized after one has gained a proper understanding of the recent advances in additive chemistry. Armed with this knowledge, one can take the mystery out of environmentally friendly coatings, and meet the challenge of the twenty-first century and beyond.

Permeability and Other Film Properties of Plastics and Elastomers

LASCT Holdings - maximum detail by Title

P

Title	Location	Edition / Series / Misc.
818 Permeability and Other Film Properties of Plastics and Elastomers		Edition:
Author: Plastics Design Library	Dynix: 99416	Series: Plastics Design Library Handbook Series
Publish.: Norwich, NY	Call No.: 745 Pe	
- place: Norwich, NY	ISBN: 1884207146	
- date: ©1995	Shelf Adult Non-Fiction	Year: 1995
Subject: Plastics -- Permeability -- Tables		Price: \$205.00
Desc: x, 706 p., illus., 29 cm.		

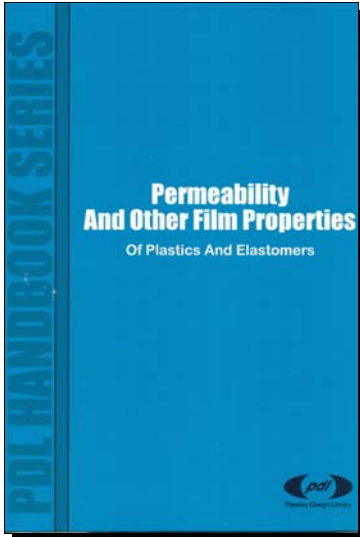


Table of Contents

- Introduction
- Some Notes About The Information In This Book
- How To Use This Book
- Barrier Materials - An Overview
- THERMOPLASTICS
- Acetal Resin
- Polyoxymethylene (Acetal) - Chapter 1
- Acrylonitrile
- Polyacrylonitrile (PAN) - Chapter 2
- Acrylic Resin
- Acrylonitrile-Methyl Acrylate Copolymer (AMA) - Chapter 3
- Cellulosic Plastic
- Cellophane Film - Chapter 4
- Fluoroplastic
- Fluoroplastic - Chapter 5
- Ethylene-Chlorotrifluoroethylene Copolymer (ECTFE) - Chapter 6
- Ethylene-Tetrafluoroethylene Copolymer (ETFE) - Chapter 7
- Fluorinated Ethylene-Propylene Copolymer (FEP) - Chapter 8
- Fluorinated Polyethylene (FPE) - Chapter 9
- Perfluoroalkoxy Resin (PFA) - Chapter 10
- Polychlorotrifluoroethylene (CTFE) - Chapter 11
- Polytetrafluoroethylene (TFE) - Chapter 12
- Polyvinyl Fluoride (PVF) - Chapter 13
- Polyvinylidene Fluoride (PVDF) - Chapter 14
- Ionomer
- Ionomer (EMA) - Chapter 15
- Parylene
- Polyparaxylylene - Chapter 16
- Polyamide
- Nylon - Chapter 17
- Amorphous Nylon - Chapter 18
- Nylon 6 - Chapter 19
- Nylon 66 - Chapter 20
- Nylon 6/66 Chapter 21
- Nylon 66/610 - Chapter 22
- Nylon MXD6 - Chapter 23
- Polycarbonate
- Polycarbonate (PC) - Chapter 24
- Polyester
- Polybutylene Terephthalate (PBT) - Chapter 25
- Polyethylene Naphthalate (PEN) - Chapter 26
- Polyethylene Terephthalate (PET) - Chapter 27
- Glycol Modified Polycyclohexylenedimethylene Terephthalate (PCTG) - Chapter 28
- Polycyclohexylenedimethylene Ethylene Terephthalate (PETG) - Chapter 29
- Liquid Crystal Polymer (LCP) - Chapter 30
- Polyimide
- Polyimide (PI) - Chapter 31
- Polyolefin
- Polyethylene (PE) - Chapter 32
- Low Density Polyethylene (LDPE) - Chapter 33

Subjects

533 .	Elastomers -- Permeability -- Tables
534 .	Plastics -- Permeability -- Tables

Linear Low Density Polyethylene (LLDPE) - Chapter 34
Ultra Low Density Ethylene-Octene Copolymer (ULDPE) - Chapter 35
Medium Density Polyethylene (MDPE) - Chapter 36
High Density Polyethylene (HDPE) - Chapter 37
Ethylene-Alpha Olefin Copolymer (POP) - Chapter 38
Ethylene-Vinyl Acetate Copolymer (EVA) - Chapter 39
Ethylene-Vinyl Alcohol Copolymer (EVOH) - Chapter 40
Polyethylene-Acrylic Acid Copolymer (EAA) - Chapter 41
Polyethylene-Ionomer Copolymer (PE-Ionomer) - Chapter 42
Polypropylene (PP) - Chapter 43
Polypropylene Copolymer (PP Copolymer) - Chapter 44
Graphical Information Polybutylene - Chapter 45
Textual Information Polymethylpentene (PMP) - Chapter 46
- Polyphenylene Sulfide
Polyphenylene Sulfide (PPS) - Chapter 47
- Polysulfone
Polysulfone (PSO) - Chapter 48
- Polyvinyl Alcohol
Polyvinyl Alcohol (PVA) - Chapter 49
- Styrenic Resin
Acrylonitrile-Butadiene-Styrene Copolymer (ABS) - Chapter 50
Acrylonitrile-Styrene-Acrylate Copolymer (ASA) - Chapter 51
Polystyrene (PS) - Chapter 52
General Purpose Polystyrene (GPPS) - Chapter 53
Impact Resistant Polystyrene (IPS) - Chapter 54
Styrene-Acrylonitrile Copolymer (SAN) - Chapter 55
Styrene-Butadiene Block Copolymer - Chapter 56
- Vinyl Resin
Polyvinyl Chloride (PVC) - Chapter 57
Polyvinyl Chloride-Polyvinylidene Chloride Copolymer (PVC-PVDC) - Chapter 58
Polyvinylidene Chloride (PVDC) - Chapter 59

THERMOPLASTIC ALLOYS

- Plastic Alloy
Polyethylene/Polystyrene Alloy (PEIPS) - Chapter 60

MULTILAYER STRUCTURES

- Co-Continuous Lamellae Multilayer Structure
Co-Continuous Lamellar Injection Molded (LIM) Multilayer Structure - Chapter 61
- Laminar Multilayer Structure
Laminar Multilayer Structure - Chapter 62
- Multilayer Films
Multilayer Films with Ethylene-Vinyl Alcohol Copolymer (EVOH) Barrier - Chapter 63
Multilayer Films with Polyvinylidene Chloride (PVDC) Barrier - Chapter 64
Multilayer Films - General - Chapter 65

THERMOSETS

- Epoxy Resin
Epoxy Resin (EP) - Chapter 66
- Polypyrrole
Polypyrrole - Chapter 67

THERMOPLASTIC ELASTOMERS

- Olefinic Thermoplastic Elastomer
Olefinic Thermoplastic Elastomer (TPO) - Chapter 68
- Polyamide Thermoplastic Elastomer
Polyamide Thermoplastic Elastomer (Polyamide TPE) - Chapter 69
- Polybutadiene Thermoplastic Elastomer
Syndiotactic 1,2-Polybutadiene Thermoplastic Elastomer (Polybutadiene TPE) - Chapter 70
- Polyester ThermoPlastic Elastomer
Polyester Thermoplastic Elastomer (Polyester TPE) - Chapter 71
- Polyurethane Thermoplastic Elastomer (TPUR)
Thermoplastic Polyester-Polyurethane Elastomer (TPAU) - Chapter 72
Thermoplastic Polyether-Polyurethane Elastomer (TPEU) - Chapter 73

- Styrenic Thermoplastic Elastomer
Styrenic Thermoplastic Elastomer (Styrenic TPE) - Chapter 74
- Vinyl Thermoplastic Elastomer
Polyvinyl Chloride Polyol (pPVC) - Chapter 75

RUBBERS

- Acrylic Rubber
Ethylene-Acrylate Copolymer (EACM) - Chapter 76
- Butadiene Rubber
Polybutadiene - Chapter 77
- Butyl Rubber
Isobutylene-Isoprene Copolymer (IIR) - Chapter 78
- Bromobutyl Rubber
Bromoisobutylene-Isoprene Copolymer (BIIR) - Chapter 79
- Chlorobutyl Rubber
Chloroisobutylene-Isoprene Copolymer (CUR) - Chapter 80
- Isobutylene Rubber
Isobutylene - Chapter 81
- Chlorosulfonated Polyethylene Rubber
Chlorosulfonated Polyethylene (CSM) - Chapter 82
- Epichlorohydrin Rubber
Polyepichlorohydrin (CO) - Chapter 83
Polyepichlorohydrin Copolymer (CO Copolymer) - Chapter 84
- Ethylene-Propylene Rubber (EPR)
Ethylene-Propylene Copolymer (EPM) - Chapter 85
Tabular Information Ethylene-Propylene-Diene Copolymer (EPDM) - Chapter 86
- Fluoroelastomer
Vinylidene Fluoride-Hexafluoropropylene Copolymer (FKM) - Chapter 87
- Natural Rubber
Natural Rubber (NR) - Chapter 88
- Neoprene Rubber
Polychloroprene (CR) - Chapter 89
- Nitrile Rubber
Acrylonitrile-Butadiene Copolymer (NBR) - Chapter 90
- Polyisoprene Rubber
Polyisoprene Rubber (P1) - Chapter 91
- Polysulfide Rubber
Polysulfide Rubber (T) - Chapter 92
- Polyurethane
Polyester Urethane (AU) and Polyether Urethane (EU) - Chapter 93
- Propylene Oxide Rubber
Propylene Oxide (PO) - Chapter 94
- Silicone Rubber
Silicone (MQ) - Chapter 95
Methylvinylfluorosilicone (FVMQ) - Chapter 96
- Styrene-Butadiene Rubber
Styrene-Butadiene Copolymer (SBR) - Chapter 97

APPENDICES

Penetrant Sort
Permeation Rates
Permeability of Rubber Glove Films
Permeability Units Conversion
Glossary of Terms

INDICES

Table and Graph Index
End Notes to Tables
Reference Index
Trade Name Index

Reviews - Synopsis - Dust Jacket

This data handbook from Plastics Design Library provides comprehensive permeation data for thin plastics and elastomers. Data on permeation of liquids, gases, moisture, aroma, and flavor — each an important consideration in a

wide range of applications — is extensive and cross-referenced by permeation rate and penetrant. Test conditions, exposure environments, and test specimen details are reported in full.

Permeability and Other Film Properties of Plastics and Elastomers covers pre-processed resins as well as composite and multilayer films. The nominal thickness of each material in the database is 10 mils (.010") or less. Information provided in this handbook ranges from a general overview of the barrier properties of plastics and elastomers to detailed discussions and test results.

Book Description: Permeability and Other Film Properties of Plastics and Elastomers covers nearly 100 preprocessed resins, composite and multilayer films. Thermoplastics, thermosets, thermoplastic elastomers and rubbers are included. Permeability data has been normalized to allow for easy comparison between material and test conditions.

INTRODUCTION:

Plastics Design Library is pleased to introduce "Permeability And Other Film Properties Of Plastics And Elastomers", a unique reference and data bank on the barrier and film properties of polymeric materials. The basic physical characteristics of polymers are generally well defined by manufacturers. However, data on the more capricious phenomenological issues such as permeability are difficult to find, especially in a comprehensive compilation. This volume serves to turn disparate information from wide ranging sources (i.e. conference proceedings, test laboratories, materials suppliers, monographs, trade and technical journals) into useful engineering knowledge.

The information provided ranges from a general overview of the barrier properties of plastics and elastomers to detailed discussions and test results. For users to whom the study and use of permeability and film property data are relatively new, the primer on barrier properties and detailed glossary of terms, including descriptions of test methods, will prove useful. For those who wish to delve beyond the data presented, source documentation is presented in detail.

Data presented in these pages detail differences in permeation between generic families of plastic and rubber materials. Also covered are differences within the same generic family due to environmental factors such as temperature and humidity or material characteristics such as sample preparation and material composition. This data serves as an indication of how one material is likely to behave relative to another material or relative to the same material exposed under different conditions.

The permeation of gases and vapors through thin films is dependent on the molecular size, shape, wettability and soundness of the fabricated membrane. Since permeation in well made items is a molecular transport phenomenon, it is affected by orientation, degree of crystallinity and temperature. Attempts have been made to relate permeation rates through thin films to absorption of thicker films, sheets, pipe, etc. This has been generally unsuccessful. Thicker films and sheets represent an average set of properties obtainable from many thin films produced under a variety of conditions. To produce a thin film representative of this average is not practical.

In compiling data, the philosophy of Plastics Design Library is to provide as much information as is available. This means that complete information corresponding to each test result is provided. At the same time, an effort is made to provide information for as many tests, conditions, penetrants and materials combinations as possible. Therefore, even if detailed test metadata are not available, information is still provided. The belief is that some limited information serves as a reference point and is better than no information. In all cases, we undertake to provide information in as complete and detailed a form as it was presented in the source document. Flexibility and ease of use are also carefully considered in designing the layout of the book.

How a material performs in its end use environment is a critical consideration and the information here gives useful guidelines. However, this or any other information resource should not serve as a substitute for actual testing in determining the applicability of a particular part or material in a given end use environment.

We trust you will greet this reference publication with the same enthusiasm as other Plastics Design Library titles and that it will be a useful tool in your work. As always, your feedback on improving this volume or others in the PDL Handbook series is appreciated and encouraged.

Some Notes About The Information In This Book:

This publication contains data and information from many disparate sources. In order to make the product most useful to end users, Plastics Design Library normalizes presentation of the information. Permeability data, for example, are presented in many different units (greater than 60) throughout the literature. In this reference' source, permeability data have been normalized into two units – cm³.mm/m².day.atm for permeability coefficient and g.mm/m².day for vapor transmission rate.

Although substantial effort is exerted throughout the editorial process to maintain accuracy and consistency in unit conversion and presentation of information, possibility for error exists. Often these errors occur due to insufficient or

inaccurate information in the source document. For this reason, values in the tables of permeability data are given in units as they appeared in the source document as well as in the converted (normalized) units. Appendix Four provides a conversion table detailing the conversion factors used and any assumptions which were made.

As with all PDL products, complete information as it was presented in the source document is provided. This includes details of test methods, test conditions, penetrant, sample size, material composition and other factors which may affect the resulting value. As a result, the user has all available information on which to make a judgment or comparison.

How To Use This Book:

This publication is divided into 97 chapters and four appendices. Chapters are divided by generic families of plastics or elastomers. Within each chapter, information is presented as combinations of text, tables and graphs. Included are permeability data and data on the film properties (i.e. mechanical, optical, thermal, etc.) of the subject material. Information in the 97 chapters is in the most complete and detailed form.

Appendix I presents permeability data sorted by penetrant with a secondary sort on generic family. Appendix I is a resort and abridged presentation of information contained in the tables of the 97 chapters. (Data from Appendix III are also included for convenience.) If more information about a specific piece of information in Appendix I is needed, the user is directed to the chapter containing the appropriate material generic family.

Appendix II is useful in comparing permeation rates of penetrants through different materials at various temperature ranges. It is sorted by penetrant with a secondary sort on temperature range and a final sort on either permeability coefficient (cm³.mm/m².day.atm) or vapor transmission rate (g.mm/m².day). Appendix Two presents data in the most concise form. Only normalized values for permeability coefficient or vapor transmission rate appear. As a result, the user is provided a convenient ranking of the permeability of a penetrant through various plastics and/or elastomers. Supporting test information, except for temperature, is not included. For more detailed information the user is directed to the chapter containing the appropriate material generic family.

Appendix III provides permeation data for penetrants through glove films. Appendix IV gives the conversions used in converting to permeation coefficient or vapor transmission rate.

Permeability Properties of Plastics and Elastomers: A Guide to Packaging and Barrier Materials

LASCT Holdings - maximum detail by Title

P

Title	Location	Edition / Series / Misc.
1027 Permeability Properties of Plastics and Elastomers: A Guide to Packaging and Barrier Materials		Edition: 2nd edition
Author: Massey, Liesl K.	Dynix: 111660	Series: PDL (Plastics Design Library) Handbook Series
Publish.: Plastics Design Library / William Andrew Publishing	Call No.: 620.1 Ma	
- place: Norwich, NY	ISBN: 1884207979	
- date: ©2003	Shelf Adult Non-Fiction	Year: 2003
Subject: Plastics -- Permeability		Price: \$208.50
Desc: xiv, 601 p., illus., 29 cm.		

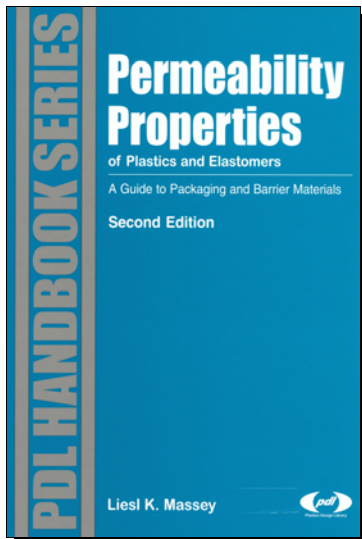


Table of Contents

- Introduction
- 1.0 Nature of Barrier Polymeric Materials
 - 1.1 Transport of Gases and Vapors
 - 1.2 Mass Transport of a Gas
 - 1.3 Special Situations—Coatings and Laminates
 - 1.4 Factors Affecting Permeability
 - 1.5 Polymers 101
 - 1.6 Molecular Design
 - 1.7 Elastomers 101
- 2.0 Collected Comparative Barrier Properties of Plastics and Elastomers
- 3.0 Processing
- 4.0 Markets and Applications for Packaging: Overview
 - 4.1 Packaging Materials
 - 4.2 Markets and Applications
- 5.0 Automotive Fuels
- 6.0 Multilayer Films
 - 6.1 General Constructions and Characteristics
 - 6.2 Barrier Layers
 - 6.3 Relative Humidity of Barrier Layer
 - 6.4 Application and Design
 - 6.5 Retort Sterilized Packages
 - 6.6 Illustrated Multilayer Packaging
- 7.0 Food and Beverage Packaging
 - 7.1 Food and Drug Administration, FDA
 - 7.2 Barrier Resins
 - 7.3 Oriented Materials
- 8.0 Standard Measurements and Tests
 - 8.1 Units of Measurement
 - 8.2 Standard Test Methods
 - 8.2.1 Gas Transmission
 - 8.2.2 Water Vapor Transmission
 - 8.2.3 Rubber
- 9.0 ASTM Tests
- THERMOPLASTICS
- Acetal Resins
 - Polyoxymethylene (Acetal) - Chapter 1
 - Tabular Information
- Acrylic Resin
 - Acrylonitrile-Methyl Acrylate Copolymer (AMA) - Chapter 2

Subjects

722 .	Elastomers -- Permeability
723 .	Plastics -- Permeability

Tabular Information
Graphical Information

Cellulosic Plastic

Cellulosic - Chapter 3
Tabular Information

Fluoroplastic

Fluoropolymer - Chapter 4
Tabular Information

Ethylene-Chlorotrifluoroethylene Copolymer (ECTFE) - Chapter 5
Tabular Information
Graphical Information

Ethylene-Tetrafluoroethylene Copolymer (ETFE) - Chapter 6
Tabular Information

Fluorinated Ethylene-Propylene Copolymer (FEP) - Chapter 7
Tabular Information
Graphical Information

Perfluoroalkoxy Resin (PFA & MFA) - Chapter 8
Tabular Information

Polychlorotrifluoroethylene (PCTFE) - Chapter 9
Tabular Information
Graphical Information

Polytetrafluoroethylene (PTFE) - Chapter 10
Tabular Information

Polyvinyl Fluoride (PVF) - Chapter 11
Tabular Information

Polyvinylidene Fluoride (PVDF) - Chapter 12
Tabular Information
Graphical Information

Hexafluoropropylene, Tetrafluoroethylene, Ethylene (HTE) - Chapter 13
Tabular Information

Tetrafluoroethylene, Hexafluoropropylene, Vinylidene Fluoride Terpolymer (THV) - Chapter 14
Tabular Information

Ionomer

Ionomer - Chapter 15
Tabular Information

Parylene

Parylene - Chapter 16
Tabular Information

Polyamide

Nylon Overview - Chapter 17
Tabular Information
Graphical Information

Amorphous Nylon - Chapter 18
Tabular Information
Graphical Information

Nylon 6— PA6 - Chapter 19
Tabular Information
Graphical Information

Nylon 66— PA 66 - Chapter 20
Tabular Information

Nylon 6/66 — PA 6/66 - Chapter 21
Tabular Information

Nylon 6/12 — PA 6/12 - Chapter 22
Tabular Information

Nylon 6/6.9 — PA 6/69 - Chapter 23
Tabular Information

Nylon 6.6/6.10 — PA 66/610 - Chapter 24
Tabular Information

- Polyamide Nanocomposite
 - Polyamide Nanocomposite - Chapter 25
 - Graphical Information
 - Tabular Information

- Polycarbonate
 - Polycarbonate - Chapter 26
 - Tabular Information

- Polyester
 - Polybutylene Terephthalate (PBT) - Chapter 27
 - Tabular Information
 - Polyethylene Napthalate (PEN) - Chapter 28
 - Tabular Information
 - Polycyclohexylenedimethylene Terephthalate (PCTG) - Chapter 29
 - Tabular Information
 - Polycyclohexylenedimethylene Ethylene Terephthalate (PETG) - Chapter 30
 - Tabular Information
 - Polyethylene Terephthalate (PET) - Chapter 31
 - Tabular Information
 - Liquid Crystal Polymer (LCP) - Chapter 32
 - Tabular Information
 - Graphical Information

- Polyimide
 - Polyimide - Chapter 33
 - Tabular Information

- Polyolefin
 - Polyethylene Overview - Chapter 34
 - Graphical Information
 - Tabular Information
 - Ultra Low Density Polyethylene (ULDPE) - Chapter 35
 - Tabular Information
 - Low Density Polyethylene (LDPE) - Chapter 36
 - Tabular Information
 - Graphical Information
 - Linear Low Density Polyethylene (LLDPE) - Chapter 37
 - Tabular Information
 - Medium Density Polyethylene and Linear Medium Density Polyethylene (MDPE & LMDPE) - Chapter 38
 - Tabular Information
 - High Density Polyethylene (HDPE) - Chapter 39
 - Tabular Information
 - Graphical Information
 - Polyolefin Plastomers (POP) - Chapter 40
 - Graphical Information
 - Cyclic Olefin Copolymer (COC) - Chapter 41
 - Tabular Information
 - Ethylene-Vinyl Acetate Copolymer (EVA) - Chapter 42
 - Tabular Information
 - Graphical Information
 - Ethylene - Vinyl Alcohol Copolymer (EVOH) - Chapter 43
 - Tabular Information
 - Graphical Information
 - Ethylene-Acrylic Acid Copolymer (EAA) - Chapter 44
 - Tabular Information
 - Polypropylene (PP) - Chapter 45
 - Tabular Information
 - Graphical Information
 - Polybutene, Polybutylene (PB) - Chapter 46
 - Tabular Information

- Polyphenylene Sulfide
 - Polyphenylene Sulfide (PPS) - Chapter 47

Tabular Information

Polysulfone

Polysulfone - Chapter 48
Tabular Information

Polyvinyl Alcohol

Polyvinyl Alcohol (PVOH) - Chapter 49
Tabular Information

Styrenic Resin

Acrylonitrile-Butadiene-Styrene Copolymer (ABS) - Chapter 50
Tabular Information

Acrylonitrile-Styrene-Acrylate Copolymer (ASA) - Chapter 51
Tabular Information

Polystyrene (PS) - Chapter 52

Tabular Information
Graphical Information

Oriented Polystyrene (OPS) - Chapter 53

Tabular Information

General Purpose Polystyrene (GPPS) - Chapter 54

Tabular Information

High Impact Polystyrene (HIPS) - Chapter 55

Tabular Information

Styrene-Acrylonitrile Copolymer (SAN) - Chapter 56

Tabular Information
Graphical Information

Styrene-Butadiene Block Copolymer (SBS) - Chapter 57

Tabular Information

Vinyl Resin

Polyvinyl Chloride (PVC) - Chapter 58

Tabular Information
Graphical Information

Polyvinylidene Chloride (PVDC) - Chapter 59

Tabular Information
Graphical Information

Polyvinylidene Chloride Coated Films (PVDC) Coated Polyester Films - Chapter 60

Tabular Information
Graphical Information

THERMOPLASTIC ALLOYS

Plastic Alloy

Polyethylene/Polystyrene Alloy - Chapter 61
Tabular Information

MULTILAYER STRUCTURES

Co-Continuous Lamellae Multilayer Systems

Co-Continuous Lamellar Structures - Chapter 62

Graphical Information
Tabular Information

Laminar Multilayer Structure - Chapter 63

Tabular Information
Graphical Information

Multilayer Films

Multilayer Films - Ethylene-Vinyl Alcohol Barrier - Chapter 64

Tabular Information
Graphical Information

Multilayer Films - Polyvinylidene Chloride Barrier - Chapter 65

Tabular Information
Graphical Information

Multilayer Films - Plasma Polymerization - Chapter 66
Graphical Information
Tabular Information
Multilayer Films - Laminated Fluoropolymer Films - Chapter 67
Tabular Information
Multilayer Films - General - Chapter 68
Tabular Information

THERMOSETS

Epoxy Resin
Epoxy Thermoplastic - Chapter 69
Tabular Information

THERMOPLASTIC ELASTOMERS

Olefinic Thermoplastic Elastomer
Olefinic Thermoplastic Elastomers (TPO) - Chapter 70
Tabular Information

Polyether Block Amide
Polyether Block Amide (PEBA) - Chapter 71
Tabular Information

Polybutadiene Thermoplastic Elastomer
Polybutadiene Thermoplastic Elastomer (TPE) - Chapter 72
Graphical Information

Polyester Thermoplastic Elastomer
Polyester Thermoplastic Elastomer - Chapter 73
Tabular Information

Styrenic Thermoplastic Elastomer
Styrenic Thermoplastic Elastomer - Chapter 74
Tabular Information

Vinyl Thermoplastic Elastomer
Vinyl Thermoplastic Elastomer - Chapter 75
Tabular Information

RUBBERS

Butadiene Rubber
Polybutadiene - Chapter 76
Tabular Information
Graphical Information

Butyl Rubber
Butyl Rubber - Chapter 77
Graphical Information
Tabular Information

Bromobutyl Rubber
Bromobutyl Rubber - Chapter 78
Graphical Information

Chlorobutyl Rubber
Chlorobutyl Rubber - Chapter 79
Tabular Information

Polyisobutylene Rubber
Polyisobutylene Rubber - Chapter 80
Tabular Information

- Specialty Elastomers
 - Specialty Elastomers - Chapter 81
- Chlorosulfonated Polyethylene Rubber
 - Chlorosulfonated Polyethylene Rubber (CSPE) - Chapter 82
 - Tabular Information
- Epichlorohydrin Rubber
 - Epichlorohydrin Rubber (ECO) - Chapter 83
 - Tabular Information
- Ethylene-Propylene Rubber
 - Ethylene-Propylene Rubbers (EPM, EPDM) - Chapter 84
 - Tabular Information
 - Graphical Information
- Fluoroelastomer
 - Vinylidene Fluoride-Hexafluoropropylene Copolymer - Chapter 85
 - Tabular Information
- Natural Rubber
 - Natural Rubber - Chapter 86
 - Tabular Information
 - Graphical Information
- Neoprene Rubber
 - Polychloroprene Rubber (CR) - Chapter 87
 - Tabular Information
- Nitrile Rubber
 - Acrylonitrile-Butadiene Copolymer (NBR) - Chapter 88
 - Tabular Information
 - Graphical Information
- Polysulfide Rubber
 - Polysulfide Rubber - Chapter 89
 - Tabular Information
- Polyurethane Rubber
 - Polyurethane - Chapter 90
 - Tabular Information
 - Graphical Information
- Silicone Rubber
 - Silicone or Polysiloxane - Chapter 91
 - Tabular Information
- Styrene-Butadiene Rubber
 - Styrene-Butadiene Rubber (SBR) - Chapter 92
 - Tabular Information
 - Graphical Information
 - Additional Barrier Materials - Chapter 93
 - Metallized Films
 - Biodegradable or Organic Films
 - Barrier Properties
 - Tabular Information

APPENDICES

- Permeability of Gloves
- Permeation Rates
- Permeability Units Conversion
- Glossary of Terms

INDICES

Trade Name
References

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Permeability Properties of Plastics and Elastomers is the only data handbook on the barrier and film properties of polymeric materials in thin sections. Data on permeation of liquids, gases, moisture, aroma, and flavor — all important considerations in a wide range of applications — is extensive.

Extensive data ranges from a general overview of the barrier properties of plastics and elastomers to detailed discussions and test results. Properties are presented relative to different test conditions, exposure environments and test specimen details such as thickness or temperature. As an added feature, permeability data has been normalized to allow for easy comparison between material and test conditions.

New to this edition is textual summary information in each of the 93 resin chapters including: category, general description, processing methods, applications, and general permeability considerations for water vapor, oxygen, and other gases including aroma and flavor. The product data is presented in graphical and tabular format, with results normalized to SI units, retaining the familiar format of the first edition and allowing easy comparison between materials and test conditions.

An all new introductory chapter provides comprehensive primers on nine core topics: The Nature of Polymeric Materials; Comparative Properties of Plastics and Elastomers; Processing, Markets and Applications for Packaging; Automotive Fuels; Multilayer Films; Food and Beverage Packaging; Standard Measurements and Tests; and ASTM references.

PREFACE:

Welcome to the Second Edition of "Permeability Properties of Plastics and Elastomers: A Guide to Packaging and Barrier Materials", a unique reference and data bank on the barrier and permeability properties of polymeric materials. As a reference book, this edition strives to present data in a format that allows the user to easily compare and contrast performance characteristics between different material families, and where possible, between the products available within a material family itself. Information was gathered from many sources: material manufacturers, technical journals and papers, etc. The data are accompanied by information on test method, material notes, and conditions as available from the source document.

The introductory chapter provides a basic primer on the nature of polymeric materials, test methods, processing, and markets for barrier materials. New to this edition are chapters focusing on multilayer films, automotive fuel barriers, and tables and graphs with comparative data measuring performance of different materials on the same scale, from a single source.

Each of the ninety-three chapters presents detailed information on the permeability and barrier properties of the materials, organized by family. Within the same generic family, coverage is provided on differences between materials due to environmental factors such as temperature and humidity or material characteristics such as sample preparation and material composition. Information was included for as many tests, conditions, penetrants, and material combinations as possible. Even where detailed test metadata are not available, general information is provided, the belief being that some limited information serves as a reference point and is better than no information. It should be noted that the content of the material chapters strives to be representative rather than all inclusive. That is, a material's trends and characteristics are represented with as much detail as possible from the sources available. All manufacturers of all materials are not included due to obvious space limitations.

It is my hope that this reference is the first book to which an engineer, designer, or scientist refers when looking for general material properties and trends between families of polymers. From the data included herein, typical performance can be determined and materials selected to meet general criteria. The user can then research and evaluate within the chosen material families specific products (brands) for a specific application. Extensive references are provided for further research. Note, this resource should not serve as a substitute for actual testing to determine the choice of a particular material in a given end use environment and application.

Title	Location	Edition / Series / Misc.
1517 Physical Chemistry of Polymer Rheology		Edition:
Author: Furukawa, Junji	Dynix: 111658	Series: Springer Series in Chemical Physics:
Publish.: Kodansha Ltd. / Springer-Verlag	Call No.: 530 Fu	Vol. 72
- place: Tokyo, Japan / Berlin, Germany	ISBN: 3540000534	
- date: ©2003	Shelf Adult Non-Fiction	Year: 2003
Subject: Polymers -- Rheology		Price: \$86.50
Desc: xv, 278 p., illus., 24 cm.		

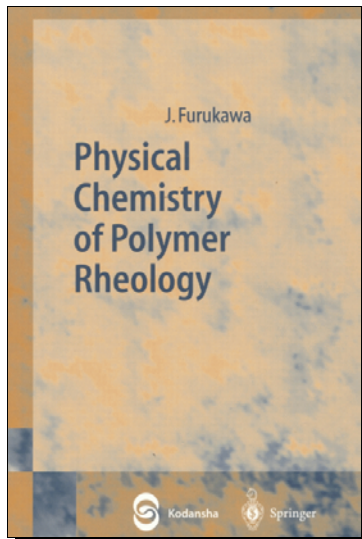


Table of Contents

Preface

Part I: Elementary Rheology of Polymers

1. Characteristic Features of Polymers

- 1.1 Introduction
- 1.2 Chemical structure
- 1.3 Properties

2. Thermodynamics of Dilute Polymer Solutions

- 2.1 Thermodynamics of ordinary molecules
- 2.2 Entropy and heat of solution of polymers
- 2.3 Osmotic pressure and vapor pressure of the polymer solution
- 2.4 Phase separation
- 2.5 Arrangement of segments in polymer chains
- 2.6 End-to-end distance of polymer chains
- 2.7 Viscosity of polymer solution

References

3. Transition Temperatures

- 3.1 Melting point
- 3.2 Thermodynamic and rheological transitions of amorphous polymers
- 3.3 Empirical rule for T_m
- 3.4 T_m of crystalline polymer
- 3.5 Glass transition and softening temperatures
- 3.6 New thermodynamics and kinetics for polymers
- 3.7 Relation between T_g and

References

4. Mechano- and Hydrodynamics

- 4.1 Measurement of elasticity and viscosity
- 4.2 Viscoelasticity
- 4.3 Dynamic spectrum
- 4.4 Viscosity

References

5. Rubber Elasticity

- 5.1 Thermodynamics of rubber elasticity
- 5.2 Chain configuration
- 5.3 Elastic force of vulcanized rubber
- 5.4 Elasticity at large deformation
- 5.5 Mooney-Rivlin equation
- 5.6 Effect of cohesion heat
- 5.7 Induced crystallization and orientation
- 5.8 Rebound resilience and T_g
- 5.9 Sound velocity in rubber
- 5.10 Other theories

References

6. Molecular Dynamics of Viscoelasticity

- 6.1 Dynamic stress-relaxation spectrum

Subjects

724 . Polymers -- Rheology

- 6.2 Superposition principle of Boltzmann
- 6.3 Models and theories
 - 6.3.1 Free volume model of Eyring
 - 6.3.2 Spring-beads model of Rouse
 - 6.3.3 Reptation model of de Gennes
 - 6.3.4 Tube model of Doi-Edwards
- 6.4 Theories on plastic zone
- References

- 7. Accounts of Viscoelasticity with the Pseudo Crosslink Model
 - 7.1 Viscoelasticity
 - 7.2 Plasticity
 - 7.3 Melt viscosity
 - 7.4 Stress relaxation spectrum
 - 7.5 Diffusion constant of polymer
 - References

- 8. Rheology for Large Deformation
 - 8.1 Elongational viscosity
 - 8.2 Accounts of elongational elasticity and viscosity
 - 8.3 Yield and failure point
 - 8.4 Creep of polymer
 - 8.5 Creep of vulcanized rubber
 - 8.6 Die swell
 - 8.7 Compliance
 - References

- 9. Gel and Suspension
 - 9.1 Transition points for solution
 - 9.2 Elasticity and viscosity of concentrated solution
 - 9.3 Osmotic pressure in gel
 - 9.4 Coil-globule transition
 - 9.5 Other transitions or critical points of chain molecules
 - 9.6 Emulsion and suspensions
 - 9.7 Stability of emulsion
 - 9.8 Application of the lattice model to suspension
 - 9.9 Thixotropy of suspension
 - References

- 10. Strength of Rubber and Active Filler
 - 10.1 Strength as a function of vulcanization
 - 10.2 Rupture of natural and synthetic rubber
 - 10.3 Effect of active filler on elasticity
 - 10.4 Effect of active filler on strength
 - 10.5 Carbon black
 - 10.6 Payne effect
 - 10.7 Mullins effect
 - 10.8 Grosch equation
 - References

- 11. Strength of Plastics and Fibers
 - 11.1 Strength of plastics
 - 11.2 Improvement of impact strength by rubbery dispersion
 - 11.3 Strength of fiber
 - 11.4 Super-strong fibers
 - References

- 12. Adhesives
 - 12.1 Chemical adhesives
 - 12.2 Tack adhesion
 - 12.3 Theory using the pseudo crosslink model
 - 12.4 Formation of voids and fibrils on peeling
 - 12.5 Tensile and shear strength of adhesives
 - References

- 13. Friction and Abrasion of Rubber
 - 13.1 Mechanics of friction
 - 13.2 Chemical aspect of friction
 - 13.3 Abrasion and anti-abrasionReferences

- 14. Polymer Blends
 - 14.1 Homogeneous blend
 - 14.2 Heterogeneous blend
 - 14.3 Blend of block polymers
 - 14.4 Interpenetrating network structure and reactive processing
 - 14.5 Blend rules
 - 14.6 Blend of plastics
 - 14.7 Blend of block copolymers
 - 14.8 Modes of blend
 - 14.9 Blend rules
 - 14.9.1 Conventional blend rule
 - 14.9.2 Deviation from the average
 - 14.9.3 Blend for dispersion
 - 14.10 RemarksReferences

- 15. New Block Copolymers
 - 15.1 SBS-TPE
 - 15.2 Polyurethane-TPE
 - 15.3 Special blend of rubber-polypropylene by dynamic vulcanization
 - 15.4 Polymer hybridsReferences

Part II: Theory of Pseudo Crosslinks of Multi-Size

- 16. Pseudo Crosslink Model—A New Thermodynamics and Kinetics of Chain Molecules
 - 16.1 Entanglement of chains
 - 16.2 Pseudo crosslink
 - 16.3 Size of links and length of chains
 - 16.4 Transition temperatures
 - 16.5 Time for translation or relaxation
 - 16.6 Relaxation time of unit segment
 - 16.7 History of the pseudo crosslink modelReferences

- 17. Theory of Glass Transition
 - 17.1 Tg and Ts
 - 17.2 Effect of molecular length on Tg
 - 17.3 Effect of vulcanization on Tg of rubber
 - 17.4 Tg of polymer solution
 - 17.5 Tg of polymer blends
 - 17.6 Tg of copolymers
 - 17.7 Tg of inorganic glass
 - 17.8 Comparison with other theories
 - 17.9 ConclusionReferences

- 18. Theory of Melting and Softening
 - 18.1 Melting temperature
 - 18.2 Theoretical considerations
 - 18.3 Softening temperature
 - 18.4 Comparison with data in the literatureReferences

- 19. Theory of Effect of Glass Transition Temperature
 - 19.1 Effect of Tg on viscoelasticity
 - 19.2 Thermal expansion coefficient

- 19.3 Tg of polymer blends
- 19.4 Cooling condition and glass
- References

- 20. Theory of Viscosity and Diffusion
 - 20.1 Viscosity of ordinary liquid
 - 20.2 Viscosity of polymer melt
 - 20.3 Viscosity of polymer solution
 - 20.4 Effect of high shear or shear rate
 - 20.5 Diffusion constant of polymer
 - 20.6 Comparison with the literature
 - References

- 21. Theory of Viscoelasticity
 - 21.1 Stress relaxation spectrum
 - 21.2 Explanation using the pseudo link model
 - 21.3 Static spectrum
 - 21.4 Dynamic relaxation spectrum
 - 21.5 Effect of high shear or shear rate
 - References

- 22. Theory of Rheology of Bulk Polymers
 - 22.1 Various mechanisms of stress dissipation
 - 22.2 Elongational viscosity
 - 22.3 Comparison with data in the literature
 - 22.4 Yield and failure point
 - 22.5 Creep of raw rubber
 - 22.6 Creep of vulcanized rubber
 - References

- 23. Theory of Elasticity of Rubber and Cohesion
 - 23.1 Vulcanized rubber
 - 23.2 Alternating copolymers
 - 23.3 Effect of structure of the repeating unit
 - 23.4 Elasticity and plasticity of raw rubbers
 - References

- 24. Theory of Strength of Vulcanized Rubber
 - 24.1 Rupture of bond
 - 24.2 Natural rubber
 - 24.3 Synthetic rubber
 - 24.4 Effect of temperature and vulcanization
 - 24.5 Alternating copolymers
 - 24.6 Comparison with data in the literature
 - 24.7 Effect of geometrical and sequential regularities
 - 24.8 Tear strength
 - References

- 25. Theory of Active Filler
 - 25.1 Basic concept of reinforcement by filler
 - 25.2 Slip of adsorbed chains by large deformation
 - 25.3 Effect of filler on strength of vulcanized rubber
 - 25.4 Mullins effect
 - 25.5 Grosch equation
 - 25.6 Structure of carbon black
 - 25.7 Payne effect
 - 25.8 Comparison with the literature
 - References

- 26. Theory of Impact Strength of Plastics
 - 26.1 Theory for brittle fracture
 - 26.2 Improvement of impact strength by rubbery dispersion
 - 26.3 Theory of relaxation of impact energy
 - 26.4 Mechanical model for craze propagation

References

27. Theory of Strength of Fiber and Ultimate Strength

27.1 Scission of chemical bond

27.2 Cohesion and orientation

27.3 Super-strong fiber

27.4 Ultimate properties

References

28. Theory of Thermoplastic Elastomer

28.1 Triblock copolymer

28.1.1 Length of blocks

28.1.2 Micelle as hard domain

28.1.3 Softening temperature of commercial TPE

28.1.4 Elasticity

28.1.5 Strength and elongation at break

28.2 Segmented polyurethane

28.2.1 Preparation

28.2.2 Softening temperature

28.2.3 Elastic properties

28.2.4 Commercial polyurethane

28.3 TPE prepared by dynamic vulcanization (DV TPE)

28.3.1 Dynamic vulcanization

28.3.2 Elastic property

28.3.3 Deformation of hard layer

28.3.4 Rupture at interface

References

29. Theory of Polymer Micelles and Suspension

29.1 Polymer solution

29.2 Homogeneous blend of polymers

29.3 Formation of micelles

29.4 Core-shell structure

29.5 Micelles of soap and ionomers

29.6 Suspensions and emulsions

29.6.1 Thermodynamics of colloids

29.6.2 Viscosity of colloids

29.6.3 Ordered structure of suspension

29.7 Rheology of polymer with filler

References

30. Theory of Tack Adhesion

30.1 Physico-chemical mechanism

30.2 Adhesion force and bonding force

30.3 Peeling without void formation

30.4 Peeling with formation of voids and fibrils

30.5 Effect of backing film

30.6 Tensile force in adhesion

30.7 Shear force between parallel plates

30.8 Peeling spectrum

30.9 Comparison with data in literature

30.9.1 Adhesion force

30.9.2 Effect of peeling angle of adhesives

30.9.3 Effect of peeling velocity

30.9.4 Effect of thickness

References

31. Theory of Friction and Abrasion

31.1 Mechanics of friction

31.2 Chemical aspects concerning friction

31.3 Vibration caused by friction

31.4 Abrasion

31.5 Role of carbon black and filler

31.6 Rolling resistance of tires

- 31.7 Comparison with literature
 - 31.7.1 Friction and abrasion
 - 31.7.2 Carbon black and active filler
- References

List of Symbols

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Rheology is the science and technology that deals with the deformation of polymeric or plastic materials. In this monograph the field of polymer rheology is explained with emphasis on the chemical theory. The book provides basic information on rheology for nonspecialists and gives clear explanations of the various phenomena. The author has developed a new theory of thermodynamics and kinetics using a model of multi-size pseudo crosslinks that provides a comprehensive principle to show that links in chain molecules affect the melting temperatures and determine polymer properties such as viscoelasticity, melt viscosity and elastic and plastic behavior of bulk polymers. The theory can be extended to include the strength of rubber and plastics, active fillers and adhesion, friction and abrasion.

PREFACE:

Polymer rheology has developed as a technology and is dealt with mostly from the standpoint of physics, mechanics or hydrodynamics. Many books have been written from these points of view and published. The present author specializes in polymer synthesis but feels the importance of physical chemistry for the understanding of polymer rheology.

Rheological properties have been investigated by many scientists and technologists, and a tremendous amount of knowledge has been accumulated. There are many rules found empirically, but their theoretical meanings are not always sufficient and the basic principles governing various rules are rather few. Indeed, viscoelasticity is the most characteristic property of polymeric materials and it changes in wide ranges of temperature and deformation rate. It has been explained by a number of theories using various models but no comprehensive principle has so far been presented.

The author proposed a new theory of thermodynamics and kinetics for chain molecules using a model of pseudo crosslinks of multi-sizes. It suggests that the links possess their own melting temperatures. They are changed by the rheological conditions providing the softening and glass-transition temperatures. These temperatures determine polymer properties, such as viscoelasticity, melt viscosity and elastic as well as plastic behaviors of bulk polymers.

The theory can be extended to the strength of rubber and plastics, active fillers, blend systems including emulsion and suspension and also to phenomena involving cohesion heat, e.g., adhesion, friction and abrasion.

In this volume emphasis is placed on the introduction of chemical theory. It is divided into two parts. Part I provides fundamental knowledge on rheology for nonspecialists of polymer physics and outlines the theory for explanation of phenomena. Part II describes the theory in greater detail.

Title	Location	Edition / Series / Misc.
110 Physical Chemistry of Surfaces		<i>Edition:</i> 2nd edition
<i>Author:</i> Adamson, Arthur W.	<i>Dynix:</i> 43932	<i>Series:</i>
<i>Publish.:</i> Interscience Publishers, Inc.	<i>Call No.:</i> 541.3453 Ad	
<i>- place:</i> New York, NY	<i>ISBN:</i>	
<i>- date:</i> [1967]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1967
<i>Subject:</i> Surface chemistry		<i>Price:</i> \$25.00
<i>Desc:</i> xx, 747 p., illus., 24 cm.		

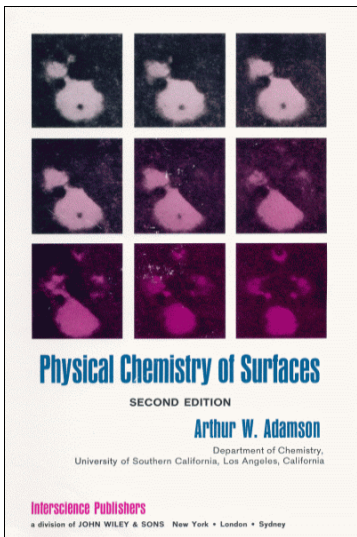


Table of Contents

- I. Capillarity
- II. The Nature and Thermodynamics of Liquid Interfaces
- III. Surface Films on Liquid Substrates
- IV. Electrical Aspects of Surface Chemistry
- V. Surfaces of Solids
- VI. Long Range Forces
- VII. The Solid-Liquid Interface -- Contact Angle -- Nucleation
- VIII. The Solid-Liquid Interface. Adsorption from Solution
- IX. Friction and Lubrication; Adhesion
- X. Wetting, Flotation and Detergency
- XI. Emulsions and Foams
- XII. The Solid-Gas Interface -- General Considerations
- XIII. Adsorption of Gases and Vapors on Solids
- XIV. Chemisorption and Catalysis

Author Index

Subject Index

Reviews - Synopsis - Dust Jacket

Preface to the Second Edition

The Preface to the First Edition states the continuing intention as to the scope and aim of this book. The general flavor also remains much the same. As before, some speculative material has been included and personal opinions have been expressed. The intention is to make the book more readable and more interesting, although serious departure from generally accepted views has been avoided.

Seven years may not seem to constitute a very long time between editions, but the pace of contemporary science has been such that a number of major developments have become so well established during this period that their inclusion is now appropriate in a text and reference book. Subject areas particularly affected include those of contact angle, adsorption from solution, and the chemical physics of the adsorbed state at the solid-gas interface. Chapters VII, VIII, XIII, and XIV are accordingly extensively revised. Some rearrangement has also occurred; contact angle and nucleation form a separate chapter, and that on adsorption from solution has been placed much earlier. In addition to these specific changes, the entire manuscript has been rewritten so as to allow a general updating of all portions in a smooth manner.

The book is now somewhat longer; it is more concentrated and more quantitative in content than before; the assumed level of undergraduate preparation in physical chemistry is higher. With respect to its use as a text, it might be noted that not only have most of the original problems been revised, but also, in response to requests, many new problems have been added. A problem section now follows each chapter. As a hint to students, many of the problems will be relatively difficult to answer unless the literature cited in the relevant section of the text is consulted. In addition, as an aid both to the teacher and to the general reader, about a third of the material has been placed in small print. Such material is dispensable with respect to the main stream of the presentation, although it is too important to be omitted entirely.

Subjects

333 .	Surface chemistry
353 .	Chemistry, Physical and theoretical

Title	Location	Edition / Series / Misc.
819 Pictorial Standards of Coatings Defects		Edition: 7th printing
Author: Philadelphia Society for Coatings Technology (Pictorial Standards Sub	Dynix: 100379	Series: FSCT Item No. PS-CPM
Publish.: Federation of Societies for Coatings Technology	Call No.: 667.9 Pi	
- place: Philadelphia, PA	ISBN: 9991165231	
- date: ©1979	Shelf Adult Non-Fiction	Year: 1979
Subject: Protective coatings -- Defects		Price: \$100.00
Desc: 1 volume, (looseleaf), illus., 29 cm.		

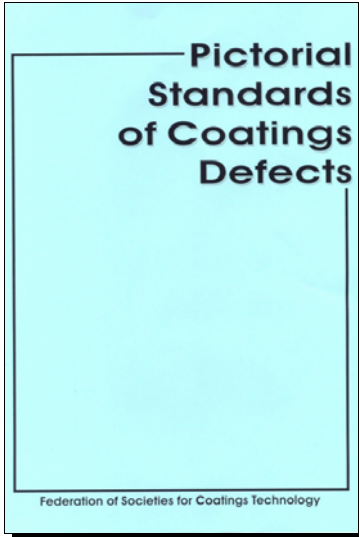


Table of Contents

1. Blistering
 2. Chalking
 3. Checking
 4. Cracking
 5. Erosion
 6. Filiform Corrosion
 7. Flaking
 8. Mildew
 9. Print
 10. Rust
 11. Frame Paint Abrasion
 12. Frame Paint Chipping
 13. Adhesion
 14. Roller Spatter
- SUPPLEMENTARY STANDARDS
RECORD SHEETS

Reviews - Synopsis - Dust Jacket

PREFACE

At the 1939 Annual Meeting of the Federation of Paint and Varnish Production Clubs (now known as the Federation of Societies for Coatings Technology), the Philadelphia club presented a paper entitled "Proposed Pictorial Standards for Designating Degree of Failure of Organic Films." Subsequently, each member club was requested to review the proposed standards and, if agreeable, to adopt a resolution signifying their acceptance as standards for the industry. The response was immediate and the majority of replies favored adoption of the standards as presented, with some constructive criticisms incorporated where it was deemed practical and advantageous to do so.

For a more detailed account of the history of the development of these standards, reference should be made to the original paper presented at the 1939 Annual Meeting.

No attempt has been made to provide standards for every failure of a particular type. For instance, checking may appear in a number of forms such as regular, irregular, crowsfoot, plastic, or line type. Rather than select standards for each, we have chosen regular checking as the most common, and the standards portray various degrees of this type. All kinds may be readily interpreted in terms of degree by reference to the standards. The same explanation serves for some of the other standards.

The standards presented are actual size photographs in all cases, and every attempt has been made to produce these photographs so that they portray distinctly the failure being illustrated. In each case, insofar as possible, only one type of failure is shown in each photograph in order to eliminate confusion. An exception is in the flaking standards, since it is practically impossible to observe this type of failure without it being accompanied by cracking. It should be kept in mind, however, that a number of types of these failures may be observed on a given film, but with some experience all of the types may be readily recognized.

With the necessity of a sixth printing, the Manual was reviewed by the Philadelphia Society for Coatings Technology jointly with American Society for Testing and Materials. A loose-leaf, open-end format was chosen for this new edition. The standards were faithfully reproduced with an attempt to improve the photographic quality of the prints. Where necessary, an improved and approved set of standard prints will be prepared to supplement or replace standards of poor quality.

This new edition also includes additional standards developed since the previous printing. As other standards are developed, they will be added to new issues of the Manual and made available for addition to previously issued

Subjects

535 . Protective Coatings -- Defects

Manuals. All standards are also available separately.

This work was previously published as "Exposure Standards Manual". The title has been changed to "Pictorial Standards of Coatings Defects" to more precisely identify the contents of the Manual.

Copies of this Manual may be obtained from: The Federation of Societies for Coatings Technology, 492 Norristown Road, Blue Bell, PA 19422

1st printing	October 15, 1941
2nd printing	December 5, 1948
3rd printing	December 5, 1953
4th printing	January 15, 1960
5th printing	January 15, 1966
6th printing	April 27, 1979

Title	Location	Edition / Series / Misc.
111 Pigment Handbook Author: Lewis, Peter A. (editor, v1); Patton, Temple C. (editor, v2, v3) Publish.: John Wiley & Sons - place: New York, NY - date: ©1988 (v1), ©1973 (v2,v3) Subject: Pigments Desc: v1(xxvi, 945 p.) v2(viii, 455 p.) v3(viii, 538 p.) illus., 26 cm.	Dynix: 08255 Call No.: 667.29 Pi ISBN: 0471828335 Shelf Reference	Edition: 2nd edition Series: Wiley-Interscience Publication Year: 1988 Price: \$50.00

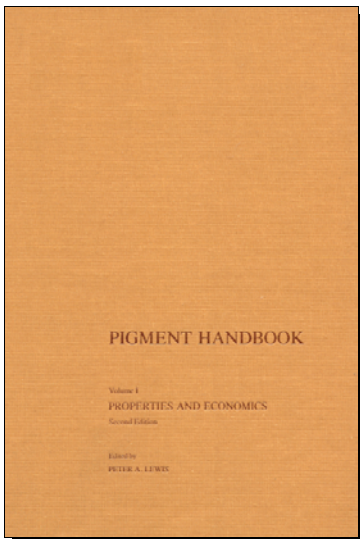


Table of Contents

VOLUME I: Properties and Economics

A WHITE PIGMENTS

- a Titanium Dioxide
- b Zinc-Based Pigments
 - 1 Zinc Sulfide
 - 2 Lithopone
- c Lead-Based Pigments
 - 1 Basic Lead Sulfate
- d Antimony Oxide
- e Zircon and Zirconium Oxide
 - 1 Zircon
 - 2 Zirconia

B EXTENDER PIGMENTS

- a Mineral Fillers — An Overview
- b Calcium Carbonates
 - 1 Natural Calcium Carbonate
 - 2 Precipitated Calcium Carbonate
- c Silicas
 - 1 Natural
 - i CRYPTOCRYSTALLINE QUARTZ—AMORPHOUS
 - ii CRYSTALLINE SILICA
 - iii DIATOMACEOUS SILICA
 - iv MICROCRYSTALLINE SILICA
 - 2 Synthetic
 - i PRECIPITATED SILICA
 - ii FUMED SILICA
 - iii SILICA GELS
- d Silicates
 - 1 Aluminum Silicate (Kaolin)
 - 2 Natural Calcium Metasilicate
 - 3 Synthetic Calcium Silicate
 - 4 Sodium Aluminosilicate
 - 5 Magnesium Silicate (Talc)
 - 6 Aluminum Potassium Silicate (Mica)
 - 7 Nepheline Syenite
 - 8 Hydrated Magnesium Aluminum Silicate
- e Sulfates
 - 1 Natural Barium Sulfate (Barytes)
 - 2 Synthetic Barium Sulfate (Blanc Fixe)
- f Miscellaneous Extender Pigments
 - 1 Expanded Perlite

C COLORED INORGANIC PIGMENTS

- a Oxides
 - 1 Natural, Colored Iron Oxide Pigments
 - 2 Synthetic, Colored Iron Oxide Pigments
 - i SYNTHETIC RED IRON OXIDE

Subjects

293 . | Pigments

Volumes

- Vol 1-Properties and Economics
- Vol 2-Applications and Markets
- Vol 3-Characterization and Physical Relationships

- ii SYNTHETIC YELLOW IRON OXIDE
- iii SYNTHETIC BROWN IRON OXIDE
- iv ZINC AND MAGNESIUM FERRITE PIGMENTS
- 3 Hydrated Chromium Oxide Green
- 4 Chromic Oxide Green
- b Chromates
 - 1 Lead Chrome Pigments
 - 2 Molybdate Orange
 - 3 Chrome Green
- c Cadmiums
 - 1 Cadmium Sulfide Pigments
 - 2 Cadmium—Mercury Sulfides
- d Ferriferrocyanides
 - 1 Iron or Muon Blue
- e Miscellaneous Inorganics
 - 1 Ultramarine Pigments
 - 2 Nickel Antimony Titanate Yellow
 - 3 Chrome Antimony Titanate Buff
 - 4 Cobalt Aluminate Blue
 - 5 Manganese Violet
 - 6 Manganese Antimony Titanate Brown
 - 7 Miscellaneous Mixed Metal Oxide Pigments
 - 8 Bismuth Vanadate/Molybdate Yellow

D COLORED ORGANIC PIGMENTS

- a Overview
 - 1 Introduction to Colored Organic Pigments
 - 2 The World Organic Pigment Market
- b Nitroso Pigments
 - 1 Pigment Green 8
- c Monoazo-Based Colors
 - 1 Hansa® Yellows and Oranges
 - 2 Orthonitroaniline and Dinitroaniline Oranges
 - 3 Toluidine, Para and Chloronitroaniline Reds
 - 4 Naphthol Reds
 - 5 Red Lake C
 - 6 Lithol Red
 - 7 Rubines
 - 8 Permanent Red 2B
 - 9 BON Maroon
 - 10 Pigment Scarlet
 - 11 Nickel Azo Yellow
 - 12 Tartrazine Yellow Lake
 - 13 Anthosine Lakes
 - 14 Benzimidazolone Pigments
- d Disazo-Based Colors
 - 1 Diarylide Yellow and Orange Pigments
 - 2 Pyrazolone-Based Pigments
 - 3 Improved Performance Diarylide Yellows
- e Disazo Condensation Pigments
- f Basic Dye-Based Pigments
 - 1 Fugitive Basic Dye-Based Pigments
 - 2 Permanent Basic Dye-Based Pigments
- g Alkali Blues
- h Quinacridone Pigments
- i Carbazole Dioxazine Violet
- j Alizarine Lake
- k Vat Pigments
 - 1 Vat Pigments Based on Anthraquinone
 - 2 Perylenes
- l Phthalocyanines
 - 1 Phthalocyanine Blue Pigments
 - 2 Phthalocyanine Green Pigments
- m Isoindoline-Based Pigments

- n Tetrachloroisindolinone-Based Pigments
- o Novel Organic Reds and Yellows
- p Pyrazoloquanzolone Pigments

E BLACK PIGMENTS

- a Carbon Black
- b Graphite
- c Black Iron Oxides
 - 1 Natural Black Iron Oxide
 - 2 Natural Micaceous Iron Oxide
 - 3 Synthetic Black Iron Oxide
- d Copper/Chrome Black

F METALLIC PIGMENTS

- a Aluminum Flake
- b Gold Bronze Flake
- c Zinc Pigment
- d Stainless Steel Flake
- e Nickel Powders and Nickel Flake Powders

G NACREOUS (PEARLESCENT) PIGMENTS AND INTERFERENCE PIGMENTS

H LUMINESCENT ORGANIC PIGMENTS

I FLUORESCENT AND PHOSPHORESCENT INORGANIC PIGMENTS

J MISCELLANEOUS

- a Cuprous Oxide
- b Mercuric Oxide
- c Modified Barium Metaborate
- d Molecular Sieves

K FOOD, DRUG, AND COSMETIC COLORS

VOLUME II: Applications and Markets

A PIGMENTATION OF PAINTS FOR THE PROTECTION AND DECORATION OF COMMON SUBSTRATES

- a Pigmentation of Masonry Coatings
- b Paints for Ferrous Metals
 - 1 Pigmentation of Automotive Finishes
 - 2 Pigmentation of Metal Coil Coatings
 - 3 Pigmentations of Coatings for Marine and Ship Service
 - 4 Pigmentation of Coatings for Structural Steel
- c Paints for Nonferrous Metals
 - 1 Pigmentation of Coatings for Zinc and Lead Substrates
 - 2 Pigmentation of Paints for Nonferrous Metals other Than Zinc or Lead
- d Pigmentation of Trade Sales Paints for Wood Substrates

B PIGMENTATION OF PAINTS THAT PROVIDE SPECIAL PROPERTIES (FUNCTIONAL PAINTS)

- a Pigmentation of Antifoulants
- b Pigmentation of Electrocoatings
- c Pigmentation of Flame-Resistant and Intumescent Paints
- d Pigmentation of Heat-Resistant Paints
- e Pigmentation of Fluorescent Paints

C PIGMENTATION OF JOINT FILLERS

D PIGMENTATION OF INKS

- a Pigmentation of Commercial Printing Inks
- b Pigmentation of Carbon Paper Inks
- c Pigmentation of Machine Communication Inks

E PIGMENTATION OF PAPER GOODS

F PIGMENTATION OF ELASTOMERS

- a Pigmentation of White Elastomers
- b Pigmentation of Colored Elastomers
- c Pigmentation of Black Elastomers (Carbon Black Reinforcement)

G PIGMENTATION OF PLASTICS

- a Pigmentation of White Plastics
- b Pigmentation of Colored Plastics
- c Pigmentation of Black Plastics

H PIGMENTATION OF COSMETICS

I PIGMENTATION OF MARKERS

J PIGMENTATION OF MAGNETIC TAPES

K PIGMENTATION OF FOODSTUFFS (CERTIFIED PIGMENTS)

L PIGMENTATION OF TEXTILES

M PIGMENTATION OF ADHESIVES

N PIGMENTATION OF CERAMICS

- a Economics and Historical Background
- b Pigmentation of Glass
 - 1 Colored Glass
 - 2 Glass Colors
- c Pigmentation of Clayware
- d Pigmentation of Porcelain Enamels
 - 1 Sheet Iron Porcelain Enamels
 - 2 Aluminum Porcelain Enamels
 - 3 Cast Iron Porcelain Enamels

O PIGMENTATION OF ARTISTS' COLORS

P PIGMENTATION OF VACUUM METALLIZED FINISHES

Q PIGMENTATION OF PHOTOCONDUCTIVE COATINGS (ELECTROSTATIC PRINTING)

R PIGMENTATION OF CONCRETE AND MORTAR

Appendix Coding for Pigment Manufacturers

VOLUME III: Characterization and Physical Relationships

A NATURE, MEASUREMENT, AND CHARACTERIZATION OF PIGMENT PARTICLES AND PIGMENT DISPERSIONS

- a Pigment Powders and Their Applications (Measurement of Application Properties)
- b Pigment Powders and Dispersions (Measurement and Interpretation of Their Physical Properties)
- c Improving the Physical Properties of Pigments (Pigment Elaborations)
- d Methods for Measuring and Characterizing the Size, Shape, and Distribution of Pigment Particles

- 1 Sieving
- 2 Sedimentation Methods

- i CHARACTERIZATION OF PIGMENTS (GRAVITY SEDIMENTATION TECHNIQUES)
- ii CENTRIFUGAL SEDIMENTATION

- 3 Microscope Methods

- i LIGHT MICROSCOPE AND PIGMENT IDENTIFICATION BY LIGHT AND ELECTRON MICROSCOPE

TECHNIQUES

- (1) Size, Shape, and Size Distribution of Pigments (Light Microscopy)

- (2) Pigment Identification (Microscopy)
 - ii THE TRANSMISSION ELECTRON MICROSCOPE (ITS ROLE IN PIGMENT TECHNOLOGY)
- 4 Size Distribution of Pigment Particles (Measurement and Characterization by Light-Scattering Techniques)
- 5 Coulter Counter (Measurement of Particle Size)
- 6 Characterization of Pigment Particles (X-Ray Techniques)
- 7 Characterization of Pigments (Permeability Techniques)
- 8 Converting Particle Surface Area Data (Mean Particle Size)

- B PIGMENT SURFACE CHARACTERISTICS
 - a Nature of Pigment Surfaces (Liquid Adsorption)
 - b Surface Measurement by Gas Adsorption
 - c Surface Treatment of Organic Pigments
 - d Surface Properties of Important Pigments
 - 1 Surface Properties of Titanium Dioxide Pigments
 - 2 The Morphology and Chemistry of Carbon Black

- C PIGMENT/BINDER GEOMETRY (INTERPARTICULATE RELATIONSHIPS)

- D PIGMENT OPTICS
 - a Radiant Energy
 - b Color Theory
 - c Opacity, Hiding Power, and Tinting Strength
 - d Surface Appearance
 - 1 Surface Appearance (Gloss, Sheen, and Flatness)
 - 2 Pearlescence (The Optical Behavior of Nacreous and Interference Pigments)

- E PIGMENT DISPERSION AND RHEOLOGY
 - a Paint Rheology and Pigment Dispersion
 - b Rheology and Dispersion of Printing Inks
 - c Paper Manufacture (Pigment Dispersion and Rheology)
 - d Carbon Black Dispersion in Elastomers (Rheology of Black-Loaded Elastomers)
 - e Pigment Dispersion and Rheology in Plastics

- F PIGMENT FLUSHING

- G PIGMENT ELECTROCHEMISTRY
 - a Pigment Electrochemistry (Corrosion)
 - b Electrocoating (Theory and Reduction to Practice)

- H COLOR ESTHETICS (COLOR PREFERENCES AND CONTEMPORARY COLOR USAGE)

- Appendix I Coding of Pigment Manufacturers

- Appendix II Abbreviations and Symbols

- Appendix III ASTM Test Procedures

- Appendix IV Glossary

Reviews - Synopsis - Dust Jacket

PREFACE:

This second edition of Pigments Handbook, Volume I, is a continuation of the work compiled originally by Temple C. Patton. It is the work of no one person, but is rather the compilation of knowledge and expertise from worldwide authorities in the pigment industry. Through it the reader can obtain an understanding of such topics as the physical and chemical meaning of color, the worldwide market for pigments, the essentials of each pigment's manufacturing or extraction process, and the properties and major reasons for use of each of the pigments covered.

By design, the second edition is not merely an update of the earlier edition. Obviously, new data have been added to update figures originally provided in the 1973 volume. In addition, the reader will find chapters on novel organic and inorganic pigments that were not even at the research stage when the 1973 volume was published.

Furthermore, there are some pigments and classes of pigments that no longer occupy a large enough place in the market or whose usage has been totally discontinued and so are not featured in the second edition.

The majority of chapters include a new and unique section concerning the effect of the pigment on health and the environment. To many, this section will have special significance in light of the varied legislated standards that today's pigment manufacturer and pigment consumer must satisfy. This second edition of Volume I, Properties and Economics, is complemented by Volume II, Applications and Markets, and Volume III, Characterization and Physical Relationships.

INTRODUCTION:

Definition of a Pigment - Fundamental to the understanding of this volume is an appreciation of just what defines a pigment. Most definitely a pigment is not a dyestuff. The Dry Color Manufacturers Association (DCMA) has prepared a legally accepted definition of a pigment. Essentially, the DCMA defines a pigment as a colored, black, white, or fluorescent particulate organic or inorganic solid which is usually insoluble in, and essentially physically and chemically unaffected by, the vehicle or substrate into which it is incorporated. A pigment will alter appearance by selective absorption and/or by scattering of light. The pigment is usually dispersed in a vehicle or substrate for application as, for example, in the manufacture of paints, plastics, or other polymeric materials and inks. The pigment will retain its own unique crystalline or particulate structure throughout the incorporation process.

By contrast, dyestuffs essentially are soluble in the carrying medium and therefore any crystalline features are lost in solution when a dyestuff is used to impart color to a material.

Title	Location	Edition / Series / Misc.
113 Pigments for Inkmakers Author: Sanders, J. D. Publish.: SITA (Selective Industrial Training Associates) Technology, Ltd. - place: London, UK - date: ©1989 Subject: Printing ink Desc: vii, 238 p., 24 cm.	Dynix: 21207 Call No.: 667.29 Sa ISBN: 0947798072 Shelf Adult Non-Fiction	Edition: Series: Year: 1989 Price: \$25.00

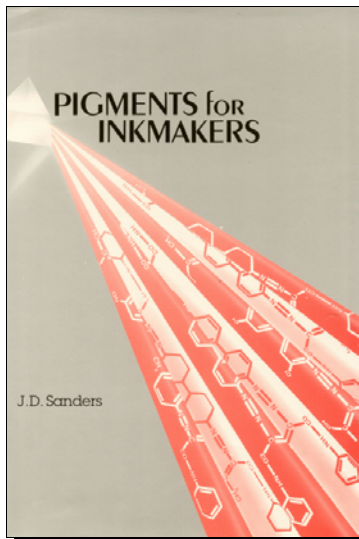


Table of Contents

Preface

1. Definitions and Terminology
2. Colour and Chemical Constitution
3. Azo Pigments
4. Phthalocyanine Pigments
5. Basic Dye Complex Pigments
6. High Performance Pigments
7. Reflex Blue
8. Pigment Green B
9. Phloxine Toner
10. Flushed Pigments
11. Stabilisation of Pigment Dispersion
12. Effect of Constitution on Pigment Properties
13. Summary of Pigment Resistance Properties

Bibliography
 General Index
 C. I. Pigment Index

Reviews - Synopsis - Dust Jacket

PREFACE

To an inkmaker pigments are rather more than the means of introducing colour. Quite often they form the most expensive part of the recipe, frequently accounting for over half the ex-works cost. Regrettably they are also to many ink technologists one of the least understood raw materials they use.

This is not altogether surprising. Most ink technologists are prepared to acknowledge that ink formulation skills are essentially empirical in nature. Great flair and ingenuity is often required in the selection and manipulation of raw materials, but rarely is there freedom for the inkmaker to solve his problems by chemical methods. Solutions are based in the main on instinct and experience.

The same is to some extent the case with pigment technology. A modification may be made in the vat to give improved dispersibility or printing performance without really understanding why. Even the 'rules' of colour chemistry are beset with exceptions and caveats.

Unlike ink manufacture, however, pigment production is essentially a chemical process. Its raw materials are, for the most part, well defined chemicals and the pigment technologist has available to him a number of chemical tools and building blocks.

SITA Technology has for many years recognised the need for better understanding between the various technologies which have an influence on printing ink. This is important if real innovation is to take place in ink technology and applies not only in fundamental research and development, which only the largest companies can afford, but ultimately in the solution of day to day technical problems. For real progress all chemists and technologists concerned either with inkmaking or pigment development must be encouraged to understand what they are trying to achieve in physical and chemical terms -- without, it should be stressed, having to be discouraged by the mathematical jargon with which so many experts surround their subjects.

This book sets out to explain the workings of organic pigment technology in language which is intelligible to ink chemists and technologists. Emphasis is placed throughout on the influence of pigment chemistry on the properties of organic pigments so that this may be better understood and hopefully viewed with less suspicion by those concerned with printing ink formulation.

Subjects

293 .	Pigments
322 .	Printing ink

The chemistry and properties of inorganic pigments and extenders are outside the scope of this book and are considered elsewhere.

Title	Location	Edition / Series / Misc.
114 Pigments for Paints and Inks: Physical and Chemical Properties <i>Author:</i> Morgans, W. M. (Wilfred Morley), 1907- <i>Publish.:</i> Selection & Industrial Training Administration Ltd. <i>- place:</i> Manchester, UK <i>- date:</i> [1977] <i>Subject:</i> Pigments <i>Desc:</i> [8], 140 p., illus., 27 cm.	<i>Dynix:</i> 12986 <i>Call No.:</i> 667.29 Mo <i>ISBN:</i> 0905716027 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> <i>Series:</i> <i>Year:</i> 1977 <i>Price:</i> \$25.00

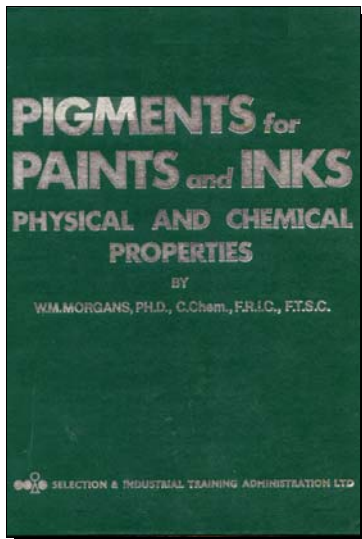


Table of Contents

PREFACE

INTRODUCTION - THE NATURE OF PIGMENTS AND EXTENDERS

PART 1 - GENERAL PHYSICAL PROPERTIES

1. TEXTURE, PARTICLE SIZE AND PARTICLE SHAPE
 Natural pigments and extenders: processing.
 Grinding by Raymond mill and microniser, levigation.
 Manufactured pigments: precipitation, filtration, drying, grinding by pin disc mill; flushing, calcination, vapour-phase oxidation.
 Particle size distribution: histogram.
 Determination of particle size distribution: sedimentational methods - gravitational - use of ICI-Joyce Loebel disc centrifuge: counting methods - optical and electron microscope, Coulter counter.
 Particle shape. Crystal form. Practical work.

2. SURFACE AREA
 Relationship to particle size and oil absorption.
 Measurement of surface area - nitrogen adsorption method; permeability method.

3. OPACITY OR HIDING POWER
 Refractive index; absorption and scatter factors; Kubelke-Munk equation.
 Measurement - Pfund cryptometer, Moresst charts, contrast ratio.

4. DISPERSION OF PIGMENTS
 Factors involved. Principles of dispersing mills - edge runner, heavy duty mixer, triple roll, ball mill, attritor, sand mill, cavitation mill, Silverson mixer.
 Hydrophilic and hydrophobic pigments
 Surface active agents - anionic, cationic, non-ionic.
 Lecithin. Surface coated pigments.
 Stabilisation of dispersions - settlement, pigment flocculation, feeding. Practical work.

5. COLOUR
 Spectrum - colour and wavelength.
 Primaries and complimentaries.
 Additive colour mixing.
 Colour perception and colour vision.
 Subtractive colour mixing. Illuminants.
 Spectral and metamerism colour matches.
 Colour measurement - additive and subtractive colorimeters; spectrophotometers.
 Instrumental colour matching. The C.I.E. system.
 Colour atlases - Munsell, B.S.4800, Ostwald.

6. SPECIFIC GRAVITY
 Uses in paint calculations.

7. FASTNESS TO LIGHT
 Measurement. Blue and Grey wool scales

8. BLEEDING OF PIGMENTS

Subjects

293 . Pigments

Causes. Types of pigment involved. Practical work.

9. WATER SOLUBLE MATTER

Types of soluble matter. Hazards or advantages. Estimation.

PART 2 - CHEMICAL PROPERTIES AND USES

10. NATURAL PIGMENTS

Sources. Ochres, siennas, umbers, red oxides, micaceous oxide of iron.

Table of properties.

11. MANUFACTURED IRON OXIDE PIGMENTS

Raw material. Yellow oxide, red oxide, black oxide, Turkey and Indian reds, purple oxides. Practical work.

12. WHITE PIGMENTS

Titanium dioxide - sulphate and chloride types; rutile and anatase grades; chalking.

Zinc oxide. Antimony oxide. White lead. Zinc phosphate.

13. BLACK PIGMENTS

Channel (impingement) blacks; furnace blacks; lamp blacks. graphite.

14. INORGANIC BLUE PIGMENTS

Prussian blue - non-bronze and bronze types.

Ultramarine blue. Cobalt blue. Cerulean blue. Cobalt violet.

Practical work.

15. CHROMATE PIGMENTS

Zinc chromes. Lead chromes; toxicity.

Basic lead silicochromate. Strontium chromate.

16. INORGANIC GREEN PIGMENTS

Chrome greens; flooding and floating. Chromium oxide.

Guignet's green. Practical work.

17. CADMIUM PIGMENTS

Sulphides; sulphide/selenides. Cadmopones.

18. METALLIC PIGMENTS

Golds and bronzes. Aluminium. Zinc. Lead. Stainless steel.

19. MISCELLANEOUS INORGANIC PIGMENTS

Red lead. Calcium plumbate. Titanate yellow.

Fluorescent and phosphorescent pigments.

20. EXTENDERS

Barytes. Blanc fixe. Whiting. Precipitated calcium carbonate.

Coated calcium carbonate. Asbestine. Talc. China clay. Mica.

Natural silicas and diatomaceous earths. Manufactured silicas.

Calcium silicate.

21. ORGANIC PIGMENTS

Pigment dyestuffs, toners and lakes; chromophores, auxochromes and chromogens. Chemical classification.

Nitroso group - Pigment Green B. Azo pigments - diazotisation and coupling. Azo pigment dyestuffs - arylamide and benzidine yellows; benzidine orange G; para red; red 2G; toluidine red;

Naphthol AS reds; azo condensation pigments.

Azo toners - Lithol red; Permanent reds 2B and 4B; Lake red C.

Rosinated toners. Lakes from azo dyestuffs - Scarlet lake 3B.

Phthalocyanine blues and greens.

Vat colour pigments - Alizarin (madder) lake flavanthrone yellow; indanthrene blue; thioindigo red B.

Quinacridones. Dioxazine violet. Complex acid toners. Reflex blue.

Aniline black. Practical work.

BIBLIOGRAPHY

INDEX

Reviews - Synopsis - Dust Jacket

PREFACE

This manual is designed primarily to assist new entrants to the industries who wish to acquire some basic understanding of the nature of the pigments and extenders employed. It is hoped that it may also help members of the industries who feel in need of a 'refresher'.

The manual consists of two parts. Part 1 contains the general physical properties of pigments and Part 2 their chemical properties and uses. It is assumed that the reader possesses a reasonable knowledge of chemistry and of elementary physics.

Whilst Part 1 deals with the important physical properties, certain straightforward and basic operations such as the determination of oil absorption or tinting strength are not included since they are covered in an earlier manual and are included in B.S.3483 (Methods of testing pigments for paints). Parts 1 and 2 contain a number of cross references and it is suggested that the two parts be studied conjointly.

Part B contains the important pigments in present day use but it is not claimed to be exhaustive. Where a group contains a number of members, especially in the organics, some of the most widely used pigments have been chosen as examples. For particulars of pigments not mentioned in the text the reader is referred to the 'Colour Index', published by the Society of Dyers and Colourists.

The reader is recommended to carry out the identification tests suggested for the inorganic pigments and to familiarise himself with the appearance and 'feel' of the pigments on the palette. Organic pigments should be examined in the same way but individual identification tests have not been included since organics do not lend themselves to simple wet analysis. Some can be recognised by colour reactions with alkali or concentrated sulphuric acid but the most satisfactory method is by infra-red absorption spectra, sometimes preceded by chemical degradation. Readers interested in this aspect are referred to the bibliography.

The chemistry of the organic primaries and intermediates used in the manufacture of dyestuffs and pigments has been omitted since the reader is likely to be familiar with these materials and they are, in any event, described in many organic chemistry text books.

The chemicals and intermediates required for the practical work are obtainable from most suppliers of laboratory chemicals. No specialised type of apparatus is required.

The bibliography contains a number of publications which provide valuable background reading and which can be consulted in the majority of technical libraries.

INTRODUCTION

The Nature of Pigments and Extenders

Coloured powders have been mixed with binders of various types and used for artistic, decorative and protective purposes for many centuries. The earliest pigments were probably charcoal, soot and coloured minerals such as the oxides and hydroxides of iron and these, in refined form, have been in use up to the present day. Other pigments, both white and coloured, have been introduced at various times until we now have at our disposal a very wide range of both inorganic and organic materials.

The inorganic pigments include both natural and manufactured products and, in the main, the manufactured types are the brighter. Ultramarine blue is a possible exception where the natural 'Lapis lazuli' competes in brightness with the manufactured blue, but little of the natural blue is now used (outside artists' colours) on account of difficulties in supply and very high cost.

On the whole the inorganic pigments possess good opacity or hiding power (Chap.3), light fastness (Chap.7) and tinting strength (page 11)

Composition of Inorganic Pigments. Most of the natural materials consist of the oxides or hydroxides of iron mixed with varying amounts of argillaceous matter. Graphite and 'Lapis lazuli' are examples of non-ferrous natural pigments. Manufactured inorganic pigments cover a wide spectrum of colours in addition to whites and blacks. (Carbon black,

although consisting essentially of elementary carbon, is usually grouped with inorganic pigments). The majority are compounds of metals of which the following are the most important:

Lead: White lead (basic lead carbonate), red lead, chromates and chromate/ sulphate (yellow to orange), chromate/molybdates (scarlet) and silico-chromates (yellow). In view of the toxicity of lead compounds generally the use of these pigments has been discontinued in a number of paints (see page 90).

Antimony: oxide (Sb₂O₃), white.

Cadmium: sulphides (yellow to orange), sulphide/selenides (red to maroon).

Iron: oxides and hydroxides (yellow, reds, browns, black), ferrocyanide (blue).

Chromium: oxide and hydroxide (green), chromates (yellow). Titanium: dioxide (TiO₂), white.

Zinc: oxide (white), sulphide (white), chromates (greenish yellow). Metallic Pigments: aluminium, lead, zinc, bronzes, stainless steel.

Black Pigments: carbon blacks, graphite (natural and manufactured).

Organic Pigments

Many early types of organic pigment were produced from animal or vegetable extracts and some of these were in use until well into the present century. Examples of these are carmine obtained by treatment of an extract of female cochineal beetles, 'Dutch Pink' from quercitron extract and Madder lake from the roots of the madder plant. These pigments were very bright in shade but the majority possessed poor light fastness. Madder lake and indigo were notable exceptions and both these pigments have been manufactured in quantity by synthetic methods. Madder lake showed good fastness to light and was used as a standard for this property until the introduction of the Blue Wool Scale.

Modern organic pigments are produced from primaries and intermediates, many of which, in turn, originate in the by-products of the petroleum industry. The range covers practically the whole spectrum of colours and, although a great number of compounds with pigmentary properties is known, the pigments in regular use are drawn from a relatively small number of types. There are no white organic pigments and, in view of the wide range of carbon blacks available, the demand for black organic pigments is comparatively small.

Organic pigments, in general, are characterised by brilliance of colour but certain other properties such as light fastness, opacity and tinting strength vary from class to class. Differences also occur between individual members of the same class depending on the type and degree of substitution. These properties are considered in Chapter 21. The move away from the lead chromes on account of toxicity has resulted in an increased consumption of some yellow, orange and red organic pigments. However, problems arise in replacement since the most light-fast organics often possess poor opacity. A more detailed description of pigment types and the properties of the important individual members is set out in Part 2 (Chapter 21).

Extenders are inorganic compounds derived either from natural sources (whiting, barytes, talc) or are products of chemical reaction (blanc fixe, fumed silicas, calcium and aluminium silicates). In the form of dry powders they are white but the natural products are often discoloured by impurities. When dispersed in aqueous media these extenders are opaque but in organic media become almost transparent and in consequence make little or no contribution to the colour or opacity of a paint. They are used in some types of paint such as low gloss finishes, undercoats and primers to control or modify physical characteristics such as gloss or flow. The opacity of a film of extender (or pigment) dispersed in a medium is a function of the extent to which the incident light is reflected or scattered from the particle surface and this, in turn, depends on the difference in refractive indices of the extender (or pigment) and medium. This theme is discussed further in the section on opacity (page 18). The following list will give an indication of some of the types of material used as extenders:

Natural Products

Barytes (barium sulphate)
Whiting (calcium carbonate)
Talc (hydrated magnesium silicate)
China clay (hydrated aluminium silicate)

Asbestine (hydrated calcium magnesium silicate)
Silica

Manufactured or By-products

Blanc fixe
Precipitated calcium carbonate
Fumed silica
Aluminium silicate
Calcium silicate

The properties of these and other extenders are examined on in Chapter 20 et seq.

Title	Location	Edition / Series / Misc.
115 Pigments in Paint Author: Preuss, Harold P. Publish.: Noyes Data Corporation - place: Park Ridge, NJ - date: ©1974 Subject: Pigments Desc: viii, 134 p., illus., 29 cm.	Dynix: 12998 Call No.: 667.623 Pr ISBN: 0815505132 Shelf Adult Non-Fiction	Edition: Series: Year: 1974 Price: \$25.00

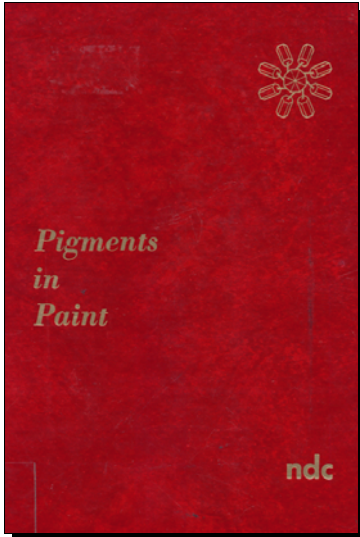


Table of Contents

- Part 1
Introduction
- Part 2
White Hiding Pigments (Section A)
White Hiding Pigments (Section B)
White Hiding Pigments (Section C)
- Part 3
Extender Pigments (Section A)
Extender Pigments (Section B)
Extender Pigments (Section C)
- Part 4
Black Pigments (Section A)
Black Pigments (Section B)
- Part 5
Color Pigments: Brown
- Part 6
Color Pigments: Inorganic Red and Maroon (Section A) Color Pigments: Inorganic Red and Maroon (Section B)
- Part 7
Color Pigments: Organic Red and Maroon (Section A)
Color Pigments: Organic Red and Maroon (Section B)
Color Pigments: Organic Red and Maroon (Section C)
- Part 8
Color Pigments: Inorganic Orange
- Part 9
Color Pigments: Organic Orange
- Part 10
Color Pigments: Inorganic Yellow (Section A) Color Pigments: Inorganic Yellow (Section B)
- Part 11
Color Pigments: Organic Yellow
- Part 12
Color Pigments: Inorganic Green
- Part 13
Color Pigments: Organic Green
- Part 14
Color Pigments: Inorganic Blue
- Part 15
Color Pigments: Organic Blue

Subjects

293 .

Part 16
Color Pigments: Inorganic and Organic Violet

Part 17
Lead in Pigments

Reviews - Synopsis - Dust Jacket

FOREWORD

This book discusses the role of pigments as primary components in a paint system. The number of available pigments, particularly the colored ones, is very large, and hence the discussion is restricted to those individual pigments that appear to be of greatest interest in the field of industrial coatings.

Being written from a practical viewpoint, the technical study should also prove of value to executives in the following functions: research, technical services, marketing, development, and market research.

The book is replete with references to contemporary journal articles and books, aside from giving the properties and standards of all the important paint pigments marketed and used in the U.S.A. Such detailed properties of proprietary pigments are usually enumerated in tabular form. Complete names and addresses of individual manufacturers are also given.

This publication is based on a series of articles written by Harold P. Preuss for the technical journal METAL FINISHING from June 1970 through May 1973. The date on which each article appeared is indicated in the book with each chapter heading.

INTRODUCTION

A conventional type of paint may be composed of these primary types of ingredients: Pigment; (2) Resin; (3) Solvent; (4) Drier; and (5) Other additives employed to accomplish a special purpose. Pigments may be defined as the fine, solid particles used in the preparation of paint and substantially insoluble in the paint vehicle. In this series of articles we plan to discuss the role of pigments as one of the prime components in a paint system. A major portion of these articles will deal with individual pigments marketed by various firms in the U.S.A.

The function of a pigment is not only to add opacity and contribute a decorative or functional color to a paint film but also to increase its durability and protective character by screening out harmful light rays: to control the transmission of moisture and gases through the film, to impart desirable mechanical properties and to contribute various other properties e.g., corrosion inhibition, chalking, control of gloss, depending on the nature of the pigment and the concentration in which it is used.

The number of available pigments, particularly the colored ones, is very large, and hence our discussion in the articles that follow will be devoted to those individual pigments that appear to be of greatest interest in the field of industrial coatings.

Classification of Pigments

Pigments fall into three general types: (1) White pigments—light entering them is refracted and, except for minor absorption, is reflected completely to the eye as white, providing the index of refraction of the pigment is greater than that of the surrounding medium; (2) Colors are pigments that absorb certain wave lengths of the light falling on them and reflect others. The wavelengths reflected to the eye produce the sensation of color. (3) Metallic powders and dusts constitute a specialized basic type of pigment.

White pigments may also be (divided into two general classes — hiding pigments and extender pigments. Hiding pigments display hiding power when completely immersed in normal paint binders. Their index of refraction must be in excess of 1.5. Extender pigments appear white when exposed to air but they do not exhibit hiding power when completely wet by normal paint binders. They usually have indices of refraction of 1.5 or less.

The colors such as blue, green, yellow and black must exhibit some hiding power. Generally their insolubility in the binder and thinner of the paint distinguishes them in this respect from dyestuff. In general, colored pigments can be divided into two classifications — organic and inorganic.

	Inorganic	
Chrome yellows		Iron blue
Chrome oranges		Ultramarine blue
Molybdate orange		Red lead

Zinc yellow	Siennas
Chrome greens	Chrome oxides
Iron oxides	Nickel titanate
Cadmiums	
	Organic
Lithols	Quinacridones
Para reds	Arylide red
Toluidine red	Thioindigoids
BON (beta-oxynaphthoic acid)	PTA (phosphotungstic)
	PMA (phosphomolybdic)
Hansa Yellow	Indanthrones
Toners	Phthalocyanines
Benzidine yellow	Anthraquinones
Nickel azo yellow	

A primary purpose of a pigment, in all pigmented coatings, is to hide the substrate by preventing the transmission of light through the film to the substrate (and out again). Colored pigments accomplish this, to a greater or lesser extent, by absorbing some of the light rays and reflecting others. White pigments, however, absorb relatively little light, so that their hiding power depends, as stated before, primarily on their ability to scatter and reflect the incident light.

Metallic pigments may consist of copper, aluminum, zinc or stainless steel. Of these, stainless steel is the newest and offers promise in the areas of corrosion protection and heat resistance.

Properties of Pigments

The principal properties of pigments may be described as follows:

Masstone color denotes the color of pigments when dispersed alone in a vehicle.

Undertone color refers to the shades obtained when colored pigments are mixed with other pigments in large quantities.

Strength refers to the coloring power when blended with other pigments of widely different undertone. It is determined on colored pigments by blending with white in certain fixed proportions and on white pigments by blending with black.

Hiding refers to the ability of a pigment to obliterate the substrate when incorporated into a suitable vehicle and spread out on the surface in a film of uniform thickness.

Particle shape. The particles of most pigments are generally amorphous, although roughly round, since the wet or dry grinding they are given tends to knock off sharp corners and edges. Some of them, such as the metallic powders, ground mica, and micaceous talcs, are definitely platelike, with one dimension much smaller than the other two. This shape is also called lamina. platy, or flaky. A few, such as the acicular tales, are needlelike in form.

Particle-size distribution. The size of individual particles of pigments affects the hiding gloss, and film smoothness of surface coatings. Since most pigment particles are more or less round, their size is usually stated in terms of mean diameter in microns. One micron is equal to 0.001 mm. The particle size of commercial pigments varies over a wide range with an upper limit of about 44u. The generally accepted lower limit for visual resolution is 8u, whereas particle diameters as large as 3u are likely to reduce the sheen in high-gloss finishes. There are many low-cost pigments which contain large percentages of particles of more than 3u in diameter and therefore are difficult to employ in finishes requiring a high gloss. To be satisfactory in high-gloss industrial finishes, pigments should have a maximum primary particle diameter of about 3u and an average of not more than 1u.

Dispersibility refers to the ease with which pigment agglomerates may be broken down by dispersion in the vehicles of surface coatings. It varies greatly with the pig and between different proprietary products of the same general type.

Effect on vehicle viscosity. Pigments vary enormously in their effect on the viscosity of surface coatings. Ten to 20 times the amount of some pigments is required to produce the same viscosity increase in a given vehicle as in some others. In general, though

—The larger the particle size, the less bodying usually develops.

—Round particle pigments generally produce less body than laminar or acicular shapes.

—Basic pigments tend to cause more thickening than neutral pigments because the basic pigments react with acid vehicles. in some highly acid vehicles basic pigments produce progressive bodying until the liquid coating material becomes a solid in the package.

—There are certain other pigments, both inorganic and organic, of fine particle size which give considerable trouble by increasing the viscosity of vehicles containing them when freshly dispersed and also by causing increasing body in

storage. It is believed that some sort of chemical reactivity or physical change occurs.

Bulking value is the relationship between the volume a pigment occupies in surface coatings and its weight. The bulking value of pigments may be expressed as pounds per gallon or as gallons per pound.

Flow and leveling refer to the orange peel in films, if applied by spray, brush marks, if applied by brush, and other patterns that are produced by other methods of application. Unless surface coatings are specifically designed to show a texture or pattern, it is usually desirable to have them as free from all such irregularities as possible.

Bleed. Certain organic pigments have limited solubility in oils, resins, and solvents and are known as "bleeding pigments." Bleeding manifests itself by staining light-colored topcoats applied over the coating containing the bleeding pigment. It is generally accentuated by baking the topcoats.

Gloss, of a satisfactory nature, can usually be achieved if a particular vehicle has an especially high degree of wetting action on the particular pigment; but, if the gloss is low, the wettability of the pigment by the vehicle will probably also be poor.

Stability. Certain types of pigments tend to be affected by heat in baking. This may result in darkening, fading, loss of gloss, loss of hiding, etc. Some pigments are affected by light and the end result is similar to the effect described for heat. Moisture limits the usefulness of pigments. Chemicals may change the color of pigments. Weathering is important in exterior surfaces, since it is desirable to avoid such defects as checking, cracking, blistering, and flaking.

Pigments contribute enormously to the protective and decorative properties of paint coatings. The addition of pigments to a film-forming base affects its hiding properties, hardness and durability. Pigments may help prevent corrosion and contribute to temperature resistance. Pigments also affect the consistency and application properties of a paint.

Thus, while a primary function of pigments in a paint system is to obscure and protect the surface to which the paint is applied, they may also have a variety of other uses. Indeed, pigments may be used whether or not they affect the obscuring power, the decorative effect or the durability of the paint system. In the articles that follow, we will discuss in detail specific properties of pigments available to the paint formulator, classified according to color.

Title	Location	Edition / Series / Misc.
116 Plasticizer Technology: Volume 1 Author: Bruins, Paul F. (editor) Publish.: Reinhold Publishing Corporation - place: New York, NY - date: ©1965 Subject: Plasticizers Desc: viii, 248 p., illus., diagrams, 24 cm.	Dynix: 13028 Call No.: 668.41 Br v.1 ISBN: Shelf Adult Non-Fiction	Edition: Series: Year: 1965 Price: \$25.00

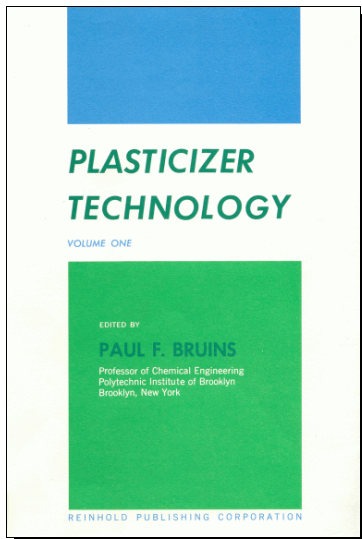


Table of Contents

PREFACE TO VOLUME 1

1. MECHANISM OF PLASTICIZATION, Arthur K. Doolittle
 Essentials of Mechanistic Theory
 Postulates of the Mechanistic Theory of Solutions of Macromolecules
 Experimental Support
 Dilution-ratio Technique
 Viscosity Technique
 Film Formation and Plasticization
 Temperature Dependence of Solvent Ability
 Influence of Molecular Weight on the Temperature Dependence of Solvent Ability
 Influence of Molecular Shape on the Temperature Dependence of Solvent Ability
 Influence of Position of Active Groups in Solvent Molecule on the Temperature Dependence of Solvent Ability

2. PLASTICIZERS FOR RUBBER AND RELATED POLYMERS, S. S. Kurtz, Jr., J. S. Sweely, and W. J. Stout
 Introduction
 Nature of High Polymers and Elastomers
 Elastomers as Viscoelastic Materials
 Free Volume and Flow
 Elasticity and Cross-linking
 Types of Elastomers
 Polyisoprene and Polybutadiene
 Butadiene Copolymers
 Neoprene
 Butyl Rubber
 Ethylene-Propylene Rubber (EPR)
 Future
 Physical Theory of Plasticizer Action
 Solubility Parameter
 Viscosity Ratios and Concentration Ratios
 Statistical and Thermodynamic Theory
 Mechanistic Approach
 Glass Transition Temperature
 Viscoelastic Properties and Free Volume
 Summary of Theory in Regard to Study of Extenders and Plasticizers for Rubber
 Milling and Plasticization of Rubber
 Physical Breakdown
 Chemical Plasticizers
 Types of Plasticizers for Elastomers
 Ester Plasticizers and Similar Synthetics
 Organic Acids and Pine Products
 Coal Tar Products
 Petroleum Products
 Analysis of Rubber Process Oils in Relation to Selection
 Historical
 Currently Available Methods
 Types of Analyses and Nomenclature
 Molecular-type Analysis
 Carbon-type Analysis
 Ring Analysis
 Analytical Data vs The Needs of Rubber Compounds

Subjects

303 . Plasticizers

ASTM Classification and Other Classifications
Future Classification of Rubber Process Oils
Getting Maximum Value from Simple Physical Tests
Molecular Weight and Viscosity
Carbon-type Compositions and Density, Refractive Index, Viscosity, and Molecular Weight
Viscosity-gravity Constant as a Basis of Classification
Graph of Viscosity vs V.G.C
Mixing and Processing
Aniline Point in Relation to V.G.C
Over-all Plan for Maximum Information on Plasticizers from a Minimum of Testing
Effect of Plasticizers in Rubber
Unworked Rubber
Definitions of Extender Index and Softening Power
Effect of Oil on Mooney Viscosity
Form of Viscosity-concentration Curves
Worked Rubber
Plasticizers for Processing
Compounded Mooney
Aromatic Components of Oil as Chemical Plasticizers and Effect of Trace Metals
Banbury Mixing
Extrusion
Vulcanized Rubber
Natural Accelerators in Process Oils
Properties of Cured SBR Rubber in Relation to Oil Extension
Summary of Discussion of Plasticizers in Cured SBR Rubber
Specific Plasticizer Applications
Petroleum Waxes as Softeners and Antiozonants
Anti-checking Agents
Plasticizers
Physical Properties of Wax in Relation to Structure and Uses
Plasticizers for Neoprene
Extenders for Nitrile Rubber
Butyl Rubber
Increasing the Elasticity of Butyl
Decreasing Butyl's Internal Viscosity
Ethylene-Propylene Rubber
Saturated EP Rubbers
Unsaturated EP Rubbers
Reevaluation of High Loadings of Oil in Natural Rubber
Blends of Natural Rubber and Polybutadienes

3. PLASTICIZERS FOR THE CELLULOSICS, J.V. M. Gearhart and F. M. Ball

Commercially Produced Cellulosics
Plasticization Techniques
Solubility Parameter
Cellulose Nitrate
Cellulose Acetate
Evaluation of Plasticizers and Resins
Effect of Plasticizers on Film Properties
Extrusion with Cellulose Acetate
Mixed Esters of Cellulose
Cellulose Acetate Butyrate
EAB-381 Esters
General Characteristics
Plasticizer Compatibility
Effect of Plasticizers on Weathering Properties
Plasticizers for Other Butyrate Esters
EAB-171, EAB-272, EAB-500
Cellulose Acetate Propionate
Plasticizer Compatibility
Ethyl Cellulose
Water-sensitive Plasticizers
Oils as Ethyl Cellulose Plasticizers
Gasoline- and Oil-resistant Plasticizers

4. PLASTICIZERS FOR ACRYLIC RESINS, Joseph L. O'Brien and John O. Van Hook

- Physical Properties of Acrylic Polymers
- Glass Temperature and Related Values
- Effect of Copolymer Composition on Glass Temperature: Internal Plasticization
- Effect of External Plasticizers on the Glass Temperature
- Other Physical Properties of Plasticized Acrylic Polymers
- Compatibility of Plasticizers with Acrylic Polymers
- Solubility Parameters in Acrylic Polymer/Plasticizer Systems
- Prediction of Compatibility from Solubility Parameters
- Known Plasticizers for Acrylic Resins
- General References
- The Patent Literature
- Applications for Plasticized Acrylic Resins
- Cast Acrylics
- Molding Powders
- Solution Coating Resins
- General
- Acrylic Lacquers
- Acrylic Resin Blends
- Thermosetting Resins
- Emulsion Coating Resins
- Miscellaneous Applications

INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book is the first of two volumes devoted to providing a practical approach to the selection and application of plasticizers in modifying polymers to produce specific desirable results.

Based upon theory as well as technology; its purpose is to provide the tools for the selection of the optimum plasticizer system for polymeric materials. It presents current physical theories of plasticizer action and their application and limitations, future theoretical developments in the area of viscoelastic and free volume theory, the mechanistic theory of plasticization, and the experimental techniques in support of this concept. Included is a comprehensive review of the present state of the art pertaining to plasticizers for the elastomers, together with data concerning the new synthetic elastomers and the elastomers in commercial use. The technology of plasticizers for the nitrates, the acetates, and the mixed esters is reviewed and performance data furnished. The discussion of plasticizers for acrylic resins includes an exposition on the physical properties of the acrylic ester homopolymers and the theoretical approach to plasticizer selection. A list of known plasticizers is presented, with their applications in castings, moldings and coatings.

This important work will find its major application in the paints and coatings, rubber, and plastics industries. Polymeric materials technologists will need this book because they have to provide the "know how" and are looking for technical information and theory that can be applied to their problems. It will also prove of special value to polymer chemists whose interest is in theory, to plastics technologists seeking practical solutions to problems, and to organic chemists responsible for the creation of new plasticizers.

PREFACE TO VOLUME I:

Although plasticizer action has come a long way in the past ten years, it is still in a stage of growth and development. The technology relating to plasticizers has been discussed in many books and technical articles, but despite this, research people and others in the plastics industry find the selection of the optimum plasticizer system a difficult task.

This is the first of two books oriented toward helping with that task. These books form a practical approach to the selection and application of plasticizers in modifying polymers to produce specific desirable results.

To relate the science to the art, chapters have been written by authorities in the plasticization of each class of polymeric materials. This included not only those polymers where plasticizers are used in large proportions, such as polyvinyl chloride, rubber, and the cellulose, but also the myriad minor applications of plasticizers to the entire range of polymers. Help in preparing this material has been generously given, and Volume I of this book is appearing now, before all the work is complete, since this is a rapidly changing field and this material should be made available without delay.

A large portion of the present volume is devoted to Plasticizers for Rubber and Related Polymers. The text for this portion was prepared by Stewart S. Kurtz and his co-workers of the Sun Oil Company. The chapter on Mechanism of

Plasticization was prepared by Dr. Arthur K. Doolittle, who is well known, especially for his much used and quoted book, "The Technology of Solvents and Plasticizers," published in 1954. The experienced technical staff of Rohm Haas contributed the chapter on Plasticizers for Acrylic Resins, and technical men from Eastman Chemical Products prepared the chapter on Plasticizers for the Cellulosics.

The editor is grateful for the interest and cooperation of the authors of the foregoing chapters, which have made this volume possible. Volume II is in preparation and will appear in the near future.

Title	Location	Edition / Series / Misc.
820 Plastics and Coatings: Durability, Stabilization, Testing Author: Ryntz, Rose Ann (editor) Publish.: Hanser Gardner Publications, Inc. - place: Cincinnati, OH - date: ©2001 Subject: Plastics -- Deterioration Desc: ix, 243 p., illus., 25 cm.	Dynix: 99419 Call No.: 620.1 PI ISBN: 1569902909 Shelf Adult Non-Fiction	Edition: Series: Year: 2001 Price: \$81.50

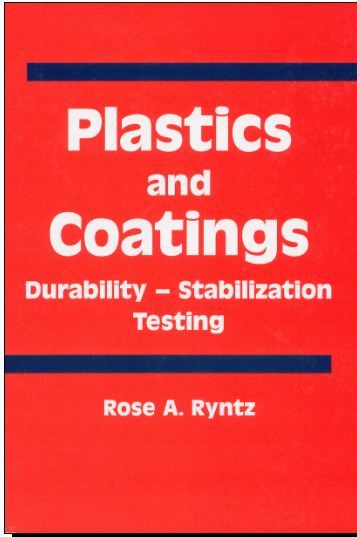


Table of Contents

- Overview of Durability in Coated and Uncoated Plastics
- A Critical Review of the Role of Field-Exposure Experiments in Predicting the Service Life of Coatings
- Role of UVA/HALS in Durability Protection
- Photostabilization of Plastics by Additives and Coatings
- Stabilization of Coatings
- Role of Stress on Durability of Organic Coatings
- Stabilization of Molded-in-Color Plastics
- Effects of Injection-Molding on the Durability of Thermoplastics
- Weathering Test Methods
- Index

Reviews - Synopsis - Dust Jacket

Plastics and Coatings: Durability, Stabilization, and Testing presents a comprehensive overview of the durability of coatings and plastics, including information on their chemical, photo-oxidation, moisture, heat, and solvent resistance. The scope ranges from predicting the service life performance of coatings and plastics to actual quantification of mechanical and physical manifestations of degradation. Stabilization mechanisms such as the role of pigments and light stabilizers are discussed, as is the influence of processing conditions on residual stress and adhesion.

This book will serve as an authoritative guide for practitioners in the plastics field for use in material selection. Plastics are an increasing part of our way of life, and those who learn to properly utilize plastics, from concept design to end-of-life recycling, will gain a competitive advantage in the global marketplace.

Subjects

536 .	Plastic coatings -- Deterioration
537 .	Plastics -- Deterioration

From the Preface: "...In addition, the longevity of plastic in a particular environment is visited in terms of 'service life predictive properties'. These predictive attributes allow one not only to hasten development, e.g. experimental timelines to define performance are shortened, but also allow one to relate performance to cost, e.g. warranty attributes. Key parameters utilized in developing predictive tests are visited..."

Target Audience: Designers, technologists, and others concerned with plastics durability.

Editorial Reviews

Book Description

A text attempting to coordinate attributes considered when choosing plastics for specific applications, outlining a number of selection criteria. Criteria discussed include chipping, cohesive shearing, chemical attack, mold-in-color capability, molding parameters, and more. An authoritative guide for practitioners using plastics. DLC: Plastics--Deterioration.

Title	Location	Edition / Series / Misc.
119 Plastics Engineering Handbook of the Society of the Plastics Industry, Inc. <i>Author:</i> Frados, Joel (editor) <i>Publish.:</i> Van Nostrand Reinhold Company <i>- place:</i> New York, NY <i>- date:</i> ©1976 <i>Subject:</i> Plastics -- Handbooks, manuals, etc. <i>Desc:</i> xvi, 909 p., illus., 27 cm.	<i>Dynix:</i> 07918 <i>Call No.:</i> 668.41 So <i>ISBN:</i> 0442224699 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 4th edition <i>Series:</i> <i>Year:</i> 1976 <i>Price:</i> \$25.00

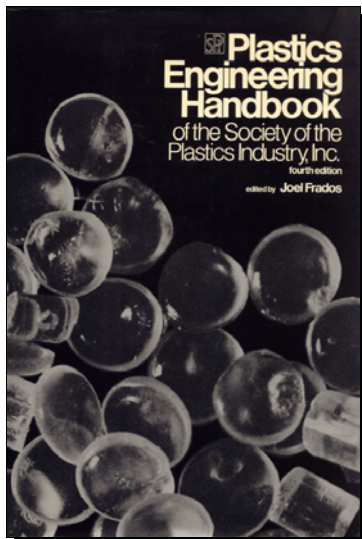


Table of Contents

- Preface
- 1. Glossary
- 2. Polymer Chemistry
- 3. Engineering and Design Guide to Plastics
- 4. Injection Molding of Thermoplastics
- 5. Controls for Injection Molding Machines
- 6. Designing Molds for Injection Molding
- 7. Extrusion
- 8. Compression and Transfer Molding
- 9. Injection Molding of Thermosets
- 10. Designing Molds for Thermoset Processing
- 11. Cold Molding
- 12. Thermoforming Plastic Film and Sheet
- 13. Blow Molding
- 14. Rotational Molding
- 15. Calendering
- 16. Vinyl Dispersions
- 17. Powder Coatings
- 18. Casting
- 19. Reinforced Plastics
- 20. Cellular Plastics
- 21. Radiation Processing
- 22. Moldmaking and Materials
- 23. Designing Molded Products
- 24. Standards for Tolerances on Molded Articles
- 25. Finishing and Machining Plastics
- 26. Decorating Plastics
- 27. Joining and Assembling Plastics
- 28. Design Standards for Inserts
- 29. Compounding and Materials Handling
- 30. Performance Testing of Plastic Products
- Index

Subjects

309 . Plastics -- Handbooks, manuals, etc.

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Reflecting many recent technological and engineering advances, here is a completely updated edition of the standard industry reference work on the processing, selection, and use of plastics. It is the broadest in scope of all the editions and includes every new technological and engineering advance currently in use. The scope was expanded in this edition to include data on the nature, properties and chemistry of plastics; the handling of plastics, pre- and post- processing; and the design, finishing, and testing of plastic products.

Covering all the plastics processing methods, the book includes for each basic manufacturing method: basic theory; available equipment; operation of a production line; recommended procedures for different plastics; molds and dies; maintenance; and controls. Comprehensive information is also provided on selecting plastics; compounding, and other aspects of preparing them for processing; finishing; decorating; and assembling. Included are detailed descriptions of manufacturing aspects particularly important to the plastics industry, such as mold design and construction, product design, instrumentation, and testing procedures.

Specific data on automation is provided in each chapter on processing, and an entire separate section is devoted to controls in the area of injection molding. New techniques such as structural foam molding and radiation processing are described in detail.

Other new areas explained are injection molding of thermosets, injection molding of reinforced plastics, co-extrusions, twin-shell thermoforming, injection blow molding, sandwich molding, composite rotational molding, twin-screw extrusion, hot-runner molds, cold-runner molds, flexible molds for casting, reinforced plastic sheet molding and bulk molding compounds. Powder coating is covered for the first time in an SPI handbook.

A massive compilation of information in one single source, this handbook is invaluable to manufacturing and production engineers and personnel; chemical engineers, mold makers and designers; machine operators and foremen; administrative, marketing, and sales personnel, as well as any materials or mechanical engineer interested in using plastic products or components.

FORWARD:

It is a great pleasure to present herewith the Fourth Edition of the Plastics Engineering Handbook. This new edition reflects substantial revisions and updating throughout. We are indeed indebted to the many contributors to this edition, especially to Joel Frados, Publisher of Plastics Focus, who served as Editor, and authored several sections.

When the Handbook was first published in 1947 the total reported production of plastics was 1,252,000,000 pounds. Currently, in 1976, we are likely to exceed 26 billion pounds. It is reasonable to believe that the earlier editions contributed in no small way to that fantastic growth through its emphasis on quality, sound engineering, and good design.

Today, plastics products are being used substantially in every industry, and the need for an authoritative and reliable Handbook like this has never been greater. It is essential that the designers and users of plastics recognize not only the potential capabilities but also the limitations of our materials.

Looking ahead, we can anticipate a rapid growth for plastics. There will inevitably be new and improved materials and dramatic innovations in production techniques, as well as thousands of new applications. Thus, plans must be made immediately for the publication of the Fifth Edition a few years hence.

All of us in plastics today owe a special acknowledgment to all of the men who worked on the earlier editions of this handbook. The most notable and most unsung of these is Charles L. Condit, now Staff Vice President of SPI, whose untiring devotion to our industry's progress continues to be an inspiration for all of us.

PREFACE:

The plastics industry has changed in many ways since the last edition of the SPI Engineering Handbook was published—so much so that it becomes difficult to make comparisons. Where thermosets dominated the Third Edition, the thermoplastics move to the fore in this one. The blow molding process, as another example, had only a few paragraphs of description in the Third Edition—it has a chapter of its own in this volume. And no one had even heard of rotational molding or structural foam molding when the Third Edition was published.

In fact, to keep pace with the fast-moving industry, virtually every chapter from the Third Edition has either been completely rewritten or revised extensively and a number of new chapters have been added.

However, the basic format and coverage that has made the SPI Engineering Handbook so important to the plastics industry has been retained. The general flow of the book continues to duplicate the general flow of plastics through the manufacturing operation—from original materials selection to processing to secondary finishing to final use.

Chapter 1 provides an up-to-date glossary of the words and expressions in common use in the plastics industry (including a special illustrated section on injection molding and extrusion nomenclature).

Chapters 2 and 3 form a basic guide to plastics materials highlighting their chemistry, their characteristics, and their applications. These two chapters are new to the SPI Engineering Handbook, but because the family of plastics has become so diverse over the years, this information is essential to a full understanding of the various manufacturing operations covered in the Handbook.

Chapters 4 through 18 are devoted to the most popular methods of plastics processing. The three major processing techniques— injection molding, extrusion, and thermoset processing—are covered first (Chapters 4 through 11). Next, thermoforming, including the relatively new concept of "cold stamping" (Chapter 12), and blow molding (Chapter 13) are reviewed. Chapters 14 through 18 cover those processing techniques that involve the use of plastics in various powder, paste, and liquid grades: rotational molding (Chapter 14), calendaring (Chapter 15), processing vinyl dispersions (Chapter 16), powder coating (Chapter 17), and casting (Chapter 18).

In most instances, each chapter covers all aspects of the individual process: machinery and equipment, molds or dies,

processing variables, etc. However, for injection molding and thermoset processing the subjects of mold design are discussed in separate chapters (Chapters 6 and 10). Many of the basic rules and principles outlined in these two chapters serve as a good starting point for understanding mold design as it applies to all the processes covered in subsequent chapters. Similarly, we have also devoted a separate chapter (5) to the subject of controls for injection molding. Again, this is intended as a review of the basic principles of process control as it applies to all processes (each subsequent chapter, however, does cover the type of controls used for the particular techniques being discussed).

Chapters 19 and 20 are devoted to two forms of plastic—reinforced plastics and foamed or cellular plastics—that are so unique and so widely used that they have virtually spawned entire industries of their own. Chapter 21 on radiation processing is another subject that is entirely new to an Engineering Handbook.

The next three chapters—mold making and materials (Chapter 22), designing molded products (Chapter 23), and standards for tolerances of molded articles (Chapter 24)—should more logically have been placed in the front of the Handbook, since they cover procedures that are generally undertaken after the basic plastic has been selected and before processing begins. However, we have carried them in the middle of the Handbook, after processing and before secondary finishing, because we feel that the success of these activities, especially design, will depend to a large extent on a complete understanding of the process to be used. As the reader will quickly note, when working with plastics, there are strong interrelationships between the basic material, the process, the design, and even finishing and assembly. This latter subject is covered in the four chapters that follow the sections on design—Chapter 25 through Chapter 28.

Finally, there is a chapter on Compounding and Materials Handling (Chapter 29) and one on Performance Testing of Molded Products (Chapter 30).

Title	Location	Edition / Series / Misc.
118 Plastics Engineering Handbook of the Society of the Plastics Industry, Inc. <i>Author:</i> Berins, Michael L. (editor) <i>Publish.:</i> Van Nostrand Reinhold Company <i>- place:</i> New York, NY <i>- date:</i> ©1991 <i>Subject:</i> Plastics -- Handbooks, manuals, etc. <i>Desc:</i> xvi, 845 p., illus., 26 cm.	<i>Dynix:</i> 08308 <i>Call No.:</i> 668.41 So <i>ISBN:</i> 0442317999 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 5th edition <i>Series:</i> <i>Year:</i> 1991 <i>Price:</i> \$25.00

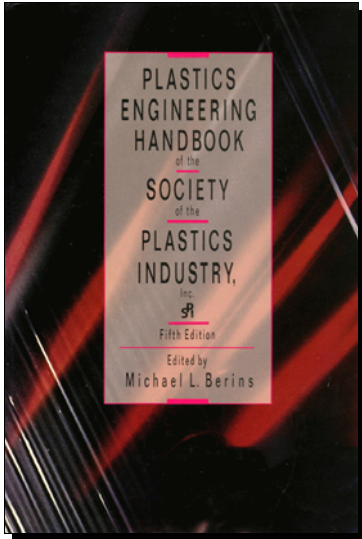


Table of Contents

- Foreword, by Larry L. Thomas
- Preface
- 1. Glossary
- 2. Polymer Chemistry
- 3. Plastic Materials/Properties and Applications
- 4. Extrusion Processes
- 5. Injection Molding of Plastics
- 6. Design Considerations for Injection Molds
- 7. Injection Mold Manufacturing
- 8. Injection Molding of Thermosets
- 9. Compression and Transfer Molding
- 10. Designing Molds for Thermoset Processing
- 11. Molded Part Design
- 12. Blow Molding of Thermoplastics
- 13. Thermoforming of Plastic Film and Sheet
- 14. Rotational Molding
- 15. Calendering
- 16. Vinyl Dispersions
- 17. Powder Coatings
- 18. Reinforced Plastics and Composites
- 19. Cellular Plastics
- 20. Radiation Processing
- 21. Material and Parts Handling
- 22. Compounding
- 23. Finishing and Machining Plastics
- 24. Joining and Assembling Plastics
- 25. Design Standards for Inserts
- 26. Decorating Plastics
- 27. Performance Testing of Plastics Products
- Index

Subjects

309 . Plastics -- Handbooks, manuals, etc.

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Since its first edition was published in 1947, the best-selling Plastics Engineering Handbook of the Society of the Plastics Industry, Inc. has been the most comprehensive reference available on plastics processing methods, equipment, and materials. Now the revised and updated Fifth Edition continues the tradition of excellence established by its predecessors, offering the very latest information from leaders in the plastics field.

Sponsored by the Society of the Plastics Industry, Inc. (SPI), the Fifth Edition incorporates all major advances in the plastics industry since the previous edition was published in 1976. It features brand- new coverage of the state of the art in both materials—high-temperature thermoplastics, liquid crystal polymers, and thermo plastic composites, and processing—resin transfer molding (RTM), structural reaction injection molding (SRIM), gas-assisted injection molding, stretch blow molding, automation, and process control.

Throughout the book you'll get practical guidance on polymer chemistry, selecting plastics for specific applications, compounding and other aspects of materials preparation, decorating and finishing, joining and assembly, and mold design and construction. You'll also find invaluable data on product design, instrumentation, testing, and troubleshooting.

Both theory and practice are addressed in this all-encompassing source. Taking you from start to finish in plastics production, detailed chapters discuss:

- Equipment selection

- Operation of a production line
- Materials selection
- Recommended procedures for using different types of plastics
- Molds and dies
- Equipment maintenance and controls

Tips and techniques for handling incoming raw materials, distributing them to individual processing machines, and handling finishing parts and scrap are also included.

Extensive coverage of reinforced plastics includes methods for the full range of composite materials and manufacturing processes used in automotive, aircraft, aero space, marine, and construction products. A comprehensive chapter on cellular plastics covers both thermoset and thermoplastic foams. Especially valuable are sections on the latest changes in the highly versatile thermoforming processing method.

You'll also find numerous time-saving features in this updated edition. A complete glossary defines words and expressions in current industry use, and specialized glossaries with illustrations are provided in the chapters on extrusion and injection molding.

If there's one source that is indispensable to plastics professionals, it's the Fifth Edition of the Plastics Engineering Handbook. It belongs in the reference libraries of all plastics, manufacturing, industrial, and process engineers, as well as product designers, technicians, administrators, and sales personnel in the plastics industry.

FOREWARD:

I am pleased to present the Fifth Edition of the Plastics Engineering Handbook. Last published in 1976, this version of the standard industry reference on plastics processing incorporates the numerous revisions and additions necessitated by 14 years of activity in a dynamic industry.

At that last printing, then-SPI President Ralph L. Harding, Jr. anticipated that plastics production would top 26 billion pounds in 1976 (up from 1.25 billion in 1947, when the First Edition of this book was issued). As I write, plastics production in the United States had reached almost 60 billion pounds annually.

Indeed, the story of the U.S. plastics industry always has been one of phenomenal growth and unparalleled innovation. While these factors make compilation of a book such as this difficult, they also make it necessary. Thus I acknowledge all those who worked to gather and relate the information included in this 1991 edition and thank them for the effort it took to make the Plastics Engineering Handbook a definitive source and invaluable tool for our industry.

PREFACE:

In this fifth edition of the SPI Plastics Engineering Handbook, we continue a tradition of providing readers with a comprehensive manual for plastics processing. Since the last edition was published in 1976, there have been many changes in the types of materials available for manufacturing plastic products. Likewise, there have been new processes introduced and substantial improvements in those that already existed. All in all, the plastics processing industry has become much more sophisticated than it was in the 1970s, making use of higher-performance materials and computer-controlled equipment to widen the range of applications for both thermoplastics and thermosets.

Extensive revisions have resulted in an up-to-date handbook that reflects the plastics industry's state of the art. Some changes in chapter order have been made to guide the reader through the maze of processes for these versatile materials. For example, the Extrusion chapter now precedes the other chapters on thermoplastic processing because extrusion is generic to most of them.

Chapter 1 provides a glossary of words and current expressions in use in the plastics industry. Specialized glossaries with illustrations are placed at the end of the chapters on extrusion and injection molding.

Chapters 2 and 3 cover the range of polymer materials in use in today's industry. The first provides an understanding of the basic chemistry of polymers; the second supplies a description of the families of plastics, their physical and chemical properties, and a brief discussion of the applications for which they are suited. The information has been updated to include descriptions of the newest, high-temperature plastics, e.g., liquid crystal polymers.

Chapters 4 through 20 are devoted to the most widely used methods of plastics processing. The chapter on extrusion has been completely rewritten and provides a thorough understanding of the theory and practice of melting and conveying thermoplastics. For easier reference, the three chapters on injection molding and tooling have been placed in sequence in the new edition. Coverage of blow molding has been expanded considerably to include discussions of new technologies such as injection stretch blow molding. The chapter on thermoforming has also been extensively revised to

reflect the many changes in this ever more versatile processing method.

For each process, the Handbook covers all aspects of the technology: machinery and equipment, tooling, materials, process variables, and, in some cases, troubleshooting techniques.

Chapters 18 and 19, instead of concentrating on a single processing method, furnish a comprehensive presentation of the materials and methods used in two major industry segments. Chapter 18, on reinforced plastics, covers the full range of composite materials and manufacturing processes that are widely used in making products for automotive, aircraft and aerospace, marine, and construction applications. Chapter 19, on cellular plastics, covers both thermoset and thermoplastic foams as well as such new techniques as structural reaction injection molding, resin transfer molding, and gas-assisted injection molding.

Chapter 20, on radiation processing, begins the Handbook's coverage of secondary processing techniques. Chapter 21 is devoted to descriptions of equipment for handling incoming raw materials, their distribution to individual processing machines, and for handling finished parts and scrap. Chapter 22 discusses preparation of the raw materials for processing.

In Chapters 23 through 26, the Handbook moves to secondary operations, with coverage of machining, assembly, and decorating.

Finally, in Chapter 27, there is a presentation of accepted testing methods for plastic materials and manufactured products.

The last portion of the Handbook is probably the most used section. Special attention has been paid to the index for the Fifth Edition to help the reader easily locate the information he or she needs.

Title	Location	Edition / Series / Misc.
120 Plastics Extrusion Technology <i>Author:</i> Griff, Allan L. <i>Publish.:</i> Reinhold Publishing Corporation <i>- place:</i> New York, NY <i>- date:</i> [1968] <i>Subject:</i> Plastics -- Extrusion <i>Desc:</i> xi, 352 p., illus., 24 cm.	<i>Dynix:</i> 13035 <i>Call No.:</i> 668.413 Gr <i>ISBN:</i> <i>Shelf</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition <i>Series:</i> Reinhold Plastics Applications Series <i>Year:</i> 1968 <i>Price:</i> \$25.00

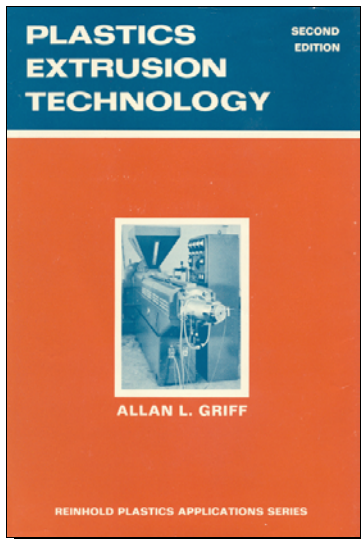


Table of Contents

Preface to Second Edition
 Preface to First Edition
 1. The extruder—components and principles
 2. Markets for extruded products
 3. Pipe
 4. Sheet
 5. Film
 6. Extrusion coating
 7. Wire and cable covering
 8. Monofilaments
 9. Miscellaneous contours
 10. Extruder selection and operation
 11. Basic extrusion fundamentals
 Supplementary Bibliography
 Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Designed and written for technical and commercial people alike, this completely revised edition provides for both makers and users of extruded products a wealth of practical up-to-date information on every major area of modern extrusion practice, and explains not only the what- to-do but also the how-to-do-it aspects of present day extrusion technology. It covers products as well as processes, deals with the construction and operation of both extruders and auxiliary extruder equipment, and is the only reference manual available in its field which emphasizes a market area approach.

Subjects

308 . | Plastics -- Extrusion

While the elements of construction and operation of extruders are covered fully, the bulk of the book—approximately two-thirds of its content—consists of distinct chapters for each market area: pipe, sheet, film, coating, wire/cable, filaments, and contours. Each chapter describes the special equipment needed in addition to the extruder itself, shows how to run this equipment, and indicates the results which may be expected. Each chapter contains a "trouble shooting guide," information on standards and test procedures, formulation data, special techniques, and an up-to-date bibliography. Although the book is necessarily based upon extrusion technology as it is practiced in the United States, considerable attention is given to methods and machinery employed in other countries; to that end, all dimensions are given in both English and metric units. The annotated bibliography, a special feature of this book, has been completely revised and rearranged. Each reference includes the company affiliation of its author, together with a brief abstract designed to guide the reader in his search for additional information. These bibliographies are sub divided by topics to make them more easily used, and over 60 percent of the references pertain to articles written between 1962 and 1967. Included in the book are more than 100 photographs and drawings amplifying and further explaining the text.

Because of its straightforward and untheoretical approach to the subject, Plastics Extrusion Technology has—through the wide acceptance of its First Edition—already won high marks as the definitive quick-reference guide for both the technical and business sides of the extrusion market. The new Second Edition, like its predecessor, is directed to the equipment manufacturer, the raw materials maker, to processors, buyers of extruded items, fabricators of auxiliary materials and equipment, firms interested in selling to the extrusion market, and to industrial planners in institutions and government agencies. It should find a place on the desk of every extrusion engineer, and it should prove especially valuable to over seas readers who are trying to keep abreast of developments in the United States. The book is well suited for use as a text for courses in extrusion practice, especially in vocational and technical high schools and in in-plant training programs.

REINHOLD PLASTICS APPLICATIONS SERIES:

When Reinhold published its first book on extrusion in 1957, the venture was thought to be a mistake by many in the plastics industry. Extrusion, they said, was an art and could not be treated as a technology in a book. However, the title

was so well received that a second book, "Plastics Extrusion Technology," by Allan Grill, was introduced in 1962 as one of the first process books in the Reinhold Plastics Applications Series. Now that extrusion has developed and expanded much further, this new 1968 edition is necessary to bring information on the subject up to date.

The series, however, will continue to feature descriptions of all types of plastics presented in a style that will make the books valuable to a variety of readers. The series should be most useful to design engineers, equipment manufacturers, producers of packages and packaging machinery, students at technical schools and, of course, all people in the plastics industry—material manufacturers, molders, extruders, and fabricators. In addition, it is hoped that the books will be of value to readers in specialized categories. For example, plastics from which fibers are made should be of interest to tire and fabric manufacturers, and materials used in the production of plastic sheet will interest handbag and luggage designers.

With many new features of extrusion constantly becoming available, it is hoped that this new book on the subject will be fully as valuable as its predecessors.

PREFACE TO THE SECOND EDITION:

In only five years since the publication of the first edition, the extrusion industry has made great technical and commercial advances. Much of the first edition is already out of date, and therefore this new and fully rewritten second edition has become necessary. It includes such recent developments as the vacuum sizing trough for pipe, five-roll high-output sheet extrusion lines, expandable mandrels for tubular film, equipment for cross-linking wire covering and making oriented narrow ribbons for twine and sack weaving, and the automatic continuous screen changer—as well as current market statistics and the latest standards for extruded products.

Like the first edition, the new book will be limited to actual manufacturing of extruded products. Consequently, the extrusion involved in compounding and blow molding is excluded, as is the extrusion that is now commonly used to heat and melt plastics in injection molding. These are certainly important applications of the extruder, but they serve different markets and thus fall outside the scope of the book.

The annotated bibliography, a special feature of this book, has been completely revised and rearranged. In the first edition, all the references were collected in one place at the end of the book, and divided into sections, with each section further subdivided into topics. In this new edition, the references that pertain to each chapter are listed at the end of that chapter, still subdivided into topics such as die design, take-off equipment, testing, market reviews, etc. All general or additional references are given in a "Supplementary Bibliography" following Chapter 11.

The entire bibliography, which comprised over 15% of the pages of the first edition, has been updated and enlarged even further. Many old references have been dropped, while over 60% are new articles written between 1962 and 1967, including many from foreign journals. As before, almost all references include brief comments as to their content and usually show the company affiliations of the authors. These comments on content will help the reader decide which references he needs, and the affiliations will enable direct contact with many of the authors. Also, to facilitate contact with the journals themselves, a list of their names and addresses is provided, in the Supplementary Bibliography.

Although the book is necessarily based on technology as practiced in the United States, considerable space is devoted to the methods and machinery in other countries. All dimensions are given in both English and metric units, because of the increasing use of the metric system in English-speaking countries (which the author strongly supports) as well as the expected use of this book in countries where the metric system is the basis of measurement. The first English edition found its way to almost every corner of the world and was also translated into Italian; several such translations are already planned for the new edition. Communications are improving among the peoples of the world, tariffs are being lowered or eliminated, and the interchange of technical information will be of increasing value in international progress and cooperation.

Title	Location	Edition / Series / Misc.
<p>122 Plastics Industry Safety Handbook</p> <p><i>Author:</i> Society of the Plastics Industry <i>Publish.:</i> Cahners Books <i>- place:</i> Boston, MA <i>- date:</i> [1973] <i>Subject:</i> Plastics industry and trade -- Safety measures <i>Desc:</i> xi, 333 p., illus., 24 cm.</p>	<p><i>Dynix:</i> 07904 <i>Call No.:</i> 668.4 So <i>ISBN:</i> 084361207X <i>Shelf:</i> Adult Non-Fiction</p>	<p><i>Edition:</i> <i>Series:</i> Cahner's Practical Plastics Series <i>Year:</i> 1973 <i>Price:</i> \$25.00</p>

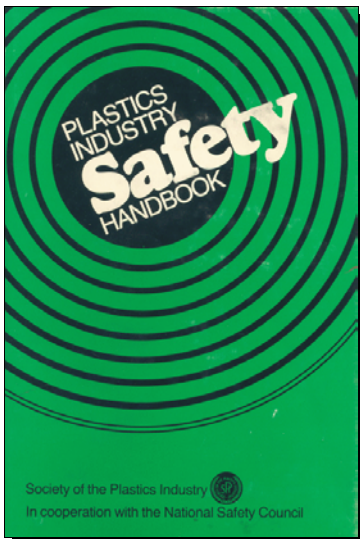


Table of Contents

- Preface
- 1 Why an Accident Prevention Program?
- 2 Planning for Safety
- 3 Accident Records and Measurement
- 4 Occupational Safety and Health Act Requirements
- 5 Maintaining Interest in Safety
- 6 Fire Protection
- 7 Health and Hygiene
- 8 Inspection and Housekeeping
- 9 Machinery
- 10 Maintenance
- 11 Materials Handling
- 12 Milling, Calendering, Coating and Casting
- 13 Compression and Transfer Molding
- 14 Extrusion
- 15 Injection Molding
- 16 Laminating
- 17 Mechanical Finishing
- 18 Reinforced Plastics
- 19 Thermo-Sheet Forming
- 20 Tool and Die Making
- 21 General Safety Equipment
- 22 Information Sources: Safety, Fire Protection and Environmental Health
- Index

Subjects

- 311 .** Plastics industry and trade -- Safety measures

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:
 This handbook sets forth detailed, practical facts and suggestions for developing safety procedures to cover nearly every aspect of the plastics industry — from material suppliers and equipment manufacturers to custom molders and converters.

The result of several years of work by specialists in accident prevention, it provides guidelines for complying with the new Occupational Safety and Health Act (O.S.H.A.). To enforce the new federal safety requirements, O.S.H.A. is now training a task force of safety officers to inspect plants for hazards such as health and fire, measure such conditions as lighting and noise, and check a company's records of illnesses and occupational accidents.

In this handbook, companies throughout the industry have cooperated to furnish proven programs and techniques applicable to both the small plant and the large corporation.

Topics covered include: accident records and measurement; O.S.H.A. requirements; maintaining employee interest in safety; fire protection; health and hygiene; inspection and housekeeping; machine safety; maintenance; materials handling; milling, calendering, coating and casting; compression and transfer molding; extrusion; injection molding; laminating; mechanical finishing; reinforced plastics; thermo-sheet forming; tool and die making; general safety equipment; and information sources.

PREFACE:

This Plastics Industry Safety Handbook, prepared by The Society of the Plastics Industry, Inc. (SPI), in cooperation with the National Safety Council (NSC), is the result of several years of voluntary work by specialists in the field of accident prevention. Mention should also be made of the excellent cooperation given by many member companies in the plastics industry that furnished recommendations and suggestions for chapter content and supplied many of the illustrations.

Safety, like ecology, has caught up with all industries—paper, metal, plastic, packaging, automotive and many others. Now the different industries are analyzing the new Occupational Safety and Health Act (OSHA) of the U.S. Department of Labor. The law, which took effect on April 28, 1971, covers all businesses engaged in commerce (about 4.1 million establishments and 60 million employees) and affects every phase and manufacturing aspect of the plastics industry.

Many processors have proved that good safety programs pay off. Therefore, it will behoove all processors to look upon the new safety law as an opportunity, not as a detriment. By cooperating with government and employees to improve the working environment, all will benefit because safe and efficient industry means greater productivity. Those who take seriously the advancement of their state-of-the-art in SAFETY will unquestionably be ahead in profits.

Based on the law passed by Congress, OSHA priorities are: (1) catastrophe investigations; (2) worker complaints; and (3) target industries—those with the worst safety records. To handle these inspections OSHA is now training a task force of safety officers and expects to have about 2000 in the field by the end of the 1970's. Inspection procedures basically include:

1. Look for hazards, such as health and fire, and measure such conditions as lighting and noise.
2. Take a look at the company's records (such as OSHA Forms 100-101) of illnesses and occupational accidents before starting through the plant.
3. Discuss pros and cons on findings. If problems exist (or tend to exist), discuss with plant managers and determine how long it will take the company to correct these items.
4. Return to the OSHA office and analyze findings with the help of other staff members. If the Department of Labor finds that a violation has occurred, it will send the company a citation, which must be posted near the spot where the violation occurred. This citation specifies the amount of time allowed for correction. Extensions are possible, but there will be no opportunity for unreasonable delay. The company can appeal on the basis of the violation 'cited, the time allotted or the penalty proposed. However, it cannot use an appeal as a delaying action. The situation must be corrected.
5. Make follow-up inspection to see that hazard has been corrected.

At the present time it appears (based on different industry indicators) that the young law is too unwieldy and undefined to establish and enforce effectively. However, if the OSHA staff does its job and maintains the present pace, the law will be very successful in improving the industrial safety record.

The SPI offers multiple safety services to both members and nonmembers through published material, film information and direct assistance on safety. In addition, it furnishes names of safety consultants; it produces safety posters; it answers questions about safety problems and maintains a safety awards program. It will keep on top of all current and developing aspects of safety, especially the OSHA laws, so that processors' questions can be answered.

Title	Location	Edition / Series / Misc.
123 Plastics vs. Corrosives Author: Seymour, Raymond Benedict, 1912- Publish.: John Wiley & Sons - place: New York, NY - date: ©1982 Subject: Plastic coatings Desc: xii, 285 p., illus., 24 cm.	Dynix: 00012 Call No.: 620.192 Se ISBN: 0471081825 Shelf Adult Non-Fiction	Edition: Series: SPE (Society of Plastics Engineers) Monographs Year: 1982 Price: \$25.00

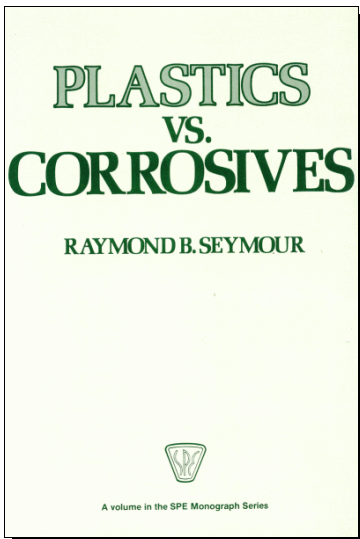


Table of Contents

1. INTRODUCTION
2. FUNDAMENTALS OF PLASTICS
3. PHYSICAL PROPERTIES OF POLYMERS
4. RELATIONSHIP OF MOLECULAR STRUCTURE TO CHEMICAL RESISTANCE
5. EFFECT OF SOLVENTS ON POLYMERS
6. TESTS FOR CORROSIVE RESISTANT COATINGS
7. TESTING OF PLASTICS FOR CHEMICAL RESISTANCE
8. PROTECTIVE COATINGS
9. HIGH SOLIDS COMPOSITIONS, PLASTISOLS, PASTES, POWDERS, AND CAULKING COMPOSITIONS
10. FOAMS, CASTINGS, AND PLASTIC MORTARS
11. POLYMERIC LININGS AND THERMOPLASTIC AND STRUCTURES
12. REINFORCED PLASTIC PIPE, TANKS AND STRUCTURES
13. SELECTION GUIDE: TYPICAL THERMAL AND PHYSICAL PROPERTIES OF COMMERCIAL PLASTICS
14. SELECTION GUIDE: CHEMICAL RESISTANCE DATA FOR TYPICAL COMMERCIAL PLASTICS
- INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This highly useful desk-top reference/handbook provides current practical information on the applied technology, art, and science of corrosion resistant plastics in a format suited for day-to-day use by corrosion engineers, plastics processors, material and polymer scientists, and all those concerned with construction in hostile environments. An updated and expanded version of the classic *Plastics for Corrosion Resistant Applications* (1955), this volume presents concisely and clearly the latest information on guidelines for the selection and use of chemical resistant plastics in place of corrodable metal structures in an easily accessible format.

Early chapters give an extensive introduction to the theoretical basis for material selection, the fundamentals of plastics, the physical properties of polymers, and the relationship of molecular structure to chemical resistance. Complete coverage of the effect of solvents on polymers, tests for corrosive resistant coatings, and the testing of plastics for chemical resistance follows.

Chapters detail such important topics as:

- High Solids Compositions, Plastisols, Pastes, Powders, and Caulking Compositions
- Foams, Castings, and Plastic Mortars
- Polymeric Linings and Thermoplastic Pipe and Structures
- Reinforced Plastic Pipe, Tanks and Structures

All pertinent engineering data and trade names are covered, and Selection Guide Tables at the end of the book provide a fast reference to "Typical Thermal and Physical Properties of Commercial Plastics" and "Chemical Resistance Data for Typical Commercial Plastics." Extensive references follow each chapter and are a convenient key to all relevant literature.

Meticulously researched and logically assembled, this handbook will be indispensable to the professional who must make decisions on the selection, specification and use of corrosion resistant plastics as materials of construction.

PREFACE:

In a report on the use of plastics in corrosive environments some 30 years ago, it was stated that the annual cost of corrosion in the United States rivals the interest on the national debt. Unfortunately, neither the magnitude of the interest on the national debt nor the expense of corrosion has subsided. According to a recent report by the National Bureau of Standards, the annual loss due to the corrosion of metals in the United States is now over \$70,000,000,000.

Of course, these costs would be much higher if chemical resistant plastics were not available to combat corrosion and to replace corrodable metal structures. It is now recognized that industrial corrosion cannot be accepted as a normal operation either from an economic or environmental viewpoint.

Current technical information on plastics available three decades ago was supplied in reports to the American Chemical Society and the Society of Plastics Engineers as well as in a comprehensive book. The volume, and variety of

Subjects

247 .	Corrosion and anti-corrosives
295 .	Plastic coating

available plastics and reports on their use in corrosive environments has grown stupendously since those inceptive reports were published. This new book has been written in an attempt to update the states of the art, technology and science in the important field of chemical resistant plastics.

It is hoped that readers of this book will find it to be a useful tool in the solution of corrosion problems.

INTRODUCTION:

The ancients used bitumens for waterproofing their boats and shelters. After the discovery of corrosives, it was observed that the bitumens used as caulking materials were not only resistant to water but also to vinegar, niter and "fuller's scope." However, the use of these organic materials as containers for either water or corrosives was limited. The Chinese and Egyptians used ceramics and alchemists used glass as containers for their crude chemical processing, and in spite of their inherent brittleness, these products are still used as materials of construction today.

That natural rubber (*Hevea brasiliensis*) was also resistant to water was recognized by the Indians in Central and South America who made waterproof boots and bottles from the product obtained from *Cau-uchu* or "weeping wood." In his abortive attempt to waterproof 150 mailbags for the United States government in the 1830's, Charles Goodyear discovered that rubber and not cotton was resistant to nitric acid fumes. Goodyear reduced the tackiness of the rubber coated mailbags and life preservers by his "acid gas" process but the fabric in these articles, which was not resistant to nitric acid, deteriorated after a relatively short period of time.

The cellulose trinitrate produced by Schonbein in 1846 by heating cellulose with nitric and sulfuric acids proved resistant to additional amounts of these acids. Celluloid, which Hyatt produced in 1868 by the plasticization of cellulose nitrate using camphor, was also resistant to many corrosives.

Menard demonstrated that cellulose nitrate was soluble in a mixture of ethanol and ethyl ether and this solution, called collodion, was used as a protective coating in the mid-nineteenth century. Prior to the 1960's, the metal surfaces of most automobiles and other outdoor equipment were protected by the application of a pigmented solution of cellulose nitrate.

Bakelite, the world's first truly synthetic plastic, was used in the early 1900's as an acid resistant molded plastic. Laminated plastic made by molding phenolic-resin-impregnated paper or cotton fabric has been used to a limited extent in corrosive environments for over a half a century.

Saureschutz Gesellschaft in Berlin produced chemical resistant equipment in the 1920's by molding a mixture of asbestos and phenolic resin. This product, under the trade names of Faolite and Haveg, is still available today. A corrosion resistant mortar, called by the trade name Asplit, was also produced in the 1930's by mixing a resole phenolic resin with a silica filler containing benzene sulfonyl chloride which served as a latent source of acid. Other chemical resistant mortars have been produced by using furan, epoxy, and polyester resins in place of the phenolic resole and by using ground coke in place of the silica filler.

Hard rubber, the first man-made plastic, has been used for molded acid resistant containers for over a century. Vulcanized natural rubber has also been used as a corrosion resistant lining for steel vessels for over 50 years.

Although shellac, bitumens, cellulose nitrate lacquers and phenolic resins have been used as protective coatings, the significant advances in this field were the result of the introduction of chlorinated rubber coatings under the trade name of Tornesit, in Germany in the 1920's and coatings of the copolymer of vinyl chloride and vinyl acetate in the United States in the 1930's. These are also still in use.

An annual review of plastics as materials of construction was published by the American Chemical Society in *Industrial and Engineering Chemistry* from 1947 to 1971. These annual reviews have been published in *Australian Plastics and Rubber* and *Popular Plastics (Bombay)* after the publication of *Industrial Engineering Chemistry* was discontinued.

Considerable history has been recorded but much more will be written as new test methods and more case history data on applications of plastics in corrosion resistant environments are developed. Plastics play a unique role in this field and their use will increase as more corrosion engineers become acquainted with plastics and more plastics engineers become acquainted with problems in the corrosion field.

Title	Location	Edition / Series / Misc.
124 Plating of Plastics with Metals		<i>Edition:</i>
<i>Author:</i> McDermott, John	<i>Dynix:</i> 66106	<i>Series:</i> Chemical Technology Review: No. 27
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 668.41 Ma	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815505264	
<i>- date:</i> ©1974	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1974
<i>Subject:</i> Plastic coatings -- Patents		<i>Price:</i> \$36.00
<i>Desc:</i> x, 278 p., illus., 25 cm.		

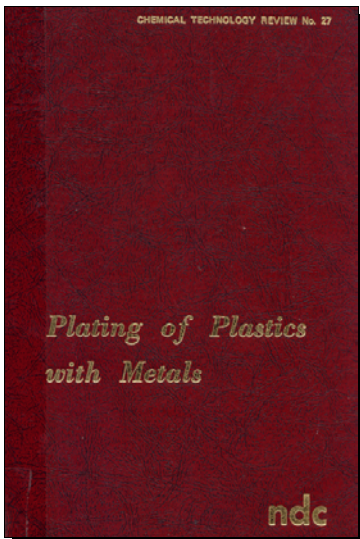


Table of Contents

INTRODUCTION
 ETCHANTS, PHOSPHORUS COMPOUNDS AND OTHER SURFACE TREATMENTS
 - General Etching Formulations
 High Chromium Content
 Hexavalent Chromium-Hydrocarbon Fraction Reaction Product
 Chromium Complex
 Fluorocarbon Surfactant - Two-Stage Treatment
 Ethylenediamine Treatment After Etch
 Ammonium Hydroxide Addition
 Electrolytic Reduction in Oxidizing Solution
 - Phosphorus-Containing Compounds
 Sodium Dihydrogen Phosphate
 Phosphorus Sesquisulfide
 Phosphorus, Metal Salt, Amine and Alkali Metal Hydroxide
 Cesium Chloride Treatment of Metal Phosphides
 Elemental White Phosphorus
 Stable White Phosphorus Solutions
 Phosphorus-Organometallic Reaction Products
 Metal Phosphide Alloys
 Phosphorus Solution Containing Viscosity and Surface Tension Modifier
 Metal Salt-Phosphine Complex
 Metal Salt-Phosphine Complex and Free Radical Generator
 - Other Surface Treatments
 Emulsified Solvents
 Sulfur-Containing Solvent Solution
 Surfactant Treatment
 Sulfuric Acid, Silver Acetate and Nitric Acid
 Acids and Metal Hydroxides
 Silver Salt and Metal Halide
 Nickel-Zero Complex in Organic Solvent
 Arsenic Chloride
 Alcohol Solutions of Metal Salts or Oxides and Polyethyleneimine
 Impregnation with Copper and Nickel Salts
 Extractable Fillers
 Silica Fillers as Catalyst Binders
 Reduction of Platinum Complex on Substrate
 Carboxyl-Modified Polypropylene Adhesive Layer
 Reduction of Metal Oxides in Elastomeric Matrix
 Glow Discharge and Oxidizing Agents
 Sulfonation

GENERAL USE ACTIVATORS AND SENSITIZERS
 - Palladium Complexes
 Using Organic Acids
 With Hydrogen Chloride and Water
 With Group IV Metal and Suitable Anion
 - Other Formulations
 Activator Hydrosols
 Stannous Chloride Pretreatment
 Colloidal Metal Solutions
 Rejuvenation of Accelerating Solution

Subjects

299 .	Plastic coatings -- Patents
384 .	Metal coating -- Patents

Water-Soluble Alcohols and Glycols as Stabilizers
Copper Chloride Stabilizer
Single Stage Activation
Spray Technique with Alkaline Tin

COPPER PLATING

- Bath Stabilizers
Mercury Salts
Covalent Mercury Salts
Molybdenum, Tungsten or Rare Earth Metal
Selenium Compounds
Polyether Adducts of Acetylenic Alcohols
Sulfamic Acid
Salts of Hydroxy Sulfonic Acids
Ethoxylated Cyclohexylamine Complexes
Rhodanine
Cyanide Complexing Agents
o-Phenanthroline and Iodides
2,2'-Biquinoline
Alkylmercaptans
Sodium Thiosulfate and Ethyl Alcohol
Multicomponent Stabilizer Mixture
Excess Methanol and Rochelle Salt Complexer
Rochelle Salt Purity Affects Stability
- Physical Property Improvers
Extraneous Ion Deposition at Inner Layer
Organic Silicon Compounds
Formaldehyde Addition Agents
- Deposition Aids
Ionic Accelerators
Osmium Tetroxide
Gold Sulfite Sensitizer
Metal Cyanide Complex Accelerators
Automatic Control of pH of Bath
Cuprous Thiocyanate and Thiourea to Impart Conductivity
"Stardusting" Prevention

NICKEL, COBALT, ALUMINUM AND PRECIOUS METALS

- Nickel and Cobalt — Pretreatments
Combined Etching and Sensitizing Treatment
Palladium-Sulfuric Acid Pickling Solution
Quaternary Amine Surfactant Solutions
Tartaric Acid Added to Sensitizer
- Nickel and Cobalt — Bath Additives
Fluoroborate and Sulfamate Ions
Sulfonic Acid Compounds
Propane Sulfone
Alkali Metal Lignosulfonate
Alkali Metal Borohydrides
Alkali Metal Cyanoborohydride
Amine Boranes
Ammonium, Acetate and Citrate Ions
Ascorbic Acid as Second Reducing Agent
Low Temperature Plating
Electroless Plating at Room Temperature
Nickel and Cadmium Salts
- Aluminum
Trihydrocarbylamine Complex
Aluminum Hydride Reduction on Surface
- Gold
Soluble Gold Compound
Cycloaliphatic Amine Stabilizers
Water-Soluble Cyanides as Stabilizers
- Other

Palladium
Cadmium

POLYOLEFINS

- Surface Treatments
Ketones
1,3-Diphenyl-2-Propanone and Cyclooctadiene
Dialkylamine
Acid Chromate Etch and Persulfate Treatment
Octyl Diphenyl Phosphite
Aqueous Emulsions of White Phosphorus and Trichloroethylene
Linseed and Castor Oil Emulsions
Aryl Sulfonic Acid Added to Chromium Bath
Organic Peroxide
Postchlorination of Polyethylene
- Internal Modification
Adhesion-Promoting Polymer and Active Filler
Catalyst Support as Filler
Talc
Inorganic Fillers
Methyl Abietate
Calcium Resinate
Surfactants
Oxidizable Additive
Blends with Ethylene-Propylene Elastomer
Blends with EPDM
Coumarone-Indene Resins
- Related Polymers
Ethylene-Diolefin Polymers
4-Methyl Pentene-1 Polymers
Sulfonic Acid Modified Polyethylene

ABS RESINS

- Surface Treatments
Organic Solvent Treatment
Glycol Ac
Chromic-Phosphoric-Sulfuric Mixture
Palladium Salt in Phosphoric Acid
Palladium Salt in Sulfuric Acid
One-Step Conditioner-Sensitizer
Molybdic, Phosphoric and Sulfuric Acid Mixture
Potassium Permanganate in Orthophosphoric Acid
Phosphoric Acid Recovery
Alkali Metal Manganates
Surface Oxidation
Resin Treatment
Adhesive in Solvent
- Isooctyl Stearate Additive
- Related Polymers
Styrene-Acrylonitrile-Polybutadiene Graft Copolymers
Styrene-Acrylonitrile-Vinylpyridine Terpolymers

MAGNETIC COATINGS WITH POLYETHYLENE TEREPHTHALATE

- Pretreatments
Cuprous Iodide and Polyvinyl Formal Binder
Nucleating Metal and Intermediate Bonding Layer
Polyester and Gelatin Coating
Iron Powder in Binder
Phenol Etching Solution
Phenol in Alkali
Alkali Metal in DMSO
Werner Chrome Complexes and Chloral
Preconditioning/Seeding
Iridescent Surface

Flame Treatment for Vacuum Metallizing
 - Bath Compositions
 Magnetic Cobalt Bath with Malonate Ion
 Regulating the Rate of Electroless Deposition
 Magnetic Cobalt and Cobalt Alloy
 Electroless Cobalt with Controlled Magnetic Properties
 Magnetic Recording Tape with Cobalt-Phosphorus Alloy
 Sequestering Agent for Iron in Magnetic Alloy Deposition

THERMOPLASTIC AND THERMOSET RESINS

- Nylon and Polyimides
 Multiple Action Bath
 Aqueous Reducing Acids
 Aqueous Iodine Treatment
 Trihydroxymethyl Phosphine Treatment
 Organic Fillers
 Polyimide
 Polyimide in Magnetic Memory Unit
 - Halogenated Polymers
 Phenol Pre-Etch
 Alkoxie-Activated Surface
 Stannous Chloride and Stannic Chloride Solutions
 "Nickel-Zero" Complex
 Vinyl Chloride-Fumarate Ester Copolymers
 Vinyl Chloride and Long-Chain Alkyl Ester Copolymers
 Graft Copolymers of Vinyl Chloride and Conjugated Dienes
 Vinyl Chloride Grafted Ethylene-Vinyl Chloride Copolymers
 Electrical Discharge Treatment of Fluorocarbon Polymers
 Pyrolysis of Nickel Carbonyl on Teflon
 Codeposition of Metal and Fluorocarbon Resin Particles
 - Polystyrene
 Monochlorobenzene Emulsion
 o-Dichlorobenzene, Sulfur Trioxide and Trimethyl Phosphate
 Nitric Acid Treatment
 Blends with ABS
 Coated Cross-Linked Polystyrene Beads
 - Polyoxymethylene Polymers
 Surface Treatment of Homopolymers
 Preparation for Vacuum Metalli
 Gas Plating
 - Other Thermoplastics
 Polyarylene Polyethers and Polycarbonates
 Polycarbonate
 Polysulfone
 Electronically Conductive Polyurethane Polymers
 Polyurethane Elastomer
 Ammoniated Carboxylic Acid Copolymers
 Plastic Polyblends
 - Thermosets
 Phenolic Resins
 UF (Urea-Formaldehyde)
 Control of Flex Strength of Plate
 Chemical Pitting of Epoxy Surface
 Epoxy and Molten Eutectic
 Diallylphthalate

PRINTED CIRCUITS ELECTRODES AND OTHER APPLICATIONS

- Printed Circuits and Selective Plating
 Colloidal Catalyst Solutions
 Activation of Metal-Clad Laminated Surfaces
 Dimethylformamide Treatment
 Octyl Phenol Surfactant Treatment
 Etching of Sensitized and Activated Surfaces
 Metal Phosphide Treatment

Activating Agent Applied as Pattern
Predetermined Patterns
Highly Stressed Deposit
Poisons to Enable Selective Plating
Copper Concentration Held Within Narrow Limits
Gold Intermediate Layer
Oxidizable Rubber Coating on Base Material
Thermosetting Resin Adhesive Layer
Inks Containing Catalytic Metal
Roughening Followed by Adhesive
Catalytically Treated Fillers
Active Silica Filler
Organic-Metallic Fillers
Acrylic Polymer Masking Agent
Multicomponent Plastic Articles
- Fuel Cell Electrodes
Polysulfone
Nylon or Glass
Cellulose Triacetate
Hollow Polyethylene Fibers
Dyes as Intermediate Activating Layer
Anionic Surface Bonds Cationic Metal
- Other Specific Uses
Protective Coatings for Plating Racks
Copper-Polypropylene Stripline Boards for Antennas
Prepared Textile Dye Tubes
Metallizing of Microcapsules
Lead Coated Fluorocarbon Polymer Expulsion Membranes
Shielded Wires and Antistatic Textiles

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD:

The detailed, descriptive information in this book is based on U.S. patents since 1966 relating to plating of plastics with metals.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of plating plastics with metals.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure."

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring our new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION:

The most common techniques for the coating of plastics with metals are chemical reduction, electroplating, spraying and vacuum metallizing. Historically, vacuum metallizing is a well established, economical method. Spray techniques are little used and with the increasing technology, particularly in surface activation treatments, the electroless and electroplating procedures are now being broadly used to metal coat a variety of plastic products for decorative and functional uses. The increasing trend to more functional applications requires greater adhesion, better wear and erosion resistance and improved corrosion resistance along with lower water permeation than can be commonly obtained by vacuum metallizing.

While electroplating on nonconductors for producing novelty items dates back over almost a century, little large scale production occurred prior to the late thirties. These early techniques, based largely on a copper encapsulation procedure, opened up limited markets, but the development of new methods for providing sufficient chemical (rather than mechanical) bonding of metal to plastic in the mid-sixties provided wide ranging product opportunities. The major improvement in this area, which led to lowered production costs by the electroplating method, resulted from the use of chemical conditioners to treat the surface to provide high, durable bond strengths and a bright final finish of the plating.

The technology over the past ten years has largely focused on the major problem developing chemical conditioners for a wide variety of plastic surfaces. Acrylonitrile butadiene-styrene (ABS) was among the first to be studied in detail and efficient chemical conditioners were developed specially for this plastic. Indeed as late as 1966, about 95% of the items plated by this modern method were made of ABS. The very considerable research effort and the general nature of this business has resulted in the development of many proprietary formulations, with Enthone Inc., Shibley Co. Inc., MacDermid, Inc., and Allied Research Products, Inc. being foremost in the marketplace.

While little specific information has been generally published on these conditioners and the many new plating bath formulations, hundreds of processes have been described in the recent patent literature. This book describes some 250 such processes and several hundred formulations which have been developed since 1966 for the pretreatment, activation and metal coating of ABS, polyolefins, polyesters, nylon, polycarbonates and many other plastics.

Additionally, while many of these techniques are used to plate decorative parts in the automotive and construction industries, a number of functional applications are described in this book relating to printed circuits, magnetic tapes and fuel cell electrodes. Thus, the research effort for new high potency surface treatments, improved plating bath compositions, and the translation of these findings into end-use applications makes this coating technique a prime candidate for rapid growth in the seventies.

As in any in-depth review of this type, many techniques and processes are applicable to more than one use, or plastic substrate or type of metal and it is necessary, for continuity and brevity, to describe only the most significant aspects of many of the processes. As noted above the critical step in all of these metal coated plastics processes is the surface conditioning procedure, which is highlighted throughout this book. The other steps of cleaning, electroless plating, and the electroplating procedures are included where required for a complete understanding of the process.

Title	Location	Edition / Series / Misc.
125 Plating of Plastics: Recent Developments		<i>Edition:</i>
<i>Author:</i> Domino, Francis A.	<i>Dynix:</i> 13047	<i>Series:</i> Chemical Technology Review: No. 138
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 668.49 Do	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815507704	
<i>- date:</i> ©1979	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1979
<i>Subject:</i> Plastic coatings -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> xi, 385 p., illus., 25 cm.		

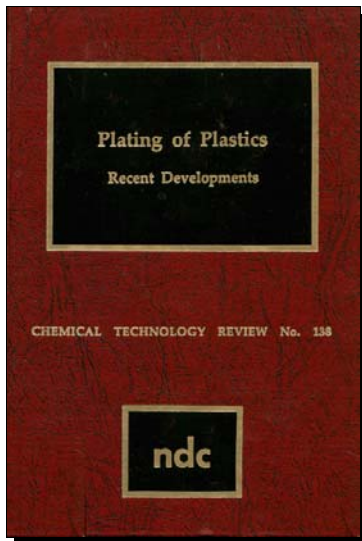


Table of Contents

INTRODUCTION

MAGNETIC COATINGS, METALLIZING COMPOSITIONS AND PRETREATMENTS

- Magnetic Coatings
- Ferromagnetic Memory Layer
- Metallizing Compositions
- Cadmium, Indium, Lead and Zinc Dispersions
- Fired-On Glass Frits
- Metallizing Pretreatments
- Sensitizing with Acid Solution of Arsenic Group Metal
- Thermoplastic Organic Polymer
- Grafting on Polymeric Textile Materials
- Hydrophilic Coating
- Metal Oxide with Swelling Agent and Chemical Roughener
- Decontamination Prior to Metallizing
- Metal Salts and Photo or Chemical Reduction

ABS RESINS AND POLYOLEFINS

- Electrodeposition on ABS
- ABS Substrate Containing Asbestos
- Resistant Resinous Vehicle for Electrocoating
- Electrocoating ABS with All-Nickel Sublayers
- Pretreatments
- Glycol Ether-Acid Stannous Chloride-Palladium Hydrosol
- Acid Solution of Noble Metals
- Catalytic Inorganic Colloidal Dispersion
- Colloidal Application of Catalytic Nonprecious Metals
- Five-Membered Oxygen Heterocyclics
- Palladium Chloride-Methyl Ethyl Ketone Complex
- Fine Abrasive and Methanol
- Polyolefins
- Isotactic Polypropylene with Organic Nitrogen
- Polymers with Natural Silica Fillers
- Direct Electroplating Compositions
- Boron, Phosphorus and Noble Metal in Alcohol
- Copper, Nickel, or Cobalt and Organic Solvent-Palladium Complex
- Polypropylene Compositions Containing a Polyhydroxy Aromatic Compound

ALUMINUM, NICKEL, COBALT AND NOBLE METALS

- Sensitizers and Activators
- Precious Metal Ions and a Group IV Metal
- Polycarboxylic Acid Activator
- Platinum Group or Noble Metal Sensitizer
- Aluminum, Nickel and Cobalt
- Sandblasting Resin Substrate Prior to Electrodeposition
- Nickel Bath Containing Hydrazine
- Metal Leaf from Metal in Resin Sandwich
- Copper as an Adhesion Aid for Nickel-Chromium Film
- Aluminum-Carbon Bond Through Metal Monocarbide
- N-Substituted Pyridyl Compounds as Nickel Bath Additives
- Noble Metals

Subjects

296 . Plastic coating -- Patents

Photolytic Method Using Gold Complexes
Chelating Agents as Promoters
Alkylene Imine and Amine Bath Additives
Electrochemical Passivation
Gold-Plating Bath with Imide Complex of Group I-B Metal
Uniform Gold Films
Electroless Gold-Plating Bath
Aldonic Acid Derivatives as Silver Bath Reducers
Silver Bath with Sulfur or Selenium Accelerator
Improved Silver Reducer Containing Alditols

GENERAL USE SENSITIZERS, ACTIVATORS AND CATALYSTS

- Palladium Complexes
Noble Metal-Tin Halide Complex
Palladium on Tin Aided by Buffering
Colloidal Sensitizing Solution and Redox Treatment
Pickling and Activation with a Noble Metal Boiled Bath
Noble Metal Activator and Polysaccharide Reducer
Chromic Acid and Ceric Ammonium Nitrate
Photosensitive Palladium Sensitizer
- Catalytic Treatment
Catalytic Sensitization Bath with Copper Ion
Autocatalytic Plating
Noble Metal-Oxygenated Ring Compound Hydrosol
Monocarbonyl Stabilizer
- Other Applications
Metal-Phosphorus-Sulfur Complex
Persulfate Ion Etch with Prior Alcohol Treatment
Pretreatment with Permanganate and Manganate Ion
Pretreatment with Sulfur Trioxide
Sacrificial Anodized Metal Foil Laminate
Oxidized Resinous Surface Neutralized by Hydrazine

THERMOPLASTIC AND THERMOSET RESINS

- Halogenated Polymers
P2O5 Treatment of Hydrophobic Substrates
Alkaline Polyhydric Alcohol Pretreatment of Polyvinyl Chloride
- Polystyrene
Electrolessly Plateable Graft or Terpolymers
Metal-Polymer Composite Containing Soft Metal or Alloy
- Polyoxymethylene Polymers
Quinoline or γ -Butyrolactone as a Pre-Etch Treatment
- Polyamides and Polyimides
Electroless Silver Plating of Nylon
Hot Palladium Chloride Activation Prior to Electroless Plating
Pretreatment with Palladium and Silver
Alkaline Ethylene Diamine Etchant
Open Flame Sensitization
Hydrazine-Caustic Soda Pretreatment
- Other Thermoplastics
Conditioner for Plastic with Siliceous Filler
Metallizing with a Noble Metal
Phosphorus Preactivation Treatment of Polyphenylene Oxide Substrate
Resin Substrate Pretreated with Fine Metal Particles
Anodic Electrodeposition on Acidic Copolymers
- Thermoset Resins
Swelling an Epoxy Substrate as a Pre-Etch Treatment
Epoxy Preconditioner Containing a Five-Member Nitrogen Heterocyclic
Pretreatment with a Low Molecular Weight Glycol Monoether
Aqueous Coating Compositions
Metallizing Thermoset Plastics
Photopolymerizable Composition
Particulate Filler-Metal Salt Resin

ELECTRODEPOSITION

- Pretreatment
- Organic Solvent-Phosphorus Solution
- Sodium Phenolate-Detergent Solution
- Metallizing a Substrate with a Polymer-Carbon Layer
- Electroplated Filament
- Pretreatment with Phosphorus or Its Compounds
- Crimped, Metal-Coated Synthetic Filaments
- Other Electrodeposition
- Cellular Metal Deposit
- Bath Containing N-Sulfonated Polyethyleneimine
- Electroplated Through-Hole Circuit Boards
- Electroplating Operation
- Electroplating Holder for Earrings
- Control of Deposition, Degradation Rates and Film Thickness

ELECTROLESS PLATING PRETREATMENTS

- Catalytic Metal Applications
- Nonactive Colloidal Dispersion and Activity Modifier
- Dry Colloidal Catalyst Compositions
- Copper, Nickel Salts
- Aqueous Suspension for Surface Activation
- Copper-Primed Substrate Followed by Developer
- Hydrous Oxide Colloid of Nonprecious Metals
- Noble Metals
- Palladium Salt and Photosensitive Binder
- Discontinuous Palladium Film and Wetting Agent Rinse
- Zero Valent Palladium Complex Activation
- Three-Step Seeding with Hot Water Rinse and Baking
- Inhibited Electroless Plating Solution
- Palladium Salt-Dimethyl Sulfoxide Complex Surface Catalyst
- One-Stage Activation with Aqueous Noble Metal Suspensions
- Polymer Applications
- Undercoating Layer of Polyvinylidene or Vinylidene Chloride
- Selective Deposition with a Vinyl-Maleic Anhydride Copolymer
- Tin and Other Metals
- Catalytic Acid Solution of Urea and Stannous Salt
- Elevated Temperature Preparation of Low Concentration Catalyst Ions
- Hydrolyzable Aged Stannic and Stannous Ions
- Colloidal Catalyst with Aged Stannic Ions
- Stannic-Stannous Sensitizer with Chloride or Bromide Ion
- Stannous-Cuprous Ion Complex as Primer
- Colloidal Tin-Palladium Catalyst
- Other Treatments
- Postetch Surfactant Rinse
- Dye and Chelating Agent as Catalysts
- Double Reducers to Enhance Substrate Coating
- Composite Particulate Diamond Metal Coating

ELECTROLESS COPPER PLATING

- Bath Additives
- Brucine for Hydrogen Inhibition
- Polyalkylene Oxide for Enhanced Ductility
- Ethylenediaminetetraac Acid and Dimethylamine Borane for Bond Strength
- Alkali Metal Borohydride Complex for Copper-Boron Film
- Nitrogen Heterocycle for Enhanced Film Strength
- Fluoroorganocopper Compound
- Perfluorocarbor Nonionic Surfactant
- Salt and Copper Ammonium Sulfate
- Cupric Tetraammino Ions plus Activator-Modifier
- Dry Replenishment for Plating Bath
- Thiol Acid Stabilizer
- Silver Base Activator with Oxyacid Salt
- Iodobenzoic Acid Stabilizer

Sulfamic Acid Stabilizer in Alkaline Bath

OTHER ELECTROLESS DEPOSITION

- Surface Improvers
- Alkanol-Modified Noble Metal-Tin Chloride Complex
- Separate Sensitization and Activation of Plastic Substrate
- Precious Metal-Phenols Complex Sensitizer
- Sensitizer Stabilized by a Lewis Base
- Bath Compositions
- Acid or Alkali-Soluble Metal Salts as Boosters
- Hectorite as a Deposition Catalyst
- Elementary Sulfur Stabilizer
- Nickel and Cobalt Plating
- Substrate Pretreatment with Reducing Agent
- Sodium Citrate-Ammonium Chloride Bath Stabilizer with Nickel Replenisher
- Fine Abrasion and Acid-Pickling Pretreatment
- Dry Replenishers for Nickel Baths
- Noble Metal Plating
- Thiol Compound as Reducer
- Vacuum or Sputtering Deposition of Gold or Palladium
- Plating Practice
- Concomitant Particulate Deposition by Tumbling

RELATED APPLICATIONS

- Other Coating Processes
- Coating a Heat-Recoverable Article
- Dispersion Coating for a Flemish Finish
- Atomized Spray Coating of a Plastic Substrate
- Vacuum Deposition of Vapor from Volatilizable Solids
- Substrate with Metal Film and Plastic Coat Overlay
- Substrate Composition
- Siliceous and Heavy Metal Oxide Fillers

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents, issued since August 1973, that deal with the plating of plastics. This title contains all recent advances since our previous title Plating of Plastics with Metals published in 1974.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, commercially oriented review of recent advances in the plating of plastics.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have by-passed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The table of contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION

The large volume production of the many varieties of plastics in the last few decades has been accompanied by increased efforts to coat them with metals. This has included the development of techniques for chemical action, vacuum deposition and spray applications. Major markets have arisen for plated products in the mechanical goods industries, and particularly in the auto industry. Efforts to improve gas mileage have compelled replacement of many metal parts with lighter metal-plated plastic counterparts.

The adoption of plated plastics for the data processing and sound recording fields has accompanied a surge in demand for printed circuits, magnetic tapes and similar parts in these industries.

Surface treatments are important in metal deposition on conductive and nonconductive substrates. Technology since the mid-sixties has brought about improved methods for preparing substrate surfaces for deposition, has enhanced chemical bonding of metal film, and has improved the bright finish of the plated article. Chemical conditioning agents that have been introduced since then have made possible the use of a wide spectrum of plastic substrates.

The patent literature presents some sophisticated organic and inorganic materials and techniques for surface treatments, conditioning agents, sensitizers, stabilizers, activators, catalysts and plating bath compositions. Metals involved in the processes include all the usual base metals as well as the noble metals.

Title	Location	Edition / Series / Misc.
126 Polyamide Resins Author: Floyd, Don Edgar Publish.: Reinhold Publishing Corporation - place: New York, NY - date: [1966] Subject: Plastics Desc: viii, 227 p., illus., 24 cm.	Dynix: 08484 Call No.: 668.41 FI ISBN: Shelf Adult Non-Fiction	Edition: 2nd edition Series: Reinhold Plastics Applications Series Year: 1966 Price: \$25.00

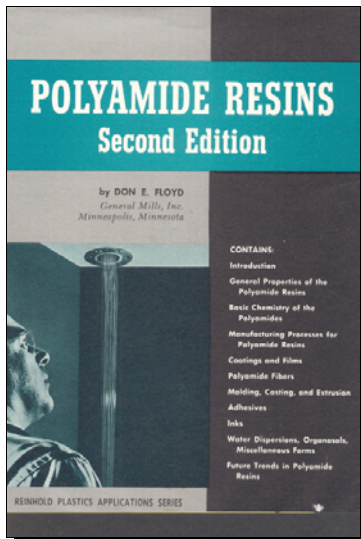


Table of Contents

PREFACE TO SECOND EDITION
 PREFACE TO FIRST EDITION
 1. INTRODUCTION
 2. GENERAL PROPERTIES OF THE POLYAMIDE RESINS
 3. BASIC CHEMISTRY OF THE POLYAMIDES
 4. MANUFACTURING PROCESSES FOR POLYAMIDE RESINS
 5. COATINGS AND FILMS
 6. POLYAMIDE FIBERS
 7. MOLDING, CASTING, AND EXTRUSION
 8. ADHESIVES
 9. INKS
 10. WATER DISPERSIONS, ORGANOSOLS, MISCELLANEOUS FORMS
 11. FUTURE TRENDS IN POLYAMIDE RESINS
 INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

During the past decade there have been many new and important advances in engineering plastics, particularly in the area of synthetic fibers, of which nylon is the most notable example. This tremendous growth can be attributed to a re appraisal of the valuable properties of the polyamides, a better insight into the utilization of these properties, and the impact of the more recent polymers opening up new applications for all polymers.

This new edition has been thoroughly revised and updated to incorporate these latest changes in this active area of plastics. Broad in scope, the book examines the different types of polyamides, their basic chemistry, and the methods for their manufacture. It presents a definitive discussion of their key properties and important applications: coatings and films; fibers; moldings, castings, and extrusions; adhesives; inks; water dispersions, organosols, and other miscellaneous forms. Throughout the book, emphasis is placed on relating the type of polyamide with end use applications. Future trends are discussed in a summary chapter.

This authoritative work is designed to suit the needs of polymer chemists, formulators, molders, and users of plastic products. It will also be of interest to anyone working in the textile, paint, packaging, plastic molding, and adhesive industries.

REINHOLD PLASTICS APPLICATIONS SERIES

It is fast becoming self-evident that the very life of our nation depends upon continuing progress in scientific development. Knowledge of plastics at this time in history is an essential part of such progress, and it is such knowledge and its applications that are the central motives behind this series, which now has reached an impressive number of volumes. It started in 1957, the thought at that time being to present in a single, condensed volume the essential features for the optimum application of the most important commercial plastics.

This plan continued for nine volumes, covering as many plastics types. Then it became apparent that fabricating processes were almost of equal importance with the types in establishing end-product characteristics. Accordingly, in 1958, Butzko's "Plastic Sheet Forming" was published as the first process book of the series—to be followed by many others. Early in 1962, a further change in the original plan of the series was introduced—the format was changed to the present 6-inch by 9-inch size.

With these changes, the theme of the series continues as first decided, namely, optimum application. The authors have attempted to keep the texts condensed but interesting, and at a level slightly below that of highly technical treatises. They have kept in mind, as probable readers, such industrial men and women as design engineers, product supervisors, equipment manufacturers, producers of packaging, students at technical schools, and of course all people in the plastics

Subjects

304 . Plastics

industry—molders, extruders, fabricators, as well as resin and powder manufacturers.

In addition, it is hoped that some titles will appeal to readers in specialized categories. Plastics from which fibers are made may be of interest to tire and fabric manufacturers, and the description of materials for production of sheets and films may be of value to many diverse industries.

The present title is offered in the hope that it will contribute its share to the successful growth of the plastics industry.

PREFACE TO THE SECOND EDITION:

When one considers how many new and important engineering plastics have come on the market during the last ten years, nylon has shown remarkable vigor. Not only has it held its own, it has registered gains in the fields of textile fibers and molding compounds, while other types of polyamides have been increasingly employed in coatings and adhesives. This growth can be attributed to a reappraisal of the valuable properties of the polyamides, a better insight into the utilization of these properties, and the impact of the newer polymers opening up new applications for all polymers. This is reflected in the strong upward trend for all engineering plastics. Thus, polyamide resins are in a growth field.

Nylon means, as it always has meant, high quality and long product life. Thus, nylon fibers for carpeting and nylon yarn for automobile tires represent growth areas which have developed during the past ten years on the basis of product improvements.

Nylon's vigor is also seen in the development of bulked fibers and stretch fibers, specialty molding powders, blown and cast film, extruded pipe, and specialty brushes from monofilament.

In this new edition, an attempt has been made to incorporate the major advances of recent years into the format established for the first edition. A few of the items of interest several years ago, which have since fallen by the wayside, have been dropped from the book. Much of the chemistry remains unaltered with appropriate additions for new process discoveries and improved routes to monomers. The established fields of fibers and molding compounds remain the mainstays in nylon end uses and, thus, still deserve major attention. But there are very interesting developments in the fields of inks, film and coatings, and adhesives. It is hoped that proper perspective has been given to all phases in this new edition.

I am again grateful to General Mills for the services of the library, stenographic, and drafting departments. The valuable help of Mrs. MarVella Swanberg for typing much of the manuscript is acknowledged with thanks. Also acknowledged with gratitude is the courtesy of E. I. du Pont de Nemours & Co. and of Allied Chemical in supplying photographic material used for illustrations.

Title	Location	Edition / Series / Misc.
<p>127 Polymer Blends</p> <p>Author: Paul, D. R. and C. B. Bucknall (editors)</p> <p>Publish.: John Wiley & Sons</p> <p>- place: New York, NY</p> <p>- date: ©2000</p> <p>Subject: Polymers</p> <p>Desc: xiv, 600 p., illus., 25 cm.</p>	<p>Dynix: 89757</p> <p>Call No.: 668.9 Po</p> <p>ISBN: 0471352799</p> <p>Shelf Adult Non-Fiction</p>	<p>Edition:</p> <p>Series:</p> <p>Year: 2000</p> <p>Price: \$245.00</p>

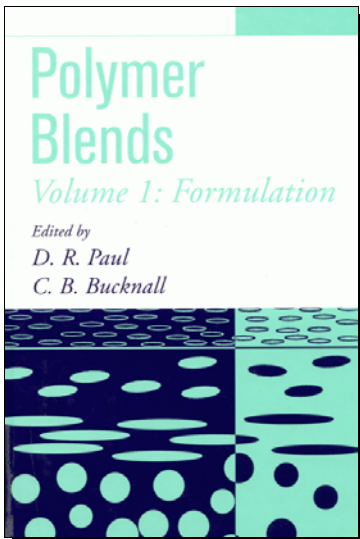


Table of Contents

VOLUME 1: Formulation

Preface

Contributors, Volume 1

Contents, Volume 2

Contributors, Volume 2

1. Introduction

THERMODYNAMICS

2. Statistical Thermodynamics of Polymer Solutions and Blends
3. Polymer-Polymer Interactions Based on Mean Field Approximations
4. Hydrogen Bonding System
5. Polymer Blends as Viewed by Analogue Calorimetry
6. Crystalline Polymer Blends
7. Fundamentals of Blends of Rigid-Chain (Liquid Crystal) Polymers
8. Thermodynamics of Polyolefin Blends

CHARACTERIZATION

9. Morphology Characterization by Microscopy Techniques
10. Viscoelastic Characterization of Polymer Blends
11. Optical Characterization: Light Scattering, Birefringence, and Ellipsometry
12. Neutron Scattering and Polymer Blends

STRUCTURE FORMATION

13. Formulation and Characterization of Thermoset-Thermoplastic Blends
14. Chemical Reactions in Blends Based on Condensation Polymers: Transreactions and Molecular and Morphological Characterization
15. Morphology and Properties of Blends Containing Block Copolymers
16. Factors Influencing the Morphology of Immiscible Polymer Blends in Melt Processing
17. Reactive Compatibilization
18. Processing Aids

Index

VOLUME 2: Performance

Preface

Contributors, Volume 2

Contents, Volume 1

Contributors, Volume 1

MECHANICAL PROPERTIES AND FRACTURE RESISTANCE

19. Quasielastic Mechanical Properties
20. Application of Fracture Mechanics for Characterization of Toughness of Polymer Blends
21. Characterizing Toughness using Standard Empirical Tests
22. Deformation Mechanisms in Rubber-Toughened Polymers
23. Strengthening Polymer-Polymer Interfaces
24. Core-Shell Impact Modifiers
25. Toughening Semicrystalline Thermoplastics
26. Toughening of Epoxies
27. Fatigue-Crack Propagation in Polymer Blends

BLENDING FOR SPECIFIC PERFORMANCE

28. Transmission and Reflection of Light in Multiphase Media

Subjects

304 .	Plastics
313 .	Polymers
476 .	Composite materials

Volumes

Formulation - vol. 2
Performance - vol. 2

29. Thermomechanical Performance of Polymer Blends
30. Barrier Materials by Blending

REINFORCED BLENDS

31. Reinforced Polymer Blends
32. Liquid Crystalline Polymer Blends
33. From Polymer Blends to Microfibrillar Reinforced Composites

ELASTOMERIC BLENDS

34. Elastomer Blends
35. Thermoplastic Vulcanizates

RECYCLING

36. Recycling of Polymer Blends and Mixtures
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Over the past two decades, the field of polymer blends has experienced enormous growth in size and sophistication. This growth has sprung from and helped to stimulate both the science base and the development of technological and commercial applications. This two—volume set, Volume 1: Formulation and Volume 2: Performance explores and summarizes the progress made in polymer blend technology through contributions from highly respected experts from around the world. These major figures in polymer blend research offer a unique combination of expertise and points of view designed to guide professionals working in the field into the twenty-first century.

This book, however, is far more than a compendium of the recent literature or a review focusing only on dramatic new advances. Designed to serve as a highly practical hand book, it offers a coherent presentation in which the style and content of each chapter are coordinated to ensure a smooth and sensible transition from topic to topic. Each definitive volume provides enough background in each chapter to enable a beginner to start work in the field; presents the most important issues gleaned from critical sifting through the literature; and features clear, concise entries and carefully selected graphics to emphasize important conceptual points.

Volume 1 is devoted to the formulation of polymer blends. Coverage includes:

- The basic thermodynamics of polymer-polymer mixtures
- Characterization of blends by a variety of techniques
- Structure formation, particularly of multiphase blends

Volume 2 is devoted to the performance of polymer blends. Coverage includes:

- Mechanical properties and fracture resistance
- The characterization of rubber-toughened polymers, including fatigue
- Blending for specific performance characteristics
- Reinforced polymer blends
- Problems of recycling blends

PREFACE:

The field of polymer blends, or alloys, has experienced enormous growth in size and sophistication over the past two decades in terms of both the scientific base and technological and commercial development. It has become clear to us that an appropriate summary of this progress is needed to educate and to guide professionals working in this area into the twenty-first century. This two-volume set is a multi-authored treatise that might be viewed as an updated version of the analogous set edited by Paul and Newman and published in 1978. (See the reading list at the end of Chapter 1.) The book is intended to be a coherent entity rather than a collection of separate chapters, and a great deal of effort has been devoted to coordinating the content and style of the chapters. The editors intended each chapter to be far more than an encyclopedic summary of the literature or a review focusing only on the most recent advances in research. The authors were asked (a) to provide enough background in each chapter to enable beginners to work in the field by reading this book; (b) to sift critically through the literature and present only the most important issues (not every reference deserves mention); and (c) to write clearly but concisely, using carefully selected graphics, in order to make the important conceptual points and capture the attention of the browser.

It is the goal of these two volumes to be the authoritative source that professionals of the next decades will seek out to learn about this important field and use to set directions for future research and product development. The two volumes are roughly equal in length. Volume 1 is subtitled Formulation and is largely about the physics, chemistry, and processing issues associated with the formation of polymer blends and the evaluation and control of their structure. Volume 2 is subtitled Performance and is primarily concerned with how blends perform in practical situations. Naturally,

there is a heavy emphasis on mechanical performance, but several chapters deal with a range of other properties as well. At some risk of oversimplification, it can be said that Volume 1 is about structure, while Volume 2 is about properties. Thus, the two-volume set provides a broad view of the structure—property relationships for polymer blends as seen by experts from around the world.

The editors have been friends and colleagues for many years. Their professional interests have been somewhat different over their careers, but there are many points of intersection. These differences and similarities have been helpful during the course of planning, which started in early 1994, and development of this book. A common view was needed in order to foster agreement on the scope, content, and choice of authors. The differences in expertise led Don Paul to have primary responsibility for Volume 1 and Clive Bucknall to oversee Volume 2.

INTRODUCTION

There are many possible ways in which a book on polymer blends, or alloys, could be organized. For example, one might devote a chapter to each of the important blends (e.g., poly(2,6-dimethyl-1,4-phenylene oxide)/polystyrene, polycarbonate/ABS, etc.) and discuss all fundamental issues of their formation, characterization, properties, and end uses. However, there is a great risk of duplication of content or omission of important concepts in this approach, and the chapters might become out of date rather quickly in some cases. An organization based on concepts and principles seems to provide a more thorough and enduring result, and that is the approach adopted here.

Usually, the development of such a product is an iterative process in which one selects the components and a process, evaluates the performance, and then repeats the cycle until the performance matches the need. To understand the relationship between performance and formulation, the researcher usually evaluates the structure of the blend (its morphology) and perhaps assesses the adhesion between phases. These attributes are affected by the processing, thermodynamic interactions between the components, and any chemical reactions (interchange, grafting, etc.) that may occur inadvertently or by design. Obviously, the intrinsic properties of the components selected (e.g., rheological, chemical, mechanical, etc.) will have a significant influence on the properties of the resulting blend, or alloy. The mechanical behavior of the product (e.g., stiffness, toughness, etc.) may be related to the structure of blend and the properties of the Components via the concepts of Composite theory or the techniques of fracture mechanics. A host of other attributes of the product might need to be considered as well.

Title	Location	Edition / Series / Misc.
1498 Polymer Characterization Techniques and Their Application to Blends		<i>Edition:</i>
<i>Author:</i> Simon, George P. (editor)	<i>Dynix:</i> 111657	<i>Series:</i>
<i>Publish.:</i> American Chemical Society / Oxford University Press	<i>Call No.:</i> 668.9 Po	
<i>- place:</i> Washington, DC / Oxford, England	<i>ISBN:</i> 0841238189	
<i>- date:</i> ©2003	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 2003
<i>Subject:</i> Polymers -- Analysis		<i>Price:</i> \$208.50
<i>Desc:</i> xiii, 516 p., [2] p. of plates: illus. (some color), 25 cm.		

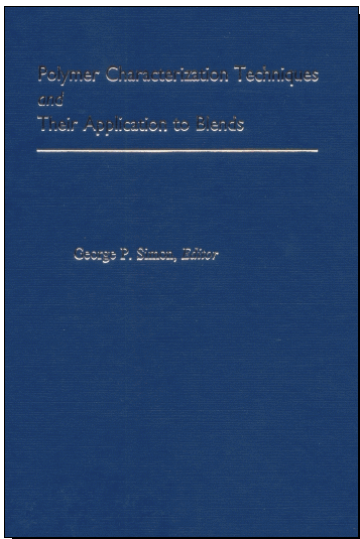


Table of Contents

- Contributors
1. Overview of Polymer Blends Characterization
 2. Application of Differential Scanning Calorimetry to Analysis of Polymer Blends
 3. Dynamic Mechanical Analysis
 4. Dielectric Relaxation and Thermal Stimulated Currents
 5. Polarized Light Optical Microscopy
 6. Infrared Analysis
 7. Fracture Behavior of Polymer Blends
 8. Thermogravimetry
 9. Tensile Properties, Creep, and Stress Relaxation
 10. Gas Permeability in Polymer Blends
 11. Light and X-Ray Scatterings
 12. Small-Angle Neutron Scattering in Polymer Blends
 13. Characterization of Polymer Blends Using Rheological Methods
 14. Positron Annihilation Lifetime Spectroscopy
 15. Electron Microscopy of Polymer Blends
 16. Nuclear Magnetic Resonance Studies of Polymer Blends

Index

Subjects

725 .	Polymers -- Analysis
726 .	Plastics -- Analysis

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book introduces the reader to a wide range of polymer characterization techniques including thermal, rheological, mechanical, relaxational, scattering, and spectroscopic analyses. In addition to discussing the techniques and their experimental considerations in general. Blends and how the data obtained are analyzed and interpreted. Practical examples of each technique are drawn from analyses of polymer blends. Thus, each chapter serves as a review of the blend literature as well as a description of the characterization method.

PREFACE:

Polymer science and engineering remains an important, growing area of endeavor in research and industrial application. We are continually seeking to control properties to a greater degree, and often to smaller size scales. To be able to manipulate polymer properties and performance, we need to be able to characterize polymers well. This applies to the property of interest, as well as to understanding the molecular behavior of the material. In this way we can hope to design and influence new and better materials, be it in terms of chemistry, processing, post-treatments, and so on. This book seeks to lay out the basics of many of the most-used techniques in polymer science. The chapters have been written by expert researchers, people well qualified to discuss the various techniques—the underlying principles, how they are to be applied, and what can be gained from the technique.

In addition, we have sought to use the highly popular area of polymer blends as a series of case studies, if you will, of how these techniques can be applied in analyzing polymer systems. Mostly the blends discussed are blends of thermoplastics with other thermoplastics, as this intersects with much of the interest in multi-component systems. The references on polymer blends under each chapter are in effect literature reviews in their own right of work done in that area; we hope they will also be useful to readers.

I thank the authors who gave of their time and expertise in this project. With all the many pressures on us these days, taking the time to write chapters of a more fundamental background is much appreciated by me, and hopefully by others. The passing down of knowledge and tips in chapters such as these (hints that may not normally appear in refereed journal articles) is something I hope readers find valuable.

Title	Location	Edition / Series / Misc.
937 Polymer Colloids: Science and Technology of Latex Systems		<i>Edition:</i>
<i>Author:</i> Daniels, Eric S., E. David Sudol and Mohamed S. El-Aasser (editors)	<i>Dynix:</i> 105714	<i>Series:</i> ACS Symposium Series: No. 801
<i>Publish.:</i> American Chemical Society	<i>Call No.:</i> 668.9 Po	
<i>- place:</i> Washington, DC	<i>ISBN:</i> 084123759X	
<i>- date:</i> ©2001	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 2001
<i>Subject:</i> Polymer colloids -- Congresses		<i>Price:</i> \$131.50
<i>Desc:</i> xii, 413 p., illus., 24 cm.		

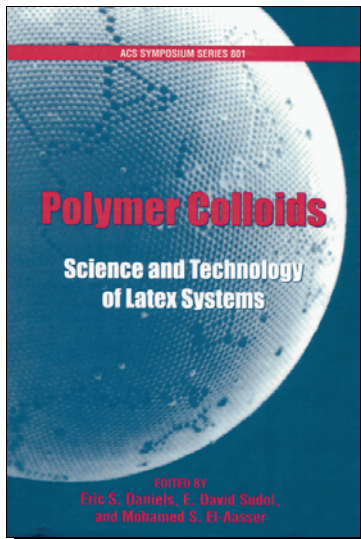


Table of Contents

- Preface
1. Overview of Polymer Colloids: Preparation, Characterization, and Applications
 2. Colloidal Stability Analysis of a Core-Shell Emulsion Polymerization
 3. Particle Aggregation in Polymer Latexes
 4. Probing the Effects of Polymer-Particle Interactions in Solution by Microrheology
 5. The Role of "Free Charge" in the Deposition of Latex Particles onto Pulp Fibers
 6. The Effect of Hydrophilic Nonionogenic Comonomers on Flow Properties of Carboxylated Latexes
 7. Seeded Growth: Avoidance of Secondary Particle Formation
 8. On-Line Monitoring of Emulsion Polymerization
 9. Challenges in On-Line Control of Composition and Molecular Weight Distribution of Nonlinear Emulsion Copolymers
 10. Kinetics of Emulsion Polymerization of Styrene in the Presence of Polyurethane Resins
 11. Living Free Radical Miniemulsion Polymerization of Styrene
 12. Dispersed Condensation Polymerization in Supercritical Fluids
 13. Improving Latex Performance by Using Polymerizable Surfactants
 14. Characterization of Latexes Synthesized Using a Reactive Surfactant and Its Polymeric Counterpart
 15. Stabilization Mechanisms in Vinyl Acetate Emulsion Polymerization Stabilized by Poly(vinyl alcohol)
 16. Modeling of Young's Modulus of Latex Blend Films as a Function of the Carboxyl Group Concentration on the Latex Particles
 17. Morphology and Adhesive Force of Natural Rubber Latex Films by Atomic Force Microscopy
 18. Microencapsulation of Fine Titanium Dioxide Powders from (S/O)/W Emulsion with Subsequent Solvent Evaporation
 19. New Core-Shell Dispersions with Reactive Groups
 20. A Novel Surface Functionalization Method for Producing Carboxyl-Functional Poly(methyl styrene) Latexes
 21. Temperature-Sensitive Hairy Particles
 22. Ethylene-Modified Latexes: Preparation, Miscibility Enhancement, and Barrier Properties
 23. Water-Based Hybrids of Vinyl Acetate-Ethylene Copolymers and Cross-Linkable Epoxy
 24. Hybrid Composite Latexes
 25. Cross-Linked Acrylate Microspheres for Solvent Absorption by SPG Technique

- Indexes
- Author Index
 - Subject Index

Subjects

566 . Polymer colloids -- Congresses

Reviews - Synopsis - Dust Jacket

PREFACE:
The diversity of research in polymer colloids continues to grow. Although the subject may seem narrow to those on the outside, it is witnessed by those of us inside as being rich in variety as can be seen by a glance at the chapter titles in this symposium book. It is an expanding field that can scarcely be contained in a single phrase or book.

This book is based on the Polymer Colloids Symposium held at Lehigh University, June 19-21, 2000, as part of the 74 Colloid and Surface Science Symposium. The former was organized to honor the memory of one of the leading figures in polymer colloids.

John William Vanderhoff was a man of diverse interests. He had two careers: the first at the Dow Chemical Company, where he spent 20 years; then moving in 1970 to his second at Lehigh University, where he spent the remainder of his career until retiring with emeritus status in 1998. He was cofounder of the Emulsion Polymers Institute at Lehigh and director of the National Printing Ink Research Institute. He coauthored more than 200 papers, and held 12 United States and 30 foreign patents. Among many notable accomplishments, he was principal investigator for a joint university-National Aeronautics and Space Administration (NASA) research program, which in 1982 produced the first commercial product to be made in space: 10 micrometer monodisperse polystyrene latex particles. As a result of this work, he was

named a corecipient of the 1984 Inventor of the Year Award given by NASA. Besides his pioneering work of developing monodisperse latexes, other areas of notable accomplishment are in latex characterization, kinetics and mechanism of emulsion polymerization, competitive growth, inverse emulsion polymerization, and film formation and drying. His formidable memory and wide-ranging interests were exhibited in his discourse on many subjects in and out of the field of polymer colloids. John Vanderhoff touched the lives of many, particularly the professors, postdoctorates, students, and colleagues with whom he interacted. He will be remembered for his prolific research ideas, congeniality, and humor. He is missed by all of us.

This book contains a wide variety of chapters ranging from the academic to the practical. Although most chapters originate in academic labs, the majority are oriented toward industrial interests. The continuing move toward environmentally responsible products is largely responsible for this. Many types of latexes are represented: homopolymers, copolymers, and natural polymers, those made with reactive surfactants and polymeric stabilizers, surface modified, hybrids, and blends. Processes vary from batch to semi-continuous, free radical, and controlled free radical, dispersion, and suspension. Kinetics, on-line monitoring, and control are represented as well.

During the past five years, more than the usual number of books have appeared with similar subject matter. This is evidence for the continuing growth in this field and the need to "keep-up" is part of the reason for this acceleration in published works. This book provides a snapshot of this field at this moment in time and should be valuable to those scientists and engineers engaged in polymer colloid research.

FORWARD:

The ACS Symposium Series was first published in 1974 to provide a mechanism for publishing symposia quickly in book form. The purpose of the series is to publish timely, comprehensive books developed from ACS sponsored symposia based on current scientific research. Occasion ally, books are developed from symposia sponsored by other organizations when the topic is of keen interest to the chemistry audience.

Before agreeing to publish a book, the proposed table of contents is reviewed for appropriate and comprehensive coverage and for interest to the audience. Some papers may be excluded to better focus the book; others may be added to provide comprehensiveness. When appropriate, overview or introductory chapters are added. Drafts of chapters are peer reviewed prior to final acceptance or rejection, and manuscripts are prepared in camera-ready format.

As a rule, only original research papers and original review papers are included in the volumes. Verbatim reproductions of previously published papers are not accepted.

Title	Location	Edition / Series / Misc.
128 Polymer Fractionation Author: Cantow, Manfred J. R. Publish.: Academic Press - place: New York, NY - date: ©1967 Subject: Polymers Desc: xii, 527 p., illus., 24 cm.	Dynix: 12957 Call No.: 660.2844 Ca ISBN: Shelf Adult Non-Fiction	Edition: Series: Year: 1967 Price: \$25.00

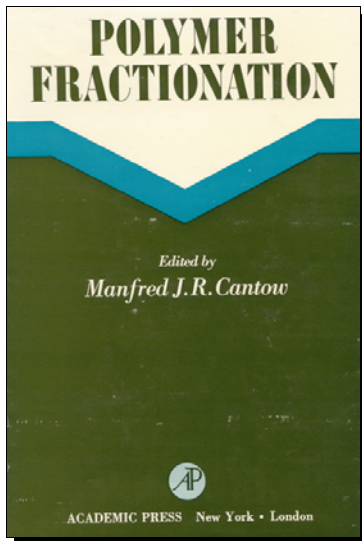


Table of Contents

CHAPTER A. Theoretical Considerations (Maurice L. Huggins and Hiroshi Okamoto)

- I. Polydispersity of High Polymers
- II. Phase Relations for Polydisperse Systems
- III. Fractionation Theory
- IV. Fractionation Efficiency
- References

CHAPTER B.1. Fractional Precipitation (Akira Kotera)

- I. Nonsolvent Addition Method
- II. Fractionation by Solvent Evaporation
- III. Fractionation by Cooling
- References

CHAPTER B.2. Fractional Solution (John H. Elliott)

- I. Introduction
- II. Theoretical Considerations
- III. Experimental Methods
- IV. Factors in Column Elution-Guiding Principles for Experimental Fractionation
- V. Comparison between Fractional Solution Methods
- VI. Possible Areas for Future Research
- References

CHAPTER B.3. Chromatographic Fractionation (Roger S. Porter and Julian F. Johnson)

- I. Introduction
- II. Apparatus
- III. Column Operation
- IV. Specific Fractionations
- V. Theoretical Considerations and Comparison with Other Methods
- VI. Preparatory-Scale Fractionation
- References

CHAPTER B.4. Gel Permeation Chromatography (K. H. Altgelt and J. C. Moore)

- I. Introduction
- II. History of Gel Permeation Chromatography
- III. The Theory of Gel Permeation Chromatography
- IV. The Gels
- V. Experimental Technique
- VI. Evaluation of Data
- References

CHAPTER B.5. Thermal Diffusion (Alden H. Emery, Jr.)

- I. History
- II. Basic Theory
- III. Studies of the Variables
- IV. Polymer Fractionations
- V. Methods of Fractionation
- References

CHAPTER C.1. Turbidimetric Titration (Hanswalter Giesekus)

- I. Introduction
- II. Outline of the Method and Range of Application.

Subjects

313 . Polymers

III. Elaboration of the Method
 IV. Apparatus
 V. Evaluation
 VI. Application
 References

CHAPTER C.2. Sedimentation (H. W McCormick)

I. Introduction
 II. Theory
 III. Experimental
 IV. Sedimentation Velocity
 V. Sedimentation Equilibrium
 References

CHAPTER C.3. Isothermal Diffusion (W. Burchard and H. J. Cantow)

I. Introduction
 II. Theory: The Differential Equation of Diffusion and Three Solutions
 III. Experimental Methods for the Determination of Diffusion Constants
 IV. Theory: Determination of Molecular Heterogeneity
 V. Methods for the Determination of the Diffusion Coefficient Distribution
 VI. Experimental Results
 VII. Critical Remarks
 References

CHAPTER C.4. Summative Fractionation (O. A. Battista)

I. The Summative Method
 II. Mathematical Interpretation of Summative Data
 III. Precipitating Power of Varying Compositions of Acetone-Water Precipitants
 References

CHAPTER C.5. Rheological Methods (J. Schurz)

I. Introduction to the Problem
 II. Parameter Methods
 III. Evaluation of Flow Curves
 IV. Evaluation of Relaxation Measurements
 V. Miscellaneous Methods
 References

CHAPTER D. Chemical Inhomogeneity and its Determination (Q. Fuchs and W. Schmieder)

I. Causes for the Chemical Inhomogeneity of Macromolecular Compounds
 II. Determination of Chemical Inhomogeneity
 III. Quantitative Description of Chemical Inhomogeneity
 IV. Literature Survey
 References

CHAPTER E. Treatment of Data (L. H. Tung)

I. Introduction
 II. Methods of Expressing Molecular Weight Distribution
 III. Calculation of Molecular Weight Distribution from Fractionation Data
 IV. Calculation of Molecular Weight Distribution from Average Molecular Weight Measurements
 V. Comparison of Methods
 Appendix: Numerical Illustrations
 References

CHAPTER F. The Numerical Analysis and Kinetic Interpretation of Molecular Weight Distribution Data
 (F. C. Goodrich)

I. Introduction
 II. On the Prediction of Molecular Weight Distributions from Kinetic Schemes
 III. Numerical Methods in the Handling of Molecular Weight Distribution Data
 Appendix to Chapter F
 References

CHAPTER G. Additional Methods of Fractionation (Manfred J. R. Cantow)

Text

References
Appendix to Chapter G
References to Appendix

AUTHOR INDEX
SUBJECT INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This is the first book dealing exclusively with the problem of polymer fractionation. Written by recognized experts in the field, each chapter contains the theoretical basis and experimental techniques of each method discussed. The first chapter presents the theory of polymer fractionation. The following five chapters deal with methods suitable for the preparation of sizable fractions, such as fractional precipitation and solution, chromatography, gel permeation, and thermal diffusion. The subsequent five chapters are concerned with techniques which give quantitative information on molecular weight distribution, such as turbidimetric titration, sedimentation, diffusion, summative precipitation, and rheological methods. In special chapters the authors discuss fractionation of mixtures and copolymers, treatment of fractionation data, and the connection between molecular weight distribution and polymer reaction kinetics. A final chapter presents information on various other methods of fractionation and an extensive table on experimental conditions of fractionation for a large variety of polymers taken from the literature.

PREFACE:

The physical properties of a given polymer type are to a large extent determined by the shape and width of its molecular weight distribution. Any study of the kinetics of polymerization and degradation of macro-molecules is again greatly aided by the knowledge of the molecular spread of the sample. Thermodynamic and hydrodynamic solution behavior are also affected by the distribution. Nevertheless, only a disproportionately small percentage of investigations in polymer science is carried out on samples with a completely characterized molecular weight distribution. One reason for this may be the considerable additional labor which is required to obtain narrow fractions or to determine the distribution of a polymer. The present volume is intended to aid workers in the field in the selection of a fractionation method suitable for a particular case. Each chapter begins with a discussion of the theoretical background of the procedure. This is followed by a thorough description of instrumentation and experimental techniques. Several practical applications are presented in detail.

Chapters B.1-B.5 cover methods which yield sizable fractions in addition to distribution data on the whole polymer. Chapters C.1-C.5 are confined to analytical scale distribution methods only. The thermodynamics of polymer fractionation, the analysis of copolymers and mixtures, and the treatment of experimental data are presented in separate chapters. The deduction of kinetic information from a knowledge of the molecular weight distribution is treated in Chapter F. A final chapter tabulates suitable solvent-nonsolvent systems for the fractionation of a large variety of polymers by the various methods discussed elsewhere in the volume.

Title	Location	Edition / Series / Misc.
130 Polymer Handbook Author: Brandrup, J. and E. H. Immergut (editors) Publish.: John Wiley & Sons - place: New York, NY - date: ©1989 Subject: Polymers -- Tables Desc: 1 v. (various pagings) illus., 29 cm.	Dynix: 07926 Call No.: 547.84 Po ISBN: 0471812447 Shelf: Adult Non-Fiction	Edition: 3rd edition Series: Wiley-Interscience Publication Year: 1989 Price: \$25.00

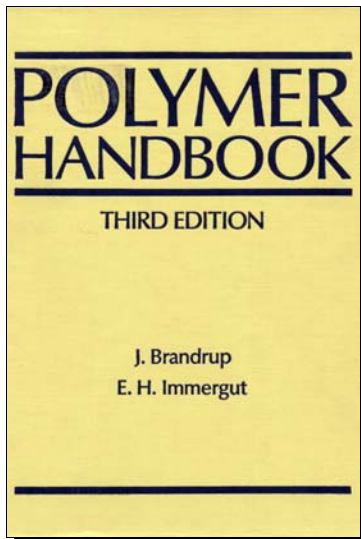


Table of Contents

- I. NOMENCLATURE RULES-UNITS
- II. POLYMERIZATION AND DEPOLYMERIZATION
- III. PHYSICAL PROPERTIES OF MONOMERS AND SOLVENTS
- IV. PHYSICAL DATA OF OLIGOMERS
- V. PHYSICAL CONSTANTS OF SOME IMPORTANT POLYMERS
- VI. SOLID STATE PROPERTIES
- VII. SOLUTION PROPERTIES
- VIII. ABBREVIATIONS OF POLYMER NAMES
- Index

Reviews - Synopsis - Dust Jacket

PREFACE:

The purpose of the Polymer Handbook is to bring together in one volume the data and constants needed in theoretical and experimental polymer research. All those working with polymers have experienced the frustration of searching for data in the ever-expanding polymer literature and know the difficulties involved in trying to locate a particular constant buried in a long journal article. The contributors to this Handbook have taken on the arduous task of searching the literature and compiling in the form of 70 tables the data and constants that polymer chemists and polymer physicists and anyone else working with polymers are likely to need.

The tables in the Handbook are divided into eight sections. The first lists the IUPAC nomenclature rules for polymers and the units used in the various tables. Although the IUPAC names may be unfamiliar to some polymer scientists, their use permits a consistent listing of all polymers in the different tables. Section II comprises tables containing data and constants needed for synthetic work and for kinetic and mechanistic and thermodynamic studies of polymerization and depolymerization reactions. Sections III and IV contain physical constants of monomers, solvents, and oligomers. Section V consists of tables listing the physical constants of many of the most important polymers. Sections VI and VII cover the solid state properties of polymers and the properties of polymers in solution. Section VIII of the Handbook lists the commonly used abbreviations or acronyms of polymers.

As in the previous editions, the Polymer Handbook concentrates on synthetic polymers, poly (saccharides) and derivatives, and oligomers. Few data on biopolymers are included. Spectroscopic data, in general, as well as data needed by engineers and designers, such as mechanical and rheological data, are excluded, since many excellent compilations exist elsewhere. Only fundamental constants and parameters, that is, those which refer to the polymer molecule or which describe the behavior of polymer molecules in the solid state or in solution, were compiled. Constants which depend on processing conditions or on sample history were not compiled, as they can be found in existing plastics handbooks and encyclopedias.

A critical evaluation of the values published in the literature was not attempted, since such a task would have required an inordinate amount of time and a sizable staff. However, the authors of the individual tables were requested to eliminate obviously erroneous data from otherwise complete compilations. The user of the Handbook is requested to keep this in mind and to consult the original literature for details when in doubt about the validity of the data.

More than ten years have gone by since the publication of the second edition of the Polymer Handbook. Therefore, a completely revised third edition was prepared. We have added many new tables, incorporated a very large amount of new data into existing tables, and deleted tables that seemed obsolete. As a result, the third edition contains approximately thirty percent more data, that is, data published in the years since 1975, and the number of pages in the Handbook has increased from about 1200 in the second edition to more than 1850 in the third edition! The editors and the publisher were faced with the choice of publishing the third edition in two volumes or using much thinner paper in a single volume. We decided that it would be more convenient for the user to have all the data accessible in a single volume and, by using a thin, high quality paper, it was possible to accommodate the additional 650 pages without increasing the physical size of the Handbook.

We hope that this new edition will be as useful to the community of polymer chemists and polymer physicists as the two earlier volumes, and that many of those who have one or both of the previous editions will also obtain the third edition for their laboratory and library.

The publisher plans to make an online service for polymer data available sometime in the future. It is their intention to

Subjects

315 .	Polymers -- Tables
545 .	Polymerization -- Tables

incorporate the data from the Polymer Handbook into this polymer database. For this reason, we would be grateful if the contributors as well as other users of the Handbook would send us, perhaps once a year, any new data they accumulate in the course of their research. We will pass such data on to the publisher for the polymer database and for future editions of the Handbook. We would also be grateful if users would point out to us any errors, misprints, omissions, and other flaws which they become aware of. In a work of this size such shortcomings are always present in spite of careful proofreading.

We would like to take this opportunity to thank all of the contributors to the Polymer Handbook for their help and continued patience. The staff of the Book Production Department at John Wiley & Sons was able to make up for earlier delays encountered in programming the tables for an electronic database and we would like to thank them for their efforts. Furthermore, we would like to thank Dr. W. Neumann, Literaturabteilung, Hoechst AG, for helping to find the correct nomenclature for many complicated polymeric structures, and Dr. R. E. Bareiss, Editorial Office of Die Makromolekulare Chemie, Mainz, for his assistance with general questions of polymer nomenclature. We hope that the excellent efforts of all of these people will also find due appreciation among the users of the HANDBOOK.

J. BRANDRUP
E. H. IMMERGUT

Frankfurt, Federal Republic of Germany
Brooklyn, New York
July 1989

Title	Location	Edition / Series / Misc.
129 Polymer Handbook Author: Brandrup, J., E. H. Immergut and E. A. Gulke (editors) Publish.: John Wiley & Sons - place: New York, NY - date: ©1999 Subject: Polymers -- Tables Desc: 1 v. (various pagings) illus., 29 cm.	Dynix: 79968 Call No.: 547.84 Po ISBN: 0471166286 Shelf Reference	Edition: 4th edition Series: Year: 1999 Price: \$350.00

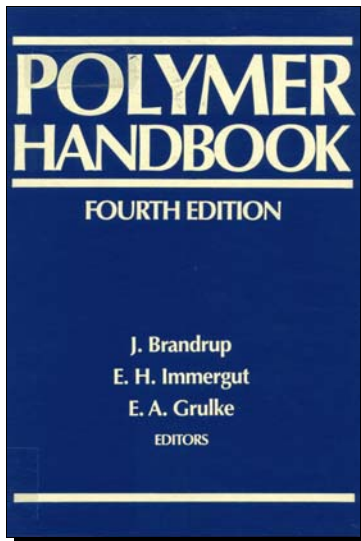


Table of Contents

I. NOMENCLATURE RULES - UNITS
 Nomenclature
 Units

II. POLYMERIZATION AND DEPOLYMERIZATION
 Decomposition Rates of Organic Free Radical Initiators
 Propagation and Termination Constants in Free Radical Polymerization
 Transfer Constants to Monomers, Polymers, Catalysts and Initiators, Solvents and Additives, and Sulfur Compounds in Free Radical Polymerization
 Photopolymerization Reactions
 Free Radical Copolymerization Reactivity Ratios
 Q and e Values for Free Radical Copolymerizations of Vinyl Monomers and Telogens
 Patterns of Reactivity (U,V) Parameters for the Prediction of Monomer Reactivity Ratios and Transfer Constants in Radical Polymerization
 Copolymerization Parameters of Metallocene Catalyzed Copolymerizations
 Rates of Polymerization and Depolymerization, Average Molecular Weights, and Molecular Weight Distribution of Polymers
 Heats and Entropies of Polymerization, Ceiling Temperatures, Equilibrium Monomer Concentrations, and Polymerizability of Heterocyclic Compounds
 Activation Energies of Propagation and Termination in Free Radical Polymerization
 Activation Volumes of Polymerization Reactions
 Activation Enthalpies and Entropies of Stereocontrol in Free Radical Polymerizations
 Products of Thermal Degradation of Polymers
 Radiation Chemical Yields: G Values

III. PHYSICAL PROPERTIES OF MONOMERS AND SOLVENTS
 Physical Properties of Monomers
 Isorefractive and Isopycnic Solvent Pairs
 Refractive Indices of Common Solvents
 Physical Constants of the Most Common Solvents for Polymers

IV. PHYSICAL DATA OF OLIGOMERS
 Physical Data of Oligomers

V. PHYSICAL CONSTANTS OF SOME IMPORTANT POLYMERS
 Physical Constants of Rubbery Polymers
 Physical Constants of Poly(ethylene)
 Physical Constants of Poly(propylene)
 Physical Constants of Fluoropolymers
 Physical Constants of Poly(acrylonitrile)
 Physical Constants of Poly(vinyl chloride)
 Physical Constants of Poly(vinyl acetate)
 Physical Constants of Poly(methyl methacrylate)
 Physical Constants of Poly(styrene)
 Physical Constants of Poly(oxymethylene)
 Physical Constants of Poly(oxyethylene oxyterephthaloyl), (Poly(ethylene terephthalate))
 Physical Constants of Poly(oxytetramethylene-oxyterephthaloyl) and Copolymers with Tetramethylene Oxide Thermoplastic Elastomers
 Physical Constants of Various Polyamides: Poly[imino(1-oxohexamethylene)], (Polyamide 6) Poly(iminoadipoyl-iminohexamethylene), (Polyamide 66), Poly(iminohexamethylene iminosebacoyl), (Polyamide 610), Poly[imino(1-oxododecamethylene)], Poly(amide 12)

Subjects

315 .	Polymers -- Tables
545 .	Polymerization -- Tables

Physical Constants of Cellulose
Physical and Mechanical Properties of Some Important Polymers

VI. SOLID STATE PROPERTIES

Crystallographic Data and Melting Points for Various Polymers
Glass Transition Temperatures of Polymers
Rates of Crystallization of Polymers
Isomorphous Polymers Pairs
Miscible Polymers
Heat Capacities of High Polymers
Surface and Interfacial Tensions of Polymers, Oligomers, Plasticizers, and Organic Pigments
Permeability and Diffusion Data
Refractive Indices of Polymers
Radiation Resistance of Plastics and Elastomers
PVT Relationships and Equations of State of Polymers

VII. SOLUTION PROPERTIES

Viscosity — Molecular Weight Relationships and Unperturbed Dimensions of Linear Chain Molecules
Sedimentation Coefficients, Diffusion Coefficients, Partial Specific Volumes, Frictional Ratios, and Second Virial Coefficients of Polymers in Solution
Polymolecularity Correction Factors
Polymer-Solvent Interaction Parameters
Concentration Dependence of the Viscosity of Dilute Polymer Solutions: Huggins and Schulz-Blaschke Constants
Theta Solvents
Fractionation of Polymers
Solvents and NonSolvents for Polymers
Specific Refractive Index Increments of Polymers in Dilute Solution
Particle Scattering Factors in Rayleigh Scattering
Dipole Moments of Polymers in Solution
Heat, Entropy and Volume Changes for Polymer- Liquid Mixtures
Heats of Solution of Some Common Polymers
Solubility Parameter Values
Optically Active Polymers
Anisotropy of Segments and Monomer Units of Polymer Molecules
Gelation Properties of Polymer Solutions

VIII. ABBREVIATIONS OF POLYMER NAMES AND CHEMICAL ABSTRACT NUMBERS

Abbreviations for Thermoplastics, Thermosets, Fibers, Elastomers and Additives
Chemical Abstract Registry Numbers and Online Database Searching for Polymer Literature

IX. Index

Reviews - Synopsis - Dust Jacket

This one-stop reference, now almost 2,000 pages, brings together all the data needed in theoretical and experimental polymer research. It is designed so the scientist doesn't have to search through multitudes of literature for information on polymers. Features:

Continues to be the only source for fundamental, validated property data of polymeric material
Explores the developments in the field since 1989, such as new pvt relationships and new co-polymer reactivity parameters

Includes 30% new data - which is more reliable and accurate due to advances in instruments
Improved nomenclature to aid indexing and search & retrieval

Like its best-selling predecessors, this extremely useful reference concentrates on synthetic polymers, polysaccharides and derivatives and oligomers. This revised and updated edition contains 30% new information, over 50% more pages and explores the latest developments in the field. Data tables are logically divided into eight sections and include IUPAC nomenclature rules. Old data tables have been brought up to date and new ones added. --This text refers to an out of print or unavailable edition of this title.

PREFACE:

The purpose of the Polymer Handbook is to bring together the data and constants needed in theoretical and experimental polymer research. All polymer researchers have experienced the frustration of searching for data in the

ever-expanding polymer literature and know the difficulties involved in trying to locate a particular constant that is buried in a long journal article. The contributors to this Handbook have taken on the arduous task of searching the literature and compiling the data and constants that polymer chemists, polymer physicists, and polymer engineers are likely to need.

The 520 and odd tables in this Handbook are divided into eight sections. The first lists the IUPAC nomenclature rules for polymers and the International System of Units. Although several naming conventions exist in the technical literature, IUPAC names permit a consistent listing of all polymers. Section II contains data and constants needed for polymer synthesis, kinetic mechanisms, and thermodynamic studies of polymerization and depolymerization reactions. Sections III and IV contain physical constants of monomers, solvents, and oligomers. Section V lists the physical constants of many important commercial polymers. Section VI and VII cover the solid state properties of polymers and the properties of polymer solutions. Section VIII of the Handbook lists the commonly used abbreviations or acronyms for polymers and Chemical Abstract Registry Numbers, and gives suggestions for electronic data searching for polymer information. This section should also be consulted in the few cases where contributors have not used IUPAC nomenclature.

As in the previous editions, the Polymer Handbook concentrates on synthetic polymers, poly(saccharides) and derivatives, and oligomers. Few data on biopolymers are included. Spectroscopic data as well as data needed by engineers and designers, such as mechanical and rheological data, are minimized, since many excellent compilations exist elsewhere. Only fundamental constants and parameters that refer to the polymer molecule, that describe the solid state of polymer molecules, or that describe polymer solutions, were compiled. Constants that depend on processing conditions or on sample history were not emphasized, as they can be found in existing plastics handbooks and encyclopedias.

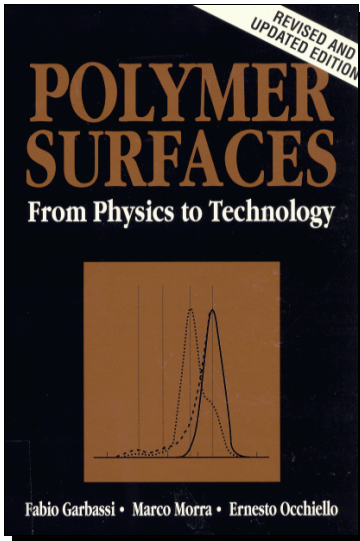
A critical evaluation of the values published in the literature was not attempted, since such a task would have required an inordinate amount of time and a sizable staff. Therefore, the users of this Handbook should consult the original literature for details when in doubt about the validity of any data. (The authors of the individual tables were nevertheless requested to eliminate obviously erroneous data from otherwise complete compilations.)

The Fourth Edition revisions have focused on data generated in the ten years since the publication of the Third Edition. Therefore, a completely revised Polymer Handbook has been prepared. We have added new tables and incorporated a large amount of new data into existing tables. As a result, the Fourth Edition contains approximately twenty-five percent more data, and the number of pages has increased from about 1850 in the Third Edition to about 2250.

We hope that this new edition will be as useful to the polymer research community as the three earlier editions and that many of the Polymer Handbook's previous users will also obtain the Fourth Edition for their laboratory and library.

The publisher plans a CD-ROM for the Polymer Handbook in the near future. We would be grateful if our contributors and users send us any new data they accumulate in the course of their research, and any errors, misprints, omissions and other flaws. We will pass on such data to the publisher, for the polymer database, and for future editions of this Handbook.

Title	Location	Edition / Series / Misc.
131 Polymer Surfaces: From Physics to Technology <i>Author:</i> Garbassi, Fabio, Marco Morra and Ernesto Occhiello <i>Publish.:</i> John Wiley & Sons <i>- place:</i> New York, NY <i>- date:</i> ©1998 <i>Subject:</i> Polymers -- Surfaces <i>Desc:</i> ix, 486 p., illus., 23 cm.	<i>Dynix:</i> 89760 <i>Call No.:</i> 547.7 Ga <i>ISBN:</i> 0471971006 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> Revised and updated edition <i>Series:</i> <i>Year:</i> 1998 <i>Price:</i> \$78.50



Subjects

314 . Polymers -- Surfaces

Table of Contents

PART I: INTRODUCTORY REMARKS

Chapter 1: The Origin of Surface Properties
 1.1 Van der Waals' forces
 1.2 Electrostatic forces
 1.3 The DLVO theory
 1.4 Structural interactions
 1.5 Short-range interactions (hydrogen, acid-base, covalent)
 References

Chapter 2: Dynamics of Polymer Surfaces
 2.1 Fundamental aspects of polymer surface dynamics
 2.2 Experimental evidence of polymer surface dynamics
 References

PART II: CHARACTERIZATION METHODS

Chapter 3: Spectroscopic Methods
 3.1 Ion scattering spectroscopy
 3.2 Secondary ion mass spectroscopy
 3.3 X-ray photoelectron spectroscopy
 3.4 Internal reflection spectroscopy
 3.5 Diffuse reflectance spectroscopy
 3.6 Photoacoustic spectroscopy
 3.7 Other vibrational techniques
 3.8 Transmission spectroscopies
 3.9 Nuclear magnetic resonance spectroscopy
 3.10 Comparison of spectroscopic methods
 References

Chapter 4: Surface Energetics and Contact Angle
 4.1 Contact angles and the Young equation
 4.2 Experimental measurement of contact angles
 4.3 Contact angle hysteresis
 4.4 From contact angle to surface tension
 4.5 Contact angle titrations
 4.6 Surface thermodynamic parameters by inverse gas chromatography
 References

Chapter 5: New and Emerging Methods
 5.1 Surface force measurements
 5.2 The evaluation of electrostatic interactions
 5.3 Reflectivity of neutrons
 References

PART III: MODIFICATION TECHNIQUES

Chapter 6: Physical Modifications
 6.1 Flame treatments
 6.2 Corona treatments
 6.3 'Cold' plasma treatments

6.4 'Hot' plasma treatments
6.5 UV treatments
6.6 Laser treatments
6.7 X-ray and y-ray treatments
6.8 Electron beam treatments
6.9 Ion beam treatments
6.10 Metallization
6.11 Sputtering
References

Chapter 7: Chemical Modifications
7.1 Wet treatments
7.2 Surface grafting
References

Chapter 8: Bulk Modifications
8.1 Polymer blend surfaces
8.2 Block copolymer surfaces
References

PART IV: APPLICATIONS

Chapter 9: Wettability
9.1 Hydrophilic surfaces
9.2 Hydrophobic surfaces
References

Chapter 10: Adhesion
10.1 Theories of adhesion
10.2 Measurement of adhesion
10.3 Methods for modifying adhesion
References

Chapter 11: Barrier Properties
11.1 Coating
11.2 Sulphonation and fluorination
11.3 Evaporation
11.4 PECVD and sputtering
References

Chapter 12: Biomedical Materials
12.1 Blood contacting devices
12.2 Contact lenses
References

Chapter 13: Friction and Wear
13.1 Compounding
13.2 Chemical coating
13.3 High energy density technologies
References

Index

Reviews - Synopsis - Dust Jacket

As the use and applications of polymers increase, so does the interactions of polymer surfaces with other materials. This updated paperback edition of this well-received, popular book presents a comprehensive approach to all aspects of polymer surfaces, from fundamental theory through applications, making it essential reading for everyone studying or working with polymers.

PREFACE TO THE FIRST EDITION

The idea to write a book on polymer surfaces came from the rapid growth of the subject and from the fact that the numerous books published on it, even if in some cases dealing with fundamentals, were more a collection of contributions from different authors on their own research work than all organic and exhaustive treatise on the subject. Moreover, the recent prolific scientific literature is spread over a large number of journals concerning different fields, and

so is only available with difficulty to the single scientist. We conceived a content that starts from the physical principles and proceeds to the more important application aspects. We intended also to focus on the latter aspect, considering mostly the scientific literature as well as the patent sources.

This book is divided into 13 chapters, grouped in four parts. The first part concerns some fundamentals, treating the origin of superficial properties of polymers and their dynamic aspects. The second part discusses the methods that characterize the polymer surfaces, highlighting the spectroscopic methods and those connected with surface energetics. The third part deals with techniques able to modify the properties of polymer surfaces. Finally, the fourth part is on applicative aspects, such as wettability, adhesion, biocompatibility, etc. all important both from the technological and the scientific points of view.

We have attempted to review the above subjects giving the state of the art for all of them; however, we lay no claim to completeness, owing to the great amount of published literature.

PREFACE TO THE REVISED AND UPDATED EDITION

Only Chapters 1 and 8 have remained unchanged from the first edition. Chapter 4 has been substantially revised and minor changes have been made to the remaining chapters, mainly in the form of additional material. We have considered more than 700 new studies published during the period 1994-1996 and have included more than 200 of these in this edition. In this way we hope to maintain the book's function as a useful handbook.

Title	Location	Edition / Series / Misc.
1543 Polymer Yearbook 18 Author: Pethrick, Richard A. and Gennady E. Zaikov (editors) Publish.: Rapra Technology Limited - place: Shrewsbury, UK - date: ©2003 Subject: Polymers Desc: v., illus, 24 cm.	Dynix: 111656 Call No.: 547.7 Po v.18 ISBN: 1859573835 Shelf Adult Non-Fiction	Edition: Series: Year: 2003 Price: \$166.50

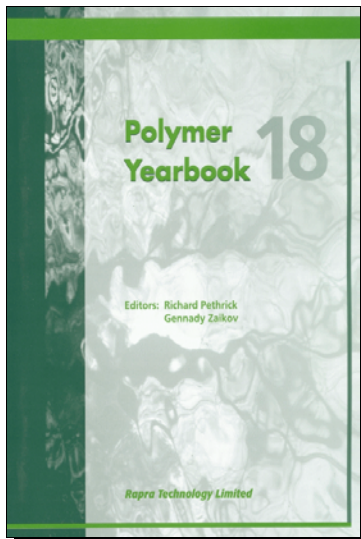


Table of Contents

Preface
Contributors

- Advances in the Synthesis of the Poly(perylene-carboximides) and Poly(naphthalene-carboximides)
 - 1.1 Abstract
 - 1.2 Poly(perylene-carboximides)
 - 1.3 Polyimides Based on Naphthalene-1,4,5,8-Tetracarboxylic Acid Dianhydride
 - 1.4 Polyimides Based on Non-condensed bis(Naphthalic Anhydrides)
 References
- Macromolecular Properties and Topological Structure of Lignin
 - 2.1 Introduction
 - 2.2 Topological Structure of Lignin Macromolecules
 - 2.3 Hydrodynamic Properties
 - 2.4 Summary
 Acknowledgements
References
- Diene Polymerization Mechanism with Lanthanide Catalytic Systems
 - 3.1 Introduction
 - 3.2 Principal Groups of Lanthanide-Based Catalysts
 - 3.3 Factors Affecting the Activity and Stereospecificity of Catalysts
 - 3.3.1 Chemical Nature of Lanthanide
 - 3.3.2 The Nature of the Ligand
 - 3.3.3 The Structure of Organometallic Component of Lanthanide Catalysts
 - 3.3.4 The Nature of the Solvent
 - 3.4 The Structure of Active Centers and the Mechanism of Stereoregulation in the Polymerization of Butadiene
 - 3.5 Role of the Structure of Diene in the Mechanism of Regio- and Stereoselectivity
 - 3.6 The Role of Anti-Syn Isomerization of the Terminal Unit of the Growing Polymer Chain
 - 3.7 Conclusions
 Acknowledgement
References
- Kinetic Model of the Bulk Photopolymerization of Glycidyl Methacrylate for High Degrees of Conversion
 - 4.1 Introduction
 - 4.2 Experimental
 - 4.3 Results and Discussion
 - 4.3.1 Discussion of Experimental Data and Formulating the Starting Position of the Kinetic Model
 - 4.3.2 The Kinetic Model
 - 4.3.3 Calculation - Results
 - 4.4 Characterization of the Peculiarities of the Linear Polymerization of the Microheterogeneous System
 - 4.5 Conclusions
 References
- Influence of Ultrasound on the Channels of the Forming Head in Extrusion Processes
 - Introduction
 - 5.1 Construction of an Extrusion Head for Producing Polymers
 - 5.2 Investigation of the Hydrodynamic Performances of the Extrusion Head
 - 5.2.1 Investigation of Flow Characteristics of Polymer Melts
 - 5.2.2 Account of the Performance of Polymer Melts
 - 5.3 Results of a Study on High-Elastic Rating of a Polymer Melt Spray

Subjects

313 .	Polymers
402 .	Polymerization

- 5.4 Rating of Solid Properties of the Polymeric Items
- 5.5 Conclusions
- References
- 6. Organosilicon Copolymers with Cyclosiloxane Fragments in the Side Chain
 - 6.1 Introduction
 - 6.2 Experimental
 - 6.2.1 Results and Discussion
 - References
- 7. Specific Features of the Thermo-oxidation of Thermo-resistant Heterochain Polymers
 - 7.1 Introduction
 - 7.2 Thermo-oxidative Degradation of Polypyromellitimide, Poly(phenyl quinoxaline and Copoly(imidophenylquinoxalines)
 - 7.3 Thermo-oxidative Degradation of Poly(alkane imide)
 - 7.4 Thermo-oxidative Degradation of Polysulfones, Polyesterketones, Liquid-Crystal Copolyesters
 - 7.5 Thermo-oxidative Degradation of Polyesterimides, Polyamidoimides, Aliphatic-Aromatic Polyamides
 - References
- 8. Fluorine-containing Polymers for Materials with the Complete Internal Light-reflection
 - 8.1 Introduction
 - 8.2 The General Principle of Selecting Polymers for Polymer Optical Fiber Coating
 - 8.3 Estimation of the Relative Activity of Fluoro-alkylmethacrylates in Block Radical Polymerization and Copolymerization with Vinyl Monomers and Structure of Macromolecular Chain of the Copolymers Obtained
 - 8.3.1 Kinetics of Block Radical Polymerization of Fluoroalkyl(meth)acrylates
 - 8.3.2 Relative Activity of Fluorine-containing Methacrylates in Bulk Radical Polymerization with Vinyl Monomers; Structure and Compositional Inhomogeneity of the Macrochain Copolymers Obtained
 - 8.3.3 Radical Polymerization of Fluorine-containing Methacrylates in the Presence of Nitroxyl Radicals
 - 8.4 Some Properties of Fluorine-containing Polyalkyl(meth)acrylates and α -fluoroacrylates
 - 8.5 The New Fluorine Containing Copolymers - Prospective Materials for Covers of Optical Fibers
 - References
- 9. Description of PMMA Molecular Orientation due to Clustering: Theoretical Model
 - 9.1 Introduction
 - 9.2 Model Considerations
 - 9.3 Results and Discussion
 - 9.4 Conclusions
 - References
- 10. The Fractal Analysis of Curing Processes of Epoxy Resins
 - 10.1 Introduction
 - 10.2 Experimental
 - 10.3 Results and Discussion
 - 10.4 Summary
 - References
- 11. Fractal Analysis of Macromolecules
 - Abstract
 - 11.1 Introduction
 - 11.2 Modeling of Macromolecules
 - 11.2.1 Fractal Dimension
 - 11.3 Polymer Fractal
 - 11.4 Statistical Fractal
 - 11.5 Experimental Determination of Fractal Dimensions
 - 11.6 Levels of Fractality
 - 11.7 Fractal Characteristics of Macromolecules
 - 11.8 The Dimension of the Sections of a Macromolecule Between Topological Fixing Points
 - 11.9 The Concept of Macromolecular Skeletons
 - 11.9.1 The Model of a Network Polymer
 - 11.9.2 Scaling Representation of a Macromolecule
 - 11.9.3 Estimation of Structural Parameters
 - 11.10 Description of Molecular Mobility Using Fractal Characteristics
 - 11.11 Conclusions
 - References

- 12. Structural Aspects of Adhesion in Particulate-Filled Polymer Composites
 - 12.1 Introduction
 - 12.2 Experimental
 - 12.3 Results and Discussion
 - 12.3.1 Description of the Aggregation of Particles in the Framework of the Models of Irreversible Aggregation
 - 12.3.2 Effect of the Surface Structure of the Filler on Adhesion
 - 12.3.3 Interfacial Adhesion and the Strength of the Interfacial Layer
 - 12.3.4 The Level of Interfacial Adhesion and Mechanical Characteristics of Composites
 - Conclusions
 - References
- 13. Change of Microgel Structure on Curing Epoxy Polymers in Fractal Space
 - 13.1 Introduction
 - 13.2 Experimental
 - 13.3 Results and Discussion
 - 13.4 Summary
 - References
- 14. Levels of Fractality in Polymers
 - 14.1 Introduction
 - 14.2 Results and Discussion
 - References
- 15. The Fractality of the Fluctuation Free Volume of Glassy Polymers
 - 15.1 Introduction
 - 15.2 Experimental
 - 15.3 Results and Discussion
 - 15.4 Summary
 - References
- 16. Rapid Method of Estimating the Fractal Dimension of Macromolecular Coils of Biopolymers in Solution
 - 16.1 Introduction
 - 16.2 Theoretical Basis
 - 16.3 A Comparison of Calculated and Experimental Results
 - References

Abbreviations and Acronyms

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Polymer Yearbook highlights areas of current interest in polymer science. This volume (v. 18) of the annual series (the first published by Rapra) is dedicated to the memory of Professor Karl S. Minsker, and has as a connecting theme the application of fractal analysis to various problems in polymer science, including the curing processes of epoxy resins and a discussion of levels of fractality in polymers. Other topics include synthesis of new materials, the kinetics of polymerization, the characterization of polymer systems, ultrasound influences in extrusion processes, and more.

PREFACE:

The Polymer Yearbook is back. After a couple of years in which we were unable to publish the Polymer Yearbook, I am pleased to say that we are now once again in print. As you will be aware the publication is now being handled by Rapra and we hope that they will be able to sustain it for the next few years. Gordon and Breach Science Publishers who had been publishing Polymer Yearbook for almost seventeen years were sold out. The new publishers in their review of titles decided that Polymer Yearbook was too specialized a publication and indicated after some considerable delay that they would not continue its production. Rapra have kindly indicated that they feel it fits into their stable of publications and have agreed to continue its production. We hope that we will be able to work with them and over the next few years produce a product that will address the needs of the polymer community.

In the previous publications we had included contributions from the former Soviet Union and also Japan. Unfortunately, we have not been able to continue the contributions from Japan for this issue, however we will be attempting to re-establish our contacts and hopefully expand the contributions to other areas of the world. Working with Professor Zaikov we have produced a volume that I trust will be of interest to many polymer scientists. The volume contains a broad spectrum of topics which we consider are of current interest.

Polymer Yearbook 18 is a collection of articles that highlight some important areas of current interest in polymer science. Two of the articles consider progress which has been made into the synthesis of new materials: Advances in the synthesis of the poly(perylene-carboximides) and poly(naphthalene-carboximides) and Key steps in the mechanism of stereochemical control in diene polymerization using lanthanide catalytic systems. Both of these topics are of general interest and highlight specific aspects of the synthetic method. An article on the organosilicon copolymers with cyclosiloxane fragments in the side chain discusses the synthesis of these materials and also considers their application in the electronic industry. The electronic interest is extended in the article on polyfluoro(meth)acrylates for optical fibers coating: synthesis, general kinetic regularities of their formation and properties. Several of the articles deal with the kinetics of polymerization: kinetic model of the bulk photopolymerization of glycidyl methacrylate for high degrees of conversion and polyfluoro(meth)acrylates for optical fibers coating: synthesis, general kinetic regularities of their formation.

Two of the articles examine the characterization of polymer systems: hydrodynamic properties and structure of lignin and specific features of the thermooxidation of thermoresistant heterochain polymers. A connecting theme of this volume is the application of fractal analysis to a number of problems in polymer science. The topic is introduced in a general manner in the article: fractal analysis of macromolecules. A series of shorter articles illustrate the application of the method to a wide range of polymer situations and systems. These articles include consideration of the description of PMMA molecular orientation due to clustering; the fractal analysis of curing processes of epoxy resins, and the structural aspects of adhesion in particulate-filled polymer composites. The fractal theme is continued with consideration of the change of microgels structure on curing epoxy polymers in fractal space and an article that considers the various levels of fractality in polymers. The possibility of a connection between fractality of the thermal fluctuation and the free volume in glassy polymers continues this theme. An article on a rapid method of estimating the fractal dimension of macromolecular coils of biopolymers in solution illustrates the potential for this method for examination of biopolymer systems. Several of the earlier articles in the Yearbook also include consideration of the use of fractal analysis. An article entitled the influence of ultrasound on the extrusion processes in channels of the forming head as this topic is currently of considerable interest technologically.

I would wish to acknowledge the help in the production of the volume from Helen Paton and Lesley Gilmore at the University of Strathclyde, who collected and collated the material. The volume would not have been produced had it not been for the help of Frances Powers and her colleagues at Rapra, who arranged the continuation of the contacts and also has had a major role in the editing and checking of the material that appears in this volume. I would also like to thank the various authors who have contributed to the volume. Thank you for your patience and also for revising the documents that you originally submitted but did not get published. The publication would not exist without your support.

I am hoping with Professor Zaikov to give the Polymer yearbook a new look in subsequent issues. We will be attempting to incorporate a broader authorship and also produce issues that will focus on specific topics. Lastly, may I thank the readers for their support of the publication and I trust that you will find the articles we have selected of interest.

Title	Location	Edition / Series / Misc.
924 Polymeric Materials: Structure, Properties, Applications		<i>Edition:</i>
<i>Author:</i> Ehrenstein, Gottfried Wilhelm	<i>Dynix:</i> 105715	<i>Series:</i>
<i>Publish.:</i> Hanser Gardner Publications, Inc.	<i>Call No.:</i> 620.1 Eh	
<i>- place:</i> Cincinnati, OH	<i>ISBN:</i> 1569903107	<i>Year:</i> 2001
<i>- date:</i> ©2001	<i>Shelf:</i> Adult Non-Fiction	<i>Price:</i> \$36.50
<i>Subject:</i> Polymers		
<i>Desc:</i> xviii, 27 p., illus., 23 cm.		

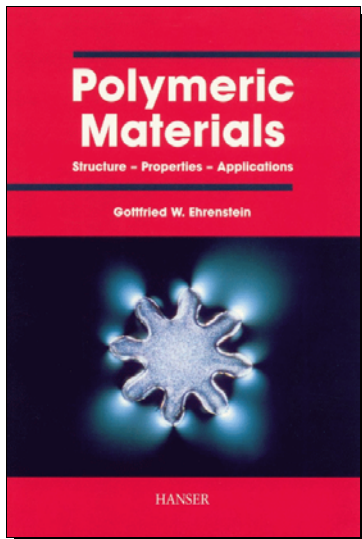


Table of Contents

Preface
Nomenclature
Abbreviations for Plastics
Other Abbreviations

1. Economic Development — Market Review and Predictions
 - 1.1 Literature
2. General Characteristics of Polymeric Materials
 - 2.1 Principles of Structure
 - 2.2 Material States and Transition Regions
 - 2.3 Deformation Behavior
 - 2.4 Literature
3. Molecular Structure and Synthesis of Polymers
 - 3.1 Macromolecular Structure
 - 3.2 Primary and Secondary Valence Bonds
 - 3.2.1 Primary Valence Bonds (Covalent Bonds)
 - 3.2.2 Secondary Valence Bonds
 - 3.2.2.1 Dipole-Dipole Forces
 - 3.2.2.2 Induction Forces
 - 3.2.2.3 Dispersion Forces
 - 3.2.2.4 Hydrogen Bonds
 - 3.3 Reactions from Monomers to Polymers
 - 3.3.1 Chain Polymerization
 - 3.3.2 Step Reaction Polymerization
 - 3.3.3 Polymerization Processes
 - 3.3.4 Comparison between Chain Reaction Polymerization and Step Reaction Polymerization
 - 3.3.5 Molecular Weight
 - 3.3.5.1 Molecular Weight Distribution
 - 3.3.5.2 Molecular Weight Averages
 - 3.3.5.3 Influence of Various Factors on Properties
 - 3.4 Literature
4. Structure of Polymeric Materials
 - 4.1 Homogeneous Polymeric Materials
 - 4.1.1 The Amorphous State
 - 4.1.2 The Crystalline State
 - 4.1.2.1 Formation of Crystallization Nuclei
 - 4.1.2.2 Crystal Growth
 - 4.1.2.3 Crystalline Superstructures
 - 4.1.2.4 Melting and Crystallization Temperature
 - 4.1.3 Cross-Linked Polymer Materials
 - 4.1.3.1 Thermosets
 - 4.1.3.2 Elastomers
 - 4.2 Heterogeneous Polymeric Materials
 - 4.2.1 Rubber-Modified Polystyrene
 - 4.2.1.1 Structure
 - 4.2.1.2 Craze Formation
 - 4.2.1.3 Mechanism of Polymer Toughening
 - 4.2.2 Plasticization

Subjects

313 . Polymers

- 4.2.2.1 External Plasticization
- 4.2.2.2 Internal Plasticization
- 4.3 Heterogeneous Composites
 - 4.3.1 Fiber-Reinforced Composites
 - 4.3.2 Fillers and Reinforcing Agents (co-authored by Prof. J. Kabelka)
 - 4.3.2.1 Loading of the Composite in the Fiber Direction
 - 4.3.2.2 Loading of the Composite Perpendicular to the Fiber Direction
 - 4.3.3 Nanocomposites
 - 4.3.4 Electrically Conductive Composites
- 4.4 Literature

- 5. Thermomechanical Properties
 - 5.1 Glassy or Energy-Elastic Region
 - 5.2 Rubbery or Entropy-Elastic Region
 - 5.3 Glass Transition Range
 - 5.4 Flow Region
 - 5.5 Dependence of Softening and Melting Temperatures or Molecular Structure
 - 5.6 Literature

- 6. Mechanical Behavior
 - 6.1 General Deformation Behavior
 - 6.1.1 Mechanical Properties
 - 6.1.1.1 Linear Viscoelastic Behavior
 - 6.1.1.2 Strength Properties
 - 6.1.1.3 Deformation Properties
 - 6.1.1.4 Temperature
 - 6.1.1.5 WaterAbsorption
 - 6.1.1.6 Toughness
 - 6.1.2 Long-Term Deformation Behavior
 - 6.1.3 Nonlinear Deformation Behavior
 - 6.1.3.1 Amorphous Thermoplastics
 - 6.1.3.2 Semi-Crystalline Thermoplastics
 - 6.1.4 Multiaxial Loading (co-authored by Prof. J. Kabelka)
 - 6.1.4.1 Non-Reinforced Plastics
 - 6.1.4.2 Reinforced Plastics
 - 6.2 Orientation and Residual Stress
 - 6.2.1 Orientation
 - 6.2.1.1 Frozen, Irreversible Molecular Orientation
 - 6.2.1.2 Shrinkage Forces
 - 6.2.1.3 Filler Orientation
 - 6.2.2 Residual Stress
 - 6.2.2.1 Thermal Residual Stress
 - 6.2.2.2 Residual Stress due to Holding Pressure
 - 6.2.2.3 Internal-Residual Stress with Inserts
 - 6.2.2.4 Structure-Dependent Residual Stress
 - 6.3 Literature

- 7. Aging and Stabilization
 - 7.1 Aging
 - 7.2 Exposure to Heat
 - 7.2.1 Heat Distortion Temperature
 - 7.2.2 Heat Resistance
 - 7.2.3 Temperature-Time Limits
 - 7.2.4 Degradation during Processing
 - 7.3 Stabilization
 - 7.4 Literature

- 8. Overview of Selected Polymeric Materials

- 9. Guide Values of the Physical Properties of Plastics

- Subject Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The book is intended to reveal the correlation between the chemical structure and the physical characteristics of plastics necessary for appropriate material selection, design, and processing. The entire spectrum of plastics is addressed, including thermoplastics, thermosets, elastomers, and blends. One of the special features is the extensive discussion and explanation of the interdependence between polymer structure, properties, and processing.

"Polymeric Materials" contains several application-oriented examples and is presented at an intermediate level for both practicing plastics engineers and advanced engineering students.

Contents:

- General Characteristics of Polymeric Materials
- Molecular Structure and Synthesis of Polymers
- Structure of Polymeric Materials
- Thermomechanical Properties
- Mechanical Behavior
- Aging and Stabilization
- Overview of Selected Polymeric Materials
- Guide Values of the Physical Properties

PREFACE:

"Without natural polymers, there is no life, without synthetic polymers, no standard of living" — Hans Uwe Schenck

The book, "Polymeric Materials: Structure — Properties — Applications", is the result of many years of industrial experience and applied research in the field of plastic materials. The successful application of plastics as engineering materials depends primarily on the ability to identify their properties. History has shown us that the number of applications for polymeric materials and therefore their production has reached levels that were at one time unimaginable. This unparalleled development of an engineering material is anticipated to continue into the future. The ability to apply polymeric materials to innovative and technically demanding applications is attributed to improvements in design principles, new processing techniques, and the determination of the influence of the processing conditions on material characteristics. With no other engineering material are processing, design, and properties so intimately related as with plastics. Therefore, a scientific book concerning polymeric materials must maintain the fine balance between the vast amount of knowledge based on both experience and intuition, and the new scientific endeavors that continue to advance their development.

Many professional colleagues have helped me during the writing of this book. I would like to thank them all for their valuable suggestions and advice. My particular thanks go to Prof. Josef Kabelka for his help in writing the sections concerning filled and reinforced materials as well as their response to multiaxial loading, to Dr. Richard P. Theriault who contributed important suggestions, collected essential information, and, in particular, performed the translation of the chapter 1, 2, 5, 6 and 8, as well as the work Dr. Ed. Immergut, who translated the remaining chapters and reviewed the corrections of the entire book, to Dr. Fabienne Montagne, who has prepared the French version of this book, and Prof. A. Wilhelm Neumann as well as Mr. Norbert Muller, M.Sc., for critically reviewing. I would also like to acknowledge the crucial assistance with the transatlantic logistics and organization provided by Ms. Gabriela Riedel and Ms. Pia Trawiel.

A scientific book develops over many years. Information comes from a multitude of sources including both scientific and industrial specialists via collaborative efforts or literary essays. This book is intended to give the reader a concise overview of the most important aspects of the interrelationship between structure, processing, and applications of polymeric materials. Since it is difficult to include all of the details that are necessary to obtain a full understanding of the subject matter in a single book, further references to relevant literature are suggested at the end of each chapter.

Title	Location	Edition / Series / Misc.
132 Polymers at Surfaces and Interfaces		Edition:
Author: Jones, Richard A. L. (Richard Anthony Lewis), 1961- and Randal W. Ri	Dynix: 79969	Series:
Publish.: Cambridge University Press	Call No.: 620.1 Jo	
- place: Cambridge, UK	ISBN: 052147440X	Year: 1999
- date: ©1999	Shelf Reference	Price: \$90.00
Subject: Polymers -- Surfaces		
Desc: ix, 377 p., illus., 26 cm.		

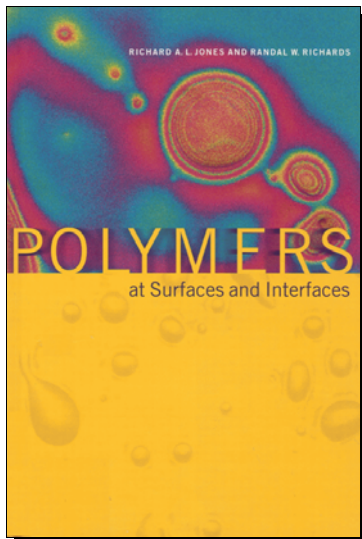


Table of Contents

Preface

1 Introduction and overview

2 The surface of a simple polymer melt

2.0 Introduction

2.1 Surface tension and surface energy

2.2 Interfacial tensions, contact angle and wetting

2.3 More precise theories of the surface tension of simple fluids

2.4 Theories of the surface tension of polymers

2.5 Surface tension of polymer melts: the experimental situation and comparison with theory

2.6 The polymer surface at a microscopic level

2.7 Dynamics of the polymer surface

2.8 References

3 Experimental techniques

3.0 Introduction

3.1 Reflection of waves from interfaces

3.2 Ion beam methods

3.3 Surface spectroscopy

3.4 Direct measurement of forces between surfaces

3.5 References

4 Polymer/polymer interfaces

4.0 Introduction

4.1 Thermodynamics of polymer mixtures

4.2 Interfaces between weakly immiscible polymers: square gradient theories

4.3 Self-consistent field theory

4.4 Kinetics of formation of polymer/polymer interfaces

4.5 The morphology of immiscible polymer blends

4.6 Appendix to chapter 4. The random phase approximation

4.7 References

5 Adsorption and surface segregation from polymer solutions and mixtures

5.0 Introduction

5.1 Surface segregation in polymer mixtures

5.2 Adsorption from polymer solutions

5.3 Wetting and surface-driven phase separation in polymer solutions and mixtures

5.4 References

6 Tethered polymer chains in solutions and melts

6.0 Introduction

6.1 Polymer brushes in solution

6.2 Polymer brushes in melts

6.3 Block copolymers at polymer/polymer interfaces

6.4 Other interfacially active species at polymer/polymer interfaces

6.5 Phase behaviour of neat block copolymers in bulk and in thin films

6.6 References

7 Adhesion and the mechanical properties of polymer interfaces at the molecular level

7.0 Introduction

7.1 The strength of interfaces involving glassy polymers

Subjects

314 .	Polymers -- Surfaces
383 .	Interfaces (Physical sciences)

7.2 The strength of interfaces involving rubbery polymers
7.3 References

8 Polymers spread at air/liquid interfaces
8.0 Introduction
8.1 Surface pressure isotherms: classification, theory and scaling laws
8.2 Organisation of polymers at the air/liquid interface
8.3 Interfacial dynamics of polymers at fluid interfaces
8.4 A generalised approach to capillary wave phenomena
8.5 Other effects and future applications
8.6 References

Index

Reviews - Synopsis - Dust Jacket

Deals with the behavior of polymers at surfaces and interfaces from a fundamental point of view. Covers the nature and properties of the surface of a polymer melt, the structure of interfaces between different polymers and non-polymers and adsorption from polymer solutions. DLC: Polymers - Surfaces

"This book is an excellent introduction into the very complex subject of the interaction of polymers at surfaces and interfaces from a fundamental point of view. It is coherent and comprehensive."
Polymer News

"Jones and Richards offer an outstanding and wonderfully affordable contribution to the literature on polymer surfaces and interfaces....The writing is outstanding throughout, with even the most difficult topics and mathematical equations clearly explained."
Choice

"...I find that this book fills a long-standing void in the area of polymers at interfaces. I recommend this book for graduate students and researchers who would like to learn the fundamentals of macromolecular concepts in the exciting area of polymers at interfaces."
Physics Today

FROM THE DUST JACKET:

This text deals with the behaviour of polymers at surfaces and interfaces from a fundamental point of view. It covers in an integrated way both current experimental results, and the most important theoretical approaches to understanding these findings.

Topics covered include the nature and properties of the surface of a polymer melt, the structure of interfaces between different polymers and between polymers and non-polymers, adsorption from polymer solutions, the molecular basis of adhesion and the properties of polymers at liquid surfaces. Emphasis is placed on the common physical principles underlying this wide range of situations. Statistical mechanics based models of the behaviour of polymers near interfaces are introduced, with the emphasis on theory that is tractable and applicable to experimental situations. Experimental techniques for studying polymer surfaces and interfaces are reviewed and compared.

Advanced undergraduates, graduate students and research workers in physics, chemistry and materials science with an interest in polymers will find this book of interest.

PREFACE:

Reputedly an oft used curse among the literati was 'May you write a book!'. Equally, among scientists prolific authors who still complain bitterly to their editors about the trials and tribulations of completing the latest commission are legion. In the area of scientific texts it is generally true that as soon as you have committed something to paper it is out of date. Consequently such books are at the mercy of the reviewers, who can easily point to the built-in obsolescence of the product. In view of these factors one might ask what prompted us to write this book; were we courageous or just foolhardy? The answer is neither.

We formed the view that in recent years sufficient new experimental evidence concerning polymers at interfaces had been obtained by the application of new techniques (and there had been an equivalent increase in the range of theoretical descriptions available) that it was worth trying to write a monograph in the attempt to bring these two strands together in a unified way. The combination of the two authors (one a physicist, one a physical chemist) also seemed

useful, in that the rigour of either discipline could be tempered by intelligent questions from the non-expert. Certainly we had some long discussions on the importance and relevance of some of the work reported in the literature and where it fitted in our overall strategy. A constant question was 'Does this work aid a clear view, or obscure it?'. We found surprisingly often that something which obscured insight in the original section in which it had been placed was a clarifying example when placed in another where originally it would have seemed out of place.

Our intention has not been to write an exhaustive treatment of polymer surfaces and interfaces but rather to produce a compact, reasonably complete treatment of the subject discussed at the level of the molecular length scales associated with polymers. This seemed appropriate because our approach was based on the statistical mechanics of coarse-grained models; a constant theme is the competition between enthalpy and entropy in polymers at or near interfaces of any kind. Thus we deal very lightly with the details of surface chemistry at the atomic level of resolution; for example our treatment of the high-resolution surface spectroscopic methods is far more brief than their overall importance to the field would indicate. Books more angled towards these aspects form a considerable proportion of the literature devoted to polymer surfaces. Similarly, a detailed account of the surface properties of specific polymers has not been attempted. We have adopted a more general approach, whereby the emphasis is on defining guiding principles and illustrating these with experimental data or applications where these principles apply (either by default or design).

More detailed texts on specific aspects of polymers at interfaces are available and some of these are referred to in the succeeding chapters. However, we are not aware of any other book whose authors have attempted the scope presented here. The choice of breadth at the expense of some depth was again deliberate; we wished to make clear the large number of areas in which the interfacial behaviour of polymers is relevant and important and to point out the close parallels between different aspects of the subject. Whether or not we have succeeded is a judgement for the reader to make. We have attempted to write a book that is relatively self-contained, though we do assume an acquaintance with elementary statistical mechanics at the level that a senior physics, chemistry or materials science undergraduate would have and a knowledge of polymer physics, again at the level of an undergraduate introductory course.

INTRODUCTION:

The study of the properties of any material must begin with the development of an understanding of its properties in the bulk state. However, pure, bulk phases are idealisations of the physicist rather than widely encountered realities; all around us we find complicated assemblies of materials mixed on an intimate, but not molecular, scale. It is an old truism that a human being is 70% water, but it would be just as accurate and probably more helpful to characterise ourselves as being almost all interface. What makes us different from 50 l of water and a few kilograms of solid, much of it polymeric, is the fantastically intricate hierarchy of structures, from sub-cellular organelles of sub-micro-metre size through cells up to organs of macroscopic size, all these structures being demarcated by interfaces of one kind or another. This is an extreme example of a common situation; most of the materials we encounter, from the food we eat to the structural materials of our technology, are composed of many different phases and the interfaces between these phases are often very important in determining the overall properties of these materials.

That there are differences between the properties of materials in bulk and close to interfaces is well known for many materials. The density and composition of liquids is different close to surfaces or interfaces (this can be thought of as the effect of 'lost molecules'), whereas in solids there may also be qualitative differences in structure; the surfaces of semiconductors may be 'reconstructed' and have a different crystal structure from the bulk. For all these situations, the most important question to be clarified is that of what actually constitutes the interfacial region — how far does one need to be from a surface or interface before essentially bulk properties are recovered? In many cases — including the examples of liquid density and semiconductor surface reconstruction just mentioned — this distance is set by atomic or molecular length scales. Hence in a macroscopic sample, even of a polycrystalline solid, the fraction of molecules that have properties characteristic of the interface rather than the bulk is very small (although in many cases their influence on the behaviour of the material may be out of proportion to this small fraction). As we shall see, this statement is also broadly true for polymer molecules, but here the molecular length scale is many times longer than the few angstrom units associated with molecules of low relative molecular mass. The additional factor for polymer systems arises from the connectivity between the units which make up a polymer molecule.

We understand the molecular level properties of gases (either pure or mixed) at low pressures sufficiently well enough to make confident predictions of bulk properties. The relative simplicity of gases is due to the low cohesive energies between the molecules and between the molecules and container walls. In contrast, relating bulk properties to molecular properties in condensed phases (liquids and solids) becomes more complex, because of the greatly increased cohesive energies between the molecules. Nonetheless, the macroscopic properties of condensed matter in the form of pure phases are now well understood from first principles.

Although such idealised pure phases are useful to develop theoretical or experimental methods, developments in society during the last 200 years have not depended significantly on the use of pure materials (with the possible exception of the steam engine and even here, despite the use of pure water and its gas, steam, the structure depends on the use of heterogeneous metals). This is even more true nowadays, as the costs of developing new single-component materials,

or new methods to process such materials, become increasingly daunting. Improvements are sought by mixing or combining existing molecules to produce materials with improved properties. Such mixtures may be true molecular 'solutions', but are more likely to be dispersions of one component in another. In such circumstances, particularly when the average size of particles of the dispersed material is small, the role of the interface between the two phases becomes important; increasingly so as the characteristic dimension of the dispersed phase becomes smaller.

This book is solely concerned with polymers in the amorphous state, that is polymer molecules in solution, the melt or that are intrinsically amorphous in the solid state by virtue of their chemical structure. We discuss surfaces and interfaces involving pure polymeric phases and interfaces between simple liquids and solids or air that are modified by an accumulation of polymeric molecules. The situation is in one sense more complicated than that for materials composed of atoms or small molecules. For these systems, as hinted at above, there is a single length scale characterising the range of forces between molecules and this molecular length scale dictates the range over which the perturbation imposed by an interface persists. For polymers there are at least two controlling length scales, which may differ substantially in magnitude. There are relatively strong interactions between segments on different polymer chains that are spatially adjacent. These interactions decay in strength rapidly as the distance between molecules increases but they are the source of the cohesion in the bulk state and in their essentials are identical to those between small molecules; they are mainly enthalpic in character and determine such properties as compressibility and surface tension.

On the other hand, many of the unusual and useful properties of polymers arise from the contiguity of segments joined together by covalent bonds to form a long chain. Thus polymer molecules are spatially extended objects, with a new length scale — the polymer chain dimension (generally expressed as a radius of gyration or end-to-end distance). For flexible polymers the connectivity of covalently bonded chains means that configurational entropy plays a leading role in determining the equilibrium, minimum free energy, state. A flexible polymer can adopt any one of a large number of configurations of equal energy; at thermodynamic equilibrium it is the configuration of maximum entropy that is chosen. If the chain is somehow constrained to some other configuration the entropy is reduced from the maximum value associated with equilibrium and the free energy of the system is increased. A testament to the greatly increased significance of entropy in macromolecular systems is provided by comparing the elasticity of polymers (above their glass transition temperature) and metals. Using classical thermodynamics the elastic (stress-strain) behaviour of polymers can be shown to be almost totally due to the entropy changes in the system. (We note that this conclusion does not in itself require the predefinition of polymer molecules which are able to explore many configurations of equal energy; in common with all classical thermodynamics we do not have to presuppose the existence of molecules or atoms at all!) The stress-strain properties of metals, on the other hand, mainly result from the strong energetic interactions between metal atoms on crystal lattices. The influence of entropy on interfacial properties is most clearly seen in mixed polymer systems, for example polymer solutions or blends. Here the short-range cohesive forces impose an essentially constant density throughout the system. However, within that overall constant density, gradients in composition are controlled by a length scale derived from overall chain dimensions. Thus we should expect that polymer/polymer interfaces and layers of adsorbed polymers at solid/liquid and liquid/air interfaces will be much more spatially extended than their analogues in exclusively small-molecule systems; dimensions of such regions will be of the order of the polymer molecule dimensions rather than a few angstrom units. It is this competition between enthalpy and entropy which underlies many of the subjects discussed in the ensuing pages.

In chapter 2 we consider perhaps the single most important quantity characterising a surface; the surface tension. Here the focus is on cohesive energies; after considering some of the classical thermodynamics of interfaces we consider how statistical mechanical models can relate surface tension to intermolecular forces. Our main tool is the theory of van der Waals; this yields the important insight that the statistical mechanics of an inhomogeneous system, such as an interface, is determined not only by the density and the composition, but also by the spatial gradients of these quantities. Near the surface of a simple liquid, the density changes smoothly and continuously from the bulk value to the vapour phase density and the distance characterising this density profile is related to the length characterising the range of intermolecular forces. Technically, the theory is constructed by writing down the free energy of the system as the integral of a functional of the density. In the simplest such theory which accounts for non-local effects, the free energy functional has one term depending on the local density and another term proportional to the square of the gradient of the density profile. This type of theory, known as a 'square gradient theory', reappears as the simplest realistic theory of inhomogeneous polymer systems and is used both in chapter 4 to discuss the polymer/polymer interface and in chapter 5 to discuss surface segregation and adsorption.

Since the energetic interactions between polymer segments are very similar to those between small molecules, the statistical mechanics of a polymer surface is rather similar to that of small-molecule liquids. The role of connectivity is minor and a theory of polymer surface tension can be constructed in the spirit of van der Waals, which is rather successful at predicting the observed surface tension of polymer melts. This is at first sight slightly surprising, for it must be the case that the presence of a surface imposes a serious perturbation on the conformation of a nearby chain. Both the theory of these conformational effects and experiments to measure them are in a rather rudimentary state, but we discuss what is known, together with the even more uncertain area of the effect of surfaces on polymer dynamics.

Theory and experiment always offer challenges to each other in any subject that is vibrant. This has been especially true

for polymer surfaces and interfaces in the last few years. Experimentally what is needed are methods that provide data pertaining to microscopic levels. In chapter 3 we outline a range of techniques that can be used; throughout the emphasis is on obtaining molecular-level information. Advantages and drawbacks for each method are summarised. The techniques chosen are usually selected on the basis of their appropriateness for a particular task.

Interfaces between polymer melts are discussed in chapter 4. Here the importance of the connectivity of polymer chains becomes paramount. One effect of the large size of polymer molecules is that their entropy of mixing is small compared with that of small-molecule liquids. Immiscibility between chemically different polymers is thus very common and the nature of an interface between coexisting phases becomes more than usually important. The simplest theoretical approach is a square gradient theory of the type introduced in chapter 2. For the polymer/polymer interface, however, the important length scale is not the range of the force between segments but the overall size of the polymer chain. This means that polymer/polymer interfaces, are typically broader than interfaces between simple liquids. However, for highly incompatible polymers interfacial widths are still smaller than the overall chain size and the simple assumptions underlying square gradient theory are not really valid. More powerful theoretical methods are required, which are provided by self-consistent field theory, which reduces the many-body problem of a chain interacting with all its neighbours to a simpler mean-field theory of one chain interacting with an effective potential that is averaged from all the segment-segment interactions in the system, the mean-field potential. This type of theory provides another level of accuracy in treating the statistical mechanics of inhomogeneous polymer systems and is referred to again in chapter 5, in the context of polymer adsorption, and in chapter 6, where it proves ideally suited to problems involving tethered polymer chains.

This kind of statistical mechanics deals with equilibrium, but many important situations deal with the kinetics of approach to equilibrium and it is this problem that is considered in the second half of chapter 4. Even though at equilibrium miscible polymers will form a single phase, bringing together two such polymers will result in an interface that will broaden in time by a process of interdiffusion. Diffusion of polymers is slow due to the entanglement of chains and will control, for example, the development of strength when polymers are welded or coextruded. The reverse situation is the demixing of two polymers that are initially in a single phase, but which are subsequently quenched into the two-phase part of the phase diagram. Domains of the coexisting phases form, interfaces between them approach their equilibrium width and the domains slowly coarsen, driven by the tendency of the system to lower its energy by reducing the total interfacial area.

Chapter 5 is concerned with interfaces between mixed polymer systems and non-polymer phases. This includes a large variety of different systems; the free surfaces of polymer blends and solutions and interfaces between blends and solutions and solids. The predominant feature here is segregation, whereby the component of a mixture or solution that has a lower surface or interfacial energy preferentially accumulates at that interface. This is a general phenomenon for all mixtures, but it is particularly important when polymers are involved. As mentioned above, the free energy of mixing of polymers is small because of their large molecular size, so even very small differences in surface energy between components can lead to very large amounts of segregation. Once again, because the natural length scale characterising compositional inhomogeneities in such mixed polymer systems is the chain dimension, this sets the distance from the interface over which the composition is perturbed from bulk values.

Segregation at the surface of blends of miscible polymers can be dealt with using the square gradient theory introduced in section 4.2. For concentrated polymer solutions such approaches are also possible, but it is more usual to use numerical versions of the self-consistent field theory described in section 4.3. However, we must be aware that both approaches are essentially mean-field ones in character and will fail in situations in which the polymer concentration in the solution falls into the semi-dilute regime, for which strong spatial concentration fluctuations are always present. Here progress has to be made using scaling theories. Finally, we consider the situation in which the two components of the mixture approach immiscibility. Here we consider the problem of whether one coexisting phase wets another one and what influence this has on the kinetics of phase separation in the vicinity of an interface.

In chapter 6 the choice of polymer architecture and the incorporation of interfacially active functional groups to make polymer molecules especially effective at modifying interfaces is outlined. In many cases this leads to a situation in which a strand of polymer is tethered by one end to the interface; an array of such polymers, when they are densely grafted enough to interact strongly, is known as a 'brush'. The properties of such brush layers (thickness, composition etc.) have been studied extensively using scaling and self-consistent field approaches. Examples of such brushes in use to modify interfaces are found when polymers are chemically end-grafted to polymer/solid interfaces, adsorbed by one end to an interface and in the selective adsorption of block copolymers. Block copolymers are used to modify polymer/polymer interfaces, in which role they can act as polymeric surfactants. Pure block copolymers microphase separate, resulting in a system in which the interfacial area between microphase-separated domains is very large and can be thought of as being made up entirely from stretched polymer brushes (at least for the case of lamellar domains).

The final two chapters develop special topics that draw on the ideas discussed in the earlier chapters. In chapter 7, the extent to which the macroscopic property of adhesion can be accounted for in terms of the microscopic structure of the interfaces involved is discussed. Although it is very far from completely understood, this area represents one place

where fundamental science and technological practice are beginning to approach quite closely. Chapter 5 considers the structure and dynamics of liquid surfaces modified by adsorbed or spread polymer layers. This area provides a bridge between the statistical mechanical theories outlined in earlier chapters and the classical aspects discussed in chapter 2, and has some relation to certain biological systems. The description is by no means complete, especially insofar as capillary wave dynamics are concerned. The essentials of this complex subject are dealt with here for the case in which one of the fluids is a material of low relative molecular mass; this should be a starting point for the consideration of the more difficult case of polymer melt interfaces, for which the importance of capillary waves is only now being considered (see chapter 4).

Several important areas relating to polymers at surfaces and interfaces are not discussed in this book. Almost nothing is said about crystalline polymers. Many engineering polymers are semi-crystalline and the nature of the interface between crystalline and amorphous phases in these materials has generated much debate and some rancour, into which the authors have no desire to venture. Concerning the nature of the surface of a crystalline polymer, beyond the results of a few experiments described in section 2.6 almost nothing is yet known.

We have said nothing at all about what is perhaps the most fascinating and important area involving polymers at surfaces and interfaces, the interfacial behaviour of biological macromolecules. The combination of the extra richness and functionality of such molecules with the subtleties of surface phenomena make this a huge and as yet barely developed field, to which we cannot hope to start doing justice. However, it will never prove possible to make progress with these complex systems without first understanding the simpler problems that we describe here.

Title	Location	Edition / Series / Misc.
133 Polymers: Chemistry and Physics of Modern Materials		<i>Edition:</i> 2nd edition
<i>Author:</i> Cowie, J. M. G. (John MacKenzie Grant)	<i>Dynix:</i> 09715	<i>Series:</i>
<i>Publish.:</i> Chapman and Hall	<i>Call No.:</i> 547.7 Co	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0412031213	
<i>- date:</i> ©1991	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1991
<i>Subject:</i> Polymers		<i>Price:</i> \$25.00
<i>Desc:</i> ix, 436 p., illus., 23 cm.		

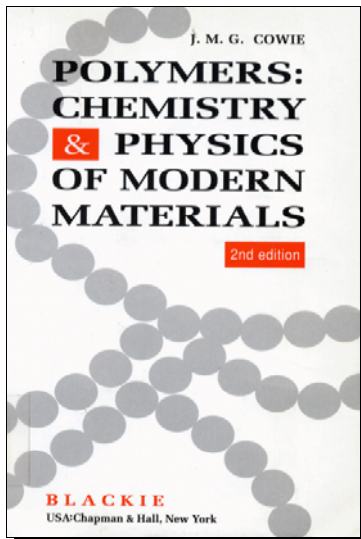


Table of Contents

- PREFACE
- 1: Introduction
- 2: Step-Growth Polymerization
- 3: Free Radical Addition Polymerization
- 4: Ionic Polymerization
- 5: Copolymerization
- 6: Polymer Stereochemistry
- 7: Polymerization Reactions Initiated by Metal Catalysts and Transfer Reactions
- 8: Polymers in Solution
- 9: Polymer Characterization – Molar Masses
- 10: Polymer Characterization – Chain Dimensions and Structures
- 11: The Crystalline State
- 12: The Amorphous State
- 13: Mechanical Properties
- 14: The Elastomeric State
- 15: Structure – Property Relations
- 16: Polymer Liquid Crystals
- 17: Polymers for the Electronics Industry

INDEX

Subjects

313 . Polymers

Reviews - Synopsis - Dust Jacket

Preface to the Second Edition

When the first edition of this book appeared in 1973 it was meant to serve two major functions; the first was to provide a broadly based text on polymer science at an introductory level which would illustrate the interdisciplinary nature of the subject, and the second was to create a high information, inexpensive text that students would be able to afford. The response to the book over the intervening years has been both surprising and gratifying, and seems to indicate that the stated aims have been achieved. However, polymer science has moved on in dramatic fashion. Significant advances have been made in the synthesis and application of new high performance materials; the area of specialty polymers has blossomed and begun to flourish; the electronics industry has "discovered" how useful polymers can be, and synthetic polymer "metals" have become a reality. These exciting developments have made it necessary to update and expand the text to reflect the progress made. I have also responded to constructive comments made by colleagues over the years and thus have altered or incorporated various sections, and added several new chapters.

The interdisciplinary nature of polymer science is obvious. Polymers are materials with characteristic mechanical and physical properties which are controlled by the structure and the methods of synthesis. Consequently a scientist or engineer gains most from the subject if the interdisciplinary approach is emphasized from the beginning, but of course there must be a starting point. Bearing that in mind, this book is developed in the sequence: preparation, characterization, physical and mechanical properties, and culminates in a coverage of structure-property relations. Concluding chapters discuss growing areas of interest for applications of polymeric materials.

Of course there will always be aspects of the subject which are omitted from this type of book, nevertheless I trust that the revisions and additions that have been made will meet with general approval and that the text continues to serve the educational needs it was designed to meet.

Title	Location	Edition / Series / Misc.
134 Polypropylene Author: Kresser, Theodore O. J. Publish.: Reinhold Publishing Corporation - place: New York, NY - date: ©1960 Subject: Polypropylene Desc: xi, 268 p., illus., 20 cm.	Dynix: 13041 Call No.: 668.423 Kr ISBN: Shelf Adult Non-Fiction	Edition: Series: Reinhold Plastics Applications Series Year: 1960 Price: \$25.00

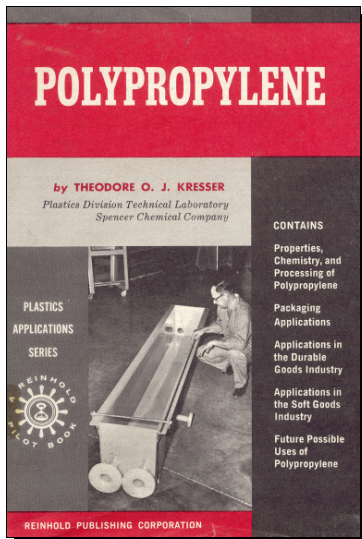


Table of Contents

PREFACE
 1. INTRODUCTION
 2. PROPERTIES OF POLYPROPYLENE
 3. CHEMISTRY OF POLYPROPYLENE
 4. PRODUCTION OF POLYPROPYLENE
 5. PROCESSING OF POLYPROPYLENE
 6. PACKAGING APPLICATIONS
 7. APPLICATIONS OF POLYPROPYLENE IN THE DURABLE-GOODS INDUSTRIES
 8. APPLICATIONS IN SOFT-GOODS INDUSTRIES
 9. FUTURE DEVELOPMENTS
 INDEX

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book brings together all phases of polypropylene properties, production and applications. Written in concise, easy-to-understand language, it is the first book to offer information on this increasingly important thermoplastic at a level where it can be readily understood by readers without special training in polymer chemistry. Throughout, particular emphasis is placed on the relationship between the development of polypropylene and the future of high polymers in general. The book contains sufficient information on the basic principles of stereochemistry to point up the unique qualities of polypropylene.

Subjects

317 . Polypropylene

As a special feature, the author includes a chapter on chemistry that describes the work of Professor Guillo Natta on the discovery and development of polypropylene. Sections dealing with applications consider both present limitations and future possibilities. One entire chapter is devoted to the application of polypropylene in the packaging industry.

The book is directed to all those readers who are interested in polypropylene but who lack the time or specialized training to obtain information on this subject from presently available sources. It will be of special value to manufacturers and salesmen of products made of polypropylene, particularly those engaged in the packaging, appliance, automotive, and housewares industries.

REINHOLD PLASTICS APPLICATIONS SERIES:

This series, which started in 1957, has now grown to greater proportions than at first planned. The present volume on "Polypropylene" is the nineteenth to be published, and five or six more are in prospect. The series, which started with the theme, "guidance in application," was designed to devote one book to each of the more important plastics materials, describing the physical and chemical properties for each material and its optimum end-product use. Now, however, stimulated by the industry's wide and cordial acceptance, the series has been broadened to include books on production processes.

Despite the introduction of volumes on production processes the general character of the books will remain the same. They will be semi-technical and addressed primarily to engineers, designers, students, and in fact to all practical people in plastics. The new plastics materials, of course, will continue to be covered. Books on Alkyd Resins and Polycarbonates are now in preparation.

The process books will include volumes on Premix Molding, Blow Molding, Plastics in Tooling, and on Modern Methods of Plastics Extrusion.

Production curves in the plastics field continue to rise at an astonishing rate, and so it is with considerable confidence that this volume in the expanded applications series is presented.

PREFACE:

In this day when scientific advances are looked upon with some suspicion, and people quite rightly wonder, sometimes, if a new miracle really is all for the good, it is a great pleasure to be able to write on a subject where no one can deny that the scientific progress made is for the greater good of mankind.

Writing a book about a material during the period when it is just starting to come into volume production is a difficult but challenging job. The technical journals each month bring out more news of growth and change, and the temptation to wait and see what the next development will be is almost irresistible.

As time goes on, however, it becomes obvious that the main lines of development are following very closely those laid out by Professor Natta and the publications of the Montecatini Company several years ago.

This book could not have been written without their assistance. The chapter on the chemistry of polypropylene is taken almost entirely from Professor Natta's publications, and he has been kind enough to read it before publication and make necessary corrections.

Both the chapter on properties and that on processing owe a great deal to publications of Drs. Ranalli and Crespi of the Montecatini organization, and permission to reproduce many of the excellent illustrations from these publications is gratefully acknowledged. The Montecatini Company was also very helpful concerning applications in Europe.

The Hercules Powder Company was very kind in making available much of their wealth of experience on applications in the United States, and the assistance of the AviSun Corp., Spencer Chemical Co., Enjay Corp., Eastman Chemical Co., Dow Chemical Co., and many others was also most valuable.

The early years in the development of any product are full of problems and difficulties, and polypropylene is certainly no exception. Some of the current problems have led a few people to doubt that polypropylene will grow in the manner predicted by its advocates. These problems may be very serious in some fields and may, indeed, change the order and direction of development; however, they are similar to problems that have been solved with other materials, and they will not long delay the development of this one.

The only real possibility that polypropylene may fail to fulfill present expectations is that closely related polyolefin materials, made by similar methods from olefins other than propylene, may be developed so rapidly that they will take away some of the markets this book predicts for polypropylene. Even this can hardly change the picture very radically. It will not be a serious miscalculation on the part of people planning to produce polypropylene, because the change in base material will not involve extensive plant revisions, and the chemical and physical research on polypropylene is equally applicable to other polyolefins. At the present time there is no reason to believe that polypropylene will not perform as expected; there is much reason to believe that it will be the most spectacularly successful thermoplastic ever produced.

The opinions expressed in this book are those of the author and do not necessarily reflect the conclusions of the Spencer Chemical Company in certain respects.

The greatest part of the information in this book is from technical publications here and abroad. Whenever a section leans very heavily on a single source it has been mentioned in the text; however, in many cases the information has been collected from various sources which are not separately acknowledged. In such a new subject, published information must necessarily be supplemented by information drawn from private conversations and private communications. If any material which the originator considered confidential has inadvertently been used, the author asks that consideration be given to the fact that this book has been written mainly as a service to the polypropylene industry. It should be a benefit to all companies in the field to have a "polypropylene primer" available to assist in orienting the public and any newcomers in the business.

Publications which have been consulted in the preparation of this book include Modern Plastics, publications of the American Chemical Society, Journal of the Society of Plastics Engineers, Plastics Technology, Plastics World, British Plastics, Chemical Processing, Chemical Week, Chemical Engineering, Modern Packaging, the transactions of the Plastics Institute (Britain) and many others.

Particular thanks are due to the Spencer Chemical Company for permission to undertake this work, and especially to S. P. Horkowitz, manager of the Spencer Technical Laboratory at Orange, Texas, and Dr. G. Ham, Technical Director of the Spencer Plastics Division, for their help in the project.

Title	Location	Edition / Series / Misc.
823 Polyurethanes, Polyamides, Phenoplasts, Aminoplasts, Maleic Resins Author: Oldring, P.K.T. and N. Tuck (editors) Publish.: John Wiley & Sons - SITA Technology Limited - place: Chichester, [West Sussex], UK - date: ©2001 Subject: Plastic coatings Desc: v, 399 p., illus., 24 cm.	Dynix: 99644 Call No.: 660 OI ISBN: 0471978965 Shelf Adult Non-Fiction	Edition: 2nd edition Series: Wiley/SITA Series in Surface Coatings Technology [Volume 3: Resins for Surface Coatings] Year: 2001 Price: \$135.00

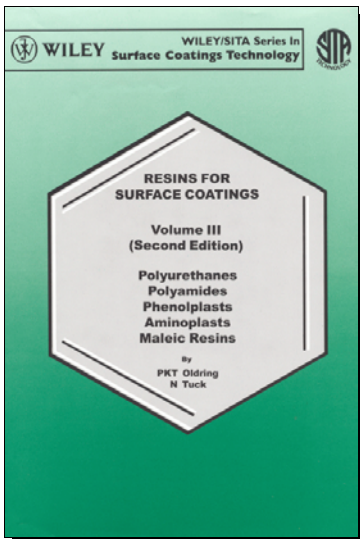


Table of Contents

I POLYISOCYANATE CROSSLINKERS AND POLYURETHANE RESINS USED IN SURFACE COATINGS
 Principal Diisocyanate Monomers for Surface Coatings
 Principal Reactions of the Isocyanate Group
 Modified Polyisocyanates
 Blocked Polyisocyanates
 Materials Used for Reaction with Polyisocyanates
 Aqueous Dispersions of Polyurethanes
 Chemistry of the Different Systems
 Examples of Formulations

II POLYAMIDES
 Raw Materials
 Preparation of Polyamides
 Polyamine, Fatty Acid Based Curing Agents for Epoxy Resins
 Principles of Formulating Solvent-Based Epoxy Polyamide Coatings
 Principles of Formulating Waterborne Polyamide Epoxy Coatings
 Non-Reactive Polyamides
 Formulations
 Commercial Sources of Polyamide and Poly Aminoamide Resins

III PHENOLPLASTS
 Raw Materials
 Types of Phenolic Resin and Their Manufacture
 Modifications of Phenolic Resins to Enable their Use in Coatings
 Crosslinking by Phenoplasts
 Waterborne Phenolic Systems: Dispersions
 Formulating Coatings with Phenolic Resins
 Suppliers of Phenolic Resins

IV AMINOPLASTS
 Raw Materials
 The Synthesis of Amino Crosslinking Agents
 The Significance of Alkylation and Degree of Alkylation
 Significance of Degree of Polymerisation
 The Chemistry of Aminoplast Crosslinking Reactions
 Commercially Available Aminoplasts
 Principles of Formulating Coatings with Aminoplasts
 Formulations and Applications

V MALEIC RESINS
 Use of Maleic Anhydride in Undayturate Polyesters
 Maleic Anhydride in Alkyds
 Maleinised Rosins

Subjects

297 .	Plastic coatings
318 .	Polyurethanes
539 .	Aminoplastics
540 .	Phenolic resins
541 .	Polyamides

Index

Reviews - Synopsis - Dust Jacket

Resins are used as surface coatings across a wide range of applications. This book (and the two others) provides a broad overview of and introduction to some of the most important resins currently used, including (for this title) polyurethanes, polyamides, phenoplasts, aminoplasts and maleic resins.

Title	Location	Edition / Series / Misc.
135 Polyurethanes: Chemistry and Technology Author: Saunders, J. H. (James Henry), 1923- and K. C. Frisch Publish.: Interscience Publishers, Inc. - place: New York, NY - date: ©1962 Subject: Polyurethanes Desc: xv, 368 p., illus., 24 cm.	Dynix: 13043 Call No.: 668.423 Sa ISBN: Shelf Adult Non-Fiction	Edition: Series: High polymers: Vol. 16, parts. 1-2 Year: 1962 Price: \$25.00

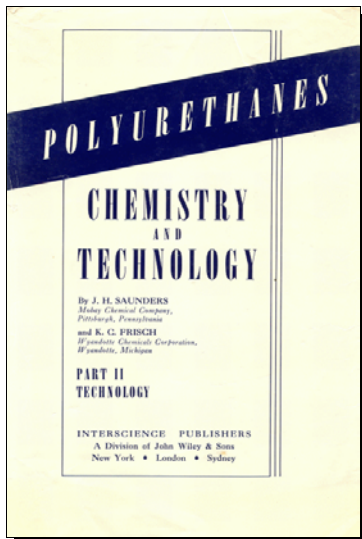


Table of Contents

CONTENTS: Part I -- Chemistry
 Frontispiece
 Preface
 List of Abbreviations

1. Introduction
2. Raw Materials
 - I. Introduction
 - II. Isocyanates
 1. Preparation of Isocyanates
 2. Molecular Structure and Spectra
 3. Analytical Methods for Isocyanates and Urethanes
 4. Handling Precautions
 - III. Polyethers
 1. General
 2. Preparation
 3. Reactions of Polyether Polyols
 4. Properties
 - IV. Polyesters
 1. General
 2. Preparation
 3. Reactions
 - V. Castor Oil and Derivatives
 1. Origin and Manufacture
 2. Composition and Properties
 3. Reactions of Castor Oil and of Ricinoleic Acid
 4. Uses
3. The Reactions of Isocyanates and Isocyanate Derivatives
 - I. Introduction
 - II. Reactions of Isocyanates Reactions with Compounds Containing the N—H Group
 2. Reactions with Compounds Containing the O—H Group
 3. Reactions with Compounds Containing the C—H Group
 4. Reactions with Compounds Containing the S—H Group
 5. Reaction with Miscellaneous Active Hydrogen Compounds
 6. Reactions with Unsaturated Compounds.
 7. Dimerization
 8. Trimerization
 9. Miscellaneous Reactions
 10. Reactions of "Inorganic" Isocyanates
 11. Charts of Reactions
 - III. Reactions of Isocyanate Derivatives
 1. Reactions of Urethanes
 2. Reactions of Substituted Ureas
 3. Reactions of Isocyanate Dimers
 4. Reactions of Isocyanate Trimers
 5. Reactions of Carbodiimides
 6. "Splitting" of "Blocked" Isocyanates
4. The Kinetics and Catalysis of the Isocyanate Reactions

Subjects

318 . Polyurethanes

Volumes

Chemistry - vol. 1
 Technology - vol 2

- I. Introduction
- II. General Considerations
- III. Reactions with Alcohols
 - 1. Reactions of Monoisocyanates
 - 2. Reactions of Diisocyanates
 - 3. Catalysis of the Isocyanate-Hydroxyl Reaction
- IV. Reactions with Amines
- V. Reactions with Water
- VI. Reactions with Carboxylic Acids
- VII. Reactions with Phenols
- VIII. Reactions with Ureas
- IX. Reactions with Urethanes
- X. Reactions with Thiols
- XI. Summary of Relative Rates of Reactions with Active Hydrogen Compounds
- XII. Summary of Catalytic Effects
- XIII. Catalysis in the Control of Polymer Formation

5. Formation of Urethane Foams

- I. Introduction
- II. The Chemistry of Foam Formation and Cure
 - 1. Reactions of Isocyanates
 - 2. Function of the Isocyanate in Foaming
 - 3. Role of Catalysts in Foam Systems
 - 4. The Final Cure of Urethane Foams
- III. Colloid Chemistry of Foam Formation
 - 1. Bubble Nucleation
 - 2. Bubble Stability
 - 3. Urethane Foam Systems
- IV. Viscoelastic Changes in Foaming
 - 1. Effect on Cell Structure, Voids and Foam Collapse
 - 2. Relations between Cell Structure and Properties
 - 3. Structural Factors Affecting Stress Relaxation and Creep in Flexible Foams

6. The Relationships between Polymer Structure and Properties in Urethanes

- I. Introduction
- II. General Considerations
 - 1. Molecular Weight
 - 1. Intermolecular Forces
 - 3. Stiffness of Chain Units
 - 4. Crystallization
 - 5. Ease of Rotation of Chain Segments
 - 6. Cross Linking
 - 7. Theory of Rubber Elasticity
- III. The Influence of Component Group Structures in Urethanes
- IV. Urethane Elastomers
 - 1. Polyester-Urethane Elastomers
 - 2. Polyether-Urethane Elastomers
- V. Urethane Foams
 - 1. Polyether-Urethane Foams
 - 2. Polyester-Urethane Foams
- VI. Urethane Coatings
- VII. Other Urethane Polymer Applications
- VIII. Flow, Creep, and Stress Relaxation in Urethane Polymers
 - 1. Factors Related to Primary Chemical Bonds
 - 2. Factors Related to Secondary Bonds
 - 3. Compression Set
 - 4. Softening of Urethane Polymers during Flexing
- IX. Summary of Structure-Property Relations in Urethanes
- X. Conclusions

Appendix A: Commercially Available Isocyanates

Appendix B: Commercially Available Polyethers

Appendix C: Commercially Available Polyesters

Appendix D: Trade Names and Generic Names

Index

CONTENTS: Part II -- Technology

- 7. Flexible Foams
 - I. Introduction
 - II. Raw Materials Used in Flexible Foams
 - 1. Isocyanates
 - 2. Polyols
 - 3. Blowing Agents
 - 4. Catalysts
 - 5. Surfactants
 - 6. Miscellaneous Additives
 - III. Foam Systems
 - 1. General Methods of Preparation
 - 2. Prepolymers
 - 3. Semi-Prepolymers
 - 4. One-Shot Foams
 - IV. Methods of Foam Application
 - 1. Foaming Equipment
 - 2. Manufacture of Slab Stock
 - 3. Molding of Flexible Foam
 - 4. Frothing of Flexible Foams
 - 5. Foaming of Urethane Elastomers
 - 6. Spraying of Flexible Foams
 - V. Properties of Flexible Foams
 - 1. General Properties
 - 2. Specific Properties
 - VI. Applications of Flexible Foams
 - 1. Furniture
 - 2. Bedding
 - 3. Transportation
 - 4. Packaging
 - 5. Clothing, Textile and Miscellaneous Foam Laminates
 - 6. Carpet Underlay
 - 7. Sporting Goods
 - 8. Toys and Novelties
 - 9. Sponges and Miscellaneous Household Items
 - 10. Filtering Materials
 - 11. Construction, Insulation and Miscellaneous Industrial Uses
 - 12. Military and Missile Uses
 - 13. Horticultural
 - 14. Footwear
 - 15. Medical
 - VII. Miscellaneous Flexible Foam Systems
- 8. Rigid Foams
 - I. Introduction
 - II. Raw Materials Used in Rigid Foams
 - 1. Isocyanates
 - 2. Polyols
 - 3. Blowing Agents
 - 4. Catalysts
 - 5. Surfactants
 - 6. Flame Retardants
 - 7. Miscellaneous Additives
 - III. Foam Systems
 - 1. Polymer Preparation
 - 2. Foam Preparation
 - IV. Methods of Foam Production
 - 1. Batch Preparation
 - 2. Continuous or Intermittent Pouring

- 3. Spraying
- 4. Production of Finished Foam
- V. Foam Properties
 - 1. General Properties
 - 2. Specific Properties
- VI. Applications of Rigid Foams
 - 1. Refrigeration Insulation
 - 2. Refrigerated Trucks and Trailers
 - 3. Insulation of Pipes and Tanks
 - 4. Structural Uses
 - 5. Uses in the Aircraft Industry
 - 6. Military Uses
 - 7. Void Filling and Insulation of Ships
 - 8. Uses in Packaging
 - 9. Uses in the Electric Industry
 - 10. Aerospace Applications
 - 11. Miscellaneous Uses
- VII. Miscellaneous Foaming Systems

- 9. Elastomers
 - I. Introduction
 - II. Chemistry of Urethane Elastomers
 - 1. Prepolymer Foundation
 - 2. Chain Extension
 - 3. Curing or Crosslinking
 - III. Urethane and Urethane-Urea Elastomer Systems
 - 1. Millable Gums, Using Conventional Rubber Equipment
 - 2. Casting (Liquid) Elastomers Prepared by the Prepolymer Method
 - 3. Casting Elastomers Prepared by One-Shot Method
 - 4. Urethane Elastomers Prepared by Thermoplastic Processing Techniques
 - 5. Miscellaneous Elastomers
 - IV. Properties of Urethane Elastomers
 - 1. General
 - 2. Mechanical Properties
 - 3. Electrical Properties
 - 4. Environmental Properties
 - 5. Radiation Resistance
 - V. Applications
 - 1. General
 - 2. Specific Applications

- 10. Coatings
 - I. Introduction
 - II. Chemistry of Urethane Coatings
 - 1. One-Component Coatings
 - 2. Two-Component Coatings
 - III. Formulations and General Properties of Urethane Coating Systems
 - 1. One-Component Coatings
 - 2. Two-Component Coatings
 - IV. Miscellaneous Coatings
 - 1. Coatings from Unsaturated Isocyanates and Carbamates
 - 2. Coatings from Isocyanate-Modified Polyvinyl Alcohols and Derivatives
 - 3. Coatings from Rosin Isocyanate Derivatives
 - 4. Coatings from Silicon- and Boron-Containing Derivatives
 - 5. Coatings from Miscellaneous Isocyanate Modified Systems
 - V. Solvents, Pigments, and Additives for Urethane Coatings
 - 1. Solvents
 - 2. Pigments
 - 3. Special Additives
 - VI. Specific Formulations and Properties for Various Applications of Urethane Coatings
 - 1. General
 - 2. Coatings for Wood
 - 3. Coatings for Concrete
 - 4. Coatings for Metal

- 5. Coatings for Electrical Applications
- 6. Flexible Coatings

- 11. Adhesives
 - I. Introduction
 - II. Chemistry of the Urethane Adhesives
 - 1. Polyisocyanate Adhesives
 - 2. Prepolymer Adhesives
 - 3. Isocyanate-Modified Polymers
 - III. The Design of Urethane Adhesives
 - IV. Summary of Properties, Comparison with other Adhesives
 - 1. Rubber-to-Fabric Adhesion
 - 2. Rubber-to-Metal Adhesion
 - 3. Other Uses
 - V. Rubber-to-Fabric Adhesion
 - 1. Triphenylmethane Triisocyanate
 - 2. Diphenylmethane Diisocyanate
 - 3. Other Isocyanate Adhesive Combinations
 - VI. Rubber-to-Metal Bonding
 - 1. Triphenylmethane Triisocyanate
 - 2. Diphenylmethane Diisocyanate
 - 3. Other Isocyanate Adhesive Combinations
 - VII. Metal-to-Metal Adhesive
 - VIII. Wood Adhesives
 - IX. Miscellaneous Adhesive Applications

- 12. Fibers
 - I. Introduction
 - II. Preparation of Urethane Fibers
 - III. Structure of Urethane Fibers
 - IV. Properties of Urethane Fibers
 - V. Applications of Urethane Fibers
 - VI. Spandex Fibers
 - 1. General
 - 2. Preparation
 - 3. Structure
 - 4. Properties
 - 5. Applications
 - VII. Miscellaneous Urethane and Other Isocyanate-Derived Polymers for Fiber Applications
 - VIII. Structural Effects in Linear Polyurethanes

- 13. Miscellaneous Applications of Isocyanates and Polyurethanes
 - I. Introduction
 - II. Textile Modification
 - 1. Waterproofing and Hydrophobizing Textiles
 - 2. Improvement of the Shrink Resistance and Other Properties of Wool
 - 3. Improvement of Textile Dyeing
 - 4. Other Treatments of Cellulose amid Cellulose Derivatives
 - 5. Miscellaneous Textile Applications
 - III. Thermoset Resins
 - 1. Preparation of Thermoset Polymers
 - 2. Treatment of Proteins for Plastic Applications
 - 3. Modification of Thermosetting Polymers
 - IV. Combinations with Poly(vinyl) Compounds
 - 1. Isocyanates, Unsaturated Hydroxy Compounds, and Olefinic Monomers
 - 2. Olefinic Monomers or Polymers Treated with Isocyanates
 - 3. Polymerization and Copolymerization of Unsaturated Isocyanates and Derivatives
 - 4. Treatment of Olefin Polymers Containing Active Hydrogen Groups
 - V. Thermoplastic Molding Compounds
 - 1. Durethan U and Related Polymers
 - 2. Other Thermoplastic Compositions
 - VI. Low Durometer Elastic Polymers
 - 1. Rocket Fuel Binders
 - 2. Caulks and Sealants

3. Potting and Encapsulating
4. Printing Rolls
- VII. Miscellaneous Applications
 1. The Modification of Paper
 2. The Modification of Starch and Sugars
 3. The Tanning of Leather
 4. Rubber Vulcanization
 5. Applications of Biological Interest
 6. Silicon and Boron-Containing Polymers
 7. Miscellaneous
- VIII. Analytical Methods Using Isocyanates

Appendix E: Bibliography of U. S. Patents
Appendix F: Trade Names and Generic Names
Index

Reviews - Synopsis - Dust Jacket

PREFACE: Part I -- Chemistry

Unlike many other great discoveries in chemistry, polyurethanes were not the outgrowth of an accidental discovery, but were the result of painstaking and systematic efforts to develop new polymers that could rival in properties those of the commercially eminently successful nylon fibers. This search did not stop with the development of polyurethane fibers but branched into a broad new concept of polymer chemistry that can be characterized as the polyaddition principle. It is a tribute to the genius of Professor Otto Bayer and his co-workers that they clearly recognized the great versatility of this new polymerization procedure and started to explore the many branches of polyurethane chemistry. To bring together the many ramifications of polyurethane chemistry in one place is the object of this volume on "Polyurethanes."

In Part I, an effort is made to group systematically the chapters dealing with the basic chemistry of polyurethanes and of the raw materials going into the make-up of these polymers. This part concludes with a chapter on the relationship between structure and physical properties of polyurethanes. The Appendices to Part I contain a series of tables with information on suppliers of raw materials, lists of trade names and abbreviations, additional tables of properties, and other statistics of interest to scientists.

Part II will be concerned mainly with the various aspects of the technology of polyurethanes, particularly as it applies to the preparation, properties, and applications of the most important end uses of these polymers. Although urethane foams have drawn most of the attention in recent years, having undergone a spectacular growth especially in the flexible foam field, other polyurethane areas are finding increasing attention. It is difficult to determine at this stage which of these fields will reach commercial importance approaching that of foams; however, elastomers and coatings have been singled out for more extensive treatment. The appendix to Part II will be a complete index of United States patents, with a very short description and key symbol denoting the special field of application of each. This index should prove helpful to those wishing to screen the patent literature for new and patentable items, as well as to those wishing to accumulate information regarding a special field of interest.

The spectacular growth of polyurethane technology in recent years, particularly in the field of flexible foams, has aroused widespread interest in promoting more comprehensive understanding and obtaining information about this relatively new class of polymers. A great deal of the earlier literature on polyurethanes is contained, unfortunately, in either patents or more inaccessible foreign journals, and documents such as P. B. Reports issued after World War II. In the development of the polyurethane industry in this country the suppliers of raw materials have done much to make available reviews and translations of earlier work, and have contributed many reports of their own original research. This information has contributed greatly to the development of the industry. However, it must be recognized that a great share of the growth of polyurethanes has come from the research laboratories of the consumer industries, small and large alike, that worked out and perfected the formulations and processes, making possible the large-scale acceptance of these products by the public.

Through the efforts of organizations in this country such as the Cellular Plastics Division of the Society of Plastics Industry and the American Society of Testing Materials, suppliers and consumers of polyurethane raw materials worked jointly in drawing up specifications for the raw materials as well as suitable test methods for end products in order to set up and maintain high standards of performance. This created a favorable climate for free interchange of technical information and helped substantially in the advancement of the art.

A major objective set by the authors of this volume is the systematic and critical presentation of available information on the various aspects of the chemistry and technology relating to polyurethanes. Although this information is treated in a fairly comprehensive manner, it is impractical to present every detail. It is hoped that all or nearly all of the most significant information—judged from today's knowledge—is included. Sufficient reference to the original literature is given that the discussions presented herein should be adequate guides to the sources of those details that could not be

included. It is hoped that Part I covers the literature adequately through 1960; some selected references and papers through approximately June 1, 1961, are also included.

Ultimately, the aim of the authors is to offer a better understanding of the basic and applied aspects of polyurethanes, with the hope that these works may serve both as a reference work and a starting point for future research. While it is realized that a certain amount of information presented in the series may be superseded by more recent developments, the basic facts uncovered in these investigations should be of interest to research workers in those fields for many years, and may give them helpful clues for future work.

PREFACE: Part II -- Technology

Part I of "Polyurethanes" dealt with the basic aspects of the chemistry of isocyanates and polyurethanes. In addition, some of the fundamental principles underlying the formation of urethane foams, elastomers and coatings were presented, and correlations between the chemical structure and the physical properties of these polymers were made.

Part II covers the rapidly expanding technology of polyurethanes. This major commercial class of polymers has grown from the early discoveries of Professor Otto Bayer and co-workers at I. G. Farbenindustrie, and their many subsequent developments at Farbenfabriken Bayer. In a relatively short time span polyurethane production in the United States has grown from 35 million pounds in 1958 to about 225 million pounds in 1963. Flexible urethane foams have paced the growth of this most versatile class of polymers. Recently, rigid foams have been giving indications that their long heralded growth may become a reality rather than a gleam in the eyes of optimistic market forecasters. Urethane coatings amid elastomers are also showing encouraging growth patterns. How fast a special area of urethane technology may experience growth is witnessed by the spectacular advent of the elastic "spandex" fibers, which by definition are composed of at least 85% segmented urethane fibers. Virtually unknown a few years ago, spandex fibers are expected to capture over half of the total elastic fiber market within the next few years and are slated to go into many new applications such as sportswear, dresses, and upholstery materials.

Other fields of polyurethane technology, though subjects of intense research efforts, are either in an early stage of commercial development or are still awaiting "breakthroughs" by diligent research workers.

The various areas of urethane technology in Part II have been treated in an extensive manner to provide a thorough coverage of early developments, as well as those systems which are currently of greatest importance. It is realized that urethane technology is a dynamic and constantly forward-moving force which is responsible for a certain obsolescence factor regarding some of the data reported in this book. Nevertheless, it is hoped that these data are useful in appraising the different approaches which researchers have taken in obtaining optimum properties to meet certain end use requirements. This knowledge should also be valuable when applied to related fields, e.g., structural components used in flexible foams may often be successfully applied to potting compounds, sealants, flexible coatings, or other similar urethane polymers.

Literature from journals, patents and United States trade bulletins through 1961 has been surveyed completely, it is hoped, although references to all naturally could not be included. In addition, many references appearing in 1962 and 1963 are included, but coverage of significant literature of those years may not be fully complete.

Wherever possible the authors have attempted to use the chemical names of the urethane polymer components. However, in many instances, certain trade names were employed which have been accepted throughout the industry, such as Dabco and Moca (trade names and generic names are listed in Appendix F). One of the difficulties with which the authors were confronted was the use of trade names for some materials which were otherwise not chemically identified by the material supplier. This was particularly true of polyethers where there is an increasingly growing trend to supply these materials in form of blends which are merely identified by code numbers and some physical data. The tendency in this case was to omit a majority of these items unless they were identified at least generically by the supplier or unless the use of the material was so significant that it could not be ignored in a discussion of the subject matter.

Title	Location	Edition / Series / Misc.
821 Powder Coating: A Practical Guide to Equipment, Processes and Productivity at a Profit		Edition:
Author: Cowley, Mike	Dynix: 99421	Series: Wiley/SITA Series in Surface Coatings Technology [Volume 2: Powder Coatings]
Publish.: John Wiley & Sons - SITA Technology Limited	Call No.: 667.9 Co	
- place: Chichester, [West Sussex], UK	ISBN: 0471979007	
- date: ©1999	Shelf Adult Non-Fiction	Year: 1999
Subject: Plastic coating		Price: \$78.50
Desc: vii, 222 p., illus., 24 cm.		

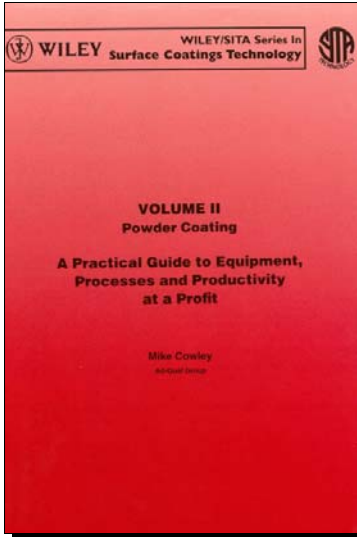


Table of Contents

Chapter I: INTRODUCTION
 History
 Why use powder coatings
 The powder coating application process

Chapter II: ASSESSMENT OF THE COMPONENT BEING COATED
 - Designing the component for coating
 Sharp edges
 Welds
 Crimping
 Rolled edges
 Holes for bolts and screws
 Threads
 Components with moving parts
 Allowing for coating thickness
 - The substrate
 Metals
 Ferrous metals
 Non-ferrous metals
 Galvanised components
 Zinc-plated ferrous components
 Glass
 Plastics
 Wood
 - Adhesion
 Wetting contact theory
 Mechanical adhesion
 Chemical adhesion
 - Handling of components
 During pre-treatment
 After pre-treatment
 During application Conveyor loading
 Cleaning of hooks and jigs
 Incineration or pyrolysis
 Fluidised bed cleaning
 Chemical stripping
 Mechanical stripping
 Masking

Chapter III: PRE-TREATMENT
 - Why pre-treat
 Removing contamination
 - Methods of pre-treatment
 Wipe cleaning Mechanical pie-treatment
 Brushing
 Abrasive pads
 Shot or grit blasting
 Chemical cleaning
 Vapour degreasing
 Conveyorised tunnel systems
 Ultrasonic cleaning

Subjects

235 .	Coating processes
295 .	Plastic coating
538 .	Plastic powders

- Spray cleaning
- Power-wash cleaning
- Steam cleaning
- Alternative cleaning materials
 - Corrosion
- Conversion coatings
- Phosphating
- Passivation of phosphate layers
- Combined cleaning and conversion
- Chromate conversion coatings
- Effluent treatment
 - Other pre-treatments
- Phosphoric acid phosphating
- Pigmented etch primers
- Primer coating powders
- Electrophoretic primers

CHAPTER IV: POWDER COATING APPLICATION

- The choice
- Why coat
- What substrate
- How many items
- What is the specification?
- How thick?
- What colours
- Production factors
- Processing costs
- What will the equipment cost
- The final choice
 - Fluidised bed coating
- Fluidised bed equipment
- Water quenching
- Post-heating and curing
 - Conveyorised fluidised bed coating
 - Electrostatic spraying
- The theory of electrostatic powder coating
- Corona charging
- Tribocharging
- Manual electrostatic application
- Powder feed systems
- Fluidised bed hopper
- Box units
- Injectors and venturis
- Electrostatic powder spray guns
 - Conveyorised electrostatic fluidised bed coating
 - Flock spraying - with electrostatic spray guns
 - Automatic electrostatic spraying equipment
- Air-assisted spray guns — corona charging
- Automatic air-assisted atomisers — tribocharging
- Powder bells
- Powder discs
 - Automatic applicators

Chapter V: POWDER SPRAY BOOTHS

- Health and safety
- Materials of construction
- Design
- Cleaning
- Selection of spray booth type
- Manual booths
- Automatic booths
 - Colour change
 - Change in polymer type
 - The importance of transfer efficiency

- Powder recovery
- Cyclone recovery Filters
- Cartridge filter systems
- Powder recycling

Chapter VI: HEATING, MELTING AND CURING SYSTEMS

- Temperature, time and flow out
- Box ovens
- Conveyorised ovens
- Convection ovens
- Radiation heating
- Infrared ovens for pre-heating
- Other types of oven
- Induction heating
- Ultraviolet curing
- Electron beam curing

Chapter VII: POWDER COATING versus LIQUID PAINT

- Cost
- Raw materials
- Processing costs
- Stoving, melting and curing costs
- Equipment and other costs
- Quality
- Health, safety and the environment

Chapter VIII: POWDER COATING IN PRACTICE

- Metals
- Glass
- Wood
- MDF
- Plastics
- Other materials
- Rubber
- Textiles
- Food products

Chapter IX: MANAGING QUALITY

- Control of quality in powder coating
- The FMECA technique
- Auditing quality
- Statistical process control
- Adopting a quality assurance culture

Chapter X: TESTING OF POWDER COATINGS

- Introduction
- Evaluation of coating powder
- Tests during and after coating
- Coating thickness assessment of electron statically applied powders before heating and curing
- Colour
- Gloss
- Dry film thickness
- Test panels
- Adhesion
- Cure
- Flexibility
- Troubleshooting and other quality issues
- Air quality
- Troubleshooting

Appendix I: HEALTH AND SAFETY AND ENVIRONMENTAL REFERENCES

- General
- COSHH
- Safety of electrostatic equipment and powder application

Standards relating to application and testing

Appendix II: TABLES AND FORMULAE

Appendix III: GLOSSARY

Appendix IV: FURTHER READING

Index

Reviews - Synopsis - Dust Jacket

This volume offers a practical and detailed guide to powder coating equipment and its operation. It enables the reader to improve the efficiency and quality of powder coating processes.

Target Audience: Anyone with an interest in the equipment and processes used in powder coating.

Note: Powder Coatings, Volume I: The Technology, Formulation and Application of Powder Coatings is a companion volume to this title.

INTRODUCTION

This book describes the techniques used industrially to apply organic coating powders to an ever-increasing range of products in order to decorate and protect them.

Coating powders consist of a mixture of polymers, pigments and other components, each chosen to provide the properties required by the end user. The basic idea is that if the surface of a component can be coated with the powder and then heated, the powder is able to melt and flow out to form a continuous coating.

Powder coating is essentially a very simple process. Changes to the process are only required if customers and users ask for special properties, or if there is a conflict between productivity and the cost of the finished article.

We will be looking in detail at this simple process and will leave further refinement to be developed case by case to meet specific needs. Innovation and development of the process can radically affect the basic process, and the results have to be continuously examined in order to improve it and make powder coating a success.

As with any fairly new technology, you will probably hear lots of theories put forward about applying and using powder coatings, but these are best left to the boffins. Hands-on experience combined with basic practical knowledge, are quite enough to meet the needs of most powder coaters.

The success of using coating powders is really a matter of keeping it simple and getting the basic principles right.

HISTORY

Powder coating has not been around for very long, the first patents being granted on the fluidised bed coating technique in the mid-1950s, so we are speaking about a technology that is barely half a century old. There had been some earlier attempts to perfect the 'flame spraying' of thermoplastic powders, and applying thermoplastics by the fluidised bed approach is still one of the simplest and easiest powder coating techniques available.

The more advanced electrostatic coating techniques are even younger and new ideas are coming along all the time. Electrostatic powder coating was first used industrially in the late 50s or early 60s.

Looking back at the ways paint can be applied, it took a very long time to move from the brush to the spray gun and almost another 50 years to the development of the electrostatic atomiser. No one should imagine that the move to powder coating is going to be any quicker.

Coating powders will not suddenly take over and make liquid paint obsolete. Each process has its good and its bad points and coating powders and powder coatings have plenty of each. New techniques are being developed all the time and these will push both coating methods into new areas of technology in the future.

Who knows what the next fifty or hundred years will bring?

So why use coating powders?

Powder coating is usually thought of as a one-coat process, but this is less and less true as higher coating specifications are demanded.

The general advantages of powder coating are economic and environmental.

Its economic advantages are:

- energy saving
- reduced labour costs
- less wastage

The relative importance of each of these is different to different companies and depends on their own individual priorities.

From the environmental point of view, the absence of organic solvents has to be a winner. When this is coupled with reduction in waste it certainly goes a long way towards counterbalancing any potential disadvantages that powder coating may be felt to have.

In practical terms these are as follows:

- It can be difficult to change colour or coating powder type.
- The choice of colour and finish is somewhat restricted.
- Unless a multi-coat system is used it is not easy to obtain corrosion resistance at moderate cost.
- There is a limit to the minimum film weight that can be applied, and there is also some difficulty in maintaining consistent coating thickness, and matters are not helped when there are wide variations within the component itself.
- The high temperatures needed during processing can be a nuisance.

The advantages and disadvantages of powder coating will vary in importance from one user to another, for instance colour change may not be a problem to one applicator and coating thickness control may be absolutely vital to another, and so on.

THE POWDER APPLICATION PROCESS

At its simplest, the component to be coated is merely heated and dipped into a thermoplastic powder. The powder melts on to its surface, and if the component remains hot enough the powder will continue to flow out into a uniform film. Once this has happened the application process can be regarded as complete.

A great deal has been written about coating powders and their formulation. A choice of specific polymers and pigments can be made to provide a surface appearance, or finish, that will be acceptable to the end user.

Polymers are either thermoplastic (retaining their ability to melt when heated) or thermosetting (curing to a form that will not soften or melt when re-heated), but in either case it is essential for them to be able to melt and develop film-forming properties during the application process. It is clear that to produce a coating from the powder first requires the application of heat to melt the powder into a film, followed by some method of curing it if the polymer is the thermosetting type.

Looking into the future, the most critical powder coating processes are yet to be fully commercialised and will increasingly call for special powders with low curing temperature. Powders can also be envisaged that will cure by altogether different methods. Such processes are needed particularly for powder coating heat sensitive substrates such as plastics.

A coating for this purpose might for example be applied and then melted using medium-wave infrared radiation, and finally cured by ultraviolet or a similar technique, with no danger of distorting or altering the structure of the substrate.

Heat sensitive materials require ingenuity and a fresh outlook to bring these ideas together to make the solution commercially viable.

There is more to successful powder coating than may be obvious at first sight, and other processes will also have a beneficial effect on the final film.

The processes involved are more than just a matter of applying the coating powder. At the outset the person planning the work will need to:

- Have a careful look at the design of the component and what it is made of, and hence its suitability for coating.
- Decide on the type of coating powder that would be most suitable to give the performance required.
- Consider how the component can be held in position during coating and, if necessary, masked.
- Assess what kind of pre-treatment should be carried out before coating.
- Choose the method of application.
- Define the standard of quality required and what process controls are needed to achieve it.
- Ensure that heat required before or after coating, depending on the method used, falls within the coating powder manufacturer's specification.

Title	Location	Edition / Series / Misc.
761 Powder Coatings Author: Jilek, Josef H. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1991 Subject: Powder coatings Desc: 35 p., illus., 28 cm.	Dynix: 55947-18 Call No.: 667.9 Fe ISBN: 0934010374 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS18 Year: 1991 Price: \$50.00



Table of Contents

- I. INTRODUCTION
 - A. General
 - B. Areas of Application
 - C. Commercial Aspects
- II. MANUFACTURE OF POWDER COATINGS
 - A. General
 - B. Premixing Operation
 - C. Melt Mixing (Extruding)
 - D. Pulverization
 - E. Quality Control
- III. APPLICATION OF POWDER COATINGS
 - A. General
 - 1. Surface Cleaning
 - 2. Surface Pretreatment
 - B. Fluidized Bed
 - C. Electrostatic Fluidized Bed
 - D. Electrostatic Spray
 - E. Triboelectric Spray
- IV. RAW MATERIALS FOR POWDER COATINGS
 - A. Thermoplastic Resins
 - 1. Polyolefins
 - 2. Polyvinylchloride
 - 3. Polyamides
 - 4. Miscellaneous
 - B. Thermosetting Resins
 - 1. Epoxy Resins
 - 2. Epoxy Novolac Resins
 - 3. Miscellaneous Epoxy Resins
 - 4. Polyester Resins
 - 5. Acrylic Resins
 - C. Curing Agents
 - 1. Curing Agents for Epoxy Resins
 - 2. Curing Agents for Polyester Resins
 - 3. Curing Agents for Acrylic Resins
 - D. Pigments and Fillers
 - 1. Inorganic Pigments
 - 2. Organic Pigments
 - 3. Fillers
 - E. Additives
 - 1. Catalysts
 - 2. Flow Control Additives
 - 3. Benzoin
 - 4. Special Effect Additives
- V. STARTING FORMULATIONS
 - A. General
 - B. Decorative Interior Applications
 - 1. Epoxy

Subjects

320 . Powder coatings

2. Epoxy-Polyester
 3. Low Temperature Cure Systems
 4. Low Gloss Epoxy and Epoxy-Polyester Systems
 - C. Decorative Exterior Applications
 1. Polyester-TGIC System
 2. Polyester-Polyurethane System
 3. Polyester-Hydroxyalkyl Amide System
 - D. Functional Applications
 1. Pipe Coating
 2. Corrugated Metal Coating
 3. Chemical Resistant Coating
- VI. TESTING OF POWDER COATINGS
- A. Testing of Raw Materials
 - B. Testing During Production
 - C. Testing of the Finished Powder Coating
 - D. Testing of the Cured Powder Coating
- VII. SUMMARY
- A. Advantages and Limitations
 - B. Toxicity and Hazards
 - C. Future Outlook and Challenges
- VIII. REFERENCES
- IX. BIBLIOGRAPHY
- X. APPENDIX
- A. Glossary of Terms
 - B. Acknowledgments

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

A. General

The coatings industry has recognized the need and desirability to reduce energy consumption and solvent emission for many years. This led to the development of several new coating technologies which differed in their composition, application method, and curing mechanism from their traditional solvent-based counterparts. Examples are the development of novel epoxy resins for cathodic electrodeposition paints, the utilization of acrylated urethanes and epoxies in radiation curable coatings, and the production of oligomers with a narrow molecular weight distribution for high solid coatings.

Powder coatings, i.e., coatings made entirely from solid components, are also the result of this endeavor, although one of the first patents of a fluidized bed application was granted as early as 1955 in Germany. The powder coatings of those days were relatively simple compared to today and consisted mainly of powdered thermoplastic polymers, like plasticized PVC or nylon. Later, thermosetting, i.e., heat curable, powder coatings based on epoxy resins were developed which broadened the range of available materials but the application of the powders remained largely limited to the fluidized bed method. It was not until the early 1960s that the development of the electrostatic spray process provided the necessary breakthrough to make powder coatings a commercially viable alternative to conventional, liquid coatings.

It took another 20 years for thermosetting powder coatings to be established and to gain acceptance in the industry. During those years, significant improvements were made not only in the choice of raw materials like resins and hardeners, but also in the quality of equipment. This led to totally automated coating booths, providing more uniform powder delivery and application.

Today, thermosetting powder coatings are a rapidly growing, albeit small segment, of the industrial coatings market and their future is exceptionally bright. This is due to the fact that powder coatings are dry paints. They are 100% solid systems containing no solvents, thus little or no volatiles are given off during manufacture, application, and cure. Furthermore, the powder coatings process is predestined to be used in a fully automated fashion and little is wasted during application. Excess or oversprayed material can easily be recovered and recycled and rejects on the coating line are relatively few. Finally, high film thicknesses of up to 500 microns can be achieved in a single application and the resultant coatings exhibit excellent film properties. Overall, powder coatings offer an almost pollution free and highly

economical way to coat a wide variety of metal substrates for either a decorative or functional purpose.

B. Areas of Application

There are, generally speaking, two broad areas of application of powder coatings — decorative applications and functional applications. The majority of powder coatings are used for decorative applications, i.e., those applications where the coating serves an aesthetic purpose and where color, gloss, and appearance are of prime importance. There is, obviously, also a protective purpose in decorative applications but the major reason for coating articles like microwave ovens and other household appliances, fire extinguishers, tool handles, and garden furniture is to make them look more appealing to the consumer.

In contrast to this, functional applications serve almost entirely one purpose, namely protection of the coated object from the environment. In most cases, this means that the substrate, which is mainly steel, has to be protected from corrosion. Examples are the inside and outside coating of steel pipelines transporting oil or gas and the coating of reinforcing steel bars in concrete constructions such as bridge decks.

For the proper choice of the resin system to be used for any particular application, it is important to know whether the object to be coated is going to be exposed to the outside environment and whether the coating requires exterior durability. For many decorative coatings, this is indeed the case and, therefore, epoxy resins are normally not used since epoxies chalk upon exposure to UV light. Polyesters or acrylates are much better suited in those areas where exterior durability is required.

For functional applications, however, it is almost always an epoxy system that is chosen and, although chalking leads to surface degradation, this does not affect the protective properties in any significant way since film thicknesses are high enough. Furthermore, functional coatings are normally not exposed to UV radiation.

Another difference between these two broad areas of applications lies in the film thickness of the applied coating. Decorative coatings usually have film thicknesses of less than 100 microns, whereas functional coatings have film thicknesses of more than 100 microns. Thus, decorative coatings are usually applied onto cold substrates and functional coatings are often applied onto preheated substrates.

C. Commercial Aspects

Worldwide in 1990, the total thermosetting powder coating production was estimated to have been around 290,000 tons. Table 1 details this production according to the four major geographical regions: Europe, North America, Far East and the rest of the world.

The worldwide production according to resin type can be split up as follows:

Epoxy	25%
Epoxy/Polyester	40%
Polyester/TGIC	15%
Polyurethane	15%
Acrylic	5%

There are significant differences between the various regions in the use of resins types. Table 2 shows the production of powder coatings according to resin type for each of the four geographic regions.

The most significant differences between the regions lie in their respective uses of epoxy/polyester hybrids, acrylics, and polyurethanes. The Far East, primarily Japan, is the only region that uses acrylics to any significant degree. Europe, on the other hand, has a very large consumption of hybrid powders, whereas North America uses polyurethanes for many applications. The rest of the world is also using a large amount of hybrids, probably due to the fact that many European powder manufacturers have overseas subsidiaries. Epoxies, being the oldest available systems, still have a large share in these regions.

In Europe, 95% of the produced powder coatings are for decorative applications and functional powders have only a small, but growing market share. The only region where functional powder coatings have a significant share of the market is North America where they constitute about 25% of the total powder production.

The market share of powder coatings represents about 5% by weight of the total industrial coatings produced in the world and it is expected that this figure should double in the next decade. Powder coatings will thus continue to play an important part in the field of coatings technology.

Table 1 — Estimated 1990 Worldwide Powder Coating Production

Region	Powder Production (Metric Tons)
Europe	145,000
North America	65,000
Far East	50,000
Rest of the world	30,000
Total	290,000

Table 2 — Worldwide Production of Powder Coating Based on Resin Type

	Europe	North America	Far East	All Others
Epoxy	20%	30%	25%	35%
Epoxy/Polyester	50%	20%	35%	45%
Polyester/TGIC	20%	20%	10%	15%
Polyurethane	10%	30%	20%	5%
Acrylic	—	—	10%	—

Title	Location	Edition / Series / Misc.
136 Powder Coatings Technology		<i>Edition:</i>
<i>Author:</i> Ranney, Maurice William, 1934-	<i>Dynix:</i> 13012	<i>Series:</i> Chemical Technology Review: No. 45
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 667.9 Ra	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815505647	
<i>- date:</i> ©1975	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1975
<i>Subject:</i> Coating processes -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> xii, 426 p., illus., 28 cm.		

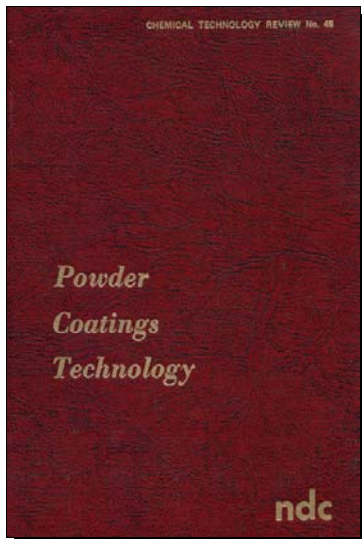


Table of Contents

INTRODUCTION

PART I. COATING COMPOSITIONS

EPOXY

- Compositions and Blends
- Polyepoxide Carbocyclic Diamine Compositions
- Condensation Products of a Terminal Di-vic-Epoxy and a Dihydric Phenol
- Cycloaliphatic Acetal Polyepoxide-Dicarboxylic Acid Reaction Product
- Chlorine-Containing Polyester for Flame Resistant Resin
- Phenolic Modified
- Thermoplastic Resin Blends
- Polyvinyl Acetal and Polyacrylate Compositions
- Polyvinyl Acetal, Silica and BF Complex
- Low Temperature Film Former
- Filled Epoxy Resin
- Coal Tar Pitch
- Addition of Silica to Prevent Sagging
- Thickened Resin
- Bonding Agents
- Curing Agents
- Hydroxypyridines
- Rapid Curing Flexible System Using Stannous Octoate
- Metal Salt-Carboxylic Compounds as Cocatalysts
- Polyol-Trimellitic Anhydride Adducts and Triphenylphosphine
- Fatty Guanamines
- Aminoaryl Phosphates
- Amine Curing Agents
- Dicyclohexyl Tertiary Amines
- Extra-Coordinate Silicon Complex
- Powdering-Techniques
- High Density Grinding Media
- Rubber Mill Blending
- Rubber Mill Blending and Dicyandiamide Curing Agent

POLYOLE FINS

- Primers and Surface Treatment
- Heated Substrate with Vacuum Treatment
- High Density Polyethylene Primer
- Carboxylated Polyethylene Resin and Vinyl Butyral Primer
- Polyvinyl Acetal Primer Coated by Flame Spraying
- Chlorinated Polyethylene on Epoxy Primer
- Chromium Trioxide Surface Treatment
- Copolymers
- Ethylene-Maleic Anhydride Copolymers
- Graft Copolymers of Polypropylene and Acrylic Acid
- Graft Copolymers of Polyethylene and Acrylic Acid
- General Processes
- Polyethylene and Peroxide Blends
- Polyethylene Powder Technique
- Addition of Lecithin
- Pretreatment of Powder with Aminophenol

Subjects

236 .	Coating processes -- Patents
290 .	Patents -- United States
296 .	Plastic coating -- Patents
456 .	Powders -- Patents

Amine Modified Clays

VINYL, ACRYLICS AND FLUOROCARBON RESINS

- Vinyl Chloride Resins
- Blends of Homopolymers
- Mixtures of Vinyl Resins
- Plasticized Vinyl Compounds
- Blends with Ethylene-Ethyl Acrylate Copolymers
- Vinyl Resin-Epoxy Fatty Acid Composition
- Solvent Vapor Technique
- Primers and Control of Film Thickness
- Acrylic-Epoxy Based Primer
- Polyvinyl Chloride Plasticized with Tricresyl Phosphate to Improve Conductivity
- Epoxy Primer
- Metal Salts as Bonding Agents
- Reduction of Sandiness
- Acrylics
- Spray Drying Techniques for Powders
- Vapor Coalescence
- Fluorocarbon Resins
- Mixtures of Vinylidene Fluoride and Tetrafluoroethylene Resins
- Polyesters as Fusion Aids for Polyvinylidene Fluoride
- Arsenic Compounds for Metal Pretreatment
- Chromic Acid Treatment
- Electroplate Pretreatment
- Thermosetting Coatings for Fluorocarbon Resins
- Laminates

POLYESTERS, POLYURETHANES AND POLYAMIDES

- Polyesters
- Polyester Resin and an Alkoxylated Polyamine-Aldehyde Resin
- Reaction Product with Cross-Linking Resins
- Heat Treatment of Amorphous Polyester Coating Compositions
- Filled Polyester Cured with Pyromellitic Acid and Anhydride
- Blends of Amorphous Polyesters
- Diallyl Phthalate Prepolymer and Unsaturated Polyester
- Composition for Glass Fiber Mats
- Oxybenzoyl Polyesters
- Polyurethanes
- Caprolactam-Blocked Polyisocyanates
- Extended Pot-Life
- Polyamides
- Styrene-Butadiene Primer
- Aromatic Polyamides
- Polyimide Prepolymers

OTHER COATINGS AND ADHESIVE PROCESSES

- Cellulose Acetate Butyrate
- Solvent Vapor Fusion
- Metallic Flake Finish
- Cellulose Acetate
- Oxymethylene Resins
- Treatment of Aluminum Substrate
- Polyvinyl Acetal Primer
- Thermally Decomposable Primer
- Other Coatings
- Arylene Sulfide Polymers
- Poly(Biphenylene Sulfide) Coating for Polyimides
- Shellac
- Polyelectrolyte Complex Resins
- Silanes as Binders for Zinc Dust
- Polylactones
- Multiple Layer Coatings
- Glass Fiber Thermoplastic Sheets

- Adhesives
Application of Powdered Adhesives
Honeycomb Cores
Adhesive Coated Encapsulated Particle
Patterned Adhesives
Adhesive Coated Ferrite Magnets

PART II. INDUSTRIAL APPLICATIONS AND COATING TECHNIQUES

ELECTRICAL COMPONENTS

- Stator and Armature Units
Plurality of Separated Material Streams
Coating Narrow Slots Using Two-Step Process
Distribution of Coating in Two-Step Process
Automatic Processing
Spray Device Employing Direction Regulator
Rotational Technique
High Speed Process
Rotation of Stator
Shutter Type Mask
Unaerated Bed
Holding and Masking Fixture
Masking Post to Fit Base of Stator
Hermetically Sealed Core Boxes
Mica-Filled Epoxy
Iron Oxide Filled Resin
Glass Fiber Filled Epoxy
Epoxy Resin with Polyester Topcoat
Thixotropic Impregnants Applied Prior to Coating
Vitreous Beads
Preformed Electric Coil
- Electrical Conduit Fittings
Masking Technique
Severing Device
- Wire Coating
Continuous Process
Induction Heating
Oxybenzoyl Polyester Coating
High Dielectric Enamel
- Lamps and Television Tubes
Coated Electric Lamps
Powder Dispensing Apparatus for Light Bulb Coating
Lamp Bases
Phosphor Coatings for Television Picture Tubes
Color Picture Tube
Flash Cube Assembly System
Sealed Beam Lamps
- Other Electrical Applications
Conformal Coating
Printed Circuit Board—Magnetic Memories
Arc Interrupting Apparatus
Distribution Transformers
Ceramic Capacitors
Battery Separator
Resistor Coatings
Nonblocking Electrical Tape

PIPE COATING

- Spray and Pouring Techniques
Initial Wet Barrier Coating for Large Diameter Pipe
Rotational Coating
Centrifugal Rotation
Tilted Position
Study of Spray Pattern Efficiency

Coating of Welding Seam
Continuous Coating Process for Tubing
Controlled Cooling
Spray Nozzle for Continuous Coating of Interior and Exterior Surfaces
Spray Nozzle for Interior Coating
Hollow Beads and Asphalt
Asphalt Composition
Mastic Coating
Masking Technique
Electrostatic Spray
Air Seal Structure
- Fluidized Bed
Differential Pressure Using Air Pervious Liner
Polyethylene
Polyethylene and Nylon
Continuous Process
Coating Plant
Agitation Device and Spacer Unit
Coating Apparatus with Rotational Agitation
Internal Cooling
Low Temperature Process
Induction Heating
Electrostatic Fluidized Bed

GLASS, METALS AND OTHER APPLICATIONS

- Glass Containers and Articles
Esters of Hydrolyzed Ethylene-Vinyl Acetate Copolymers
Ethylene-Acrylic Acid Copolymer
Cellular Expanded Polystyrene Beads
Ion Exchange Technique for Strengthening Glass
Internal Coatings for Aerosol Containers
Vacuum Bottle
Capillary Tube for Blood Sedimentation Tests
High Energy Radiation
- Metal Container and Strip Coating
Pigmented Side Striping of Can Bodies
Preconditioning of Container
Rotational Process for Drum Coating
Steel Shipping Containers
Water Storage Tanks
Dishwasher Tubs
Strip Coating
Brush Roll Assembly for Metal Strip Coating
Heated Mandrel for Foil Coating
Feed and Bed Control in Metal Coating
- Metal Fasteners
Fluidizing Chamber with Controlled Air Pulsations
Nylon Locking Patch
Binding Screw with Insulated Head
Elastomeric Sealing Compounds
- Other Applications
Bowling Pin
Epoxy Coated Seawater Valve Balls
File Hanger Rods
Pressure Differential Apparatus
Foamable Liner for Crown Caps
Powder Asphalt
Interior Coating for Polyolefin Bottles
Oxidized Polyethylene Coated Plywood
Hot Gas Spray Unit for Building Products
Ion Exchange Membrane
Reflectorized Coating of Glass Beads
Porous Cellular Structures

GENERAL POWDER COATING PROCESSES
- Fluidized Bed
Basic Fluidized Bed Processes
Fluidized Bed Apparatus
Self-Supporting Bed
Rotation of Article in Bed
Differential Heating of Panel
Application to External Surface
Circulating Unit
Auxiliary Agitation
Fluidizing Column
Continuous Flow of Particles
Two-Zone Bed with Inclined Grid
Coating and Oven Installation
Subambient Temperature Coating
Air Masking Device
Holding Devices
Vacuum Activated Supporting Device
General Techniques
Foam Preparation
- Spray Techniques and Powder
Heated Flat Cloud-Like Spray Pattern
Laminar Flow Powder Gun
Jet Pulverizer Unit
Dust Cloud Generator
Spray Coating
Dispenser Unit
Low Temperature Substrate
Vacuum Coating Technique
- Powder Preparation
Solid Solvents for Thermoplastics
Double Shelled Foamable Powders
Controlled Cyclic Movement of Particles for Particle Coating
Coated Solid Pellets
Spray Drying
- Electrostatic—Spray Techniques
Spray Gun
Nozzle Design
Rotary Discharge Device
Multilayer Process
Heated Article
Electrostatic Powder Fixing Device
Multilayer Coatings
- Electrostatic—Fluidized Bed
Stationary Fluidized Bed
Electrode Design
Addition of Barium Titanate to Increase Efficiency
Powder Hopper

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents since the early 1960s relating to powder coatings technology of all types.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of modern powder coating processes.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is

more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas to research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring our new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION

Since the early fifties, when Edwin Gemmer developed the fluidized bed process in Germany and its introduction into the United States in 1956 by Polymer Corporation, powder coating has been a subject of considerable interest and commercial viability. In 1973, approximately 30 million pounds of powder coatings were consumed and the market for the early 1980's is expected to exceed 250 million pounds, accounting ultimately for 10 to 15% of the coatings market.

These all solids systems eliminate the cost of shipping, storing, handling and the energy required for evaporation of conventional coatings. Capital equipment costs are considerably lower than for solvent based formulations and the air pollution and fire protection facilities required are minimized. These are some of the major factors responsible for the growth of powder coating during the past 15 years and its application to a myriad of uses.

The leading applications continue to be pipe, miscellaneous metal coating, metal shelving and furniture. Electrical parts, wire goods and appliances account for about 25% of the powder coatings market. In the next few years, it is expected that glass containers and automotive bodies will exceed the other powder uses. Other applications include farm and garden equipment, recreational products and coil coating.

In the United States, there are currently over twenty producers of commercially available powder coatings. Epoxy and polyester thermoset coatings are the leading materials, with PVC, polyethylene and cellulose acetate butyrate predominating among the thermoplastic powders. Nylon and polypropylene will be increasingly used as primerless formulations affording good metal adhesion. Acrylics, while currently small in volume, are logical contenders for automotive coatings and are undergoing extensive testing by the major auto manufacturers.

Fluid bed coating continues to consume over 50% of the coating powders. The largest single use for powder in America is for coating the outside of oil and gas transmission pipe, using fluid bed techniques. Electrostatic spray techniques, at times combined with fluid bed technology have made the most significant advances in the past few years. Over 100 large, automated electrostatic spray lines were installed this year. A line of 14 automatic machines has recently been installed for coating fluorescent lighting fixtures with polyester powder.

New spray techniques include charging all the particles as they flow through an ionizing chamber in the gun, thus eliminating all electrostatic field lines between the gun and the part to be coated. A high-intensity arc is used in another type of gun to heat a gas to a plasma that melts powder particles as they are blown from the gun. Originally developed for applying polytetrafluoroethylene powders, this plasma gun can now be used with many common low melting plastics.

This book described over 270 processes involving several hundred powder coating formulations, application techniques and end-use opportunities. Based on the U.S. patent literature over the past 15 years, this book provides a most comprehensive treatment of this exciting and growing technology.

The reader's attention is drawn to a related publication: *New Curing Techniques in the Printing, Coating and Plastics Industries*, Park Ridge, New Jersey, Noyes Data Corporation (1973).

Title	Location	Edition / Series / Misc.
137 Practical Guide to Plastics Applications		<i>Edition:</i>
<i>Author:</i> Crosby, Edward G. and Stephen N. Kochis	<i>Dynix:</i> 34104	<i>Series:</i> Cahner's Practical Plastics Series
<i>Publish.:</i> Cahners Books	<i>Call No.:</i> 668.4 Cr	
<i>- place:</i> Boston, MA	<i>ISBN:</i> 0843612053	
<i>- date:</i> [1972]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1972
<i>Subject:</i> Plastics		<i>Price:</i> \$25.00
<i>Desc:</i> xiv, 191 p., illus., 24 cm.		

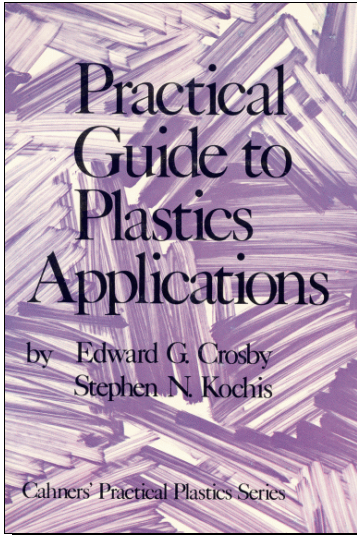


Table of Contents

Preface
 Acknowledgment
 1 What Are Plastics?
 2 Thermosetting Plastics
 3 Thermoplastics
 4 Molding of Thermosetting Plastics
 5 Injection Molding of Thermoplastics
 6 Principles of Mold Design
 7 Other Plastics Processes
 8 Molded Product Design
 9 Laminated Plastics
 10 Machining and Fabricating of Thermoplastics
 11 Testing
 Glossary of Terms Common to the Plastics Industry
 Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The present rate of advance in the plastics industry is paralleled by an increase in problems due to the lack of personnel with the practical know-how to transform raw materials into finished products.

This book shows how to convert text book technology into workable production methods and provides the understanding of materials necessary to determine the best use of the appropriate plastics in product design.

It gives answers for product designers, manufacturing engineers, mold designers and industry suppliers regarding plastics materials — their limitations, strengths and physical, electrical and chemical properties. Charts show which materials are best for which techniques.

Special problems are met with specific suggestions based on the authors' experience and their close association with custom molders, materials suppliers and equipment manufacturers. In one section, for example, defects in molded parts are categorized and five or six possible adjustments to eliminate each fault are offered.

Practical information and guidelines are given for thermoplastic and thermosetting materials, design of molds and parts, machining of thermoplastics and laminated plastics and other processes.

Comprehensive definitions of materials and processes are supplemented by a useful glossary of terms common to the industry.

PREFACE:

The use of plastics has been increasing at a rapid rate. The need to know the advantages and disadvantages of the use and application of plastics is important.

This book is written for the use of product designers, manufacturing engineers, mold designers, students, and others interested in broadening their knowledge of these materials. Users of plastics who need information will find in this book data that has been accumulated over the years through actual experience in the plastics industry.

Engineers and designers will find here useful information on various plastics materials, their limitations, and outstanding features; also their physical, electrical, and chemical properties. To design and produce plastics products, engineers must understand the best features of the material so that the result may be a quality product at a minimum cost. In various chapters of the book, the words plastic product and plastic part can be interpreted as being synonymous. This

Subjects

304 . Plastics

book will also serve as a reference in re solving manufacturing problems, material change, redesign of existing parts, and new parts release.

The authors intend to convey to the reader knowledge gained through years of experience in the hopes that it will assist in making his job easier and stimulate him to create and manufacture new products. The many wonderful features of plastics present a challenge to the ingenuity of the individual.

According to the dictionary, the adjective plastic is commonly defined to mean "capable of being molded or modeled." Used as a noun, often in the plural as in this book, plastics refers to "a substance that at some stage in its manufacture or processing can be shaped by flow (as by application of heat or pressure) with or without fillers, plasticizers, reinforcing agents, or other compounding ingredients and that can retain the new solid, often rigid, shape under conditions of use." In other words, plastics applies to items that are mostly rigid but whose base materials were moldable or formable.

The first recognized commercial plastics was developed in 1868 by Mr. John Wesley Hyatt, who was looking for a replacement material for making billiard balls. This first material, called Celluloid, was cellulose nitrate and highly flammable. However, many items were produced from this material, including umbrella handles, collars, and toys.

Dr. Leo Baekland in 1909 developed a new thermoset plastics combining phenol and formaldehyde. This first phenolic material, called Bakelite, was used in many early computer machines. To this day, there are part prints still in existence calling out this name and the plastics material. Over the next thirty-three years, materials like cellulose acetate, polyvinyl, styrene, polyethylene, and polyester were developed for commercial use.

Shortage of materials like aluminum, steel, and copper during World War II demanded the use of other materials. Use of plastics at this time increased tremendously. The government became the largest user, especially in aircraft applications. The use of plastics today is still growing at a rapid rate. Predictions are that plastics will become the largest materials industry, even outstripping steel, before the year 2000.

How can sound technical knowledge be converted into a reliable plastics product? To successfully complete such a transition requires the complete coordination and efficient teamwork of all functions involved, namely those performed by the manufacturing engineer, the quality control man, the buyer, the product designer, the estimator, the operators, and the parts scheduler.

How can all of these areas, each with its own responsibility, be effective in jointly achieving the desired result, the plastics product? How it is done is not uniquely different from making any other commodity which goes through such steps as, for example, castings and machine to blueprint. However, since the plastics industry deals with a product that falls into more of a "black-magic" category than a truly scientific category, more emphasis must be placed on specific areas of responsibility.

To answer the questions previously asked, following is one method of operation, most certainly not the only way, used successfully by at least one large company to obtain that goal of a reliable plastics product. Perhaps this chapter will shed some light on why jobs and their challenges exist in the plastics industry.

Earlier, teamwork was mentioned. Why should this be considered so important? Since a manufacturer conforms to defined operating procedures and controls for same, it would be wonderful if all facets of a manufacturing environment could operate with 100% efficiency. Among the reasons that they do not are the circumstances that equipment breaks down, manufacturing and engineering changes are made to parts, schedules are changed, suppliers miss shipment, parts are scrapped or reworked because of poor quality, or tooling must be modified.

How does teamwork help the situation when a supplier misses or anticipates missing a scheduled shipment? First of all, consider the reasons why this could happen. The probable causes are tooling problems, process and control problems, or poor quality control in the supplier's area.

Without question, the supplier should notify his customer's buyer or purchasing agent of his inability to deliver on schedule and describe the circumstance involved. It is apparent that the areas of responsibility affected, besides purchasing, are manufacturing engineering (plastics engineer) and quality control (supplier quality engineer). Communication between the areas should be immediate and a meeting scheduled for proper analysis of the problem. It may be decided that a phone call to the supplier, offering specific suggestions, may be adequate. Usually, though, this easy solution is not the case. An on-site review of the situation is now in order. This allows for a firsthand analysis and hopefully the problem can be solved quickly. Such a support effort differs from company to company.

Many claim it is expensive to transport qualified people to and from the supplier's site and that being away from home is too much of an inconvenience to the individual. They are right. However, the net gain of having good quality parts now, thereby avoiding a delay in dispatching a product otherwise ready for shipping, far outweighs the previously mentioned disadvantages.

How can teamwork ensure that a potential supplier of plastics parts will indeed be capable of producing them to the customer's requirements? Again, the areas of responsibility involved should be purchasing, manufacturing engineering, and quality control. When a custom molder requests to be considered as a source of plastics parts, a team composed of the three responsible areas in the prospective customer's plant should survey his shop.

When an inspection of the facilities is completed and the appropriate questions have been asked, the team is in a position to make comments and decisions within its responsibility as to whether the supplier is approved or not. A potential supplier may be well qualified in one area but weak or inadequate in the others. He may be quite willing to improve his weak areas to the level required, in which case another evaluation should be performed when he has done so. The results of actual team evaluations have proven to be most beneficial to the corporation and the method has been appreciated by the supplier.

How can in-house manufacturing benefit from this teamwork approach? The team in this instance consists of manufacturing engineering, product design, manufacturing personnel (operators, technician, toolmaker, and materials handlers) and sample/part inspection quality control.

When a mold for a new plastics part is completed and ready to run, the following happens: Manufacturing personnel assume that adequate and proper material is available, that the mold is set up properly, and that process parameters are correct. All this is done with adequate and accurate input from manufacturing engineering (plastics engineer). Sample molds are inspected by quality control. If deviations exist, a review by product design and manufacturing engineering is conducted to determine whether to correct or accept. If correlations in the mold are necessary, the mold designer modifies the tool drawings and the toolmaker makes the required changes; and the cycle is repeated until a good quality reliable plastics part is produced. There is no doubt that this requires good two-way communication and teamwork.

Earlier it was mentioned that in the plastics industry perhaps more emphasis is required in certain areas of responsibility than in other industries. In the previously discussed examples of teamwork, manufacturing engineering was a common denominator, but so was quality control. Simply, where does the overall total manufacturing responsibility for the plastics product lie? The answer is with the plastics engineer (manufacturing engineer). This statement is in no way intended to play down the role of all the other functions involved and the fact that each is a most important part of the team. The following paragraphs will point out why the statement can in fact be made.

Just what is a plastics engineer responsible for and how can he effectively perform his duties as they relate to the successful manufacture of a plastics part or product?

To start with, the part design must be suitable for plastics. Tolerance, thicknesses, strength, and application all must be considered at the design stage. The plastics engineer, with his knowledge of plastics materials properties, process capabilities, tooling, and cost is called upon to review the part design with the product designer. He can offer suggestions for ribbing, tolerance, thickness, and materials selection appropriate for the end product. The decision also may be made not to produce the part from plastics because of part function. Assuming that the part will be of plastics, the design should exploit those inherent characteristics of the material which, as evaluated by the product designer and the plastics engineer, are most applicable in a given case.

The plastics engineer now makes final material selection, reviews potential production quantities to determine exact process and number of cavities required, develops parts cost estimate and type of mold to use, and mold cost. A mold design is the next required step. The engineer should furnish to the mold designer all pertinent information such as shrinkage factor to use, number of cavities, type and placement of gates and runners, parting lines, type of mold, type and placement of ejectors, and all other necessary details. The designer is then responsible for producing a clear, legible, understandable, accurate design. The design should be reviewed periodically by the engineer during its progress to assure functional reliability. Upon completion of the design, the toolmakers take over and proceed to produce the mold from the design. During the design and build cycle, constructive ideas may be offered by the designer and toolmaker which should be considered carefully for possible inclusion in the mold. In some cases, new ideas cannot be included because of the possibility of missing the delivery schedule, increased cost, or the engineer's personal experience that says, "it doesn't work."

When the mold is completed, it is sampled and the process and process controls established. The engineer must define the upper and lower process parameters that yield a good quality part. Variations of mold temperatures, screw speed, back pressure, cylinder temperature, preform temperatures, clamp pressure, injection/transfer pressure, closing speed, inject time, hold time, mold release, and any combination of these factors must be tried to determine the proper procedure to use. Of course, there is literature available to supply guidelines and years of practical experience help to minimize the number of combinations that have to be tried before being successful.

Once the part is in production, the plastics engineer's work is not done. He is the one who troubleshoots and takes corrective action. He is responsible for seeing that proper costs are maintained. Accurate documentation is required to

provide an adequate history. All points discussed are the plastic engineer's responsibility whether the parts are manufactured in-house or by vendors.

Much has been written about the "exploding plastics business," "the expanding plastics industry," and "the potential of plastics," in the next decade. All of this is most probably true and a great comfort to those of us currently in the plastics field. However, increased problems will arise also, mainly due to the lack of people technically capable of transforming the raw material into the finished part. Much is to be offered, besides financial gain, to those who have the interest and desire to work in this field. It is a challenge, and the rewards are self-satisfaction upon accomplishment, opportunity for furthering technology development and for personal development in many directions.

It is certainly challenging and self-satisfying to maintain tolerances not thought practical or possible with a manufacturing process containing so many variables.

It is certainly technological advancement to take plastics materials and produce manufactured items formerly thought not feasible, or to improve or develop a method in design, tooling, or process.

Self-development comes from being equally at ease when dealing with either thermosets or thermoplastics, not to mention the personal reputation and relationships that develop throughout the plastics industry.

The need is there and will continue to be there for the technically qualified people in the plastics field. For those who recognize this void and take advantage of the opportunity, the rewards will be more than adequate.

Title	Location	Edition / Series / Misc.
138 Practical Process Research & Development		Edition:
Author: Anderson, Neal G.	Dynix: 88637	Series:
Publish.: Academic Press	Call No.: 660.282 An	
- place: San Diego, CA	ISBN: 0120594757	Year: 2000
- date: ©2000	Shelf Adult Non-Fiction	Price: \$89.95
Subject: Chemical processes		
Desc: xxiii, 354 p., illus., 24 cm.		

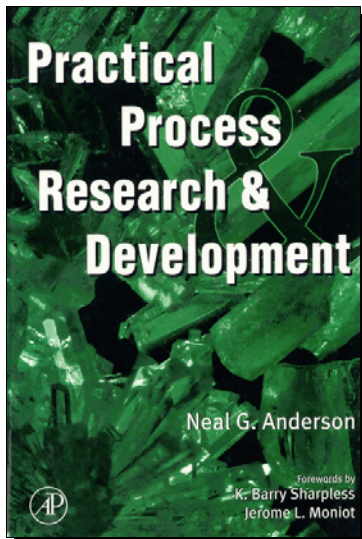


Table of Contents

1. Approaches to Process Development
2. Route Selection
3. Reagent Selection
4. Solvent Selection
5. Running the Reaction
6. Effects of Water
7. In-Process Controls
8. Optimizing the Reaction by Minimizing Impurities
9. Optimizing Catalytic Reactions
10. Work-up
11. Tools for Purifying the Product: Column Chromatography, Crystallization, and Reslurrying
12. Final Product Form and Impurity Considerations
13. Vessels and Mixing
14. Preparing for and Implementing the Scale-up Run
15. Troubleshooting
16. Chiral Synthesis

General Index
Reaction Type Index
Reagent Index

Subjects

226 .	Chemical processes
349 .	Chemical engineering
429 .	Chemical processes -- Design

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Practical Process Research & Development teaches how to anticipate and avoid these problems when processes are being scaled up from the research lab or pilot plant. The approach is pragmatic, with a minimum of theory and over 100 practical scale-up tips. Many tables and detailed reaction schemes allow the reader to identify critical processing steps quickly. This practical guide is essential reading for chemists and chemical engineers involved in industrial process research and/or process development and for anyone seeking a clearer understanding of how and why process R&D is conducted in the pharmaceutical and fine chemicals industries.

Key Features:

Provides insights into generating rugged, practical, cost-effective processes for the chemical preparation of "small molecules"

Breaks down process optimization into route, reagent, and solvent selection, development of reaction conditions, workup, crystallizations, and more

Describes how to anticipate and avoid difficulties in scaling up reactions . Discusses guidelines for the timely development of processes . Illuminates principles with examples from the recent literature . Includes over 100 tips for rapid process development

Presents guidelines for implementing and troubleshooting processes

Written by an author with over 22 years of experience in process R&D in the pharmaceutical industry

FORWARD:

The key role of process chemistry and process development in the economic success of the large-scale preparation of

fine chemicals and the manufacture of pharmaceuticals in particular has frequently been underappreciated. In the pharmaceutical industry at large, organic chemists are employed in the discovery process to determine which molecules to make and also in the development/manufacturing role to determine how to make those selected molecules. Although organic chemistry is the common denominator in these functions, the discovery chemist is additionally focused on the biological activity and novel aspects of the compounds, while the development/manufacturing chemists are focused primarily on the practicality and elegance of the process to manufacture the compounds. The approaches to the use of organic chemistry may differ, but the goals of both groups of chemists are the same, namely, to enhance human life through new and effective medicines.

The evolution of a manufacturing process for an active pharmaceutical ingredient has several distinct phases of development. Beginning with the discovery or selection of the target molecule, the development of a practical route to full evaluation of toxicological and pharmacologic attributes is undertaken. Once the route is defined, initial scale-up development and the transition to process equipment proceed, followed by process optimization and refinement for manufacturing operations for each synthetic step through pilot trials.

Effective process development is an amalgam of synthetic organic methodology, physicochemical properties, purification technologies, chemical engineering principles, and practical mechanics orchestrated with a view toward safety, product quality, reproducibility, ruggedness, and cost efficiency. The simple translation of a description of a laboratory synthetic process into the series of sequential unit operations required to replicate the procedure in process equipment reveals the complexity involved. The numbers and sizes of vessels (head tanks for reagents, reactors, distillate receivers, phase splitting vessels, filtrate hold tanks, crystallizers, etc.), as well as the numbers and types of filtration devices, product drying equipment, transfer lines, pumps, and valves, all need to be selected for chemical compatibility and operational suitability. These determinations are frequently the focus of laboratory experimentation and safety hazard studies and involve close interactions with chemical engineers.

One development concern that is not immediately intuitive to laboratory-based organic chemists beginning development work is the effect of physical size on the progress and eventual outcome of an organic reaction, beyond those obvious effects due to the length of time required for operations. An example is surface addition of a reaction component. The design of a laboratory experiment to determine the effect of adding a reagent at the surface of a large-scale reaction is challenging. Rather than a few inches of mixture separating the surface of the reaction from the agitation device, the 6- to 12-foot separation in a mid-sized process vessel can lead to troublesome mixing gradients and localized stoichiometric imbalances (hot spots). As the text highlights, mixing is critical to the successful execution of an organic reaction and requires that process chemists and engineers work together closely to minimize difficulties with this aspect of process scale-up during development.

As Dr. Anderson points out, a key to many a successful process is the careful integration of physical phenomena, such as insolubility, preferential solvent phase distribution, and volatility, with control rates of desirable reactions or the rates of undesirable side reactions.

One of the thrusts of synthetic chemistry that distinguishes process development work is the emphasis on the postreaction workup and purification/isolation aspects of a process. Isolated intermediates must necessarily be filterable solids, and the tolerance of the chosen purification methods for impurities in the solution will have a profound effect on both yield and quality of the product.

Dr. Anderson has produced a very insightful and informative book for a process development team in pursuit of their ultimate goal. That goal can be summarized as the definition of a process that is characterized as being high throughput, safe, reproducible, and rugged and one in which a minimum number of different solvents are used to carry out the maximum amount of synthetic construction in the shortest amount of time, with the highest isolated yield of high-quality product, for the lowest cost per kilogram.

Dr. Anderson's text ably highlights many of the interrelations of the key facets of the development process, along with many practical reference tables to facilitate parameter selections for evaluation.

Title	Location	Edition / Series / Misc.
925 Prediction of Polymer Properties Author: Bicerano, Jozef, 1952- Publish.: Marcel Dekker, Inc. - place: New York, NY - date: ©2002 Subject: Polymers Desc: xviii, 756 p., [4] p. of plates, illus. (some color), 27 cm.	Dynix: 105717 Call No.: 668.9 Bi ISBN: 0824708210 Shelf Adult Non-Fiction	Edition: 3rd edition, Revised and expanded Series: Plastics Engineering: No. 65 Year: 2002 Price: \$168.50

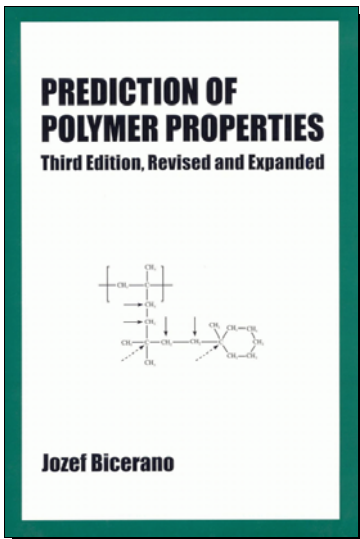


Table of Contents

Preface
 Acknowledgements

Chapter 1. Introduction
 A. Properties of polymers
 B. Group contribution techniques
 1. Basic technique
 2. An extension
 C. Topological technique
 1. Topology and geometry
 2. Graph theory and connectivity indices
 3. Nature and scope of the new approach
 D. Interconversion between mole, weight and volume fractions
 E. Outline of the remaining chapters of this book
 References and notes for Chapter 1

Chapter 2. Topological Method for Structure-Property Correlations
 A. Review of connectivity index calculations for simple molecules
 B. Extension of connectivity index calculations to polymers
 C. General forms of the correlations in terms of connectivity indices
 D. Backbone and side group portions of the connectivity indices
 E. Shortest path across the backbone of a polymeric repeat unit
 F. Extensions for the calculation of some conformation-related properties
 References and notes for Chapter 2

Chapter 3. Volumetric Properties
 A. Background information
 1. Definitions and phenomenology
 2. Simple empirical relationships
 3. Synopsis of further treatment of volumetric properties
 B. Correlation for the van der Waals volume
 1. Development of the correlation
 2. Nature of the correction terms used in the correlations
 3. Examples of the predictive use of the correlation
 C. Correlation for the molar volume at room temperature
 D. Final equations for temperature dependences of volumetric properties
 1. Introductory remarks
 2. Polymers with $T_g > 298K$
 3. Polymers with $T_g < 298K$
 E. Pressure-volume-temperature relationships
 F. Effects of crystallinity
 References and notes for Chapter 3

Chapter 4. Thermodynamic Properties
 A. Background information
 1. Thermophysical properties
 2. Thermodynamic properties
 3. Heat capacity
 B. Improvements in the ability to predict the heat capacities of polymers
 C. Rotational degrees of freedom of the backbone and the side groups
 D. Correlation for the heat capacity of "solid" polymers at room temperature

Subjects

313 . Polymers

- E. Correlation for the heat capacity of "liquid" polymers at room temperature
 - F. Correlation for the change in the heat capacity at the glass transition
 - G. Equations for thermodynamic properties as functions of temperature
- References and notes for Chapter 4

Chapter 5. Cohesive Energy and Solubility Parameter

- A. Background information
 - 1. Cohesive energy
 - 2. Components of the cohesive energy
 - 3. Solubility parameter
 - 4. Components of the solubility parameter
 - 5. Improvements in the ability to predict the cohesive energies and solubility parameters of polymers
 - B. Correlation for the Fedors-type cohesive energy
 - C. Correlation for the van Krevelen-type cohesive energy
 - D. Solubility parameter calculations
 - E. Correlation for dispersion component of the molar attraction constant
- References and notes for Chapter 5

Chapter 6. Transition and Relaxation Temperatures

- A. Background information
 - 1. Operational definition of the glass transition
 - 2. Practical importance and common methods for measurement of T_g
 - 3. Key physical aspects of the glass transition
 - 4. Fundamental theoretical considerations concerning the glass transition
 - 5. Quantitative structure-property relationships for T_g
 - 6. Detailed simulations of the glass transition
 - 7. Comprehensive list of factors determining T_g
 - 8. Outline of remainder of this chapter
- B. Correlation for the glass transition temperature
 - 1. Outline
 - 2. The structural parameters
 - 3. The correlation
- C. Effects of number-average molecular weight
- D. Effects of plasticization
- E. Effects of crosslinking
 - 1. A correlation
 - 2. Other developments
- F. Effects of tacticity
- G. Secondary relaxations
- H. Crystalline melting temperature
 - 1. Homopolymers
 - 2. Copolymers and crosslinked polymers
- I. T_m/T_g as indicator of intrinsic crystallizability
- J. Roles of T_g and T_m in determining the crystallization kinetics
 - 1. Introductory remarks
 - 2. Overall rate for isothermal crystallization
 - 3. Overall rate for non-isothermal crystallization
 - 4. Nucleation
 - 5. Isothermal crystal growth rate from existing nuclei

References and notes for Chapter 6

Chapter 7. Surface Tension and Interfacial Tension

- A. Surface tension
 - 1. Total surface tension
 - 2. Components of surface tension
 - B. Interfacial tension
 - C. Adhesion
 - D. Improvements in the ability to predict surface tension and interfacial tension
 - E. Approximate "master curve" as a function of reduced temperature
 - F. Correlation for the molar parachor
 - G. Frontiers of interfacial modeling
- References and notes for Chapter 7

Chapter 8. Optical Properties

- A. Background information
 - 1. Types of optical properties
 - 2. Refractive index and molar refraction
 - 3. Optical losses
 - 4. Stress-optic coefficient
 - B. Improvements in the ability to predict the refractive indices of polymers
 - C. Correlation for the refractive index at room temperature
 - D. Example of application: specific refractive index increments of solutions
 - E. Calculation of the molar refraction
- References and notes for Chapter 8

Chapter 9. Electrical Properties

- A. Background information
 - B. Correlation for the dielectric constant at room temperature
 - C. Calculation of the molar polarization
 - D. Calculation of the effective dipole moment
 - E. Dissipation factor
 - F. Dielectric strength
- References and notes for Chapter 9

Chapter 10. Magnetic Properties

- A. Background information
 - B. Correlation for the molar diamagnetic susceptibility
- References and notes for Chapter 10

Chapter 11. Mechanical Properties

- A. Stress-strain behavior of polymers
 - B. Small-strain behavior: moduli, compliances, and Poisson's ratio
 - 1. Definitions and phenomenology
 - 2. Structure-property relationships for glassy polymers
 - a. Introductory remarks
 - b. Correlations by Seitz for the elastic moduli
 - c. Bulk modulus via molar Rao function
 - d. Shear modulus via molar Hartmann function
 - e. Thermosets
 - 3. Structure-property relationships for rubbery polymers
 - a. Shear modulus
 - b. Bulk modulus and Young's modulus
 - 4. Effects of anisotropy (orientation)
 - C. Large-strain behavior: failure mechanisms
 - 1. Phenomenology
 - a. General mechanisms
 - b. Toughening by incorporating another phase
 - 2. Structure-property relationships for the brittle fracture stress
 - 3. Structure-property relationships for the yield stress of thermoplastics
 - 4. Attempts to model rate dependence of yield stress of thermoplastics
 - 5. Structure-property relationships for the crazing stress
 - 6. Stress-strain curves of elastomers
 - 7. Ductile thermoplastics at large extension ratios
 - 8. Thermoset resins
 - a. General observations
 - b. Yield stress
 - c. Fracture toughness
 - d. Residual stresses
 - 9. Effects of anisotropy (orientation)
 - D. Creep, stress relaxation, fatigue and durability
 - E. Improvements in the ability to predict the mechanical properties
- References and notes for Chapter 11

Chapter 12. Properties of Polymers in Dilute Solutions

- A. Background information
 - 1. General considerations
 - 2. Steric hindrance parameter
 - 3. Characteristic ratio

- 4. Persistence length
 - 5. Radius of gyration
 - 6. Statistical chain (Kuhn) segment length
 - 7. Intrinsic viscosity under theta conditions
 - 8. Intrinsic viscosity away from theta conditions
 - 9. Solution viscosity at small but finite concentrations
 - B. Correlation for the steric hindrance parameter
 - 1. Definitions of the fitting variables
 - 2. Development of the correlation
 - C. Calculation of the characteristic ratio
 - D. Correlation for the molar stiffness function
- References and notes for Chapter 12

Chapter 13. Shear Viscosity

- A. Definitions and general considerations
 - B. Dependence of melt zero-shear viscosity on average molecular weight
 - 1. Dependence on critical molecular weight
 - 2. A correlation for the critical molecular weight
 - 3. Alternative correlation for critical molecular weight
 - C. Dependence of melt zero-shear viscosity on temperature
 - 1. General relationships
 - 2. Estimation of E_n without using group contributions
 - D. Dependence of melt zero-shear viscosity on hydrostatic pressure
 - E. Melt zero-shear viscosity: summary, examples and possible refinements
 - F. Combined effects of shear rate and polydispersity on melt viscosity
 - G. Zero-shear viscosity of concentrated polymer solutions
 - H. Shear viscosity of dispersions of solid particles in fluids
- References and notes for Chapter 13

Chapter 14. Thermal Conductivity and Thermal Diffusivity

- A. Background information
 - 1. Definition and general considerations
 - 2. Temperature dependence of the thermal conductivities of amorphous polymers
 - 3. Thermal conductivities of amorphous polymers at room temperature
 - 4. Improvements in the ability to predict the thermal conductivities of polymers
 - B. Direct correlation for the thermal conductivity at room temperature
- References and notes for Chapter 14

Chapter 15. Transport of Small Penetrant Molecules

- A. Background information
 - 1. Definitions and major industrial applications
 - 2. The solution-diffusion mechanism
 - 3. Theories, simulations and empirical correlations
 - B. Correlations for the permeability at room temperature
- References and notes for Chapter 15

Chapter 16. Thermal Stability

- A. Background information
 - 1. Definitions
 - 2. Measurement of thermal and thermooxidative stability
 - 3. Mechanisms of weight loss during degradation
 - 4. Effects of structure on thermal and thermooxidative stability
 - a. Qualitative summary of trends
 - b. Reactive molecular dynamics simulations
 - c. Quantitative structure-property relationships
 - B. Correlation for the molar thermal decomposition function
- References and notes for Chapter 16

Chapter 17. Extensions, Generalizations, Shortcuts, and Possible Directions for Future Work

- A. Introduction
- B. Examples of designer correlations
 - 1. Glass transition temperatures of a family of polyimides
 - 2. Glass transition temperatures of polyesters
 - 3. Fedors-type cohesive energies of hydrocarbon polymers

- 4. Glass transition temperatures of hydrogenated styrenic polymers
 - C. Combination of new correlations and group contributions
 - 1. Calculation of group contributions from the new correlations
 - 2. Combined use of new correlations and group contributions
 - D. Calculation of the properties of alternating copolymers
 - E. Calculation of the properties of random copolymers
 - F. A software package implementing the key correlations
 - G. Utilization to provide input parameters for other types of methods
 - H. Possible directions for future work
- References and notes for Chapter 17

Chapter 18. Detailed Examples

- A. Introductory remarks
- B. Polystyrene
- C. Random copolymers of styrene and oxytrimethylene

Chapter 19. Morphologies of Multiphase Materials

- A. Materials and morphologies
- B. Interplay between thermodynamic and kinetic factors
- C. Prediction of morphologies
 - 1. Introductory remarks
 - 2. Methods and examples of their use
 - 3. Common themes

References and notes for Chapter 19

Chapter 20. Properties of Multiphase Materials

- A. General considerations
- B. Analytical expressions
 - 1. Thermoelastic properties
 - 2. Transport properties
- C. Numerical simulations
 - 1. Thermoelastic and transport properties
 - 2. Mechanical properties under large deformation
 - a. Overview of various methods
 - b. Understanding the influence of interfaces via simulations

References and notes for Chapter 20

Glossary: Symbols and Abbreviations

- A. Terms starting with a lower-case letter of the Latin alphabet
- B. Terms starting with a capital letter of the Latin alphabet
- C. Terms starting with a lower-case letter of the Greek alphabet
- D. Terms starting with a capital letter of the Greek alphabet

Appendix: Repeat Unit Molecular Weights

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

about the third edition...

This newly revised and updated reference features the latest breakthroughs in the methodology of predicting polymer properties and its potential application to a wider variety of polymer types than previously thought possible — highlighting especially a broad range of new topics at the frontiers of multi-scale modeling and methods for anticipating the morphologies and the properties of interfaces and multiphase materials.

A comprehensive source for the predictive modeling of polymers.

The Third Edition features new material on interplay between thermodynamic and kinetic factors in multiphase materials...analytical and numerical methods for predicting thermoelastic and transport properties of multiphase materials...mechanical properties under large deformation...and influence of interfaces via simulations, and presents updated treatments of backbone and side group portions of the connectivity indices...final equations for temperature dependences of volumetric and thermodynamic properties...pressure-volume-temperature relationships...crystallization and the effects of crystallinity...effects of crosslinking and orientation...properties of polymers in dilute solutions...optical properties...and solubility parameters.

PREFACE

The efficient design of new polymers for many technological applications requires the prediction of the properties of candidate polymers and the use of these predictions to evaluate, screen, and help prioritize the synthesis of these candidates. The solution of these problems often requires significant extensions of existing quantitative structure-property relationships. In particular, the candidate polymers for advanced "high-tech" applications requiring outstanding performance characteristics often contain exotic structural units for which the simple additive (group contribution) techniques cannot be applied. Some of the required group contributions to the physical properties are often not available, and there are no experimental data to use in estimating these missing group contributions. This limitation is inherent to group contribution methods and unavoidable in applying such methods to truly novel types of structures.

This difficulty was overcome in 1989 by developing a method in which many properties are expressed in terms of topological variables (connectivity indices) combined with geometrical variables and/or other structural descriptors used to obtain refined correlations. The remaining properties are calculated from relationships that express them in terms of the properties being calculated by using the topological variables. This method enabled the prediction of the properties of all polymers of interest, without being limited by the absence of the group contributions for the structural fragments from which a polymeric repeat unit is built. It was equivalent to the prediction of the properties by the summation of additive contributions mainly over atoms and bonds instead of groups. The values of these atom and bond contributions were dependent on the environment of each atom and bond in a particularly simple relationship.

The relationships developed in this work therefore enabled their users to transcend the limitations of traditional group contribution techniques in predicting the properties of polymers. Our work owed much, however, to the solid foundation of earlier quantitative structure-property relationships in polymers, developed over many decades by the meticulous efforts of many researchers. In particular, much of the information provided in D. W. van Krevelen's classic textbook, *Properties of Polymers* (whose third and last edition was published by Elsevier, Amsterdam, in 1990), was extremely valuable in our work.

The new methodology was tested extensively in practical work at The Dow Chemical Company. It was found to be able to predict the properties of novel polymers as accurately and reliably as can be reasonably expected from any scheme based on simple quantitative structure-property relationships. The only computational hardware required to perform these calculations is a good hand calculator. The method was, nonetheless, automated by implementation in a simple interactive computer program (SYNTHIA). This software implementation has enabled its much easier use, especially by non-specialists. It has thus resulted in much greater efficiency as well as significantly reducing the possibility of human error.

The use of this computer program involves simply drawing the structure(s) of the repeat unit(s), specifying the calculation temperature (and also the mole fractions or weight fractions of the repeat units for copolymers), and asking the program for the predicted values of the properties. In addition, this program allows the user to obtain graphs of many of the predicted properties as a function of the temperature; and, for copolymers, also as a function of the composition. This computer program is available from Accelrys, Inc., in San Diego, California, USA, to which it has been licensed for commercialization by Dow.

At the core of this book is the new scheme of quantitative structure-property relationships developed in the course of the author's work, as summarized above. However, as described below, the book has evolved significantly since its first edition was published a decade ago.

The first edition (1993) was essentially a research monograph describing the new method. It was written mainly to help scientists and engineers working on applied problems in polymer science and technology in the chemical and plastics industries. Secondary objectives included providing detailed information that could serve as starting points for fundamental research on polymer properties, as well as serving as an auxiliary textbook to help teach students at both the undergraduate and graduate levels how to calculate the industrially important properties of polymers. A highly empirical approach was used throughout the first edition. Fundamental considerations were often deliberately not addressed in detail, to avoid lengthy digressions from the main theme and the very practical focus of the research monograph.

The commercial successes of both the book and the SYNTHIA software program, as well as the positive feedback which the author received directly from many readers of the book and many users of the software, provided the encouragement needed to develop first the revised and expanded second edition of the book (1996), and now this completely revised third edition.

Some of the revisions in each new edition are direct improvements and/or extensions of the methods developed earlier to predict the physical properties of polymers. Other revisions consist of more detailed background information and discussion on the topics covered by the book, including extensive tabulations of additional experimental data and literature references. Some revisions involve mainly the reorganization of the material discussed in a given chapter in a

manner which may facilitate comprehension. Revisions and extensions were made to increase the utility of the book as a research monograph presenting a new method to calculate polymer properties, while also making it much more self-contained to encourage its extensive use as both a general reference and a textbook. The third edition takes a major step forward in the expansion of the breadth of the scope of the book. While still keeping simple quantitative structure-property relationships for amorphous polymers at its core, it now also covers a broad range of topics at the frontiers of polymer modeling. These "frontier" areas include multi-scale modeling, and methods for predicting the morphologies and the properties of interfaces and of multiphase materials. It is hoped that, especially with its significant expansion in scientific scope to cover state-of-the-art methods based on fundamental physics, readers will find this third edition useful in their work as a far more comprehensive resource for the predictive modeling of polymers than the previous two editions.

Title	Location	Edition / Series / Misc.
139 Prepaint Specialties and Surface Tolerant Coatings		<i>Edition:</i>
<i>Author:</i> Flick, Ernest W.	<i>Dynix:</i> 09716	<i>Series:</i>
<i>Publish.:</i> Noyes Publications	<i>Call No.:</i> 667.9 FI	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815512732	
<i>- date:</i> ©1991	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1991
<i>Subject:</i> Primers (Coating)		<i>Price:</i> \$25.00
<i>Desc:</i> xxvi, 614 p., 25 cm.		

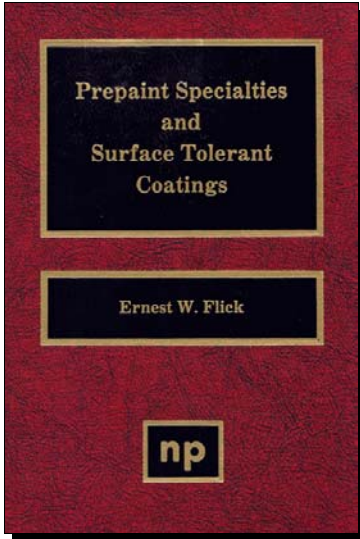


Table of Contents

- PRODUCT INFORMATION
- Abatron, Inc.
- Advanced Materials
- Allied-Kelite Division
- Alvin Products, Inc.
- Ameron
- Bartlett Chemicals, Inc.
- Beck Chemicals, Inc.
- Berlage
- Big Three Industries, Inc.
- M. A. Bruder & Sons., Inc.
- Samuel Cabot Inc.
- Calbar Inc.
- California Chemical Co.
- California Products Corp.
- Carboline
- Coatings/Composites
- Composition Materials Co., Inc.
- Crest Industrial Chemicals, Inc.
- Crown Industrial Products Co., Inc.
- DAP Inc.
- James B. Day & Co.
- Detrex Corp.
- Devoe Coatings Co.
- Dolphin Paint & Chemical Co.
- DuPont Maintenance Finishes
- Dutch Boy Paints
- Flame Control Coatings, Inc.
- The Flood Co.
- The Glidden Co.
- Insl-X Products Corp.
- Intex Chemical, Inc.
- Jones-Blair Co.
- Kop-Coat, Inc.
- Lion Oil Co.
- Loctite Corp.
- LPS Laboratories, Inc.
- Mantrose-Haeuser Co.
- McGean-Rohco, Inc.
- Metelbrite Products Corp.
- Mohawk Finishing Products, Inc.
- Benjamin Moore & Co.
- National Solvent Corp.
- The Naval Jelly Co.
- Ocean Coatings
- Peterson Chemical Corp.
- Phillip Brothers Chemicals, Inc.
- Poly-Carb
- PPG Industries, Inc.
- Randolph Products Co.
- Red Devil, Inc.

Subjects

239 .	Coatings
321 .	Primers (Coating)
324 .	Protective coatings
412 .	Sealing compounds

Red Spot Paint & Varnish Co., Inc.
Rust-Oleum Corp.
Stan Sax Corp.
Sentry Chemical Co.
The Sherwin Williams Co.
Somay Products, Inc.
Steelcote Manufacturing Co.
Sterling-Clark-Lurton Corp.
Sunnyside Corp.
3M Co.
Titan Laboratories
Tnemec Co., Inc.
United Solvents of America, Inc.
U. S. Polychemical Corp.
WCC Industries Inc.
Wisconsin Protective Coatings Corp.
Xymax Inc.

SUPPLIERS' ADDRESSES
TRADE NAME INDEX
PRODUCT TYPE INDEX

Reviews - Synopsis - Dust Jacket

Preface

This book describes more than 1500 currently available prepaint specialties and surface tolerant coatings. It has been compiled from information received from 67 manufacturers and distributors of these products.

Specialty prepaint products and surface tolerant coatings make up a small, but growing segment of the paint and coatings industry. These products are particularly attractive to the do-it-yourself market and to small contractors. They also find use in the marine and transportation industries, and in the refinishing market.

The products described in the book may, for example, prepare the surface for paint, thin the paint, allow painting over rusted areas, or provide quick and easy clean-up. They may be fillers, sealers, rust preventives, galvanizers, caulks, grouts, glazes, phosphatizers, corrosion inhibitors, neutralizers, graffiti removers, floor surfacers, etc. Substrates involved can be wood, metal, masonry, or asphalt. In some cases a specific product is described, in others a "treatment" involving a specific company's products may be indicated.

The data included represent selections from manufacturers' descriptions, in the manufacturer's own words, made at no cost to, nor influence from, the makers or distributors of the materials. Only the most recent information has been included. It is believed that all of the products listed here are currently available, which will be of interest to readers concerned with product discontinuances.

The book lists the following product information, as available, in the manufacturer's own words:

- (1) Company name and product category,
- (2) Trade name and product number,
- (3) Product description including specifications, properties and applications, as presented by the supplier.

Products are presented by company, and the companies are listed alphabetically.

Also included in the book are a Trade Name Index and a Product Type Index, for easy and rapid location of products by the reader. In addition, another section, which will be useful, contains Suppliers' Addresses. It can be found immediately following the Product Information section.

My fullest appreciation is expressed to the companies and organizations which supplied the data included in the book.

Title	Location	Edition / Series / Misc.
926 Preparative Methods of Polymer Chemistry		Edition: 3rd edition
Author: Sorenson, Wayne R. (Richard), Fred (Wilfred) Sweeny and Tod W. Ca	Dynix: 105716	Series: Wiley-Interscience Publication
Publish.: John Wiley & Sons	Call No.: 547 So	
- place: New York, NY	ISBN: 0471589926	
- date: ©2001	Shelf Adult Non-Fiction	Year: 2001
Subject: Polymers		Price: \$73.50
Desc: xvi, 488 p., illus., 24 cm.		

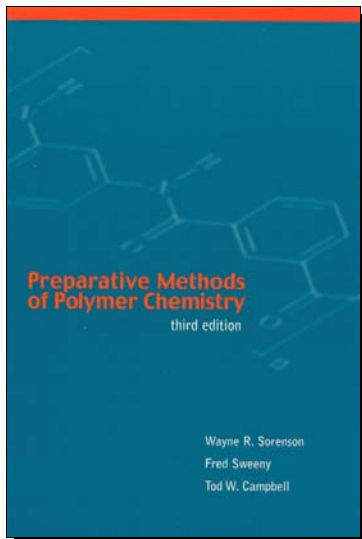


Table of Contents

Preface
 Preface to the Second Edition
 Preface to the First Edition

Chapter 1: Polymerization and Characterization of Polymers
 Chapter 2: Preparation, Fabrication, and Characterization of Polymers
 Chapter 3: Advanced Processing
 Chapter 4: Polyamides, Ureas, Urethanes, and Other Amide-Linked Polymers
 Chapter 5: Polyesters, Polycarbonates, and Polyurethanes
 Chapter 6: High-Temperature and High-Performance Polymers
 Chapter 7: Solid-Phase Polymerization
 Chapter 8: Ring-Opening Polymerization
 Chapter 9: Addition Polymerization
 Chapter 10: Elastomers for Fabrics
 Chapter 11: Synthetic Resins and Composites
 Chapter 12: Nonclassical Routes to Polymers

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The long-awaited Third Edition of the classic in polymer synthesis

Thirty years ago, the Second Edition of Preparative Methods of Polymer Chemistry further established its reputation as the laboratory bible for polymer synthesis. The last three decades have witnessed a deeper understanding of the principles involved in preparing and processing polymers, leading to tremendous advances in polymer synthesis. Guiding practicing scientists through the methods of synthesizing polymers, the Third Edition retains theory and vital protocols, while revising and updating the sections on synthesis, fabrication techniques, and characterization methods.

Delving into the physical and chemical aspects of polymer processing, each chapter includes a discussion of the relevant background and principles, enabling the scientist to apply synthetic techniques intelligently. The Third Edition also contains sections on current topics such as:

- Extended-chain polymer technology
- High-temperature and high-performance polymers
- Carbon fibers
- Electrically conductive polymers
- Group-transfer polymerization
- Composites

"Preparative Methods of Polymer Chemistry", Third Edition provides essential information for both students and practicing polymer scientists.

PREFACE:

Polymer chemistry has grown rapidly in the last 40 years, and world production of polymeric materials, including plastics, rubber, paint and adhesives, to more than 100 million tons per year. Key advances include polymers with strength and stiffness four to five times that of steel on a weight basis, electrical conductivity approaching that of copper, and broad structural functionality at low density in the area of composites.

Since the last edition of this book (1968), we have witnessed tremendous advances in the chemistry of polymer synthesis from new intermediates and new fabrication techniques (e.g., gel spinning combined with extreme polymer

Subjects

313 .	Polymers
402 .	Polymerization

chain extension, air-gap fiber spinning, and solid-state extrusion). These improvements have not occurred by chance but from development of a deeper understanding of the principles involved in preparing and processing polymers.

The intent of this book is to provide the organic chemist with tried and true methods of making specific polymers. Its intended audience is students, both undergraduate and graduate, and practicing chemists whose work involves or portends the need (1) to synthesize polymers and (2) to characterize them. The latter, as we approach the subject here, involves those first steps required to ascertain the basic properties of the polymer under study. It should be possible to gain enough insight to guide the experimenter in making course corrections in synthetic strategy or perhaps even in continuing the project. We also provide a chapter titled "Advanced Processing," which goes more deeply into the physical and chemical aspects of polymer processing. The reason for this is that in today's world of polymer research, especially in industry, no researcher is likely to want, or to be allowed, to confine his or her work solely to synthesis. The wishes of the individual and the prevailing forces of the work place are likely to put the researcher into the processing environment to follow-up the laboratory work on a polymer problem.

Each chapter on synthesis includes a discussion of the background and principles relating to polymers of that general type. This should enable the chemist to apply the synthesis technology intelligently and to make desired changes without loss of molecular weight or functionality. Regarding experimental strategy, the chemist should ask questions such as: What is my goal? Do I understand the mechanism of the reaction? What do I have to do to ensure the purity of my reactants? What are the best conditions for the reaction? Are any catalysts suggested from related simple organic reactions? What possible side-reactions do I have to be alert to? How do I minimize these? Are the reactants and polymer stable under the chosen conditions? Do I need a solvent? Might the solvent react? Is it a good solvent for the polymer product? Are moisture or oxygen deleterious to the reactants? What do the structural aspects of the polymer suggest about processing problems and conditions?

The book includes polymers and technologies from previous editions, because they encompass many important commercial polymers. Updated technology has been particularly expanded and includes new polymer types, processing technologies and characterization methods. We apologize in advance for any omissions.

Regarding polymer science, it is fair to say that the discipline is at a stage at which polymer application is being stressed at the expense of seeking new knowledge and new concepts. Advances may be expected in the so called specialty polymers (i.e., polymers designed for a particular end use or function). Specific examples include engineering plastics with superior mechanical properties and thermal resistance, liquid-crystalline polyarylates, polymer alloys, conductive polymers, advanced composites for aerospace use from high-modulus carbon fiber, and toughened thermosets or thermoplastic polyimides. To optimize these high-performance materials requires precise control of the polymer structure at the molecular, macromolecular and supra molecular levels. In the instances of polymers from olefins and diene, emphasis is on new catalysts which can more precisely control properties, less so on variations in monomer structures.

Regarding fibers, close to theoretical tensile modulus has been achieved in some polymers by efficient chain alignment, but fiber-breaking strength remains at less than 10% of theoretical, based on C—C single chain bond breakage. Reducing defect level and increasing the percentage of load-bearing chains will be required for further improvements. Advances should also be expected in the electrical and optical properties of polymers and their use in the rapidly expanding electronic and telecommunication industries.

We wish to note here and throughout this edition a general statement about the safe handling of chemicals and the safe execution of laboratory procedures. While this will be understood by, and will have become an article of belief to, chemical professionals and students of chemistry and chemical engineering, it is wiser, we believe, to be repetitious than ommissive in the following: All properly trained chemists and chemical engineers understand that many of the materials they work with, often routinely, are inherently hazardous to some degree and under some circumstances, and that some are much more hazardous than others. Information on real and potential hazards is now abundant and every chemical professional, student and technician is obligated to be informed on current safety knowledge and practice regarding the material and equipment to be used. The point cannot be over stressed, whether the subject is polymerization or any other field of chemistry. We have tried to identify the most evident hazards to the reader, but leave it to the readers to use the full range of information available about the materials and methods described here, and their own laboratory equipment, to ensure their own and their co-workers' safety.

Title	Location	Edition / Series / Misc.
140 Pressure Sensitive Adhesives: Formulations and Technology		<i>Edition:</i> 2nd edition
<i>Author:</i> Dunning, Henry R.	<i>Dynix:</i> 13019	<i>Series:</i> Chemical Technology Review: No. 95
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 668.3 Du	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815506724	
<i>- date:</i> ©1977	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1977
<i>Subject:</i> Adhesives -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> xii, 428 p., illus., 25 cm.		

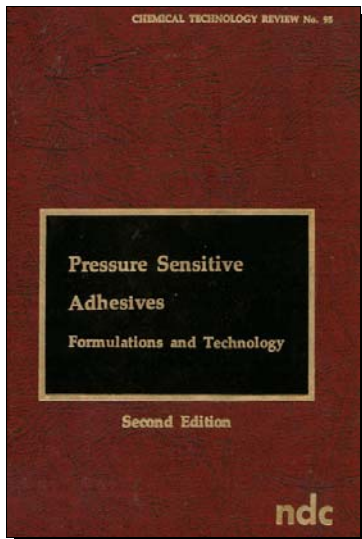


Table of Contents

INTRODUCTION

ACRYLICS

- Copolymer Composition
- Emulsion Polymerization of Latently Crosslinkable Polymers
- Epoxy Substituted Acrylics and Diketene
- Copolymers of Fumaric Acid Diesters and Vinyl Compounds
- Cyanoacrylates
- Heterocyclic N-Vinyl Compounds
- Hydrolysis of Maleic Anhydride Copolymers
- Acrylic Acid and Hydroxylated Amide Interpolymers
- Carboxy Functional Polymers and Polyvalent Metals
- Aqueous Alkali Removable Adhesives
- Polymer-Chelated Titanium Ester Reaction Products
- Unsaturated Zwitterion Monomers
- Vinyl Carboxylic Acid-Aminoalkyl Acrylate-Alkyl Acrylate Terpolymer
- Maleic Anhydride-Alkyl Acrylate-Ethylene-Vinyl Acetate Polymer
- Solvent-Free Adhesive Which Is Melttable and Soluble in Organic Solvents
- Pressure Sensitive Adhesive for Velvet-Type Fasteners
- Carboxybetaine and Sulfobetaine Copolymers
- Quaternary or Betaine Acrylics Copolymerized with Alkyl Acrylates
- Acrylate-Vinyl Carboxylic Acid Copolymer Neutralized with Alkanolamine
- Alkyl Acrylate-Emulsifier Latex
- Polymers of Carbocyclic Alkyl Acrylates and Vinyl Esters
- Copolymerizing with Tertiary Amine and Organometallic Salt
- 2-Acrylamido-2-Methylpropanesulfonic Acid Interpolymers
- Acrylate-Oxypropylacrylamide-Acrylic Acid Interpolymers
- Anaerobics
- Acryloyloxyalkyl Acrylates
- Thermoplastic Polymer Plasticized with Anaerobic Adhesive
- High-Molecular Thermoplastic Polymer
- Organic Nitrene Stabilizers
- Additives
- Fatty Alkyl Amines to Improve Adhesion
- Amine Plasticity Modifiers
- Hydrolyzed Gluten and Acrylates
- Phenol-Formaldehyde to Improve Thermal Stability
- Polyfunctional Aziridines
- Carboxylated Monoether of Polyglycol
- Crosslinking Techniques
- Isocyanate Prepolymers
- Polymerizable Isocyanates
- Polyfunctional Amines
- 3-Methacryloxypropyltrimethoxysilane
- Electron Beam Curing
- Irradiation Treatment of Hot Melts
- Irradiation of Monomer Layer
- Ionizing Radiation
- Acid-Epoxy Self-Curing Interpolymer
- Other Processes
- Flame Retardant

Subjects

218 . Adhesives -- Patents

Aqueous Emulsion Adhesive for Vinyls
Impregnation of Nonwoven Fabric Base

ELASTOMERS

- Polymer Compositions
Low Styrene Butadiene-Styrene Copolymers
Styrene-Isoprene Block Copolymers
ABA Block Copolymer and Poly(α -Methylstyrene)
Polypentenomers
Branched Rubbery Block Copolymer
Blend of Amorphous Polyolefin, Rubbery Block Polymer, Polybutylene, Polyisobutylene and Crystalline Polypropylene
Styrene-Butadiene, Styrene-Isoprene and Isoprene-Piperylene Copolymers
Polydodecene
 α -Olefin Copolymers
Isotactic Polyolefins
Cyclic Monoolefin Copolymers
Carboxyl-Containing Chloroprene Polymer
Water-Soluble Polymers from Epoxidized cis-1,4-Polybutadiene
Acid-Grafted Polyolefins
Sulfo and Thiouronium Derivatives
Ethylene-Vinyl Acetate-Diolefin-Ester Copolymer
Polyisocyanate Modified Rubber
Functionally Terminated Polybutadiene-Isocyanate Reactions
Isocyanates and Hydroxylated Styrene-Butadiene Copolymers
- Tackifiers
Alkylated Polystyrene Resins
Piperylene-2-Methyl-2-Butene Copolymers
Styrene-Isobutene- β -Pinene Terpolymer
Hydrogenated Petroleum Fraction
Blend of Solid and Liquid Tackifiers
Low-Molecular Hydrocarbon Resin or Liquid Natural Ester Resin
Rosin and Polyterpene Resins
Rosin Ester and Olefin-Diolefin Copolymer
Zinc Resinates of Disproportionated Rosin
Phenol-Diene-Phenol Resin Adduct
Tackifier Containing Carboxy, Hydroxy or Hydroxymethyl Groups
Alkylated Melamine-Aldehyde Resin
Polyalkene Tackifier Modifier
- Other Additives and Curing Techniques
Acid-Modified Resin
Hydroxycarboxylic Acid or Ester as Thixotropic Agent
Naphthenic Process Oil Plasticizer
Finely Divided Silica
Aminoorganosilane
Phenol-Formaldehyde Curing Agents
Brominated Phenol- Formaldehyde and Zinc Resinate
Alkaline-Catalyzed Phenol-Formaldehyde Resin

OTHER PRESSURE SENSITIVE POLYMERS

- Polyvinyl Ethers
Moisture-Vapor-Permeable Sheet
Transparent Water-Soluble Adhesive
- Silicones
Curable Polyorganosiloxane
Alkylarylsiloxane or Alkylarylsiloxane Extender
- Polyurethanes
Hydroxylated Elastomer-Polyurethane Reaction Products
In Situ Polymerization and Crosslinking with Polyamines
Adhering with Polyesters and Polyisocyanates
Highly Branched Capped Polyurethanes
Polyether-Polyol and Diisocyanatodiurethane
Bonding Polyurethanes and Polyethylene Oxide
Self-Adhesive Coat
3-(Isocyanatomethyl)-3,5,5-Trimethylcyclohexyl Isocyanate

Moisture-Resistant Polyurethanes
- Polyesters
Soft Thermoplastic Segmented Copolyesters
Adhesive from Waste Polyethylene Terephthalate
- Other Polymer Materials
Polyvinyl Alcohol and Metal Curing Agent
Adducts of N-Substituted Aziridines and Maleic Anhydride
High-Temperature Bis(Epoxyalkyl)Carborane Adhesives
Aromatic Polysulfones
Polyamide Resin
Epihalohydrin Polymer and Polyketone
Isethionic Acid Ester Matrix Builder
Polythioethers
Aldehyde-Phenolic Condensation Copolymer
Lignin-Sulfonate Extender for Urea-Formaldehyde Resin
Ethers of N-Methylolamide

WEB AND BACKING CONSTRUCTION AND RELEASE COATINGS...

- Backing Construction
Nitrous Oxide Treatment of Polypropylene
Longitudinal Stretching of Polyolefinic Sheet
Tape Substrate with Increased Splitting Resistance
Extensible and Elastic Backing of ABA Block Copolymers
Flocked Covering
Transfer-Proof Ink on Web
Cellulose Acetate Butyrate and Copolyester and/or Acrylate Copolymer
Continuous Self-Sealing Webs for Forming Booklets
Polyurethane Foam Backing with Fluoroaliphatic Stabilizer
Heterocyanoacrylate Ultraviolet Absorbers
- Silicone Release
Polypropylene Liner and Polysiloxane Coating
Hydroxy-Terminated Polysiloxane Formulations
Hydroxy-Terminated Polysiloxanes, Titanates and Organic Polymers
Polysiloxane and Alkyl Vinyl Ether-Maleic Anhydride Copolymers
Reaction Product of Isocyanate and Organosilicone
Corona Treatment of Silicone Surfaces
- Nitrogen-Containing Release Coatings
Acylated Polyethyleneimines
Stearyl Methacrylate-Acrylonitrile Copolymers
Stearic Acid-Morpholine Release Agents
Alkyl Sulfide, Alkyl Sulfoxide and Alkyl Sulfone Terminated Oligomers
- Other Release Coatings
Polyvinyl Alcohol and Werner Complex Fluorocarbon
Gelled Cellulose Triacetate
Printable Release Coat

SPECIALTY TAPES

- Electrical
Self-Fusing Tape Based on EPDM Elastomer
Linerless Tape Having Elastomeric Backing
Polyimides Containing Inorganic Flakes
Acrylic Polymers
Acrylic Vinyl lactam Copolymers
Highly Aromatic Polyester Resin
Conductive Carbon Black and Elastomers
Electrically Conductive Projections
Conductive Tape Using Metal Mesh and Silver Particles
Fluorocarbon Film for Silicone Adhesive
Direct Bonding of Coatings Without the Use of Primer
- Medical
Primer Applied to Opposite Side of Backing
Foamed Tape
Polyurethane Foam
Woven Spandex

Micropleated Web Using Wood Pulp, Hemp and Rayon Fibers
Pervious Tape
Breathable Tape Containing Hydroxyethylcellulose
Zinc Resinate
Polyisoprene, Block Copolymers and Natural Rubber
Nonwoven Fabric Coated with Natural and Synthetic Elastomers
Corticosteroid Treatment of Dermatological Lesions
Adhesive Containing 5-Fluorouracil
Retinoic Acid Dermatological Tape
- Transfer
Noncontinuous Adhesive Patterns
Copy Sheet for Patterns
Recording Paper for Dental Pantograph
Recording Sheet of Polyolefin Fibers
Translucent Sheet of Printing Characters
Correction Tape for Hectographic Stencils
Transfer Adhesives for Rolled Paper Products
Dry Transfer
- Other Applications
Facing Lens Abrading Tool
Waterproof Tape
Low Temperature Tar Tape for Pipe Wrapping
Encapsulated Epoxy Sealant for Mechanical Fasteners
Gold Reflective, Polyimide Based Tape
Tear Tape
Two-Color Embossable Tape
Sewing Tape with Lines of Perforations
Nongumming Sewing Tape
Adhesive Zipper Tapes
Shipping Documents Tape

CONTAINERS, LABELS AND LAMINATES

- Containers
Reusable Composite Sealing Tapes
Bread Wrapper Sealing
Polyamide Films
Polyethylene Coatings for Multiwall Bags
Closure for Hermetically Sealed Cans
Mail Envelope
- Labels
Recording Label
Dry Decals
Adhesive Coated Label with Silicone Release Coating
Polyurethane Elastomer in Label Sheet Stock
Self-Sticking Material of EVA-VC Graft Polymer
Wash-Off Labels
Electrophotographic Reproduction Label
- Laminates
Asbestos-Foam Products
Asbestos Laminates
Slidable Laminate
Polyisocyanate-Polyvinyl Alcohol Barrier Layer
Bituminous Adhesive
Bisimide-Polyamine Reaction Products
Polyimide Film Coated with Acrylic Resin
Bonding Using Strings of Adhesive
Polyvinyl Acetate-Impregnated Plastic Laminate
Adhesive Cement Containing Sulfobutyl Rubber
Decorative Adhesive Laminate
Laminate for Tear-Resistant Labels
Sprayable Latex Adhesives

OTHER END USES

- Disposable Diapers

Integral Fasteners
Loop-Type Adhesive Fastener
Primary and Secondary Tab Fasteners
Pleated Tab Fastener
Tab Fastener with Zone-Coated Adhesive
Applying Adhesive Tape to Pads
- Other Specific Applications
Wall Covering Employing Encapsulated Adhesive
Wallpaper
Self-Supporting, Non-Load-Bearing Resilient Tape Sealant
Adhering Preformed Resins to Architectural Surfaces
Lint Remover
Tape Splice Connection
Photograph Mounting Sheet
Protective Sheet for Metal Working Plates
Disposable Headrests
Solar Control Film for Window Glass
Vehicle Sun Blindness Eliminator
Road Markings
Sealing Strips for Highways
Reusable Bulletin Board
Display Board
Protecting Hulls of Marine Vessels from Fouling
Self-Sealing Roof Shingle
- General Processes
No Preformed Core
Reusable Tape
Slit Vinyl-Backed Tape
Light-Reflecting Markings on Tape
Removing Adhesive
Joining Fibers or Metals
Composite of Isocyanate-Coated Elastomer and Metal

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents issued since 1970 that deal with pressure sensitive adhesives.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of pressure sensitive adhesives.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring our durably bound

books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION

Pressure-sensitive adhesives generally combine a high degree of tackiness, for instantaneous bonding, with a high cohesive strength to facilitate removal of tape from a surface without leaving any residue. Typically the adhesive is based on a film-forming elastomeric material such as SBR, polychloroprene, polybutadiene and acrylics. Commonly, blends of various materials are needed to optimize initial tack, cohesive strength and, of course, the actual adhesive properties for a given substrate. Considerable research effort has been expended in finding tackifiers for these systems and terpene resins are used in many formulations.

Pressure-sensitive tapes are composed of the following compounds: (a) the adhesive, (b) a primer coating which is applied to the plastic or metal foil surface, (c) a release coating on the backing to allow unrolling of the tape and (d) a suitable backing material such as plastic, metal foil, paper and, in recent years, nonwoven textiles.

In view of the wide utility and consumer acceptance of these pressure-sensitive adhesives, a high level of basic research and product development has evolved over the past 15 years and is continuing. This interest is broadly based throughout the resin industry, tape and container producers, surgical bandage suppliers and in every conceivable segment of the consumer product field.

Thus, the purpose of this book is not only to describe the synthetic resin processes which are so basic to this technology but to provide hundreds of starting formula for developing new and improved adhesives and to describe in some detail as wide a variety of end uses as possible.

The first two chapters are largely devoted to a consideration of the developments in adhesive resins and formulations, particularly acrylics, styrene-butadiene, modified polybutadiene, polyvinyl ethers and silicones. The construction and use of various backings, which is extremely important where high tensile strength, good tear and flexibility are required, are described in the next chapter, which also describes silicone and many fatty nitrogen-containing compounds, which are used as release agents.

The following chapter describes specific formulations and production techniques for electrical, medical and other end uses. The use of pressure-sensitive adhesives for containers, labels, laminates and other applications, all the way from decorative wall coverings to disposable diapers are described in the last chapter.

Overall, some 280 processes and over 1,000 formulations, as described in the patent literature since 1970 are included in this book. Where possible, for continuity the individual processes are covered with reference to a specific adhesive or application, although it is recognized that many of these pressure-sensitive adhesive systems have broad utility.

Title	Location	Edition / Series / Misc.
141 Principles of Aerosol Technology Author: Sanders, Paul A. (Paul Amsdon), 1913- Publish.: Van Nostrand Reinhold Company - place: New York, NY - date: [1970] Subject: Aerosols Desc: x, 418 p., illus., 24 cm.	Dynix: 64296 Call No.: 660 Sa ISBN: Shelf Adult Non-Fiction	Edition: Series: Year: 1970 Price: \$25.00

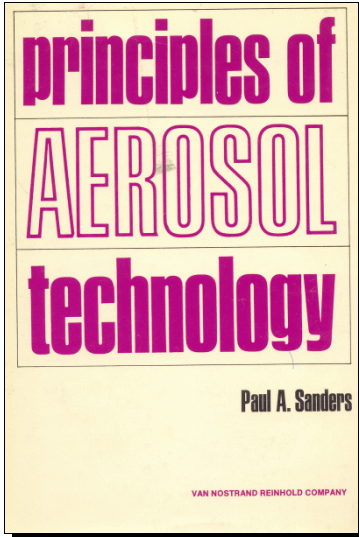


Table of Contents

CHAPTER I: HOMOGENEOUS SYSTEMS AND THEIR PROPERTIES

1. Introduction
2. Historical Background
3. The Structure of Liquids and Gases
4. Propellants
5. Containers
6. Valves and Actuators
7. Loading Methods
8. Spray Characteristics
9. Vapor Pressure
10. Solubility
11. Viscosity
12. Density
13. Stability
14. Flammability of Aerosols and Aerosol Propellants

CHAPTER II: EMULSIONS, FOAMS AND SUSPENSIONS

15. Surfaces and Interfaces
16. General Properties of Emulsions
17. General Properties of Foams
18. Aqueous Aerosol Emulsions and Foams
19. Molecular Complexes in Aerosol Emulsions and Foams
20. Aqueous Alcohol Foams
21. Nonaqueous Foams
22. Aerosol Powders

CHAPTER III: MISCELLANEOUS

23. Food Aerosols
24. Miscellaneous Aerosol Systems
25. Sampling and Analysis of Aerosol Products
26. Toxicity
27. Triangular Coordinate Charts Index

Index

Subjects

220 . Aerosols

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

To answer the critical need for a fully current, comprehensive overview of modern aerosol technology, Dr. Paul Sanders, well-known for his major research contributions to the aerosol industry, brings you the first up-to-date, concentrated treatment of the basic theories and fundamental scientific principles governing the phenomena of the aerosol field.

Emphasizing the basic properties of aerosol systems, such as solubility, viscosity, vapor pressure, as well as the surface chemistry of aerosol systems, the book provides a rich fund of background information helpful to all aerosol technical personnel.

Aerosol chemists will value the book's rich fund of reliable, up-to-date guidance -- much of it, previously unpublished, new material or restricted to scattered technical papers. Explains the principles underlying the formulation and properties of aerosols. . . describes the various systems that can be used to formulate aerosols... pinpoints significant properties of propellants including vapor pressure, density, solubility parameters, etc and describes helpful methods for carrying out the various calculations in the aerosol industry.

Cosmetic chemists will be particularly interested in the author's coverage topics of current interest in their field -- particularly, the systems used for the formulation of aerosol cosmetic products concerned with emulsions and foams.

Pharmaceutical chemists can rely on the book's authoritative treatment of the systems that are used for the formulation of aerosol pharmaceuticals.

What's more, the book not only lends it- self to a wide variety of industrial applications, ranging from valves and containers to perfumes. . . but it will also be of express value to the freshman in aerosol technology who can now gain a better understanding of the phenomena in the field through step-by-step development of key aerosol principles. Many aerosol properties are given individual chapter treatment.

Vital coverage of recent developments in all areas of aerosol technology makes this book a dependable reference on new methods of dispensing and packaging aerosols, for example, as well as on the latest advances in the area of aerosol emulsions and foams. Many of the major research contributions to this latter area are credited to the extensive work of Dr. Sanders.

Here is the first modern book in the field to bring together in a single source so much essential background material for all who work with aerosols.

PREFACE

The "Freon" Products Division of the Du Pont Company has provided a course in aerosol technology for over ten years. The course, designed to present a comprehensive picture of the technical areas in the aerosol field, consists of lectures combined with laboratory experiments. The lectures have been given to a cross section of aerosol technical personnel, ranging from those who needed basic instruction to experienced aerosol chemists who wished to discuss specific areas in detail. The course has been well received by the aerosol industry; therefore it seemed desirable to make the lecture material more readily available to the academic and industrial scientific community in the form of a textbook. The present volume on aerosol technology is a modified and expanded version of the lectures.

Particular emphasis in the book has been placed upon the fundamental principles that govern the characteristics and behavior of aerosols. Only through an understanding of these principles will many of the problems in the aerosol field be solved. For this reason, the basic properties of aerosols, such as spray characteristics, vapor pressure, solubility, and flammability, have been treated as individual subjects. Aerosol emulsion and foam technology, particularly in the fields of cosmetic and pharmaceutical products, has become increasingly important in recent years. Many of the fundamental concepts of surface chemistry have been reviewed in some detail in the chapters of Part Two.

In any field, there is a considerable amount of information useful to laboratory chemists which is difficult to find in the literature. Much of this type of information has been included in the present volume. Examples in the aerosol field which fall into this category are methods for determining the compositions of propellant blends with a specified density or vapor pressure, and the pitfalls that may be encountered in the measurement of properties such as solubility, flammability, and vapor pressure.

The class of fluorinated hydrocarbon propellants is generally referred to in this text by the Freon nomenclature. This seemed appropriate because most of the data listed in the text for the fluorinated hydrocarbon propellants were obtained with the Freon propellants. The Freon compounds were the first fluorinated hydrocarbon propellants to appear on the market and were the only fluorinated hydrocarbon propellants available for a considerable number of years. At the present time, these same chemical compounds are also manufactured by a number of other companies in the world who use the same numerical nomenclature prefixed by their respective trade names.

Title	Location	Edition / Series / Misc.
142 Principles of Color Technology Author: Billmeyer, Fred W. and Max Saltman Publish.: John Wiley & Sons - place: New York, NY - date: ©1981 Subject: Color Desc: xv, 240 p., illus., [4] leaves of plates (some color), 29 cm.	Dynix: 50827 Call No.: 535.6 Bi ISBN: 047103052X Shelf Adult Non-Fiction	Edition: 2nd edition Series: Year: 1981 Price: \$25.00



Table of Contents

- Preface
- 1. What is Color?
- 2. Describing Color
- 3. Color and Color-Difference Measurement
- 4. Colorants
- 5. The Coloring of Materials in Industry
- 6. Problems and Future Directions in Color Technology
- 7. Annotated Bibliography
- Bibliography
- Author Index
- Subject Index

Reviews - Synopsis - Dust Jacket

PREFACE

It is our feeling that the major reasons for a new edition of Principles of Color Technology arise from a need for realignment of our emphasis on what is important, based on our experience in industry and in teaching for the past 15 years. During that period, the principles we wish to emphasize have not changed, but in many cases the practice has become considerably more automated. Consequently, the practitioner can tend to lose sight of what the principles really are. This leads us to the need to place emphasis on the following topics, among others:

- Metamerism, which we consider to be of major importance in virtually all aspects of the practice of color technology.
- Some "noncolor" problems, such as the need for adequate techniques of sampling and sample preparation, the application of simple statistics, and good quality-control practices.
- How to select instruments most suited to the prospective user's needs, in place of detailed descriptions of current instruments-probably the topic going "out of date" most rapidly in the book.

As anticipated, virtually all of the material formerly in Chapter 6B, "Some Guesses About the Future," has either found its rightful place in earlier chapters or has been tried, superseded, and discarded. In its place, we have this time chosen to draw attention to what we see as continuing problem areas in the application of the principles of color technology. Similarly, both the Annotated Bibliography and the Bibliography have been completely revised and are up to date through 1980.

We have been gratified to see the unexpectedly wide use of Principles of Color Technology as a textbook. We found, however, very little need to change the text to accommodate this use: a few numerical examples have been added to assist both the instructor and the student.

Finally, we wish to reiterate that we have limited the content of the book to topics within the scope of our personal knowledge. Topics such as color vision, color reproduction, and color photography are covered only briefly, with reference to the literature in those fields included in the Annotated Bibliography.

Subjects

244 . Color

Title	Location	Edition / Series / Misc.
143 Principles of Industrial Chemistry		<i>Edition:</i>
<i>Author:</i> Clausen, Chris A., 1940- and Guy C. Mattson	<i>Dynix:</i> 12953	<i>Series:</i>
<i>Publish.:</i> John Wiley & Sons	<i>Call No.:</i> 660 CI	
<i>- place:</i> New York, NY	<i>ISBN:</i> 047102774X	
<i>- date:</i> ©1978	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 1978
<i>Subject:</i> Chemistry, Technical		<i>Price:</i> \$25.00
<i>Desc:</i> xiv, 412 p., illus., 24 cm.		

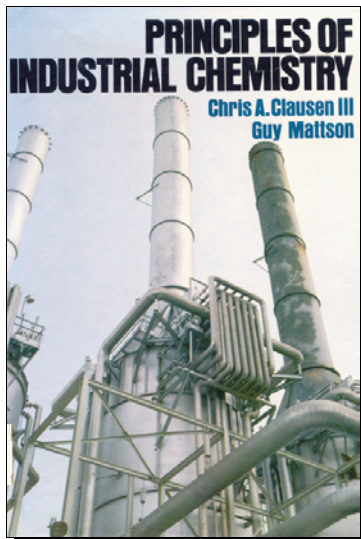


Table of Contents

1. The Chemical Industry -- What It Is and What It Does
 2. Basics Considerations -- Envisioning the Process
 3. Material Accounting -- The Law of Conservation of Mass Really Works
 4. Energy Accounting in Chemical Processes -- The Law of Conservation of Energy Works Too
 5. Chemical Transport -- A Chemist's View of Fluid Flow
 6. Heat Transfer -- Which Way Does It Go?
 7. Kinetics -- Experimental Data, Rate Constants and Reactor Design
 8. Separation Processes -- Isolating the Product
 9. Instrumentation -- Controlling the Process
 10. Further Considerations -- Developing the Process
 11. Chemical Patents -- What, How and Why
 12. Economics -- Financial Analysis of the Process
 13. Research -- Where Are We Going?
 14. Development of a Process -- The Manufacture of Urea, A Case Study
- Appendix A: Units and Conversion Factors
Appendix B: Selected Physical Properties of Various Organic and Inorganic Substances
Appendix C: Heat Capacity and Enthalpy Data
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Subjects

230 . Chemistry, Technical

The typical rigorous undergraduate chemistry curriculum provides a solid foundation in chemical concepts, principles, and theories. How can these principles be applied to the specific, practical problems associated with the commercial practice of chemistry?

This book is designed to help students make the transition from the academic to the industrial world. It uses process development as its general theme to provide information that historically has been acquired only through on-the-job training.

The first two chapters give an insight into the chemical industry: what it consists of, what it does, and the role chemists play in helping to make it function. These chapters also examine, "Where and how does an industrial chemical project begin?"

Chapters 3 through 6 present -- from a chemist's viewpoint -- concepts in unit operations and their application in industry. These chapters cover material accounting, energy accounting, mass transport, and heat transfer.

The next four chapters focus on bringing an industrial chemical process from the idea stage to a fully operational plant. These chapters review the necessary principles of kinetics, separation methods, and instrumentation.

Chapters 11 through 13 discuss economic concepts and patent procedures. Finally, Chapter 14 presents an industrial case study which shows how a chemical process is fully developed, thus illustrating the responsibilities and duties of the chemist.

PREFACE

Principles of Industrial Chemistry has been written in response to the frequently expressed concern for the widening gulf between chemistry as it is taught in our colleges and universities, and chemistry as it is practiced commercially. This work is intended as a textbook in a senior or graduate level course in industrial chemistry. It is hoped that it will also be useful, as a guide, to recent graduates who are just starting their industrial careers.

There have been many studies, reports, and discussions regarding the need for providing our students with a better preparation for working in industry. Although the conclusions and suggestions of these studies vary, considerably, there seem to be two common general thoughts. The first, and most important, is that most observers feel that the typical, rigorous undergraduate chemistry curriculum is providing a fine foundation in chemical concepts, principles, and theories. Difficulties appear to arise in the application of these principles to specific, practical problems; in a poor understanding of some very basic engineering concepts; and in a lack of awareness of what the chemical industry is, how it operates, and how the chemist fits into the scheme. The second general point of agreement is that most chemists with initiative and experience eventually pick up the tools required to operate successfully in industry.

Our purpose then in writing this book has been to supplement or complement the traditional training of a chemist in order to help him through the change from the academic to the industrial world. To a great extent the content reflects much of the information we wish we had known when we entered industry. Generally we have assumed that the reader has completed the junior year of a typical chemistry curriculum; specifically we have assumed a general knowledge of physical chemistry. We have made no attempt to describe the many industrially important processes currently in use, nor to catalog or describe the many important industrial chemicals. Such descriptive material is available in sources such as the Kirk-Othmer Encyclopedia of Chemical Technology. Selected topics of this nature should certainly be included in any course in Industrial Chemistry.

The general theme we have used throughout the book is that of process development. This is not to imply that most industrial chemists are involved exclusively with process development. It simply reflects our opinion that other important areas, such as product development and applications work, are very specialized. Process development seems to be a topic that is more general and affords greater opportunities to stress the correlations between classical and industrial chemistries.

Title	Location	Edition / Series / Misc.
144 Printing and Dyeing of Fabrics and Plastics Author: James, Ronald W. Publish.: Noyes Data Corporation - place: Park Ridge, NJ - date: ©1974 Subject: Dyes and dyeing -- Textile fibers, synthetic -- Patents Desc: x, 275 p., illus., 25 cm.	Dynix: 34094 Call No.: 667.3 Ja ISBN: 0815505337 Shelf Adult Non-Fiction	Edition: Series: Chemical Technology Review: No. 29 Year: 1974 Price: \$25.00

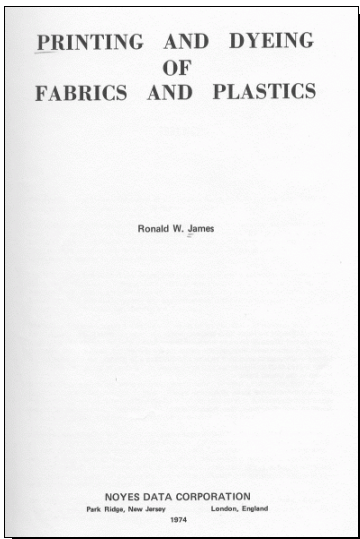


Table of Contents

INTRODUCTION

CELLULOSICS

- Dyestuff Formulations
 - Thiosulfate Vat Dyes
 - Soluble Leuco Ester Vat Dyes
 - Acylated Vat Dyes
 - Vat Dyes Containing Sulfonic Acid Amide Groups
 - Mixture of Reactive Dyes
 - Quinoxalines
 - Betaines
 - Water-Insoluble Dyes and Acid-Binding Agents
 - Pastes of Metallizable Dyes
 - Ultramarine Blue Dye
 - Dye Sensitive to Chlorine Bleaching Agents
- Fixatives and Reducing Agents
 - Thiocarbonyl Compounds
 - Cobalt Complexes
 - Hexahydro-1,3,5-Triacryloyl-s-Triazine
 - Difunctional Reactive Dyestuffs
 - Sulfoxylate Formaldehyde and 3-Nitrobenzene-1-Sulfonic Acid
 - Alkanesulfonic Acid Derivatives and Chelate Complexes
 - Reducing Agent Treatment During Alkaline Fixation
 - Alkaline Curing Agent
 - Dimethylhydrazine
- Pretreatments and Resists
 - Urea
 - Colloidal Sol of Fibrous Boehmite
 - Aminoplast Treatment
 - Alkali Hydroxy Methane Sulfonate
 - Sodium Formaldehyde Sulfoxylate
- Surfactants and Other Additives
 - Quaternary Ammonium Compounds for Discharge Paste
 - Ethylene Oxide Adducts of Fatty Alcohols
 - Aqueous Solutions of Phthalocyanine Pigments
 - P2O5-Polyoxyalkylene Ether Reaction Products
 - Foam Control Using Leveller with 2-Ethylcapronic Acid Esters
 - Algin Solution as Thickeners
 - N-Alkyl Phthalimides with Amino-Imino Pyrrolenines
 - Alkali Metal Hydroxide to Improve Mixing
 - Sodium Salt of 3-Nitrobenzenesulfonic Acid and Vanadium Salts
- Polymeric Pigment Binders
 - Etherified Crotonylidenediurea Resins
 - Acrylic Copolymers
 - Thermosetting Acrylates and Dispersing Aids
 - Polyvinyl Acetate
 - Vinyl Acetate-Ethylene Copolymers
 - Polymethylene Ureas
 - Aminoplast-Pigment Compositions
 - High Energy Electrons
- General Printing Ink Formulations

Subjects

252 .	Dyes and dyeing -- Textile fibers, Synthetic -- Patents
419 .	Textile printing -- Patents
457 .	Printing on plastics -- Patents

Ultraviolet Sensitive Ink
Cellulosic Casings
Polyepoxide Primer for Cellulosic Casings
Flexo Inks Using 4,4-Bis(p-Hydroxyphenyl)Pentanoic Acid
Polyester Urethane Ink Vehicle
Other Processes
Producing Heat-Induced Effects
Creaseproofed Fabric
Transfer Printing by Heating
Iron Oxide Pigments
Printed Pile Fabric
Perforative Etching Pastes

POLYETHYLENE TEREPHTHALATES AND CELLULOSE TRIACETATES

Dyestuffs
Hydroxy-Aryl Aminoanthraquinones
Mixtures of Azo Dyes
Mixtures of Azo and Anthraquinone Dyes
Indandiones
Carboxy-Containing Dyestuffs
Bath Formulations and Additives
Disperse Dye and Copper Compound Resist
Basic Disperse Dyes with Resist Pattern
Metal Formaldehyde Sulfoxylate, Thickener and Swelling Agent
Disperse Dye, Oxyethylated Fatty Alcohol and Thickener
Water-Soluble Dyestuff and Urea
Ethoxylated Phenols
Glycerol Diaryl Ether Carrier
Finely Divided Cellulose
Carboxylic Acid Amides
Screen Printing of Pile Structures
Fiber Blends
Polyester, Acrylic and Cotton Blends
Low Pressure Transfer Dyeing of Polyester Cotton Blend
Print Paste Formulation with Resin Bonded Pigment
Other Processes
Transfer Dyeing by Sublimation
Conditioning with Hydroxyethylcellulose

POLYAMIDES

Dye Assists and Bath Additives
Halogenated Solvents and Alcohols
Dye Carrier Mixtures
Benzyl Alcohol
Emulsions Containing Styrene Homopolymer
Lauric Acid Diethanolamide and Ethoxylated Glycerol Monolaurate
Nitrogen-Containing Carboxylic Acids
Aftertreatments
Polyhalogenoquinones
Ammonia and Formaldehyde Generators
Other Processes
Transfer Printing with Subliming Reactive Dyestuffs
Dye Transferring Method
Multitone Effects Using Locally Applied Dye Rate Control Agent
Hydroxy Diaryl Sulfone-Formaldehyde Resist
Fast Black Shades
Blue Shades
Polyamides from Dodecanoic Acid and Bis(p-Aminocyclohexyl)Methane

ACRYLICS AND POLYPROPYLENES

Acrylic Fiber Processes
Acrylonitrile-Vinylidene Chloride Copolymers
Carpet Yarn
Anthraquinone Dye

Polypropylene Textile Processes
Receptivity Modifier with α -Sulfolauric Acid
1,4-Quinone Dichloride Dye
Dye Containing the 8-Hydroxyquinolyl Group
Vat Dyestuffs

POLYOLEFIN PLASTICS

Polymeric Fatty Acid Amides
Using Acetic, Propionic and Hexanoic Acids
Using Hydroxy Monobasic Carboxylic Acids
Using 4,4-Bis(Hydroxyaryl)Pentanoic Acid
Using Spiroacetal Dicarboxylic Acids
Using Caprolactam
Using Bis(Hexamethylene)Triamine
Formation of a Polyamide-Polyimide Resin
Pigment Binders
Ethylene-Acrylic Acid Interpolymers
Carboxylic Acid Modified Polyethylene Wax
Polyethylene and Rosin Blends
Ethylene-Diene Interpolymers
Polybutenes and Pinene Resins
Epoxidized Polybutadienes
Acrylic Latex and Cyclized Rubber
Phenol-Aldehyde Resin and Polyepoxide-Rosin
Alkyd Resins
Unsaturated Ester and Photoinitiator
Surface Treatment
Foaming Agent
Pentane Treatment Prior to Extrusion
Mineral Acids and Hexavalent Chromium
Elemental Phosphorus
Sulfocarboxylic Acids
Ozone
Resin Additives
Addition of Organometallic Compound
Blends with Inorganic Filler and Organic Resin
Printing Formulations
Heat Fusion Process
Highly Volatile Solvents
Penetrating Ink
Diffusion of Dye into Surface Layer

OTHER PLASTIC SUBSTRATES

Polyvinyl Chlorides
Methacrylate Polymer in Nitropropane
Cross-linked PVC-Epoxy-Anhydride Coatings
Selectively Expanded Articles
Credit Card Processing
Polystyrenes
Offset Printing
Hot-Transfer Printing
Allyl Alcohol-Styrene Copolymers as Ink Vehicle
Cellulose Ether Ink Composition
Fluorocarbons
Radiant Energy Fixing of Teflon Ink
Hot Stamping Machine
Miscellaneous Processes
Branding Silicone
Band Tinting of Polyvinyl Butyral
Continuous Plastic Dyeing for laminated Glass Windshields
Transfer-Proof Ink for Pressure-Sensitive Adhesives
Encapsulated Ink for High Pressure Decorated laminates
Pigment Composition for Marking Gelatin Capsules
Polyester Magnetic Tape

- Ink Formulations
 - Radiation Curable Inks
 - Solid Pigment Dispersions
 - Sublimatory Transfer Using 2-Cyano-1,4-Diamine Anthraquinones
- Processing Equipment
 - Dry Offset Printing Using Flexible Segmented Blanket For Hollow Objects
 - Printing During Molding

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents since 1963 relating to the printing and dyeing of fabrics and plastics.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of modern printing and dyeing techniques as applied to fabrics and plastics.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure."

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring our new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

15 Reasons Why the U.S. Patent Office Literature Is Important to You

1. The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical commercial process information assembled here than is available from any other source
2. The technical information obtained from the patent literature is extremely comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure."
3. The patent literature is a prime source of basic commercially utilizable information. This information is overlooked by those who rely primarily on the periodical journal literature.
4. An important feature of the patent literature is that it can serve to avoid duplication of research and development.
5. Patents, unlike periodical literature, are bound by definition to contain new information, data and ideas.
6. It can serve as a source of new ideas in a different but related field, and may be outside the patent protection

- offered the original invention.
7. Since claims are narrowly defined, much valuable information is included that may be outside the legal protection afforded by the claims.
 8. Patents discuss the difficulties associated with previous research, development or production techniques, and offer a specific method of overcoming problems. This gives clues to current process information that has not been published in periodicals or books.
 9. Can aid in process design by providing a selection of alternate techniques. A powerful research and engineering tool.
 10. Obtain licenses - many U.S. chemical patents have not been developed commercially.
 11. Patents provide an excellent starting point for the next investigator.
 12. Frequently, innovations derived from research are first disclosed in the patent literature, prior to coverage in the periodical literature.
 13. Patents offer a most valuable method of keeping abreast of latest technologies, serving an individual's own "current awareness" program.
 14. Copies of U.S. patents are easily obtained from the U.S. Patent Office at 50 cents a copy.
 15. It is a creative source of ideas for those with imagination.

INTRODUCTION

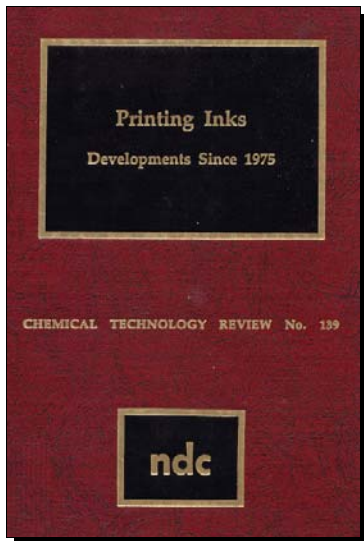
The rapid growth and consumer acceptance of synthetic textile fabrics and the generally widespread use of plastics has placed strong demands on the technical community over the past decade to provide printing inks and dyeing formulations to meet the demands of a style and color conscious society. While technically most difficult with the hydrophobic fibers and substrates, the increasing need for sophisticated dyeing processes for cotton and in recent years for cotton/polyester blends, has resulted in a worldwide effort to improve the dyeing techniques for cellulose. Thus, hundreds of new formulations, containing surfactants, fixation and reducing agents, specific dyestuffs, resin-based pigment binders and many other auxiliary additives have been developed.

Most prominent among the synthetic fibers have been the polyethylene terephthalates, cellulose triacetates, polyamides and, of course, the polyolefins. For each of these fiber types, it has been necessary to develop specific pretreatments, dyeing and printing ink formulations, fixation agents and processing technology consistent with the modern high speed, low cost needs of this vast industry. The low surface energy of the polyolefin plastics has required rather severe surface pretreatments, the development of many specialty inks, largely based on polyamide binders as well as hundreds of proprietary formulations.

This book describes over 150 processes, and several hundred formulations as described in the patent literature over the past ten years. While in many cases the printing ink and dyeing formulations may be applicable to more than one substrate, it is necessary in a book of this size and scope to highlight the most significant use for continuity. Thus Chapters 1 through 3 largely comprise these processes related to textile fibers, with special emphasis on cellulose, polyesters and polyamides, while Chapters 4 and 5 relate more directly to printing techniques used on the more important plastics such as the polyolefins, polystyrene, polyvinyl chloride and many other plastic substrates. The dyestuff chemistry and process technology are covered only where it is pertinent to an understanding of the total formulation and may be specific for a given substrate. A more complete understanding of the process literature relating to dyestuff synthesis and technology may be found in another publication by Noyes Data Corporation:

K. Johnson, Dyeing of Synthetic Fibers Recent Developments 1974

Title	Location	Edition / Series / Misc.
145 Printing Inks: Developments Since 1975		<i>Edition:</i>
<i>Author:</i> Duffy, J. I. (Joan Irene), 1950-	<i>Dynix:</i> 12989	<i>Series:</i> Chemical Technology Review: No. 139
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 667.5 Du	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815507720	
<i>- date:</i> ©1979	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1979
<i>Subject:</i> Printing ink -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> xii, 336 p., illus., 24 cm.		



Subjects

290 .	Patents -- United States
323 .	Printing ink -- Patents

Table of Contents

CONVENTIONAL PRINTING INKS

- Flexographic, Lithographic and Intaglio Inks
- Styrene Polymer Dispersion
- Solvent-Free Ink
- Printing of Plastic Webs
- Printing Ink Varnish from Acid Sludge
- Fast-Drying Ink
- Metal Amine Complexer
- Infrared Dryable Ink
- Sublimable Printing Ink

Binder Resins

- Polyethylene Oxide Resins
- Modified Cyclopentadiene Resin
- Cyclopentadiene and Unsaturated Fatty Acid
- Polymerized Dicyclopentadiene
- Dicyclopentadiene and Carboxylic Acid
- Polyvalent Metal/Carboxyl Group Copolymers
- Cyahoethylated Polyurethane Resins
- Nitric Acid Treated Resin
- Methylated Urea-Formaldehyde Resin

Multicolor Printing

- 3-Color Printing System
- 4-Color Printing System

Additives

- Methylenedisalicylic Acid Antiscumming Agent
- Paste or Powdered Pigment Preparation for Brilliancy
- Pigment Dispersions for Improved Gloss and Flow
- Stabilizer for Phthalocyanine Formulations
- socyanate Dispersing Agent
- High Molecular Weight Monocarboxylic Acids
- Fluorocarbon Surfactant
- Antimist Compound
- Stilbene Optical Brightener
- Cyclic Acetals as Emulsifiers
- Loss-of-Dry Inhibitor
- Drying Accelerator
- Auramine Salts as Stabilizers

DUPLICATING AND LATENT-IMAGE INKS

Color Formers

- Alkyl Bis(2,4-Dinitrophenyl) Acetate
- 3,3-Bis(Indolyl)Phthalides
- Dianhydride Derivatives
- Heterocyclic Substituted Lactones
- 3-Indolyl-3-Phenylphthalides
- Indolyl Methylene Leuco Dyestuffs
- Leuco Dye/Amine Composition
- Triphenylmethane p-Amino Leuco Salt
- Indolyl-Substituted Furanones
- Substituted Trimethylenecyclopropane
- Stable Oil/Dye Solutions

Color Production from Solvent Evaporation
 Multicolor Reproduction
 Latent Sensitizing Ink
 Latent-Image System
 Iodide/Starch System
 Color-Change Ink
 Aqueous Color-Developing Coating
 Acid-Treated Smectite
 Oil-in-Water Emulsion
 Desensitizing Composition
 N-(Aminoalkyl) Lactam Desensitizer
 Marking Liquid
 Solid Writing Material
 Imaging Crayon
 Preparation of Microcapsules
 Stilt Material for Microcapsules
 Carbon Inks
 Monoester-Containing Printer-Ribbon Ink
 Alcohol-Containing Ink
 Flow Agent
 Oxygen-Treated Wax
 Wax-Maleic-Polyamine Compounds
 Isocyanated Imides of Hydrocarbon Anhydrides
 Polyvalent Metal Salts of Oxidized Waxes
 Isocyanated Polyvalent Metal Salts of Oxidized Waxes
 Hectographic Inks
 Nonbleed Spirit Duplicating Masters
 Thixotropic, Semisolid Ink
 Latent Image Spirit Duplicating Masters
 Electrostatic Inks
 Silane-Treated Fumed Silica
 Triethylene Glycol Monobutyl Ether
 Quaternary Ammonium Compounds
 Constant Viscosity Ink
 Photoelectrophoretic Yellow Pigment
 Thermocopy
 Piperidine Derivative/Cyclic Polyketo Composition
 1,2-Epoxy Ring Compounds
 Higher Fatty Acid Iron Salt and Gallic Acid Composition
 N-Substituted Piperazine and Cyclic Polyketo Preparation
 Metallic Compound/Chelating Agent Composition
 Complexed Phenolics with Lactones or Spiropyran Compounds

PIGMENTS AND DYESTUFFS

Monoazo Pigments
 Heterocyclic Azo Compounds
 5-(Benzimidazolonylazo)-3-Cyano-4-Methyl-1,2-[1',2']-Benz-[4',5']-Imidazo-6-Hydroxypyridine
 4-Methyl-6-Hydroxypyridone-(2) Component
 Phthalimide-Containing Pigment
 Barbituric-Acid-Containing Pigment
 Quinolone-Barbituric Acid Pigment
 6-Methylbenzimidazolonylazobarbituric Acid Pigment
 Barium-Laked, Sulfonic-Acid-Containing Dye
 Benzimidazolone Coupling Components
 b-Hydroxynaphthoic Acid Amide Coupling Component
 Naphthyl-Quinazolone Coupling Component
 Phenyl-Substituted Phthalazone Azo Dye
 Red Pigment
 Other Azo Pigments
 Tetrakisazo Pigment
 Nitro-Containing Pigment
 Bis(Benzimidazoloneazoacetylamino) Phenylene Pigments
 Polyazo Dyestuff
 Bis(Dialkoxycarbonylphenylazo)Acetoacetamidoarylenes

3,8-Diaminophenanthridone-(10)
 Diphenylsulfide
 Chlorine-Containing Disazo Pigments
 5-Aryloxy-6-Hydroxypyridone-(2) Radicals
 2-Acyl-, 2-Carboxy-, or 2-Cyanobenzothienyl Radicals
 Triazinyl- or Pyrimidyl-Acetic Acid Ester Component
 Phthalocyanines
 Copper and Nickel Phthalocyanines
 a-Modified Copper Phthalocyanines
 Tetra(Alkylsulfamoyl)Copper Phthalocyanines
 PolyhaloCopperPhthalocyanines
 Cryallization-Stable Compositions
 Nonflocculating Pigment Composition
 Indolines
 Isoindolinones
 Iminoisoindolinones
 Cocondensate Mixtures of Iminoisoindolinones
 Iminoisoindolenines
 Metal Complexes
 Ni, Co and Cu Complexes
 Bisazomethine Polymer Compositions
 Azomethine Copper Complexes
 Sulfonic Acid Salts
 Tertiary Alkylamine Salts
 Other Pigments
 Acridone Compounds
 Metallic Pigment
 Daylight Fluorescent Compounds
 Enhanced Iridescent Pigments

JET PRINTING

 General Formulations
 Glycerol/Ether/Polyethylene Diol Preparation
 Buffered Blue Ink Composition
 Aliphatic Polyhydric/Monohydric Alcohol Preparation
 Phosphorescent Ink
 Printing on Nonabsorbent Surfaces
 KetoneSolvents
 Ink for Glass Surfaces
 Printing Ink for Metal
 Nonaqueous Ink
 Other Processes
 Nonmagnetic Jet Printing
 Ultrasonic Removal of Impurities
 Production of Iron Particles

RADIATION CURABLE INKS

 Acrylates
 Polyacrylate Reaction Products
 Acrylate and Methacrylate Monomers
 2-(N-Alkylcarbomoyl) Alkyl Acrylate
 Amine Acrylate Addition Reaction Products
 Storage-Stable Ink
 Pentaerythritol Triacrylate
 Acryloyl- and Hydroxyl-Group-Containing Monomers
 Epoxy Compounds
 BenzophenoneSensitizer
 Group V-A Onium Salts
 GroupVI-A Aromatic Onium Salts
 Conductive Inks
 Particulated Metal-Containing Material
 Wax-Containing Resin
 Nonionic Organic Surfactant
 Polymerization Initiators

Poly(Trichloroacetylbenzyl) Compounds

TEXTILE PRINTING

Dyestuffs

Aminoanthraquinones
 Diaminoanthraquinones
 Diaminoanthraquinone Sulfonic Acid Derivatives
 Phthalocyanines
 Disazo Compounds
 2,6-Diaminopyridines
 Tetrareactive Disazo Dyestuffs
 Unsymmetrical 1:2-Chromium Complexes

Thickeners

High Molecular Weight Compounds
 Copolymer Latex
 Sodium Cellulose Sulfate
 Polygalactomannan Compositions
 Heteropolysaccharides
 Alcohol-Propylene Oxide Condensation Product
 Acid Salt-Alcohol-Paraffin-Urea

Transfer Printing

Ink for Acid-Modified Fibers
 Indolenine Methine Compounds
 Carbinol Bases
 Resin-Treated Fiber
 Hydrophilic Fibers
 Sublimable Azo Dyestuffs
 Cationic-Dye-Containing Ink.
 Black Dyestuff Composition
 4-Nitroacridone
 Ink for Screen Printing
 Anionic and Nonionic Dispersant Mixture
 Tris(Hydroxyethyl) Isocyanurate
 Flow-Improving Additive
 Cold Water Soluble Transfer Ink
 Marking Pen Ink

Dry Heat Processes

Anthraquinones
 Cationic Dyestuffs
 Carbinol Bases
 Ethylene-Vinyl Acetate Copolymer
 Methoxymethylated Nylon Copolymer

Marking Inks

Erasable Marking Ink
 Disappearing Marking Ink

Other Processes.

Polymer-Printed Fabric
 Discharge Effects
 Polyoxyethylene and Glycerin Derivatives
 Acyl-Modified Cellulose Fiber
 Developing Dyes
 Printing of Acrylic Fibers
 Oxyethylated Phenol
 2-Hydroxynaphthalene-3-Carboxylic Acid Phenyl Amide
 Ethylene Oxide Adduct
 Dinaphthyl Derivatives
 Carboxyl-Group-Containing Dyestuff.
 Tanning Agent
 Naphthol/Nitrite Impregnated Fiber

SPECIALTY INKS AND APPLICATIONS

Thermochromic Materials
 Ink for Thermometers
 Low-Temperature-Indicating Composition

- Ball-Point Pen Inks
 - Stable Liquid Dye Composition
 - Nonclogging Ink
 - Transitorily Erasable Ink
- Marking Compositions
 - Marking Pen Ink
 - UPC Marking Composition
 - Marking Composition for Identification
 - Multidetactable Fluorescent Ink
 - Electromarking Solution
 - Erasable Ink
 - Gel for Drawing Stick
- Electrical Resistor Inks
 - Pyropolymeric Refractory Inorganic Oxide
 - Pyropolymeric Refractory Inorganic Oxide and Carbon Black
 - Pyropolymeric Refractory Inorganic Oxide and Transition Metal Oxide
- Other Applications
 - High-Speed Ink
 - Aqueous Ink for Vinyl Flooring
 - Graphite-Free, Weld-Resist Printing Paste
 - Foam-Growth-Controlling Printing Ink
 - Ink for Beryllia Substrates
 - Ink for Waxed Substrates
 - Fusible Polyolefin Powder

COMPANY INDEX
 INVENTOR INDEX.
 U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents, beginning with January 1976, that deal with printing inks, their preparation and application. Previous titles on this subject were published by Noyes Data in 1972 and 1976.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, commercially oriented review of recent advances in printing inks.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have by-passed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The table of contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor

and patent number help in providing easy access to the information contained in this book.

15 Reasons Why the U.S. Patent Office Literature Is Important to You

1. The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical commercial process information assembled here than is available from any other source.
2. The technical information obtained from the patent literature is extremely comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure."
3. The patent literature is a prime source of basic commercially utilizable information. This information is overlooked by those who rely primarily on the periodical journal literature.
4. An important feature of the patent literature is that it can serve to avoid duplication of research and development.
5. Patents, unlike periodical literature, are bound by definition to contain new information, data and ideas.
6. It can serve as a source of new ideas in a different but related field, and may be outside the patent protection offered the original invention.
7. Since claims are narrowly defined, much valuable information is included that may be outside the legal protection afforded by the claims.
8. Patents discuss the difficulties associated with previous research, development or production techniques, and offer a specific method of overcoming problems. This gives clues to current process information that has not been published in periodicals or books.
9. Can aid in process design by providing a selection of alternate techniques. A powerful research and engineering tool.
10. Obtain licenses - many U.S. chemical patents have not been developed commercially.
11. Patents provide an excellent starting point for the next investigator.
12. Frequently, innovations derived from research are first disclosed in the patent literature, prior to coverage in the periodical literature.
13. Patents offer a most valuable method of keeping abreast of latest technologies, serving an individual's own "current awareness" program.
14. Copies of U.S. patents are easily obtained from the U.S. Patent Office at 50 cents a copy.
15. It is a creative source of ideas for those with imagination.

Title	Location	Edition / Series / Misc.
146 Printing Inks: Recent Developments		Edition:
Author: Wells, Andrew M.	Dynix: 12990	Series: Chemical Technology Review: No. 61
Publish.: Noyes Data Corporation	Call No.: 667.502 We	
- place: Park Ridge, NJ	ISBN: 0815506058	
- date: ©1976	Shelf Adult Non-Fiction	Year: 1976
Subject: Printing ink -- Patents		Price: \$25.00
Desc: xii, 328 p., illus., 25 cm.		

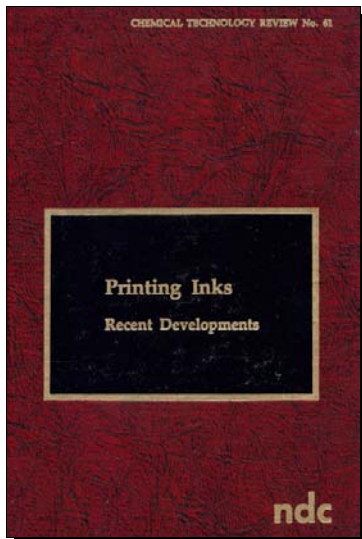


Table of Contents

- Introduction
- Flexographic Inks
- Lithographic Varnishes, Heat Set And Moisture Set Inks
- Gravure Inks
- Newspaper Inks
- Specialty Inks And Applications
- Additives For Printing Inks
- Pigments And Dyestuffs
- Radiation Curable Systems
- Company Index
- Inventor Index
- U.S. Patent Number Index

Reviews - Synopsis - Dust Jacket

INTRODUCTION

Printing ink is a mixture of coloring matter dissolved or, in the case of newspaper inks, dispersed in a carrier to form a fluid or paste. The colorants are pigments and dyes while the vehicle or carrier may range from a light petroleum solvent to heavy mineral oils. In addition, large volumes of ink are based on drying oils such as linseed or dehydrated castor oil and, as such, do not use mineral oils.

Subjects

323 . Printing ink -- Patents

One way of classifying printing methods is to determine whether the ink is above, on, or under the surface from which it is applied. In the typographic process raised type is used. This method is known also as letterpress or relief printing. When the ink is on the plane of the applying surface it is called planographic or lithographic printing. In the last case, the ink is applied from depressions into which paper is forced. This is the intaglio process represented by engraved or incised plates.

Letterpresses (for typography) vary from slow handfed flatbed machines to high speed rotary and cylinder newspaper presses. These presses represent by far the largest number of the types in use. The inks used with much of this equipment are oil-based. The rotaries use a cylindrical cast as the type form and such a rotating type face can turn out copies at a much faster rate than a flat bed hand loaded press. The typographic method excels in the reproduction of letters and characters and thus its use is widespread in printing newspapers, books, catalogs, etc.

Lithography takes its name from the original process in which inked designs were drawn on limestone. Moisture is applied to prevent ink spreading over the stone and causing smudging. Zinc and aluminum litho plates are now used as the transfer medium and high quality reproductions can be produced without distortion (a vital requirement in maps, etc.).

At the other extreme, offset lithography excels in printing cheap papers and in much metal printing. In this technique, the printing material is transferred from a plate cylinder carrying it to a blanket cylinder and from this to paper running between the latter and a so-called impression cylinder. The blanket cylinder has a fabric base covering which is surfaced with a skim coating of rubber. Since it is this rubber which receives and transmits the printing, it is essential that the ink have as little effect on the rubber as possible. This severely restricts the amount and type of mineral oils that can go into inks for use in offset printing.

The intaglio procedure transfers ink through a depressed rather than a raised metal pattern and is, thus, the exact opposite of typography. The system is more properly known as gravure and involves preparing a metal plate with a series of cells varying in depth and diameter. By reducing cell size, sharper images are obtained. The amount of ink transferred determines the intensity of printing area and depends on cell depth. Printing plates in the gravure process are either cylindrical or flat. Generally they are made by a photographic method which is referred to as photogravure or rotogravure. Low viscosity inks are required. Another method of intaglio printing is by means of copper and steel plate engraving. Bank notes, for example, are printed this way. Such printing requires high viscosity drying oil inks.

With the many types of printing methods currently in use, a variety of printing inks are required. The inks can be broken down into those based on mineral oils and those using other vehicles.

The latter category appears to be based on a varnish technology similar to that in the protective coatings field. Both natural and synthetic resins are or have been used with drying oils. Coloring is through organic dyes or inorganic pigments. Aliphatic and aromatic petroleum solvents are used. The former include light naphthas, selected spirit cuts, etc. Because of toxicity, aromatic solvents are employed in relatively small amounts to increase solubility rather than as a viscosity adjuster or main solvent. Inks employing solvents dry by solvent removal either by rapid evaporation or forced drying. Nonhydrocarbon materials such as alcohols, glycols, ethers, etc. can also be used.

In the area of solvent inks, mention should be made of the so-called Magie oils. These are closely cut petroleum fractions which are apparently used either directly as solvents for pigmented resins, or as conventional solvents with varnish inks. These inks are used mainly as lithographic inks.

Mineral oil inks are used almost exclusively in newsprint, where they dry by penetration into absorbent stock. In addition to the oil, they contain printing grade carbon blacks (or, for colored ink, dyes and/or pigments) and sometimes a little rosin or other resin. Letterpress printing consumes large volumes of these inks.

Printing ink production in the United States now exceeds one billion pounds per year. The major components include drying oils, resins, varnishes, shellac pigments and many specialty additives. A very complex market, the industry comprises over 250 printing ink producers and some 50,000 commercial printers. However, industry figures indicate that about seven companies share over 50% of the market. These are Inmont, Sinclair and Valentine, Sun Chemical, Cities Service (F. H. Levey), Tennessee Chemicals California Ink, Borden and Flint Ink. Many large volume users are captive producers, as for example, American Can, Reuben H. Donnelly, Bemis Bag and others.

In recent years, there has been a proliferation of inks for rather specific end uses, such as porous tip pens, ball point pens, electrical microcircuitry, textiles, magnetic applications as in bank check processing and conductive coatings. Improved pigments including reactive mixtures and fluorescent dyes have also been developed. Specialty inks likely account some 20% of the U.S. market.

With the increasingly stringent regulations for air pollution control and the energy crisis related concern for the high cost of drying, considerable research and development activity is evident in high solids systems and ultraviolet curable printing inks. Ultraviolet cured inks have been shown to require only one-third the energy and one-fifth the capital cost when compared with conventional heat cured systems.

While these newer techniques and specialty applications are gaining a foothold in this business, large volume markets continue to be concentrated in the four basic classifications: letterpress, lithographic, rotogravure and flexographic. Newsprint (letterpress) is of course, largest in volume, but its low selling price significantly limits its dollar volume. These inks largely comprised of carbon black and mineral oil, have undergone very little change over the years.

Lithographic inks used in publications, packaging and commercial printing now have a substantially larger dollar volume than letterpress inks. The use of web-offset equipment in printing newspapers and general publications has accelerated this growth.

In the solvent based inks, flexographic inks are increasing their market share at the expense of letterpress. The inks dry rapidly affording efficient operation using continuous webs. Flexographic inks are used on corrugated boxes, transparent films, foils and flexible laminates.

Gravure inks, historically used to print the newspapers' Sunday supplements are now used to print many decorative consumer packages such as cereal cartons, frozen food packaging and soap wrappers. The printing industry is one of the largest consumers of pigments due to the increasing demand for color, and as the patent literature clearly indicates, the development of high performance pigments for a wide variety of substrates has greatly accelerated over the past few years.

This book reviews over 250 processes related to binder resin development, ink formulation and additives, with considerable emphasis being placed on the industry efforts for the newer developments in specialty type inks, pigments, radiation cure and their application to solve difficult printing problems on a variety of substrates.

Title	Location	Edition / Series / Misc.
927 Project Management: Strategic Design and Implementation <i>Author:</i> Cleland, David I. and Lewis R. Ireland, 1937- <i>Publish.:</i> McGraw-Hill Book Company <i>- place:</i> New York, NY <i>- date:</i> ©2002 <i>Subject:</i> Project management <i>Desc:</i> xx, 656 p., illus., 24 cm.	<i>Dynix:</i> 105698 <i>Call No.:</i> 658.4 CI <i>ISBN:</i> 0071393102 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 4th edition <i>Series:</i> <i>Year:</i> 2002 <i>Price:</i> \$58.50

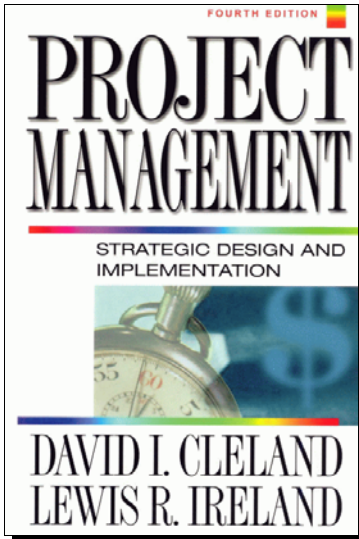


Table of Contents

Preface
 Acknowledgments
 Introduction

Part 1: Introduction

Chapter 1. Why Project Management?
 1.1. Introduction
 1.2. Strategic Management — The Project Linkages
 1.3. A Historical Perspective of Projects
 1.4. Other Examples
 1.5. Early Literature
 1.6. Organizational Liaison Devices
 1.7. Teams
 1.8. The Project Management Professional Societies
 1.9. A Philosophy
 1.10. Breaking Down Hierarchies
 1.11. To Summarize
 1.12. Additional Sources of Information
 1.13. Discussion Questions
 1.14. User Checklist
 1.15. Principles of Project Management
 1.16. Project Management Situation — External and Internal Projects
 1.17. Student/Reader Assignment

Chapter 2. The Project Management Process
 2.1. Introduction
 2.2. The General Management Process
 2.3. The Project Management Process
 2.4. The Project Life Cycle
 2.5. Product Development
 2.6. Managing the Life Cycle
 2.7. Project Life Cycles and Uncertainty
 2.8. To Summarize
 2.9. Additional Sources of Information
 2.10. Discussion Questions
 2.11. User Checklist
 2.12. Project Management Principles
 2.13. Project Management Situation — Strategic Monitoring and Control
 2.14. Student/Reader Assignment

Part 2: The Strategic Context of Projects

Chapter 3. When to Use Project Management
 3.1. Introduction
 3.2. Business Process Changes
 3.3. Specific Uses
 3.4. Projects and Strategic Planning
 3.5. When Is a Project Needed?
 3.6. Promoting Participative Management
 3.7. Senior Management Responsibility

Subjects

583 . | Project management

- 3.8. Selling Project Management to Senior Managers
- 3.9. External Project Management Selling
- 3.10. What It Takes to Sell Project Management
- 3.11. Two Views of Selling Project Management
- 3.12. Types of Projects
- 3.13. The Management of Small Projects
- 3.14. To Summarize
- 3.15. Additional Sources of Information
- 3.16. Discussion Questions
- 3.17. User Checklist
- 3.18. Principles of Project Management
- 3.19. Project Management Situation — When to Use Project Management
- 3.20. Student/Reader Assignment

Chapter 4. The Strategic Context of Projects

- 4.1. Introduction
- 4.2. Strategy Transitions
- 4.3. Implications of Technology
- 4.4. A Stream of Projects
- 4.5. Strategic Relationship of Projects
- 4.6. Determining Strategic Fit
- 4.7. The Vision
- 4.8. A Project Selection Framework
- 4.9. Projects and Organizational Management
- 4.10. Project Planning
- 4.11. The Project Owners Participation
- 4.12. Project Management System
- 4.13. To Summarize
- 4.14. Additional Sources of Information
- 4.15. Discussion Questions
- 4.16. User Checklist
- 4.17. Principles of Project Management
- 4.18. Project Management Situation — Improvement of Project Management
- 4.19. Student/Reader Assignment

Chapter 5. The Board of Directors and Major Projects

- 5.1. Introduction
- 5.2. The Need for Boards of Directors
- 5.3. Surveillance
- 5.4. Some Board Inadequacies
- 5.5. Exemplary Board Behavior
- 5.6. The Board's Responsibilities
- 5.7. Empowerment of the Board
- 5.8. The Role of Projects
- 5.9. The Organizational Design
- 5.10. Project Reviews
- 5.11. Information for the Board
- 5.12. The Performance Audit
- 5.13. Cultural Considerations
- 5.14. Selection of Directors
- 5.15. To Summarize
- 5.16. Additional Sources of Information
- 5.17. Discussion Questions
- 5.18. User Checklist
- 5.19. Principles of Project Management
- 5.20. Project Management Situation — Board of Directors' Inadequacies
- 5.21. Student/Reader Assignment

Chapter 6. Project Stakeholder Management

- 6.1. Introduction
- 6.2. Why Manage Stakeholders?
- 6.3. Organizational Stakeholders
- 6.4. Project Stakeholders
- 6.5. Some Examples of Stakeholder Influence

- 6.6. Some Examples of Successful Stakeholder Management
- 6.7. Project Stakeholder Management (PSM) Process
- 6.8. Planning Stakeholder Management
- 6.9. A Model of the PSM Process
- 6.10. Identification of Stakeholders
- 6.11. Primary Stakeholders
- 6.12. Secondary Stakeholders
- 6.13. Gathering Stakeholder Information
- 6.14. Identification of Stakeholder Mission
- 6.15. Determining Stakeholder Strengths and Weaknesses
- 6.16. Identification of Stakeholder Strategy
- 6.17. Prediction of Stakeholder Behavior
- 6.18. Project Audit
- 6.19. Implementing Stakeholder Management Strategy
- 6.20. To Summarize
- 6.21. Additional Sources of Information
- 6.22. Discussion Questions
- 6.23. User Checklist
- 6.24. Principles of Project Management
- 6.25. Project Management Situation — Stakeholder Initiatives
- 6.26. Student/Reader Assignment

Chapter 7. Strategic Issues in Project Management

- 7.1. Introduction
- 7.2. What Are Strategic Issues?
- 7.3. Some Examples
- 7.4. An Application of the Concept of Strategic Issues: Nuclear Construction Industry
- 7.5. Managing Project Strategic Issues
- 7.6. Issue Identification
- 7.7. Assessment of an Issue
- 7.8. Analysis of Action
- 7.9. Implementation
- 7.10. Strategic Issues of Project Success and Failure
- 7.11. Portfolio Management for Projects
- 7.12. To Summarize
- 7.13. Additional Sources of Information
- 7.14. Discussion Questions
- 7.15. User Checklist
- 7.16. Principles of Project Management
- 7.17. Project Management Situation — Some Strategic Issues
- 7.18. Student/Reader Assignment

Part 3: Organizational Design for Project Management

Chapter 8. Organizing for Project Management

- 8.1. Introduction
- 8.2. Project-Driven Organization
- 8.3. Self-Management in Organizations
- 8.4. Organizational Deficiencies
- 8.5. The Project Organization
- 8.6. Various Forms of the Project Organization
- 8.7. The Matrix Organization
- 8.8. Functional Area Knowledge
- 8.9. Focus of the Matrix Design
- 8.10. Importance of Work Packages
- 8.11. The Project-Functional Interface
- 8.12. A Controversial Design
- 8.13. No One Best Organizational Design
- 8.14. Global Project Organizations
- 8.15. Project-Customer Relationships
- 8.16. Organizational Networking
- 8.17. The Project Management Office
- 8.18. Procurement and Contract Negotiations/Administration
- 8.19. To Summarize

- 8.20. Additional Sources of Information
- 8.21. Discussion Questions
- 8.22. User Checklist
- 8.23. Principles of Project Management
- 8.24. Project Management Situation — Understanding the Matrix Organization
- 8.25. Student/Reader Assignment

Chapter 9. Project Authority

- 9.1. Introduction
- 9.2. Authority, Responsibility, and Accountability
- 9.3. Defining Authority
- 9.4. Power
- 9.5. Matrix Implications
- 9.6. The Power to Reward
- 9.7. Reverse Delegation
- 9.8. Documenting Project Manager's Authority
- 9.9. What Is Responsibility?
- 9.10. What Is Accountability?
- 9.11. Project Organization Charting
- 9.12. Traditional Organizational Chart
- 9.13. Linear Responsibility Chart
- 9.14. Work Packages
- 9.15. Work Package — Organizational Position Interfaces
- 9.16. A Project Management LRC
- 9.17. Developing the LRC
- 9.18. To Summarize
- 9.19. Additional Sources of Information
- 9.20. Discussion Questions
- 9.21. User Checklist
- 9.22. Principles of Project Management
- 9.23. Project Management Situation — Prescribing Project Management Authority
- 9.24. Student/Reader Assignment

Chapter 10. Project Management Maturity

- 10.1. Introduction
- 10.2. Organizational Productivity Improvements
- 10.3. Project Management Maturity Models
- 10.4. Total Organizational Capability Maturity Model
- 10.5. Assessing Project Management Maturity
- 10.6. Building a Mature Capability
- 10.7. Benchmarking
- 10.8. Competitive Intelligence
- 10.9. To Summarize
- 10.10. Additional Sources of Information
- 10.11. Discussion Questions
- 10.12. User Checklist
- 10.13. Principles of Project Management
- 10.14. Project Management Situation — Gaining Project Management Maturity
- 10.15. Student/Reader Assignment

Part 4: Project Operations

Chapter 11. Project Planning

- 11.1. Introduction
- 11.2. The Importance of Planning
- 11.3. Planning Realities
- 11.4. A Conceptual Model of Planning
- 11.5. Project Planning Model
- 11.6. Project Planning Process
- 11.7. Project Planning Considerations
- 11.8. Work Breakdown Structure
- 11.9. Project Schedules
- 11.10. Scheduling Techniques
- 11.11. Project Life-Cycle Planning

- 11.12. Project Planning Elements
- 11.13. Plan Format
- 11.14. Project Management Manual
- 11.15. Project Planning Work Packages
- 11.16. Management Realities
- 11.17. Project Partnering
- 11.18. Types of Project Partnering Arrangements
- 11.19. Examples for Project Partnering Arrangements
- 11.20. Managing Partnered Projects
- 11.21. Technical Aspects of Partnered Projects
- 11.22. Partnering Challenges and Benefits
- 11.23. Outsourcing Project Management
- 11.24. Project Management as an Outsourced Service
- 11.25. Outsourcing Trends
- 11.26. Selecting an Outsource Provider
- 11.27. Outsourcing Project Management Services and Products
- 11.28. Project Management Outsourcing Guidelines
- 11.29. Outsourcing Potential
- 11.30. To Summarize
- 11.31. Additional Sources of Information
- 11.32. Discussion Questions
- 11.33. User Checklist
- 11.34. Principles of Project Management
- 11.35. Project Management Situation — Developing a Project Plan
- 11.36. Student/Reader Assignment

Chapter 12. Project Management Information System

- 12.1. Introduction
- 12.2. The Project Management Information System
- 12.3. Information Failures
- 12.4. Value of the PMIS
- 12.5. Describing a PMIS
- 12.6. Uses of the PMIS
- 12.7. Information Characteristics and Attributes
- 12.8. Sharing Information
- 12.9. Information Value
- 12.10. Technology and the PMIS
- 12.11. Challenges to an Effective PMIS
- 12.12. PMIS Hardware and Software
- 12.13. Planning for the PMIS
- 12.14. Essential Elements of a PMIS
- 12.15. To Summarize
- 12.16. Additional Sources of Information
- 12.17. Discussion Questions
- 12.18. User Checklist
- 12.19. Principles of Project Management
- 12.20. Project Management Situation
- 12.21. Student/Reader Assignment

Chapter 13. Project Monitoring, Evaluation, and Control

- 13.1. Introduction
- 13.2. Project Control Cycle
- 13.3. Steps in the Control Cycle
- 13.4. Monitoring and Evaluation
- 13.5. Management Functions Evaluation
- 13.6. When to Monitor and Evaluate
- 13.7. Planning for Monitoring and Evaluation
- 13.8. Who Monitors and Evaluates?
- 13.9. Project Audits
- 13.10. Post-Project Reviews
- 13.11. Configuration Management and Control
- 13.12. Planning and Control Implications for Project Success or Failure
- 13.13. Results of Projects — Success or Failure
- 13.14. Examples of Project Success/Failure

- 13.15. The Causes of Success or Failure
- 13.16. Project Evaluation
- 13.17. To Summarize
- 13.18. Additional Sources of Information
- 13.19. Discussion Questions
- 13.20. User Checklist
- 13.2.1. Principles of Project Management
- 13.22. Project Management Situation — Establishing a Project Control System
- 13.23. Student/Reader Assignment

Chapter 14. The Project Earned Value Management System

- 14.1. Introduction
- 14.2. Background
- 14.3. EVM Capability
- 14.4. EVM Implementation Considerations
- 14.5. Planning for EVMS
- 14.6. Measuring Progress
- 14.7. Performance Achievement
- 14.8. EVMS Considerations
- 14.9. To Summarize
- 14.10. Additional Sources of Information
- 14.11. Discussion Questions
- 14.12. User Checklist
- 14.13. Principles of Project Management
- 14.14. Project Management Situation — Implementing Earned Value
- 14.15. Student/Reader Assignment

Chapter 15. Project Termination

- 15.1. Introduction
- 15.2. Why Terminate?
- 15.3. Types of Project Termination
- 15.4. Strategic Implications
- 15.5. Continuing the "Losers"
- 15.6. Projects in Trouble
- 15.7. Termination Strategies
- 15.8. Evaluation of Termination Possibilities
- 15.9. Termination Procedures
- 15.10. Post-termination Activities
- 15.11. To Summarize
- 15.12. Additional Sources of Information
- 15.13. Discussion Questions
- 15.14. User Checklist
- 15.15. Principles of Project Management
- 15.16. Project Management Situation — Shutting Down a Project
- 15.17. Student/Reader Assignment

Part 5: Interpersonal Dynamics in the Management of Projects

Chapter 16. Project Leadership

- 16.1. Introduction
- 16.2. Concept of Leadership
- 16.3. What Is Leadership?
- 16.4. Studies of Leadership
- 16.5. Leadership Style
- 16.6. Management vis-à-vis Leadership
- 16.7. Project Leadership
- 16.8. Leadership Competencies
- 16.9. To Summarize
- 16.10. Additional Sources of Information
- 16.11. Discussion Questions
- 16.12. User Checklist
- 16.13. Principles of Project Management
- 16.14. Project Management Situation — Being a Project Leader
- 16.15. Student/Reader Assignment

Chapter 17. Project Communications
17.1. Introduction
17.2. Importance of Communication
17.3. Communication Problems
17.4. The Process of Communication
17.5. Informal Communication
17.6. Listening
17.7. Nonverbal Communication
17.8. Written Communications
17.9. Project Meetings
17.10. The Role of Technology
17.11. Communication Links
17.12. To Summarize
17.13. Additional Sources of Information
17.14. Discussion Questions
17.15. User Checklist
17.16. Principles of Project Management
17.17. Project Management Situation — How to Communicate
17.18. Student/Reader Assignment

Chapter 18. Effective Project Teamwork
18.1. Introduction
18.2. The Need for Effective Teamwork
18.3. What We Know about Project-Oriented Teamwork
18.4. Measuring Project Team Performance
18.5. A Model for Team Building
18.6. Building High-Performing Teams
18.7. Recommendations for Effective Team Management
18.8. To Summarize
18.9. Additional Sources of Information
18.10. Discussion Questions
18.11. User Checklist
18.12. Principles of Project Management
18.13. Project Management Situation — Using Teams to Meet Challenges
18.14. Student/Reader Assignment

Part 6: The Cultural Elements

Chapter 19. Continuous Improvement through Projects
19.1. Introduction
19.2. Why Continuous Improvement?
19.3. Some Examples
19.4. Survival through Change
19.5. Management Innovation
19.6. Continuous Improvement in Productivity
19.7. Product Quality through Projects
19.8. Trendsetters
19.9. Product Integrity
19.10. Continuous Improvement in Manufacturing
19.11. Manufacturing Philosophies
19.12. Computer-Integrated Manufacturing (CIM)
19.13. Just-in-Time Manufacturing (JIT)
19.14. To Summarize
19.15. Additional Sources of Information
19.16. Discussion Questions
19.17. User Checklist
19.18. Principles of Project Management
19.19. Project Management Situation — Challenges for the New Managers
19.20. Student/Reader Assignment

Chapter 20. Cultural Considerations in Project Management
20.1. Introduction
20.2. Defining Culture

- 20.3. The Nature of an Organizational Culture
- 20.4. The Strategic Management Linkage
- 20.5. Additional Examples of Corporate Culture
- 20.6. Cultural Features
- 20.7. The Project Culture
- 20.8. Why Change?
- 20.9. The Constancy of Change
- 20.10. Project Management Actions
- 20.11. The Trust Factor
- 20.12. Culture and Project E
- 20.13. Influencing the Team's Culture
- 20.14. Conflict
- 20.15. Code of Ethics for Project Professionals
- 20.16. To Summarize
- 20.17. Additional Sources of Information
- 20.18. Discussion Questions
- 20.19. User Checklist
- 20.20. Principles of Project Management
- 20.21. Project Management Situation-Conducting a Cultural Assessment
- 20.22. Student/Reader Assignment

Part 7: New Prospects

Chapter 21. Alternative Project Teams

- 21.1. Introduction
- 21.2. A Place in Business for Alternative Teams
- 21.3. Traditional and Nontraditional Project Teams
- 21.4. The Types of Alternative Teams
- 21.5. Alternative Teams: More about Their Roles
- 21.6. The Personal Impact of Teams
- 21.7. Role Change
- 21.8. To Summarize
- 21.9. Additional Sources of Information
- 21.10. Discussion Questions
- 21.11. User Checklist
- 21.12. Principles of Project Management
- 21.13. Project Management Situation — Positive and Negative Results
- 21.14. Student/Reader Assignment

Chapter 22. The Future of Project Management

- 22.1. Introduction
- 22.2. Recent Disaster Shapes the Future
- 22.3. The Practice of Project Management
- 22.4. Past and Current Influences
- 22.5. Some General Future Trends
- 22.6. Changing Management Philosophies
- 22.7. Distribution Changes
- 22.8. Infrastructure Needs
- 22.9. What Does It Mean?
- 22.10. The Future of Project Management
- 22.11. Management Philosophy Modifications
- 22.12. Increase in Megaprojects
- 22.13. Other Project Management Changes
- 22.14. Additional Changes
- 22.15. A Turning Point
- 22.16. To Summarize
- 22.17. Additional Sources of Information
- 22.18. Discussion Questions
- 22.19. User Checklist
- 22.20. Principles of Project Management
- 22.21. Project Management Situation — What Does the Future Hold?
- 22.22. Student/Reader Assignment

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The Landmark Reference on Project Management Updated and Expanded to Reflect the Challenges and Opportunities of the New Millennium

The first book to truly apply the theory, processes, practices, and techniques of project management is still the best! Here in a single definitive volume is unmatched top-to-bottom coverage of project management for the organization.

Head and shoulders above any other project management guide, this is the only source of guidance on strategic project management in both large and small industrial organizations. Written by two world leaders in project management, this book focuses on the use of flexible teams to implement organizational strategies—particularly changes in products, services, and processes—placing this book at the forefront of project management design.

The Fourth Edition places heightened emphasis on strategic management for the organization and provides leading-edge information and techniques on self-managing teams, innovative organizational structuring, team composition, and alternative teams. Enhanced throughout with new diagrams, tables, chapter summaries, checklists, and case studies, this publication sets a standard of excellence that is not found in any other book on the subject.

PREFACE:

In today's environment, certainty of change is without precedent. Although the practice of project management has been with us for centuries, only in the past few decades has an expression in the literature of a philosophy and process of managing projects taken place. In recent years, there has been a growing interest in the use of projects as building blocks in the strategic management of the enterprise. This book's fourth edition continues to hold the commanding lead, taken by previous editions, in showing how to use projects for the management of product, service, and organizational process change to prepare the organization for its competitive future.

Today, project management has reached a maturity level in which it is applied to many uses. It is the principal means by which operational and strategic changes are managed in contemporary organizations, in both for-profit and not-for-profit enterprises. This growing maturity of project management has fostered the use of "nontraditional" project teams in the management of change. Benchmarking teams, concurrent engineering teams, reengineering teams, and self-managed production teams are a few of these nontraditional teams that are gaining popularity in strategies used by today's managers.

Formal project management emerged in an unobtrusive manner in the late 1950s and began taking on the characteristics of a distinct discipline. No one can claim to have invented project management. Its beginnings can be found in the creation and construction of many different historical architectural artifacts, such as in cathedrals, canals, highways, and in voyages of discovery and military campaigns, to name a few. In more recent times, project management has gained special attention in the military weapons and systems development businesses. The modern-day origins of project management concepts and techniques can be found in such large-scale ad hoc endeavors as the Manhattan Project and the Polaris submarine program, in large construction initiatives, and in the use of naval task forces.

The emergence of professional societies has helped stimulate the development and dissemination of project management knowledge and skills. There are many such professional societies in existence—with a commanding lead being taken by the Project Management Institute (PMI®). The growth of PMI in recent years in many ways reflects the increasing interest in the use of project management. PMI has over 90,000 members drawn from a wide variety of different industries and organizations.

Many books and articles that have been published about project management treat the subject as if it were a nearly separate entity in the management of organizations. Little is found in this literature that puts project management in its proper place in the strategic management of organizations. This book tries to do just that. Our study of how contemporary organizations deal with change reinforced our belief that, in spite of an abundance of books and periodical literature, there was a serious lack of theoretical and practical literature that placed project management in the context of the design and execution of organizational strategies.

We found that too many leaders and managers, particularly at the upper and senior levels, were inclined to view project management as a special case of management—a minor departure from the proper or expected ways of managing the organization. Too often these managers failed to appreciate the strategic role that projects can play in the management of their organizations. Up until the last few years, many managers tended to tolerate rather than fully accept project management as the way to enhance organizational effectiveness. This caused project managers, functional managers, and project professionals to see themselves in ambiguous roles in supporting project initiatives. However, once upper and senior managers recognized project management for what it is—a philosophy and process for managing

change—they embraced the use of project management in the enterprise.

In this fourth edition of "Project Management: Strategic Design and Implementation", special care has been taken to update the material in each chapter. New material has been added that has emerged as part of the growing literature supporting project management, such as earned value, project management maturity, nontraditional teams, project partnering, and the outsourcing of project management, to name a few. In some cases, the growing literature in project management is adequately described in the text. In some cases, an area is only mentioned with guidance on where the reader can find expert references on the subjects. To give a detailed description of all of the emerging areas of thought that relate to project management would greatly lengthen the book to an unwieldy size.

Updated examples of the use of project management in many different contexts have been added. End-of-chapter material has been strengthened through the use of detailed chapter summaries, additional sources of information, discussion questions, user checklists, project management principles, a project management situation, and a student/reader assignment for further investigation of project management areas. Sufficient end-of-chapter material exists to support the use of the text in undergraduate and graduate programs as well as in short training courses. The book is valuable as well for the professional practitioners, who want to increase their knowledge and skills in the practice of project management. Upper-level and senior managers will find an abundance of information that can be used to enhance their use of project initiatives in the management of the enterprise.

INTRODUCTION:

This fourth edition of Project Management: Strategic Design and Implementation has been put together with the objective of further contributing to the project management knowledge of professionals at all levels of responsibility and to the student aspiring to be a part of a project team.

Managers and professionals engaged in project management, who desire to be more effective contributors in their organization's success, will find this book useful. The format of the book is adaptable to many different uses. Readers may read sections and topics in whatever order best suits their interests. The 7 parts and 22 chapters provide an easy division of information for readers.

Part 1, Introduction, consists of two chapters that introduce project management and describe the management processes that are involved in the practice of this discipline. Here, a historical perspective shows early efforts that could only be called projects in our modern interpretation.

Part 2, The Strategic Context of Projects, shows how projects are used in both the strategic and operational management of the enterprise. The theme emphasized in this section is how projects are building blocks in preparing the enterprise for its uncertain future. When to use project management, the strategic context of projects, strategic issues, and the role of stakeholders and boards of directors are examined in this part.

Part 3, Organizational Design for Project Management, looks at how to organize human resources, project authority, and project management maturity. Management of people and gain in project maturity capability are important to the achievement of enterprise goals.

Part 4, Project Operations, reviews project planning, information systems, project control, project termination, and earned value systems. Foundation areas of project operational framework provide views of what is needed to successfully manage a project.

Part 5, Interpersonal Dynamics in the Management of Projects, presents information on project leadership, communications, and effective project teamwork. Because only people can make things happen, various ways an individual or a team is motivated comes into play.

Part 6, The Cultural Elements, reviews a strategy of continuous improvement through projects, and cultural considerations in project management. A new awareness is raised in project management that cultural aspects are perhaps as important as the "traditional" cost, schedule, and technical performance issues.

Part 7, New Prospects, considers the alternative uses to which project teams can be put. The final chapter of the book speculates on what the future of project management might be. The challenges of the future give rise to new and unique applications for project management.

The reader can do further reading about project management from the additional sources of information noted at the end of each chapter. Then, too, each reference cited in the text of the book can be a valuable source of additional information.

We wish readers much success in their project management work!

Title	Location	Edition / Series / Misc.
171 Properties of Solvents Author: Marcus, Y. Publish.: John Wiley & Sons - place: New York, NY - date: ©1998 Subject: Solvents Desc: xiv, 239 p., illus. 24 cm.	Dynix: 79970 Call No.: 541.3 Ma ISBN: 0471983691 Shelf Reference	Edition: Series: Wiley Series in Solution Chemistry: Vol. 4 Year: 1998 Price: \$170.00

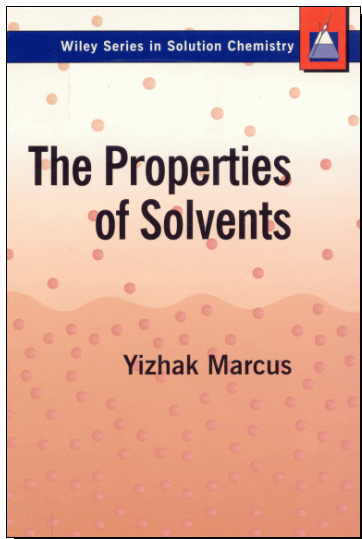


Table of Contents

Series Preface
 Preface
 List of Symbols

Chapter 1: Introduction
 1. A survey of useful solvents
 2. Solvent purity and purification methods
 3. Tests of solvent purity
 4. Toxicity and other hazards of solvents
 References

Chapter 2: Solvent Effects
 1. Solvation
 2. Solution composition
 3. Solvent effects on solubility and partition
 4. Solvent effects on chemical equilibria
 5. Solvent effects on reaction rates
 6. Solvent effects in spectroscopy
 7. Solvent effects in electrochemistry
 References

Chapter 3: Physical Properties of Solvents
 1. The liquid range of solvents
 2. The P-V-T properties of solvents
 3. Vaporization properties of solvents
 4. The heat capacity of solvents
 5. The molecular sizes of solvents
 6. Electrical and optical properties
 7. Magnetic properties of solvents
 8. Surface and transport properties
 9. Water and heavy water
 References

Chapter 4: Chemical Properties of Solvents
 1. The structuredness of solvents
 2. Solvent polarity
 3. Electron-pair donicity
 4. Hydrogen bonding ability
 5. Solvent softness
 6. Solvent acidity and basicity
 7. Aqueous solubility and partition
 8. Windows for spectroscopy and electrochemistry
 References

Chapter 5: Applications
 1. A survey of typical applications
 2. Applications in solvent extraction
 3. Applications in electrochemistry
 4. Applications in organic chemistry
 5. Applications in polymer science and technology
 6. Special features of water as solvent

Subjects

329 .	Solution (Chemistry)
330 .	Solvents

References

Index

Reviews - Synopsis - Dust Jacket

Solvents are used in most processes in chemical and pharmaceutical industries. As a result, their chemical and physical properties provide vital information for their optimal selection. This book contains such information for over 250 solvents, and answers key questions including what hazards are connected with a particular solvent, and what solvent should be selected for a particular application.

FROM THE DUST JACKET:

"The Properties of Solvents" contains extensively annotated tables of physical, chemical and related properties for over 250 solvents.

Factual knowledge of solvent effects on solvation, solubility, chemical equilibria and reaction rate is important for theoretical and practical applications. This volume will enable chemists to choose solvents rationally, taking into account solvent properties and the expected results.

"The Properties of Solvents" is a valuable source of information for all who are interested in the behavior of solutions. These include solution, organic, analytical and physical chemists.

SERIES PREFACE:

There are many aspects of solution chemistry. This is apparent from the wide range of topics which have been discussed during recent International Conferences on Solution Chemistry and International Symposia on Solubility Phenomena. The Wiley Series in Solution Chemistry was launched to fill the need to present authoritative, comprehensive and up-to-date accounts of these many aspects. Internationally recognized experts from research or teaching institutions in various countries have been invited to contribute to the Series.

Volumes in print or in preparation cover experimental investigation, theoretical interpretation and prediction of physical chemical properties and behaviour of solutions. They also contain accounts of industrial applications and environmental consequences of properties of solutions.

Subject areas for the Series include: solutions of electrolytes, liquid mixtures, chemical equilibria in solution, acid-base equilibria, vapour-liquid equilibria, liquid-liquid equilibria, solid-liquid equilibria, equilibria in analytical chemistry, dissolution of gases in liquids, dissolution and precipitation, solubility in cryogenic solvents, molten salt systems, solubility measurement techniques, solid solutions, reactions within the solid phase, ion transport reactions away from the interface (i.e. in homogeneous, bulk systems), liquid crystalline systems, solutions of macrocyclic compounds (including macrocyclic electrolytes), polymer systems, molecular dynamic simulations, structural chemistry of liquids and solutions, predictive techniques for properties of solutions, complex and multi-component solutions applications, of solution chemistry to materials and metallurgy (oxide solutions, alloys, mattes etc.), medical aspects of solubility, and environmental issues involving solution phenomena and homogeneous component phenomena.

Current and future volumes in the Series include both single-authored and multi-authored research monographs and reference level works as well as edited collections of themed reviews and articles. They all contain comprehensive bibliographies.

Volumes in the Series are important reading for chemists, physicists, chemical engineers and technologists as well as environmental scientists in academic and industrial institutions.

PREFACE:

I would like to thank Dr Peter Fogg for encouraging me to participate in this series edited by him on Solution Chemistry. This is the subject towards which my research has gravitated in the last two decades, dealing mainly with solvation phenomena. Since solution chemistry is carried out in solvents, it is necessary to be very familiar with their properties in order to understand what is going on.

As will become apparent, it is expedient to continue with the following excerpts from the preface to a previous book of mine, *Ion Solvation*, published in 1985:

'During my work of research on chemical interacting systems, I seem to succumb every eight years or so to the urge to sit down and write a book. The first effort, *Ion Exchange and Solvent Extraction of Metal Complexes* (with [late] Aviezer Steven Kertes) was published in 1969, the second one, *Introduction to Liquid State Chemistry*, was published in 1977,

and here is the third one.'

Since 1985, another book, *Ion Properties*, was published in 1997, so that the eight year interval has not been kept, but to amend this, the present book is offered. To quote further:

'My main purpose does not change... I use this opportunity to locate gaps in our knowledge, and either fill these with new research while the book is being written or do this to the best of my ability in the course of time. Many new research ideas have thus come to me from my attempts to present current factual knowledge and theoretical interpretation in an organized form... The scope of university research nowadays, I regret to record, is not conducive to the carrying out of extensive and systematic sets of measurements of high accuracy on the properties of chemical systems. Both from the standpoint of student interest and from that of the necessary financial support, work on systems that are not of immediate practical importance, but which could become so in time, is not encouraged. Still, as pointed out in the final chapter of this book, the applications of [solvents] in many fields of chemistry and other disciplines depends on the availability of reliable data on such systems. Furthermore, theories, models, and interpretations require adequate data to operate on, in order to be tested and to provide the insight on the interactions and processes that is being sought. I have therefore endeavored in this book to present as many reliable data as seem to be relevant, without trying to be exhaustive, and to provide these with appropriate annotations I hope that the long lists of references [the extensive tables do not detract too much from the readability of the book. I preferred to have the tables right at the place where the data are discussed or where they can be employed by the reader as an illustration to the points discussed, rather than have them relegated to appendixes.'

Is it necessary to justify further the writing of the present book?

The data collected and shown are from secondary sources—where they have previously been critically evaluated and selected—whenever warranted, but more recent primary sources in research journals have been used to supplement the former or to supersede them if deemed necessary. Access to the primary sources has been through the abstracts up to 1996. The selection of the solvents for which the data are included in this book (the List) is discussed in the Introduction. I am solely responsible for such choices, regarding solvents and data, as have been made. I will be grateful for indications of errors, oversights, and further useful data that may be brought to my attention. Some of the tables are confined to those solvents from the List for which the relevant data have been reported. However, for most of the more extensive tables, many blank spaces have been left, and in some cases entire rows of data have been left blank. This was done with the hope of calling attention to the lack of reliable data, and the expectation that some of these blanks may be filled within the useful lifetime of this book (and its author).

INTRODUCTION:

A Survey of Useful Solvents

Solvents are substances that are liquid under the conditions of application and in which other substances can dissolve, and from which they can be recovered unchanged on removal of the solvent. So many substances conform to this definition—practically all those that can be liquefied under some conditions—that it is not very helpful, unless the word 'application' is stressed, meaning that the solvents and the solutions in them ought to be applicable for some purpose. In the present context, therefore, materials that can be liquefied only under extreme conditions of temperature and pressure will not be considered extensively. This excludes, for instance, molten salts and slags on the one hand and 'permanent' gases on the other, unless they have found some use as 'supercritical solvents'. Then, again, binary or multi-component liquid mixtures are not dealt with here, although they can be very useful as solvents, since this would have expanded the size of this book enormously. This still leaves a host of organic and many inorganic substances that are liquid at or near ambient conditions, which could be considered to be solvents under the present definition. Of these, a limited number are selected, in order for this book to be useful and handy, rather than trying in vain to be comprehensive and encyclopedic.

The solvents that are included in the extensive compilations of physical and chemical properties shown in this book (the List, referred to as such in this book) have been selected so as to cover the major classes of solvents, and bring several examples of each class. The properties of solvents that have not been included, but that belong to these classes, in particular isomers or higher members of homologous series, can often be inferred from the reported data at least to some extent. One criterion according to which solvents have been selected for inclusion in the List is that most of their physical and chemical properties, among those considered here, should be known. In particular, those chemical properties pertaining to their ability to solvate solutes are stressed as criteria for inclusion, since this book is a part of a series on Solution Chemistry. This solvating ability can be characterized by so-called solvatochromic parameters or similar indices of solvation ability, and some, at least, of the most commonly used of these parameters, ought to be known for inclusion of the solvent in the List.

Water, being the most abundant, extensively employed, and a very useful solvent, has always been accorded very wide attention by chemists of all sub-disciplines who have been studying solutions. As an antithesis, the keyword 'non-aqueous' has figured in the titles of many treatments of other solvents. Inorganic solvents have long been considered to be the typical 'non-aqueous solvents', as is manifested in the titles of several books dealing almost exclusively with them,

written or edited in the fifties and early sixties by authors such as (Audrieth and Kleinberg 1953; Sisler 1961; Waddington 1965). Only little attention was accorded at the time to organic non-aqueous solvents. In the last few decades, however, this tendency has reversed completely, and a large number of organic, in particular dipolar aprotic, solvents have been dealt with extensively in this context of 'non-aqueous solvents', almost to the exclusion of the traditional inorganic ones, as, for instance, in the books edited by (Coetzee and Ritchie 1969; Lagowski 1966-1978; Covington and Jones 1968). However, the older compilations of physical properties of organic substances (International Critical Tables 1926-1930; Landolt-Börnstein Tables 1959 and Timmermann's compilation) do not include most of the now commonly used dipolar aprotic solvents, the relevant data being found only in more recent works, e.g., (Riddick, Bunger and Sakano 1986 and the DIPPR compilation 1997). Then, again, in many books with extensive data, solvents used for electrolytes or ions, polar solvents, whether protic or not, are not always considered together with those used for non-polar commercial materials, such as paints, polymers, etc., or for pharmaceuticals and industrial processes. Here, both kinds are accorded the appropriate space.

A classification scheme for solvents needs, therefore, to reflect to some extent the uses for which the solvents are put. Many classification schemes have been proposed, and a single major property, that may form the basis for the usefulness of solvents for certain applications, can often be employed in order to classify solvents. On the other hand, a few selected properties may advantageously be used to form the basis for the classification. Various solvent classification schemes have been presented (Reichardt 1988) and a common solvent classification scheme is:

- (i) non-polar solvents (such as hexane and tetrachloromethane),
- (ii) solvents of low polarity (such as toluene and chloroform),
- (iii) aprotic dipolar solvents (such as acetone and N,N-dimethylformamide),
- (iv) protic and protogenic solvents (such as ethanol and nitromethane),
- (v) basic solvents (such as pyridine and 1,2-diaminoethane), and
- (vi) acidic solvents (such as 3-methylphenol and butanoic acid).

Title	Location	Edition / Series / Misc.
998 Protective Coatings: Fundamentals of Chemistry and Composition		Edition:
Author: Hare, Clive H., 1941-	Dynix: 108665	Series: SSPC Publication: No. 94-17
Publish.: SSPC: The Society for Protective Coatings	Call No.: 667.9 Ha	
- place: Pittsburgh, PA	ISBN: 0938477900	
- date: ©1998	Shelf Adult Non-Fiction	Year: 1998
Subject: Protective coatings		Price: \$195.00
Desc: vi, 514 p., illus., 29 cm.		

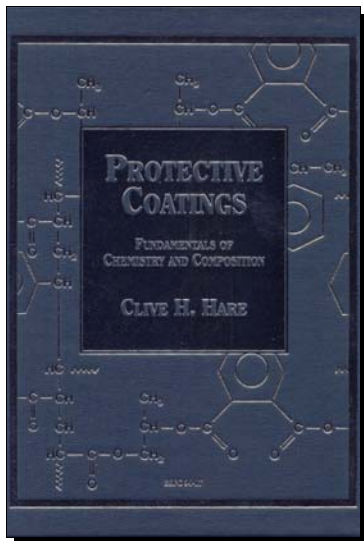


Table of Contents

1. The Basic Composition of Paint
2. Bonding—Cohesion and Adhesion in Paint Systems
3. Elementary Organic Chemistry and the Design of Polymeric Systems
4. The Chemistry of Film Forming Systems
5. Introduction to Coating Binders—Natural Resins
6. Rubber-Based Coating Binders
7. Vinyl Resins
8. Acrylic Resins
9. Hydrocarbon Resins and Bituminous Binders
10. Cellulosic Resins
11. Vegetable Oils
12. Alkyd Resins
13. Polyester Resins
14. Formaldehyde Resins
15. Epoxy Systems
16. Polyurethanes
17. Silicone Resins
18. Silicate Resins
19. Pigments
20. Pigment Dispersion: Theory and Methods
21. Aesthetics: Gloss, Opacity, and Color
22. Prime Color and Hiding Pigments
23. Extender Pigments
24. Corrosion and Its Control by Coatings
25. Introduction to Viscosity and the Evaporation of Solvent Systems
26. Solvent Families
27. Solvent Systems for Water-borne Coatings
28. Formulating for Low VOC
29. Plasticization
30. Catalysts
31. The Rheology of Coatings
32. Paint Flow and Related Phenomena
33. The Effect of Light and Radiation on Coatings
34. Film Enhancements with Aluminum Pigments
35. Miscellaneous Additives
36. Anti-Foulant Coatings
37. To Where from Here—Further Reading
- Index

Subjects

239 .	Coatings
324 .	Protective coatings

Reviews - Synopsis - Dust Jacket

PREFACE:

The following volume is based largely on a series of some seventy essays in coating materials technology that first appeared between 1989 and 1995 in the Journal of Protective Coatings and Linings (JPCL) as the monthly column, "Anatomy of Paint." The text here has been edited and reset in what is hopefully a more meaningful sequence, and embellished with a number of additional illustrations, tables, and appendices. Additionally, an expanded set of references has been included to direct the reader to more specific sources for in-depth treatment of the various cells of technology that are treated here in introductory or elementary fashion.

The original intention of the essays on which this book is based was to introduce coatings chemistry in a way that would fulfill the dual purpose of providing the non-scientist, involved in and having interest in coatings, with an easy to understand primer that might broaden his understanding of the subject and, at the same time, retaining some value for

the paint technologists, chemists, and coatings engineers as a concise source of basic technology for quick review. To sustain the interest and the understanding of the one group without boring and offending the other has been perhaps the most difficult and challenging aspect of the assignment. In review, it appears that the earlier chapters lean more decidedly in favor of the first group (painting contractors, specification writers, architects, engineers and corrosion scientists), while the latter chapters, particularly those dealing with the polymer chemistry of coating resins, are less simplistic, and will have more appeal to formulators and coating chemists.

Intelligibility has, however, always been the cornerstone of this exercise, to an extent where even, on some points, absolute accuracy has been sacrificed for better comprehensibility. (Basic chemistry is approached from a classical rather than a quantum standpoint, for example.) If apologies are due because of this, they are herewith tendered. The idea behind the work was, first, to briefly review enough of the elementary principles of physical, organic, and inorganic chemistry to make the initial introductory text on paint chemistry understandable and interesting to readers with little formal training. Then, the work was planned to progress into the general subject of coating science slowly, giving additional treatment of the more complex aspects of basic chemistry (e.g. polarity, crystallinity, tautomerism, etc.) in the form of sidebars as these concepts were necessarily introduced into the general text.

Although the book is primarily directed at that branch of the industry most concerned with heavy duty maintenance, and whose products are variously described as protective coatings, high performance coatings, and still more specifically, anti-corrosive coatings for the protection of steel, our discussion also encompasses other areas, if in some what less detail. Thus, while there is one entire chapter directed towards a more complete review of corrosion science and the methodologies and devices used to control this phenomena with coatings, there is more modest coverage of powder coatings, automotive coatings, radiation curing systems, and even coating applications on wood, leather, textiles, and paper.

The book is, however, most concerned with the composition of coatings and the raw materials that are employed in their formulation, rather than with application technology. Application technology is most comprehensively discussed where it is directly concerned with corrosion control although there is a chapter on anti-fouling coatings, and some of the text in those chapters covering specific resin chemistries is also concerned with the practical application of coatings based on these resins in service.

Although every effort has been made to keep the text current, this has not always been possible in a technology that is expanding daily, and the omission of some of the newer aspects of the technology is regrettable. The work should not, therefore, be considered an up-to-the-minute reference text of the sort typified in the 80s by that excellent work of Swaraj Paul, *Surface Coatings*. This text is more an appetizer than a main course, and it is hoped that the reader will be persuaded to further his appetite for the subject by following up with the more detailed treatises found elsewhere. Towards this end, the present volume closes with an annotated bibliography that might serve valuably in this respect.

One aspect of the original set of essays that troubled some readers was the lack of commercial reference to many of the raw materials described. This practice was dictated by Journal policy on impartiality, and was unfortunately unavoidable. But the identity of many raw materials in the paint industry is more customarily realized by trade name than by the more esoteric genericism, and, thus, in this volume the restriction no longer applies. We have corrected the deficiency by including notations in the text to trade literature that is listed in the references. It should be emphasized that in many cases there are more manufacturers of a specific type of product than the single product listed in the references. That one manufacturer is listed and not another is by no means an endorsement of the product either by the author or by Technology Publishing Company; nor does it indicate that a competitive product might be any less suitable for the given application.

Some additional criticism may be justified over our inclusion of some of the early, more traditional technology, specifically that relating to natural resins and the preparation of oleoresinous varnishes. While it is true that paints based on these systems have today become virtually extinct, they do have historical significance, and to omit coverage of these materials gives pause as to just where to stop. If we omit references to vegetable oils, do we omit thermoplastic lacquers? In a climate of some considerable public disenchantment with the fruits of many synthetically produced coating types, in fact, it is not inconceivable that one day we may be forced to revisit these older natural materials again. What we have tried to do is to present these products in terms of their chemical structure and potential reactivities instead of merely rehashing the more traditional approach to their listing.

Title	Location	Edition / Series / Misc.
147 PVC Technology Author: Penn, W. S. Publish.: Wiley - Interscience Publishers - place: New York, NY - date: [1972, ©1971] Subject: Polyvinyl chloride Desc: xii, 545 p., illus., 23 cm.	Dynix: 13042 Call No.: 668.423 Pe ISBN: 0471679305 Shelf Adult Non-Fiction	Edition: 3rd edition Series: Year: 1971 Price: \$25.00

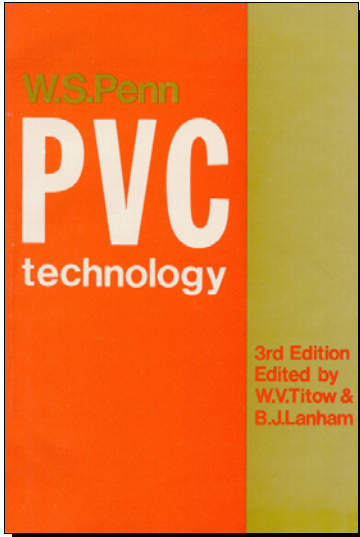


Table of Contents

PREFACE
 ACKNOWLEDGEMENTS
 1. INTRODUCTION
 2. COMMERCIAL PVC RESINS
 3. COMMERCIAL PVC COMPOUNDS
 4. ELEMENTARY FORMULATION AND COMPOUNDING PRINCIPLES
 5. GENERAL ASPECTS OF PLASTICISERS
 6. CHOICE OF PLASTICISER
 7. SOME COMMERCIAL PLASTICISERS
 8. COMPOUNDING WITH MONOMERIC PLASTICISERS
 9. COMPOUNDING WITH POLYMERIC PLASTICISERS
 10. FILLERS IN PVC
 11. STABILISERS
 12. COMMERCIAL STABILISERS
 13. SOME MISCELLANEOUS COMPOUNDING INGREDIENTS
 14. COMPOUNDING PVC FOR SPECIAL PROPERTIES
 15. THE PRODUCTION OF PVC COMPOUNDS
 16. EXTRUDERS AND EXTRUSION
 17. INJECTION MOULDING OF PVC
 18. BLOW-MOULDING OF PVC
 19. CALENDERING AND MOULDING
 20. LOW PRESSURE MOULDING METHODS
 21. PVC SHEETING AND ITS FABRICATION
 22. COMPOUNDING AND PROPERTIES OF RIGID PVC
 23. PROCESSING RIGID PVC (UPVC) AND PIPES
 24. PVC PASTES: PROPERTIES AND FORMULATION
 25. PREPARATION, PROCESSING AND APPLICATION OF PASTES
 26. PVC LATICES
 27. VINYL SOLUTIONS AND ADHESIVES
 28. CELLULAR VINYL PRODUCTS
 29. APPLICATIONS OF PVC
 APPENDIX I: Standards Relevant to PVC and Vinyl Materials
 APPENDIX 2: Units, Conversions, Definitions
 INDEX

Subjects

319 . Polyvinyl chloride

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Penn's "PVC Technology" was the first English text and reference book of the subject and one of the most comprehensive. This Third Edition has been completely revised and up-dated and continues to present a thorough and detailed outline of the pvc industry and technology.

Inter alia information is provided on what pvc resins, compounds and compounding ingredients are available and what the principal sources of supply are. A large number of trade names are identified with the materials.

The types of pvc materials used and processed are discussed, as are the principles and methods of formulating and compounding pvc compounds, their processing and fabrication (including methods and machinery), and the resulting semi-products and products; the applications of the products, methods of testing and standards are discussed and/or listed.

The treatment of the subject is such that the book can be read and utilised at several levels. It will be useful as a general guide to the subject for the non-specialist; as a textbook for the student; and as a reference book for the skilled

technologist, particularly one specialising in a single sector of the field but requiring information on the other sectors. For similar reasons the book should be of interest to sales personnel.

PREFACE TO THE THIRD EDITION

The task we were originally set was to revise the book in the sense of bringing up to date the information it contained. We have done our best to achieve this. Having no brief to re-cast it completely we have retained the original concept, scheme, plan and pattern of the work; these, together with a considerable proportion of the text which we left without substantial alterations, still stand fully and entirely to the credit of the late Author.

However, we have also tried — within certain stipulated space restrictions — to add something to the true technological content of the book. To this end we have largely re-written some of the chapters (chapters 1, 5, 11, 16, 18, 24, 28 and 29), and revised certain others fairly extensively. We have also revised, amended and augmented the literature references in most chapters. Finally, we have replaced many of the original illustrations and added two Appendices. Appendix 1 is a specially compiled, extensive list of international and national specifications (British, German and American) relating to material standards and standard test methods for pvc and products therefrom. Appendix 2 contains conversion factors and definitions of units. Apart from such matters as the arrangement and presentation of the material, the nature and effect of the changes we have made are our responsibility.

INTRODUCTION

1. EARLY WORK ON COMPOUNDS

It is surprising how comparatively recently pvc, in its plasticised form, became a commercial material. Carleton Ellis could still write in 1935 that 'one disadvantage of polyvinyl chloride as a moulding resin is its tendency to decompose at the temperature required in the moulding operation'. The use of stabilisers and plasticisers, as we know them, was almost unknown. However, it was realised that some esters acted as plasticisers and some alkaline earth metal soaps as stabilisers, even though they were not much used.

In those early days, pvc was plasticised with such materials as tung oil, alkyd resins and similar products. True plasticisers such as DBP were added more or less as an afterthought and, in one case, DBP was added to the extent of 11 phr in a coating composition. The impression conveyed is that the infant plastics industry was desperately trying to find some real use for pvc and one suggested was an adhesive (with rubber and cellulose derivatives) for sticking patches on worn places in clothing!

Some progress was made when it was discovered that copolymers with vinyl acetate moulded more easily. It is now realised that this is internal plasticisation but it was hardly thought of as such then. It may appear surprising that one of the early applications of the copolymers was in gramophone records where fillers such as silica and mica and a little DBP might have been employed. Moulded dentures were another important application. In some cases it is possible that a 'rigid' copolymer (with no external plasticiser) was inadvertently being moulded. Thanks to the work of Kaufmann the early history of pvc polymers, compounds and processing is now well recorded and documented.

It was World War II that really brought pvc into its own. It was soon realised that plasticised pvc was an effective substitute for rubber in some applications, particularly cable insulation and sheathing. Thus pvc helped to ameliorate the acute rubber shortage and at the same time established itself as a material in its own right. Although some companies reverted to rubber as soon as they could after the war, many did not and pvc grew rapidly in importance. Now it is widely used in many industries and applications.

2. EARLY MACHINES

In the pre-war period, and to some extent during the war, pvc processing was largely carried out by methods and on machinery developed for rubber or celluloid. The processes involved were mixing, calendering, compression moulding and extrusion (including wire coating).

The paddle-type Gardner premixers were in use at an early period, but between, say, 1942 and 1945, open mill mixing of the final product was in very common use. As the use of internal mixers was adopted it was soon found that pvc compounds could be readily mixed in them, in spite of contamination from rubber lodged behind rotors.

The open mills (and mixers) had to be used at higher temperatures than usual. Steam pressures were increased at the risk of grease melting extensively and draining away from bearings, and it is surprising how much work was accomplished without damage. Electrical heating, particularly for extruders, was a logical development but one which was fully utilised only slowly. The need to modify the rubber extruders on which early work was carried out at temperatures higher than normal soon became plain, and modifications, e.g. to enable the polymer to be fed in granular form and reliably to provide higher processing temperature (by electrical heating), followed. A special ram extruder was employed in Germany for the production of pvc rigid pipe from a pvc billet. The history and early development of the pvc

extruder and other processing machinery have been well described by Kaufmann.

The modern techniques and machines are dealt with in this book.

The development of modern pvc processing machinery and of the many specialised processes which comprise present-day pvc technology has paralleled the remarkable expansion of the volume of pvc production and the scope and number of its applications.

3. GENERAL STATISTICS

Today PVC is second only to the polyolefins in terms of the amount produced, which represents about 25% of the total production of all plastics, and about 40 % of thermoplastics.

Good regular sources of current statistical and commercial information on pvc include the following: British Plastics (current commercial and production statistics for plastics in the UK are provided in the January issue each year); Modern Plastics (provides similar information on the position in the USA; and Polymeric (Sections A and B contain information on statistics and commercial activities). Some statistics and market information specifically relating to pvc will also be found in the Plastics Industry Profit Guide published annually by the Society of Plastics Engineers.

In addition, useful commercial and statistical surveys of the pvc field have appeared in the European Chemical News, and Courier d'Europlastique Eurocaoutchouc.

Quality Control in Metal Finishing: Based on a Symposium at the Borough Polytechnic, London

LASCT Holdings - maximum detail by Title



Title	Location	Edition / Series / Misc.
148 Quality Control in Metal Finishing: Based on a Symposium at the Borough Polytechnic, London		<i>Edition:</i>
<i>Author:</i> Isserlis, G. (editor)	<i>Dynix:</i> 14900	<i>Series:</i>
<i>Publish.:</i> Columbine Press	<i>Call No.:</i> 671.73 Qu	
<i>- place:</i> Manchester, UK / London, UK	<i>ISBN:</i>	
<i>- date:</i> ©1967	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1967
<i>Subject:</i> Electroplating -- Testing		<i>Price:</i> \$25.00
<i>Desc:</i> x, 118 p., illus., [16] plates, tables, diagrams, 23 cm.		

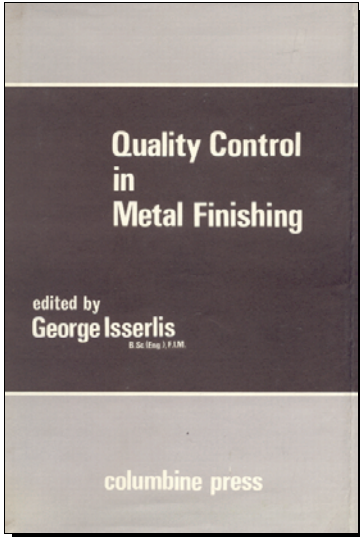


Table of Contents

- Introduction
- 1. NATIONAL STANDARDS FOR SURFACE COATINGS by J. M. Clarke
- 2. VALUE OF A SPECIFICATION FOR NICKEL-CHROMIUM PLATING by H. C. Castell
- 3. THICKNESS TESTING OF METALLIC COATINGS: NON-DESTRUCTIVE METHODS by A. H. Nicholson
- 4. THICKNESS TESTING OF METALLIC COATINGS: DESTRUCTIVE METHODS by J. K. Dennis
- 5. CORROSION TESTING OF NICKEL AND CHROMIUM COATINGS by S. A. Watson
- 6. REFLECTIVITY MEASUREMENT by B. A. Scott
- 7. HARDNESS AND ABRASION RESISTANCE OF ANODIC FILMS ON ALUMINIUM by B. A. Scott
- 8. EMBRITTEMENT OF HIGH TENSILE STEELS DURING PICKLING AND PLATING by H. G. Cole
- Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The introduction of automation and mass-production methods in metal finishing has brought to the fore the subject of quality control, involving methods of testing and evaluation which will ensure serviceability of the product under diverse conditions. To this end agreed standards and specifications are a primary requirement and accordingly these form the opening subject of the book. A critical assessment of various methods of determining coating thickness follows, destructive and non-destructive techniques being dealt with in separate chapters, and this section is completed by a detailed examination of corrosion testing as applied to electrolytically deposited nickel and chromium coatings. The measurement of reflectivity, an important factor where many forms of plated or otherwise finished product are concerned, is discussed in a separate chapter and this is followed by an equally important chapter dealing with the hardness and abrasion resistance of anodic films on aluminium. To conclude the book, which is based on a symposium held at the Borough Polytechnic, London, and compiled by a team of authorities, detailed consideration is given to a somewhat special problem in metal finishing, namely the causes and prevention of hydrogen embrittlement during the cleaning and plating processes commonly applied as a preventative against corrosion to the low alloy, high tensile steels now being used in the aircraft industry.

INTRODUCTION:

In a competitive market the salability of engineering products depends not only on their functional quality and design, but in many instances on the appearance, effectiveness and lasting quality of their surface finish. Such requirements can only be achieved by the rigid control of all operating parameters and, where surface coatings are concerned, by the maintenance of such criteria of quality as coating thickness, corrosion resistance and reflectivity, necessitating accurate methods of testing.

With the modern trend in metal finishing, particularly the introduction of automation techniques and their integration into mass production systems, quality control has become a vital factor in industrial economics. Not only are greatly increased quantities being processed at one and the same time in balance with the output and demands of production lines, but the economics of production demand the application of finishes which, while adequate to meet service requirements, do not involve the unnecessary and extravagant use of time and materials.

Accepted standards and agreed tolerances are fundamental to any quality control system and it is appropriate therefore

Subjects

255 . Electroplating -- Testing



that the opening chapter of this book should survey the differing requirements of various countries in respect to surface coatings and draw attention to the work which is being done to achieve an internationally agreed basis of standardization.

The technical significance of specifications, with special reference to the requirements of decorative nickel-chromium coatings, is discussed in considerable detail in Chapter 2 and this is logically followed by two chapters in which the instruments and techniques for measuring coating thicknesses are described. Corrosion resistance, one of the main requirements of surface coatings, is comprehensively considered in a separate chapter, while others deal specifically with the measurement of reflectivity and the determination of the hardness of anodic films on aluminium. The protection against corrosion required by the very high tensile steels now being used in the aircraft industry has introduced problems of a character totally different from those encountered in other coating processes, and it would be difficult to over-emphasize the importance of the concluding chapter in which the causes and prevention of hydrogen embrittlement during pickling and plating are carefully considered.

In many respects the book—based on a very successful symposium held at the Borough Polytechnic, London—forms an appropriate companion volume to a previous book, "Automation in Metal Finishing" (published by Columbine Press in 1963 and incidentally based on an earlier symposium) for, whereas that was primarily concerned with the control of operating parameters, the present volume deals largely with the testing on which such control must be based and which is essential if metal finishers are to ensure the optimum quality of their products. It should perhaps be pointed out that the instruments described in the book have been arbitrarily selected purely to illustrate the application of the basic principles involved.

As editor of this volume and as organizer of the symposium on which it has been based, it remains for me to thank the several authors for their painstaking work in preparing the manuscripts and illustrations which have made the book possible. It is confidently hoped that the result will prove of value to all engaged in, or responsible for, one or more of the variety of processes comprised in modern metal finishing.

Title	Location	Edition / Series / Misc.
762 Radiation Cured Coatings		<i>Edition:</i>
<i>Author:</i> Costanza, John R., A. P. Silveri and Joseph A. Vona	<i>Dynix:</i> 55947-29	<i>Series:</i> Federation Series on Coatings
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Fe	<i>Technology:</i> No. FS29
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i>	
<i>- date:</i> ©1986	<i>Shelf</i> Reference	<i>Year:</i> 1986
<i>Subject:</i> Coatings -- Periodicals		<i>Price:</i> \$50.00
<i>Desc:</i> 24 p., illus., 28 cm.		

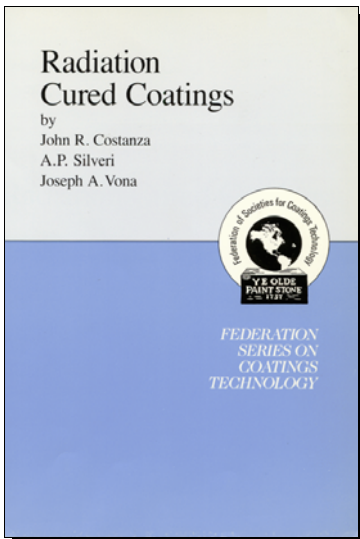


Table of Contents

- I. INTRODUCTION
- II. TECHNOLOGY
 - A. Multifunctional Monomers
 - B. Acrylated Oligomers
 - C. Diluent Monomers
 - D. Photoinitiators
 - E. Additives
 - F. Radiation Curable Formulations
- III. RADIATION CURING EQUIPMENT
 - A. Ultraviolet Cure Systems
 - B. Electron Beam Cure Systems
- IV. RADIATION CURING — COMMERCIAL APPLICATIONS
 - A. Metal Coatings
 - B. Wood Coatings
 - C. Plastic Coatings
 - D. Paper and Paperboard
 - E. Printing Inks
 - F. Photoresists and Printing Plates
 - G. Emerging Applications
 - H. Wire Coatings
 - I. Video Disc Coatings
 - J. Optical Fiber Coatings
 - K. Adhesives
 - L. Release Coatings
 - M. Magnetic Tape Coatings
- V. MATERIAL AND EQUIPMENT HAZARDS
 - A. Materials
 - B. Equipment
- VI. STORAGE AND HANDLING
 - A. Bulk Handling
 - B. Drum Handling
 - 1. Unloading Drums
 - 2. Emptying Drums
 - 3. Filling Drums
 - 4. Drum Disposal
 - C. Frozen Containers
 - D. Storage Stability
 - E. Spills and Waste Disposal
 - F. Uncontrolled Polymerization and Fire
- VII. PERSONNEL PROTECTION
 - A. Personnel Hazards
 - B. Safety Equipment and Protective Clothing
 - C. First Aid
 - D. Environmental Control
 - E. Cleaning and Repairing Equipment

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

VIII. TOXICITY

- A. Toxicity Categories
- B. Toxicological Classification
- C. EPA Classification

IX. REFERENCES

X. APPENDIX — Definitions of Terminology

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Radiation curing is a process which facilitates the formation of crosslinked compositions by subjecting them to ultraviolet (UV) or electron beam (EB) sources of energy. Radiation curable coatings, inks, adhesives, et al., have gained widespread acceptance in industry because of improved performance and the combined impact of escalating energy costs and environmental regulations which have affected the markets being served by conventional technologies.

Conventional coatings consist of resins dissolved or dispersed in non-reactive volatile liquids. This liquid must be removed shortly after application; this process requires thermal energy and often leads to undesirable emissions. The key feature of ultraviolet/electron beam (UV/EB) coatings is that reactive (monomeric) liquids eliminate the need for volatile solvents. When the "wet" coating is irradiated, the monomers polymerize rather than volatilize and become a solid component of the cured (dry) coating. Much less energy is required to polymerize than to volatilize liquid components and vapor emissions are drastically reduced or eliminated completely. Furthermore, increased line speeds are often realized and, for an all new facility, the radiation curing equipment costs can be less than conventional oven costs.

Many sources of radiation can be used to initiate polymerization. However, the present technology is limited almost exclusively to ultraviolet (UV) or accelerated electron beam (EB) irradiation. Ultraviolet irradiation is low energy (actinic) and requires formulation additives (photoinitiators) to effect the polymerization. Usually medium pressure mercury vapor lamps are used. Electron accelerators use very high voltages to produce penetrating electrons which are so energetic that photoinitiators are not required. Neither UV nor EB curing is associated in any way with "radioactivity."

The technique of inducing free radical polymerizations by either UV or EB radiation has gained widespread recognition and acceptance in many industrial applications. The technology is well established and fully commercial for many end uses such as UV curable inks and coatings for wood, paper, metal, vinyl, and other plastic substrates.

Presently, the main thrust is toward UV radiation because of lower installation costs; however, there have been many advances with other radiation sources such as electron curtain and various other accelerator systems which are useful and preferable in certain applications. The principles, techniques, and formulations apply equally well for other radiation sources.

The chemistry of UV curing is a combination of modern photochemistry and traditional free radical polymerization with radiation energy replacing the less efficient thermal energy. The kinetics and chemistry of UV curing has been the subject of many articles.

Title	Location	Edition / Series / Misc.
911 Radiation Curing of Coatings		<i>Edition:</i>
<i>Author:</i> Koleske, Joseph V., 1930- (ASTM Committee D-1 on Paint and Relate	<i>Dynix:</i> 105699	<i>Series:</i> ASTM Manual Series: MNL 45
<i>Publish.:</i> ASTM International	<i>Call No.:</i> 668.4 Ko	
<i>- place:</i> West Conshohocken, PA	<i>ISBN:</i> 0803120958	
<i>- date:</i> ©2002	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2002
<i>Subject:</i> Radiation curing		<i>Price:</i> \$79.00
<i>Desc:</i> vii, 244 p., illus., 23 cm.		

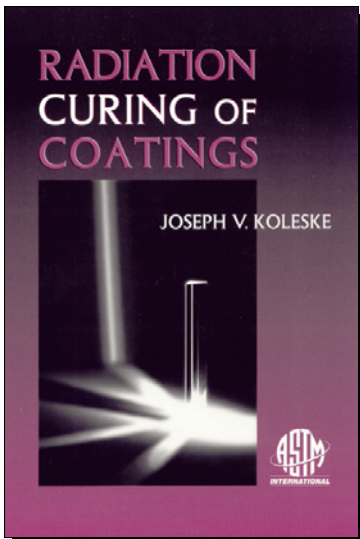


Table of Contents

- Preface
- Chapter 1: Radiation Curing
 - Introduction
 - What is Radiation Curing and Why is it Used?
 - Radiation
 - Simplified Classic to Modern Light/Radiation/Energy Theory
 - Magnitude of Ultraviolet and Visible Radiation Energy
 - Photon Production
 - Electrons
 - References
- Chapter 2: Curing Equipment
 - Electron Beams
 - Ultraviolet Radiation Systems
 - Xenon Lamps
 - Hybrid Xenon/Mercury Lamps
 - Excimer Radiation
 - Visible Radiation, Light
 - References
- Chapter 3: Free-Radical Photoinitiators and Initiation Mechanism
 - Introduction
 - Photoinitiators
 - Free Radical Photoinitiators
 - Homolytic Fragmentation Type
 - Hydrogen Abstraction Type
 - Photosensitizers
 - Oxygen Inhibition
 - Visible Radiation Photoinitiators
 - References
- Chapter 4: Cationic Photoinitiators and Initiation Mechanism
 - Introduction
 - Onium Salts, General
 - Diazonium Salts, Lewis Acids
 - Iodonium and Sulfonium Salts, Bronsted Acids
 - Organometallic Compounds
 - Photosensitization
 - References
- Chapter 5: Free Radical Initiated Polymerization Systems
 - Free Radical Systems
 - Unsaturated Polyester/Styrene Systems
 - Polyene/Thiol Compositions
 - Acrylate Compositions
 - Monofunctional Acrylates
 - Polyfunctional Acrylates
 - Oligomeric Acrylates-Epoxy, Urethane, Oils
 - Acrylated Epoxides or Epoxy Acrylates
 - Urethane Acrylates
 - Esterified Polyol Acrylates

Subjects

295 .	Plastic coating
325 .	Radiation curing
548 .	Ultraviolet radiation -- Industrial applications
549 .	Radiation -- Industrial applications

- Acrylated Oils
 - Shrinkage
 - References
- Chapter 6: Cationic Initiated Polymerization Systems
 - Cationic Cycloaliphatic Epoxide Systems
 - Oils
 - Mechanism of Polymerization
 - Polyols
 - Water, Humidity, and Temperature Effects
 - Effect of Added Thermal Energy
 - Electron Beams and Epoxide Cure
 - Pigmentation
 - Formulation
 - References
- Chapter 7: Vinyl Ethers
 - Introduction
 - Free Radical Polymerization
 - Cationic Polymerization
 - Hybrid Polymerizations
 - Donor/Acceptor or Charge-Transfer Polymerizations
 - Oligomeric Vinyl Ethers
 - Urethane Vinyl Ethers
 - Ester Vinyl Ethers
 - Vinyl Ether-Silicone Blends
 - Vinyl Ether-Epoxide Blends
 - References
- Chapter 8: Ultraviolet Radiation-Curable Powder Coatings
 - Introduction
 - Polymer Systems
 - Wood Substrates
 - Metal Substrates
 - Fiberboard Substrates
 - Summary
 - References
- Chapter 9: Dual-Cure Mechanisms
 - Free Radical/Cationic Systems
 - Radiation/Thermal Cures
 - Radiation/Moisture-Cure Urethane Cures
 - Radiation/Epoxide Cure
 - Radiation/Radiation Cure
 - Radiation/Air-Drying Cures
 - References
- Chapter 10: Adhesives
 - Introduction
 - Pressure Sensitive Adhesives
 - Release or Anti-Adhesive Coatings
 - Other Adhesives
 - References
- Chapter 11: Additives and Miscellaneous
 - Antifoaming Agents
 - Expanding Monomers
 - Gloss Control
 - Inorganic Glasses for Pigmented and Thick Section Cures
 - Odor
 - Scratch, Slip, and Abrasion Resistance
 - Silane Coupling Agents
 - Surfactants
 - Textured Coatings

Thick Section Curing
Water-Based Systems
Weathering
References

Chapter 12: Safety and Health Considerations
References

Chapter 13: End Uses
Automotive
Electrical/Electronics
Magnetic Media
Optical Components and Materials
Printing Inks and Graphic Arts
Stereolithography or Three-Dimensional Object Curing
Wood Coatings
General
The Future
References

Glossary of Terms
Index

Reviews - Synopsis - Dust Jacket

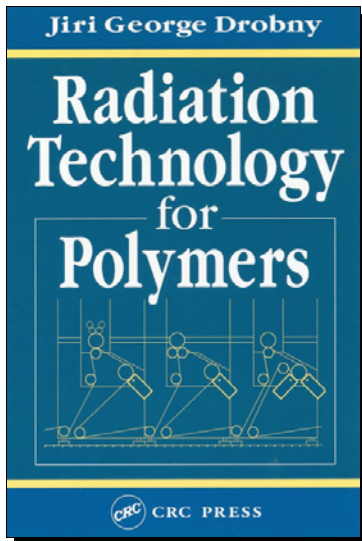
FORWARD:

This publication, "Radiation Curing of Coatings", was sponsored by Committee D01 on Paint and Related Coatings, Materials, and Applications. This is Manual 45 in ASTM International's manual series.

PREFACE:

Imagine placing a layer of a low viscosity liquid mixture made up of monomeric and oligomeric compounds on a substrate, shining a beam of ultraviolet radiation on the liquid, and then in less time than it takes to snap your fingers -- effectively, instantaneously -- having the entire liquid mass turn into a solid, cross-linked, hard, tough coating with both functional and decorative properties. Sound impossible? Sound magical -- like Mary Poppins (to the older generation) or the X-Files (to the younger or younger thinking generation)? Certainly it does! It sounds too good to be true, or as if it were magical in nature. However, it is merely a brief, popularized description of the coating technology known as "radiation curing" or the more limiting term, "photocuring." This technology that deals with using the substrate as your polymerization vessel will be described in detail, but in an understandable manner, in this book. Reading it will give one a good understanding of this topic and enough knowledge to begin formulating radiation-curable inks, coatings, and sealants.

Title	Location	Edition / Series / Misc.
929 Radiation Technology for Polymers		Edition:
Author: Drobny, Jiri George	Dynix: 105700	Series:
Publish.: CRC (Chemical Rubber Company) Press	Call No.: 668.9 Dr	
- place: Boca Raton, FL	ISBN: 1587161087	
- date: ©2003	Shelf Adult Non-Fiction	Year: 2003
Subject: Radiation curing		Price: \$135.00
Desc: 206 p., illus., 24 cm.		



Subjects

295 .	Plastic coating
325 .	Radiation curing
548 .	Ultraviolet radiation -- Industrial applications
549 .	Radiation -- Industrial applications

Table of Contents

- Chapter 1: Introduction
 - 1.1 Basic Concepts
 - References
- Chapter 2: Producing UV and EB Energy
 - 2.1 UV Energy and its Properties
 - 2.1.1 Light Emission from Mercury Gas Discharge
 - 2.1.2 Light Emission from a Microwave Excited Discharge
 - 2.1.3 Generation of Monochromatic UV Radiation
 - 2.2 Electron Beam Energy and Its Properties
 - References
- Chapter 3: Ultraviolet and Electron Beam Curing Equipment
 - 3.1 UV Curing Equipment
 - 3.1.1 Lamps
 - 3.1.1.1 Medium-Pressure Arc Lamps
 - 3.1.1.2 Electrodeless Lamps
 - 3.1.1.3 Low-Pressure Mercury Lamps
 - 3.1.1.4 High-Pressure Mercury Lamps
 - 3.1.1.5 Excimer Lamps
 - 3.1.1.6 Xenon Lamps
 - 3.1.2 Lamp Housing²¹
 - 3.1.3 Power Supply and Control Systems
 - 3.1.3.1 Power Supply Systems
 - 3.1.3.2 Control Systems
 - 3.2 Electron Beam Curing Equipment
 - 3.2.1 Particle Accelerators
 - 3.2.1.1 Direct Accelerators
 - 3.2.1.2 Indirect Accelerators
 - 3.2.1.3 Low-Energy Electron Accelerators
 - 3.2.2 Recent Trends in Development of Electron Beam Curing Equipment and Technology
 - References
- Chapter 4: Ultraviolet Radiation Processes
 - 4.1 Basic Concepts
 - 4.2 Photoinitiators and Photosensitizers
 - 4.2.1 Free Radical Photoinitiators
 - 4.2.1.1 Type I Photoinitiators
 - 4.2.1.2 Type II Photoinitiators
 - 4.2.2 Cationic Photoinitiators
 - 4.2.3 Anionic Photoinitiators
 - 4.2.4 Oxygen Inhibition of Cure
 - 4.2.5 Initiation of UV Hybrid Curing
 - 4.3 Kinetics of Photoinitiated Reactions
 - 4.3.1 Kinetics of Free Radical Photopolymerization
 - 4.3.2 Kinetics of Cationic Photopolymerization
 - 4.4 Chemical Systems in UV Processing
 - 4.4.1 Free Radical-Initiated Systems
 - 4.4.1.1 Acrylate/Methacrylate Systems
 - 4.4.1.2 Styrene/Unsaturated Polyesters
 - 4.4.1.3 Vinyl Ether/Unsaturated Esters

- 4.4.1.4 Thiol-ene Systems
- 4.4.1.5 Donor-Acceptor Complexes
- 4.4.2 Cationic Systems
- 4.5 Photocross-linking of Polymers
- References

- Chapter 5: Electron Beam Processes
- 5.1 Radiation Cross-link Promoters
 - 5.1.1 Indirect Cross-link Promoters
 - 5.1.1.1 Halogenated Compounds
 - 5.1.1.2 Nitrous Oxide
 - 5.1.1.3 Sulfur Monochloride
 - 5.1.1.4 Bases
 - 5.1.2 Direct Cross-link Promoters
 - 5.1.2.1 Maleimides
 - 5.1.2.2 Thiols (Polymercaptans)
 - 5.1.2.3 Acrylic and Allylic Compounds
- 5.2 Retardants of Radiation Cross-Linking
- 5.3 Electron Beam Processing of Plastics
 - 5.3.1 Polyolefins
 - 5.3.1.1 Polyethylene
 - 5.3.1.2 Polypropylene
 - 5.3.2 Polystyrene
 - 5.3.3 Polyvinyl Chloride⁷⁵
 - 5.3.4 Polymethacrylates and Polyacrylates⁷⁵
 - 5.3.5 Polyamides
 - 5.3.6 Polyesters
 - 5.3.7 Fluoroplastics
 - 5.3.7.1 Polytetrafluoroethylene
 - 5.3.7.2 FEP
 - 5.3.7.3 Other Fluoroplastics
- 5.4 Electron Beam Processing of Elastomers
 - 5.4.1 Physical Properties of Radiation Cross-linked Elastomers
 - 5.4.2 Effects of Radiation on Individual Elastomers
 - 5.4.2.1 Natural Rubber and Synthetic Polyisoprene
 - 5.4.2.2 Polybutadiene and Its Copolymers
 - 5.4.2.3 Polyisobutylene and Its Copolymers
 - 5.4.2.4 Ethylene-Propylene Copolymers and Terpolymers
 - 5.4.2.5 Polychloroprene
 - 5.4.2.6 Silicone Elastomers
 - 5.4.2.7 Fluorocarbon Elastomers
 - 5.4.2.8 Fluorosilicone Elastomers
- 5.5 Electron Beam Processing of Liquid Systems
- 5.6 Grafting and Other Polymer Modifications
 - 5.6.1 Grafting
 - 5.6.2 Other Polymer Modifications
- References

- Chapter 6: Coating Methods Used in UV and EB Technology
- 6.1 Roll Coating
 - 6.1.1 Direct Roll Coating
 - 6.1.2 Reverse Roll Coating
- 6.2 Curtain Coating
- 6.3 Spray Application
 - 6.3.1 Compressed Air Gun Spraying
 - 6.3.2 Airless Gun Spraying
- 6.4 Dip Coating
- 6.5 Flow Coating
- 6.6 Spin Coating
- 6.7 Rod Coating
- References

- Chapter 7: Applications of UV Radiation
- 7.1 UV Curing of Coatings and Paints

- 7.1.1 Functional and Decorative Coatings
 - 7.1.1.1 Coatings on Flat, Rigid Substrates
 - 7.1.1.2 UV Curing of Coatings on Flexible Substrates
 - 7.1.2 UV Curing of Lacquers, Varnishes and Paints
 - 7.1.3 Three-Dimensional Curing
 - 7.1.4 UV Curing of Coatings and Inks on Cylindrical Parts
 - 7.1.5 UV Matting of Coatings
 - 7.2 UV Curing of Adhesives
 - 7.3 UV-Cured Silicone Release Coatings
 - 7.4 Spot Curing
 - 7.5 UV Curing in Printing and Graphic Arts
 - 7.5.1 Screen Printing
 - 7.5.2 Flexography
 - 7.5.3 Letterpress and Offset Letterpress (Dry Offset)
 - 7.5.4 Lithography
 - 7.5.5 Rotogravure Printing
 - 7.6 Rapid Prototyping
 - 7.7 UV Powder Coatings
 - 7.7.1 The Chemistry of UV-Curable Powders
 - 7.7.2 Material and Substrate Preparation
 - 7.7.3 Powder Coating Application
 - 7.7.4 Substrates Suitable for UV Powder Coating
 - 7.7.4.1 Plastics
 - 7.7.4.2 Wood and Wood Composites
 - 7.7.4.3 Preassembled Parts
 - 7.7.4.4 Large-Mass Parts
 - 7.7.5 Applications
 - 7.8 Other Applications for UV Curing
 - 7.8.1 Electronics
 - 7.8.2 Optical Components and Optoelectronic Applications
 - 7.8.2.1 Optical Fibers
 - 7.8.2.2 Other Optical and Optoelectronic Applications..
 - 7.9 Production of Composites
 - 7.9.1 Dental Applications
 - 7.9.2 Other Composite Applications
- Chapter 8: Applications of Electron Beam Radiation
- 8.1 EB Processing in the Wire and Cable Technology
 - 8.1.1 Equipment and Process
 - 8.1.2 Recent Developments and Trends
 - 8.2 EB Processing in Tire Technology
 - 8.3 EB Processing in the Manufacture of Polyolefin Foams
 - 8.3.1 Foam Expansion and Its Control
 - 8.3.2 Manufacturing Processes
 - 8.3.3 Comparison of Chemical and Radiation Processes
 - 8.4 EB Processing in the Production of Heat-Shrinkable Materials
 - 8.4.1 Heat-Shrinkable Tubing
 - 8.4.2 Heat-Shrinkable Sheets and Films
 - 8.5 EB Processing in Coatings, Adhesives, Paints and Printing Inks.
 - 8.5.1 Magnetic Media
 - 8.5.2 Coatings
 - 8.5.3 Printing and Graphic Arts
 - 8.5.4 Adhesives
 - 8.5.4.1 Pressure-Sensitive Adhesives (PSAs)
 - 8.5.4.2 Laminating Adhesives
 - 8.5.5 Polymeric Fiber-Reinforced Composites
- References
- Chapter 9: Dosimetry and Radiometry
- 9.1 EB Dosimetry
 - 9.2 UV Radiometry
 - 9.2.1 Actinometers
 - 9.2.2 Radiometers
 - 9.2.3 Radiachromic Films

References

Chapter 10: Safety and Hygiene
10.1 UV Equipment Health and Safety
10.2 EB Equipment Health and Safety
10.3 Chemical Hazards
References

Chapter 11: Recent Developments and Trends
11.1 Current Trends in Equipment and Chemistry
11.1.1 UV/EB Equipment
11.1.2 Chemistry
11.2 Emerging Technologies
References

Appendix I
Bibliography

Appendix II
Major Equipment Manufacturers
Glossary
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The industrial use of ultraviolet (UV) and electron beam (EB) radiation is growing rapidly and now penetrates an ever-widening range of applications, including electronics, printing and packaging. Resources and references for seasoned professionals abound, but few effectively introduce the field to newcomers or provide fast access to specifics on UV and EB effects on particular materials. This book does both.

"Radiation Technology for Polymers" systematically presents the practical aspects of using UV and EB radiation to treat polymeric materials. Drawing on more than 30 years of engineering experience in polymer processing, the author describes the production and properties of UV and EB energy, explores processes associated with both types of radiation and provides a detailed overview of their applications. He concludes with a look at recent developments and emerging trends in equipment, chemistry and technologies.

Whether you are an engineer or scientist new to radiation technology or a product or process designer researching the effects of radiation on a specific material, Radiation Technology for Polymers is the place to begin your search for information. It offers a complete overview of the technology and provides valuable direction to sources of more specific detailed data.

Features

- Presents an accessible introduction to the field of radiation processing that forgoes deep coverage of polymer science in favor of more practical matters
- Covers the processing of thermoplastics and elastomers in film, sheet and other forms as well as coatings, paints, inks, and adhesives
- Presents detailed reaction schemes in a simplified manner
- Brings together material previously scattered throughout many sources to provide a single well-organized reference

PREFACE:

The industrial use of ultraviolet (UV) and electron beam (EB) radiation is growing at a fast pace and penetrating many areas such as electronics, printing, packaging, etc., which traditionally have had their own well established processes. Information on this topic useful to a professional can be found in many places, such as encyclopedias (Encyclopedia of Polymer Science and Engineering, Ullmann's Encyclopedia of Industrial Chemistry), professional publications (PCI, Paint and Coating Industry Paint & Powder, FLEXO, Converting, Modern Plastics, Rubber Chemistry and Technology, Modern Plastics, Wire and Cable, Radiation Physics and Chemistry, Journal of Applied Polymer Science) and others. RadTech News, a publication of RadTech North America, covers applications, new technology and industry news. During the past few years, several very informative books, published by SITA Technology Ltd. in the U.K., have covered different aspects of UV/EB radiation technology in great detail. However, because seeking specific information may be prohibitively time consuming, the need for a quick reference book is obvious.

Radiation Technology of Polymers is designed to meet this need by providing systematic fundamental information about

practical aspects of UV/EB radiation to professionals in many different fields. The intended audiences are mainly chemists or chemical engineers who are new to UV/EB radiation technology. Another reader of this book may be a product or process designer looking for specifics about the effects of UV/EB on a specific polymeric material or for a potential technological tool. This book might also be a useful resource for recent college and university graduates or for graduate or undergraduate students in polymer science and engineering, and for corporate training. Because of the breadth of the field and the multitude of applications, the book does not go into details; this is left to publications of a much larger size and scope and to professional periodicals. Rather, it covers the essentials and points the reader toward sources of more specific or detailed information. Radiation Technology of Polymers is not intended to compete with other books on the subject, it merely complements them.

With this in mind, this book is divided into 11 separate chapters, covering the principles of generating UV and EB energy, equipment, processes, applications, dosimetry, safety and hygiene. The last chapter covers the newest developments and trends.

The book began as lectures and seminars at the Plastics Engineering Department of the University of Massachusetts at Lowell and to varied professional groups and companies in the United States and abroad. It draws from the author's more than 40 years of experience as a research and development (R&D) and manufacturing professional in the polymer processing industry and, more recently, as an independent international consultant.

INTRODUCTION:

Radiant energy is one of the most abundant forms of energy available to mankind. Nature provides sunlight, the type of radiation that is essential for many forms of life and growth. Some natural substances generate yet another kind of radiation that can be destructive to life, but, when harnessed, it can provide other forms of energy or serve in medical or industrial applications.

Human genius created its own devices for generating radiant energy useful in a great variety of scientific, industrial and medical applications. Cathode-ray tubes emit impulses that activate screens of computer monitors and televisions. X-rays are used not only as a diagnostic tool in medicine, but also as an analytical tool in inspection of manufactured products such as tires and other composite structures. Microwaves are used not only in cooking or as a means of heating rubber or plastics, but also in a variety of electronic applications. Infrared radiation is used in heating, analytical chemistry and electronics. Man-made ultraviolet radiation has been in use for decades in medical applications, analytical chemistry and in a variety of industrial applications. Devices used to generate accelerated particles are not only valuable scientific tools, but also important sources of ionizing radiation for industrial applications. Both ultraviolet (UV) and electron beam (EB) radiations are classified as electromagnetic radiations along with infrared (IR) and microwave (MW).

Polymeric substances, which are predominantly high molecular weight organic compounds such as plastics and elastomers (rubber), respond to radiation in several ways. They can be gradually destroyed by UV radiation from sunshine when exposed for extended periods of time outdoors — more or less changing their properties. On the other hand, man-made UV radiation is actually used to produce polymers from monomers (low molecular weight building blocks for polymers) or from oligomers (essentially very low molecular weight polymers). Almost always in these reactions, a liquid is converted into a solid almost instantaneously. Ionizing radiation (γ -rays and high-energy electrons) is even more versatile; it is capable of converting monomeric and oligomeric liquids into solids, but also can produce major changes in properties of solid polymers.

BASIC CONCEPTS

Industrial applications involving radiation processing of monomeric, oligomeric and polymeric substances depend essentially on two electrically generated sources of radiation: accelerated electrons and photons from high-intensity ultraviolet lamps. The difference between these two is that accelerated electrons can penetrate matter and are stopped only by mass, whereas high-intensity UV light affects only the surface. Generally, processing of monomers, oligomers and polymers by irradiation by UV light and electron beam is referred to as curing. This term encompasses chemical reactions including polymerization, cross-linking and surface modification and grafting. These reactions will be discussed in detail in the appropriate chapters.

The process of conversion of liquid to solid is mainly designed for use on compositions based on nonvolatile monomers and oligomers with molecular weights less than 10,000. These have low enough viscosities to be applied without the use of volatile solvents (volatile organic compound or VOC). This, of course, is very beneficial for the environment — more specifically, the air. In fact, in their legislative actions, some states have recognized UV/EB curing of coatings, printing inks, paints and adhesives as environmentally friendly.

UV/EB processing has another positive side. They both represent a clean and efficient use of electric energy. When compared with water-based technology, another "green" alternative to VOC-based technology, it is found to be far superior in energy consumption.

Clearly, UV and EB radiation have a great deal in common, as shown above. However, there are also differences. Besides the nature of interacting with matter, where high-energy electrons penetrate and photons cause only surface effects, issues concerning the capital investment and chemistry are involved.

Without any doubt, UV irradiation process is the lower-cost option, because the equipment is simpler, smaller and considerably less expensive to purchase and operate. Normally, it is not necessary to use nitrogen inerting, which adds to operating expenses. However, free radical based UV curing requires the addition of photoinitiators, some of which are expensive and may bring about some undesirable effects, such as discoloring of the film and, often, also odor. Both these effects can be minimized or eliminated by nitrogen blanketing. It is much more difficult to cure pigmented films, particularly thick ones using UV irradiation, which can be cured by electron beams with no problem. Photoinitiator and sensitizer residues from UV-cured formulations may migrate and render some products, such as food packaging, unacceptable. In most cases, this problem does not exist with EB-cured products. Coatings formed from similar formulations, but cured with UV or EB radiation, may differ in such physical properties as scratch resistance and swelling resistance. This is conceivable, because the two processes are fundamentally different.

Organic molecules become electronically excited or ionized after absorption of energy. For the transformation of organic molecules from the ground state to the excited state, energies typically in the range from 2 to 8 eV are required. The excited molecules are able to enter into chemical reactions leading to chemically reactive products that initiate the polymerization, cross-linking and grafting reactions.

Ionization of organic molecules requires higher energy. The ionization process generates positive ions and secondary electrons. When reacting with suitable monomers (e.g., acrylates), positive ions are transformed into free radicals. Secondary electrons lose their excess energy, become thermalized and add to the monomer. The radical anions formed this way are a further source of radicals capable of inducing a fast transformation.

In industrial irradiation processes, either UV photons with energies between 2.2 and 7.0 eV or accelerated electrons with energies between 100 and 300 kV are used. Fast electrons transfer their energy to the molecules of the reactive substance (liquid or solid) during a series of electrostatic interactions with the outer sphere electrons of the neighboring molecules. This leads to excitation and ionization and finally to the formation of chemically reactive species. Photons, on the other hand, are absorbed by the chromophoric site of a molecule in a single event. UV-curing applications use special photoinitiators that absorb photons and generate radicals or protons. The fast transformation from liquid to solid can occur by free radical or cationic polymerization, which, in most cases, is combined with cross-linking. In liquid media, the transformation takes typically 1/100 of a second to 1 second. However, in a rigid polymeric matrix, free radicals or cationic species last longer than a few seconds. A post- or dark-cure process proceeds after irradiation and the result is a solid polymer network.

In summary, UV and electron beam technology improves productivity, speeds up production, lowers cost and makes new and often better products. At the same time, it uses less energy, drastically reduces polluting emissions and eliminates flammable and polluting solvents.

The technology is widely used to protect, decorate or bond items including fiber optics, compact discs, DVDs, credit cards, packaging, magazine covers, medical devices, automotive parts aerospace products and more.

Title	Location	Edition / Series / Misc.
822 Rauch Guide to the U. S. Paint Industry: A Market Survey and Analysis -- 2001-02 Edition		<i>Edition:</i> 5th edition
<i>Author:</i>	<i>Dynix:</i> 97813	<i>Series:</i>
<i>Publish.:</i> Impact Marketing Consultants, Inc.	<i>Call No.:</i> 338.4 Ra 2001-20	
<i>- place:</i> Manchester Center, VT	<i>ISBN:</i>	
<i>- date:</i> ©2001	<i>Shelf</i> Reference	<i>Year:</i> 2001
<i>Subject:</i> Paint industry and trade -- Directories		<i>Price:</i> \$445.00
<i>Desc:</i> x, 274 p., illus, 28 cm.		

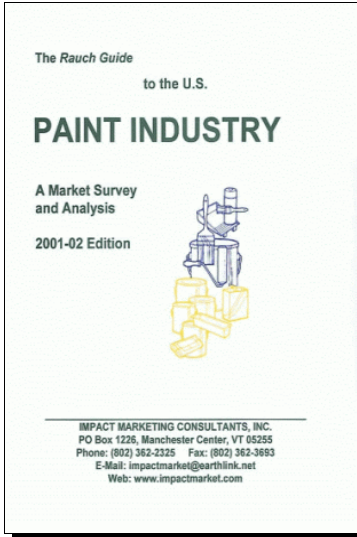


Table of Contents

1. ECONOMICS, GOVERNMENT REGULATIONS, AND FOREIGN MARKETS

- Introduction
- Industry Shipments
 - OEM product finishes
 - Architectural coatings
 - Special purpose coatings
- Forecast
- Company performance
 - Concentration
 - Major acquisitions
 - Total acquisitions
- Industry profitability
 - Selling, general and administrative expenses
 - Inventory turnover
 - Land, buildings and equipment
 - Sales produced by assets employed
 - Average sales per employee
- Prices
 - Architectural coatings
 - OEM finishes
 - Special purpose coatings
- Operations/productivity
- Employment/productivity
- Regional patterns
- Transportation
- Distribution
- Government regulations
 - Background
 - The laws
 - Air pollution
 - Water quality
 - Hazardous wastes
 - Toxic substances
 - Safety
 - Containers
- Outlook
- VOC's
- Waste disposal
- Community right to know
- Worker right to know
- Heavy metals and lead
- Powder coatings
- Radiation cured coatings
- Electrodeposition coatings
- Electrostatic spray and HVLP
- Plural component spray
- Foreign trade and markets
- World production and markets

2. MATERIALS AND MANUFACTURING

- Raw materials

Subjects

282 .	Paint industry and trade -- United States
391 .	Paint industry and trade -- United States -- Directories

- Binders
 - Synthetic resins
 - Alkyds
 - Acrylic resins
 - Vinyl resins
 - Epoxy resins
 - Polyurethane resins
 - Polyester resins
 - Amino resins
 - Other resins
 - Oils and natural resins
 - Solvents
 - Organic solvents
 - Hydrocarbon solvents
 - Oxygenated solvents
 - Pigments
 - Titanium dioxide
 - Zinc oxide
 - Carbon black
 - Color pigments
 - Iron oxides
 - Chromate pigments
 - Cadmium yellows and reds
 - Synthetic organic pigments
 - Corrosion inhibiting pigments
 - Metallic pigments
 - Magnetic pigments
 - Pearlescent or luster pigments
 - Color shifting pigments
 - Paint coloring
 - Fillers and extenders
 - Calcium carbonate
 - Clays
 - Talc
 - Mica
 - Silica
 - Barytes
 - Other filters and extenders
 - Additives
 - Surfactants
 - Plasticizers
 - Thickeners
 - Driers
 - Biocides
 - Antifoulants
 - Defoamers
 - Other additives
 - Prices
 - Containers
3. PRODUCTS AND MARKETS
- Architectural coatings
 - Interior paints
 - Exterior paints
 - Industrial OEM coatings
 - Transportation
 - Motor vehicle finishes
 - Automobiles
 - Trucks and buses
 - Other types
 - Metal finishes
 - Metal cans and closures, collapsible tubes, pails and drums
 - Coil coating
 - Metal furniture and fixtures

- Coil coatings
 - Can end stamping
 - Transportation
 - Appliances
- Appliances
- Wood
 - Wood furniture and fixtures
 - Wood composition board and flat stock
- Machinery and equipment
- Powder coatings
- Radiation cured coatings
- Other OEM coatings
 - Magnet wire coatings
 - Insulating varnishes
 - Conformal coatings
 - Conductive coatings
- Packaging
 - Overprint varnishes
 - Release coatings
 - Pipe coatings
- Special purpose coatings
 - Automotive, transportation and machinery
 - Industrial maintenance paints and coatings
 - Highway and traffic marking paints
 - Marine paints
 - Aerosol paints
 - Miscellaneous special purpose coatings
- Substrates
 - Plastics
 - Automotive industry
 - Flooring
 - Hot stamping of foil
 - Other uses
 - Other substrates
 - Packaging
 - Magnetic recordings
 - Release coatings

4. INDUSTRY ACTIVITIES, ORGANIZATIONS AND SOURCES OF INFORMATION

- Meetings, Exhibitions and Trade Shows
- Sources of Statistical Information
 - General
- U.S. Production and Sales
- Canada
- Trade Associations
- Trade and Technical Periodicals

5. U.S. PAINT COMPANIES WITH SALES AT OR OVER \$5 MILLION (332)

5A U.S. PAINT COMPANIES WITH SALES UNDER \$5 MILLION (437)

CROSS REFERENCE

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The Rauch Paint Guide, fifth edition, provides industry structure and current market information about this \$17 billion US industry. The report is divided into five major chapters with 82 tables and 21 figures in its 274 pages. Unique to the Guide is a profile of 769 industry manufacturers, with sales estimates, products, mergers and acquisitions, divestitures and other information for the 332 largest companies. The Guide provides information that is either widely scattered or difficult to find, saving valuable time and money. Users describe the Guide as the best single-source document on the entire US paint industry. Thousands of copies have been sold worldwide to producers, raw material suppliers, consultants, investment bankers, and others with a stake in this fast-changing, complex industry.

Section 1 includes much crucial industrial and economic information as to industry shipments, markets, structure, capital

expenditures, company performance and industry concentration, profits, and forecasts. Also included is information on operations, employment and distribution. The discussion of foreign trade (including Canada) and world production is very complete. The list of recent mergers and acquisitions is quite complete and well prepared; it is further referred to in Section 5. The treatment of the all-important government regulations affecting the industry is outstanding, in greater depth than the previous Guide, and very useful.

Section 2 treats the materials used in the coatings industry in impressive detail. The raw materials covered include: vehicles (resins and other binders), solvents, pigments, fillers and extenders and additives (and containers - metal and plastic). The materials are tied into their finished product usage (Section 3) and the statistical information presented is quite helpful. The discussion of acrylics is very thorough, and emphasizes their importance (as mostly waterborne) in the industry. Discussions of epoxies and urethanes are very complete. Most solvent usage has declined, due to the growth of waterborne coatings and solvent emission restrictions; however, oxygenated solvents usage has increased slightly.

Section 3 covers the products of the coatings industry: architectural, industrial OEM (original equipment manufacturer, product coatings), and special-purpose coatings. The vehicles used, major producers and shipments are listed, tabulated and discussed in good detail. The coverage of architectural coatings is one of the best I have seen. The treatment of automotive coatings is excellent, with data brought up to 1999. The sub-sections on powder and radiation-curable coatings have been expanded and are very helpful.

Section 4 is a useful tabulation of sources of statistical information, meetings, trade shows, trade associations, professional societies, periodicals, directories and buyers' guides that are important to the industry.

Section 5 continues to be probably the most valuable and important section for market researchers seeking information about U.S. paint companies. There are an estimated 1,120 coatings companies in the United States. This directory lists and describes in detail 332 of the larger companies with annual U.S. sales of over \$5 million. The remaining 437 companies (Section 5A) with annual sales under \$5 million are covered in less detail. The arrangement of this whole section is most helpful, giving pertinent and useful information about each company up to year 2000. For the larger companies, this includes plant locations, total company sales, number of employees, types of products, telephone and fax numbers, and (new) websites.

In Section 5B, a cross-reference is included, listing parent companies, subsidiaries, divisions and affiliations that are not described as separate entities.

INTRODUCTION:

The U.S. paint industry, with revenues of \$16.6 billion in 2000, includes companies engaged primarily in the manufacture of paints in paste and ready mixed form, varnishes, lacquers, enamels, and powder coatings. It is associated with such allied products as fillers and sealers, thinners and paint removers, and other miscellaneous products. In total, product shipments of the larger paint and all products industry were \$18 billion. Paints are a part of the chemical and allied products industry (NAICS 325, SIC 28) with shipments of \$418 billion, the fourth largest U.S. manufacturing industry.

The industry experienced modest growth in dollar volume since the declines caused by the recession of 1981-1982. Both dollar values and physical volume increased steadily with only a slight slowing during the modest recession of 1991 and 1992. While its products touch every sector of the U.S. economy, paint industry shipments, regardless of how measured, represent only 0.18% of GDP, down from 0.24% in 1990.

Shipment data in units and dollars for paint, varnish and lacquer are available from the U.S. Census Bureau in Current Industrial Report M325F (formerly M28F; published quarterly and annually). Industry economic data are also reported as Paints and Allied Products (U.S. SIC code 2851, NAICS code 32551) in the Annual Survey of Manufactures (ASM) or every fifth year in the Economic Census-Manufacturing - Industry Series EC97M-3255A (formerly Census of Manufactures). Companies who report to the U.S. Census Bureau are classified in the industry that they mainly serve. They also report detailed information on all products as classified in the Standard Industrial Classification system, which after 1997 is being reclassified as the North American Industry Classification System. As a result, the value of industry shipments includes data on secondary products also made by manufacturers classified in the paint industry. Due to reclassification of some types of products, and to the time required to convert some of the reports to the new system, some data may not be directly comparable to previous years or to each other.

Shipments of primary products and re-sales were 91.7% of the total industry in 1997. Large non-paint products include plastics, adhesives and sealants, and polishes. The value of product shipments includes paint data from all manufacturers. As shown, product shipments were 96.9% of overall industry shipments, including only 3.1% made as secondary products by manufacturers classified in other industries. This Guide excludes allied products (shipments of \$1 491 .7 million) and also coatings used for electrical insulation and on such non-durable products as textile, plastic film, paper and paperboard.

The paint industry is a mature business that is highly fragmented in types of paints, end uses and technology, and can be characterized by change in practically all segments. Many grades of paint have become commodity type products. However, due to emission and hazardous waste regulations, considerable effort continues to be spent on developing water-base coatings, high-solids and solvent-free liquid finishes, powder coatings and radiation curable materials.

The industry is very competitive and concentrated. There have been constant acquisitions and consolidation as illustrated by the reduction of the number of companies in the industry. The total dropped from 1,288 in 1977, to 1,170 in 1982, to 1,123 in 1987, to 1,130 in 1992, to an estimated 1,129 companies in 1997, and 1,120 in 2000.

In 2000, the 1,120 US paint companies operated 1,400 plants, of which 60% have less than 20 employees. The ten leading U.S. producers controlled over 75% of the U.S. market in 2000, and the leading company, PPG, held approximately 17%. Although a number of companies have sales nationwide, the paint industry remains a regional business. Factors causing this are cost of shipping, difficulties in maintaining prompt deliveries to distant locations, and other distribution problems.

There also is a high degree of product and market specialization among major producers. For example, Sherwin Williams is both the largest supplier to tie Do-It- Yourself (DIY) market and for other retailers under private label, and also the largest retailer through company owned stores; BASF is the major supplier of industrial coil coatings; PPG, DuPont, and BASF are leaders in OEM automotive finishes; PPG ranks number one in automotive refinishes; Akzo Nobel leads in marine coatings; Valspar is the largest supplier of finishes for residential furniture; and Rohm and Haas (Morton) and Ferro are the leaders in powder coatings.

Paints and coatings are used specifically to decorate walls and other surfaces, provide a pleasing, but long lasting finish on durable products, and protect and maintain most surfaces and goods produced. Some 45% of paint shipments are used on existing surfaces and equipment. For the most part, paints are in liquid form and are applied as a thin film in a variety of ways. Products are grouped as architectural coatings, OEM product coatings, and special purpose coatings.

The industry also faces competition from alternate materials for interior and exterior surfaces. Vinyl wall coverings compete with interior paints, vinyl siding competes with exterior paints, and plastics and chrome compete with automotive OEM coatings. Corrosion resistant metals or polymers compete in areas where coatings might have otherwise been used.

The industry continues to face many challenges such as shifting technologies, intermittent raw material shortages, varying costs, increased imports of finished goods, changing consumer living patterns, and slowing population growth. All this is occurring in an environment of increasing regulation by federal and state authorities, including regulations on air pollution, hazardous waste, worker and consumer safety, labeling, packaging and transportation. Customer needs, such as ease of application, VOC levels and aesthetic also increasingly influence product development.

Title	Location	Edition / Series / Misc.
930 Reactive Polymer Blending		<i>Edition:</i>
<i>Author:</i> Baker, W. (Warren E.), C. (Chris E.) Scott and G.-H. (Guo-Hua) Hu (ed)	<i>Dynix:</i> 105701	<i>Series:</i> Progress in Polymer Processing Series
<i>Publish.:</i> Hanser Gardner Publications, Inc.	<i>Call No.:</i> 668.9 Ba	
<i>- place:</i> Cincinnati, OH	<i>ISBN:</i> 1569903123	
<i>- date:</i> ©2001	<i>Shelf:</i> Adult Non-Fiction	<i>Year:</i> 2001
<i>Subject:</i> Polymers		<i>Price:</i> \$115.00
<i>Desc:</i> xvi, 289 p., illus., 25 cm.		

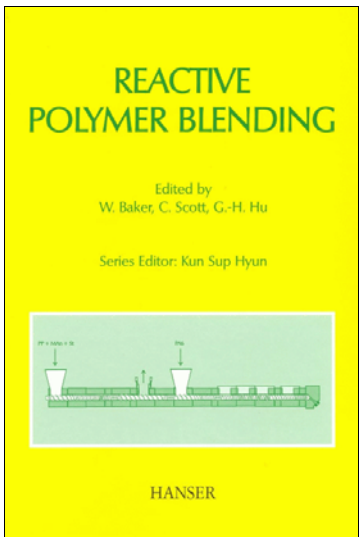


Table of Contents

- 1 Introduction
 - 1.1 Background
 - 1.2 Important Blending Principles
 - 1.3 A Historical Perspective on Reactive Blending
 - 1.4 The Evolution of Commercial Practice
 - 1.4.1 Patents and Products
 - 1.4.2 Processing
 - 1.5 Summary
- References
- 2 Types of Reactive Polymers Used in Blending
 - 2.1 Introduction
 - 2.2 Compatibility in Polymer Blends
 - 2.2.1 Basic Concepts
 - 2.2.2 Strategies for Blend Compatibilization
 - 2.2.2.1 Addition of Block and Graft Copolymers
 - 2.2.2.2 Utilization of Non-Bonding Specific Interactions
 - 2.2.2.3 Addition of Low Molecular Weight Coupling Agents
 - 2.2.2.4 Reactive Compatibilization
 - 2.3 Preparation of Reactive Polymers
 - 2.4 Types of Compatibilizing Reactions
 - 2.5 Types of Reactive Polymers and Their Applications
 - 2.5.1 Reactive Polymers Having MAn Functionality
 - 2.5.2 Reactive Polymers with Carboxylic Acid Rinctionality
 - 2.5.3 Reactive Polymers Capable of Interchange Reactions
 - 2.5.4 Reactive Polymers Containing Primary and Secondary Amines
 - 2.5.5 Reactive Polymers Containing Hydroxyl Groups
 - 2.5.6 Reactive Polymers Containing Heterocyclic Groups
 - 2.5.7 Reactive Polymers Capable of Ionic Interactions
 - 2.5.8 Miscellaneous Reactive Polymers
- 2.6 Concluding Remarks
- List of Abbreviations
- References
- 3 Reactive Blending with Immiscible Functional Polymers: Molecular, Morphological, and Interfacial Aspects
 - 3.1 Introduction
 - 3.2 Reactive Versus Physical Blending with Respect to Compatibilization
 - 3.2.1 Similarities and Differences
 - 3.2.2 Industrial Feasibility and Current Trends
 - 3.3 In Situ Interfacial Chemical Reactions of Functional Polymers
 - 3.3.1 Types of In Situ Chemical Reactions Involved
 - 3.3.2 Kinetics of Interfacial Reactions and Molecular Characterization
 - 3.4 Effects of Reactive Blending on Phase Morphology
 - 3.4.1 Effect of Reactive Blending on Phase Morphology Generation
 - 3.4.1.1 General Aspects of Phase Morphology Development
 - 3.4.1.2 Phase Morphology Development in Non-Reactive Blending
 - 3.4.1.3 Phase Morphology Development in Reactive Blending
 - 3.4.2 Effect of Reactive Blending on Phase Stabilisation in the Melt
 - 3.4.3 Effect of Reactive Blending on Phase Co-Continuity
 - 3.4.4 Interfacial Stability of the In Situ Formed Copolymer
 - 3.5 Effect of Reactive Blending on Crystallization of Blends Containing Crystallizable Components

Subjects

304 .	Plastics
313 .	Polymers

- 3.6 Blend Interface Characterization
 - 3.6.1 General Aspects Concerning Polymer/Polymer Interfaces
 - 3.6.2 Determination of the Interfacial Tension in Reactively Compatibilized Blends
 - 3.6.2.1 Blend Rheology Using the Palierne Model
 - 3.6.2.2 The Breaking Thread Method
 - 3.6.3 Determination of the Interfacial Thickness in Reactive Blends
 - 3.6.3.1 Ellipsometry
 - 3.6.3.2 Neutron Reflectometry
 - 3.6.3.3 Transmission Electron Microscopy
- 3.7 General Conclusions
- References

- 4 Key Role of Structural Features of Compatibilizing Polymer Additives in Reactive Blending
 - 4.1 Introduction
 - 4.2 General Principles
 - 4.3 Molecular Architecture of the Compatibilizer
 - 4.3.1 Alternative 1
 - 4.3.2 Alternative 2
 - 4.3.3 Alternative 3
 - 4.4 Phase Morphology Development
 - 4.5 Effect of the Interfacial Reaction on the Phase Morphology Development
 - 4.6 Effect of the Molecular Characteristic Features of the Reactive Polymers
 - 4.6.1 Kinetics of the Interfacial Reaction
 - 4.6.2 Molecular Weight of the Compatibilizer Precursors
 - 4.6.3 Reactive Group Content of the Reacting Polymers
 - 4.6.4 Distribution of the Reactive Groups Along the Chains
 - 4.7 Effect of Processing Conditions
 - 4.7.1 Melting Order of the Constitutive Components of Reactive Polyblends
 - 4.7.2 Effect of Shearing
 - 4.7.3 Initial State of Dispersion
 - 4.7.4 Mixing Temperature
 - 4.8 Conclusions
 - References

 - 5 Morphological and Rheological Aspects of Reactive Polymer Blending
 - 5.1 Morphology Development During Blending of Immiscible Polymers
 - 5.1.1 The Melting Regime
 - 5.1.2 The Melt Flow Regime
 - 5.1.3 Final Morphology of Reactive Blends
 - 5.1.4 Miscible Reactive Polymer Blends
 - 5.2 Rheological Aspects of Reactive Polymer Blending
 - 5.2.1 Rheological Changes During Blending
 - 5.2.2 Rheology of Reactively Compatibilized Polymer Blends
 - 5.3 Conclusions
 - 5.4 Future Challenges
 - References

 - 6 Reactive Blending in Screw Extruders
 - 6.1 Introduction
 - 6.2 Reactive Blending in Mixers
 - 6.2.1 Copolymer Formation at Polymer/Polymer Interfaces
 - 6.2.1.1 Chemical Considerations
 - 6.2.1.2 Copolymer Architecture Considerations
 - 6.2.1.3 Kinetics Considerations
 - 6.2.1.4 Experimental Assessment of Reaction Kinetics at Polymer/Polymer Interfaces
 - 6.2.2 Batch Mixers for Reactive Blending
 - 6.2.2.1 Reactive Compatibilization vs. Physical Compatibilization
 - 6.2.2.2 Morphology Development
 - 6.2.3 Reactive Blending in Screw Extruders
 - 6.2.3.1 Non-Reactive vs. Reactive PP/PA6 Blends
 - 6.2.3.2 Influence of Screw Configuration
 - 6.2.3.3 Influences of Feed Rate and Screw Speed
 - 6.2.3.4 Influence of the Maleic Anhydride Modified PP Content
 - 6.2.3.5 Correlation Between Morphology and Mechanical Properties

6.4 One-Step and Two-Step Reactive Blending Processes

6.4.1 PP/PA6 Blends

6.4.2 PP/PBT Blends

6.5 Concluding Remarks

References

7 Extrusion Equipment for Reactive Blending

7.1 Extruders Used for Reactive Blending

7.2 Mixing Mechanism

7.2.1 Distributive and Dispersive Mixing

7.2.1.1 Distributive Mixing

7.2.1.2 Dispersive Mixing

7.2.1.3 Viscosity Ratio and Surface Tension

7.2.1.4 Extensional Flow

7.2.2 Dissipative Melting

7.3 Residence Time and Residence Time Distribution

7.4 Devolatilization

7.5 Microstructure Development and Monitoring in Reactive Blending

7.6 Hybridized Polymer Processing Systems

7.7 Conclusions

References

8 Rubber Toughening of Polyamides by Reactive Blending

8.1 Introduction

8.2 Evolution of Polyamide Impact Modification Technology

8.3 Comparison of Reactivity vs. Toughening Efficiency of Various Functional Rubbers

8.4 Toughening Efficiency of Maleated EP Rubbers

8.4.1 Effect of Maleic Anhydride Content

8.4.2 Effect of Polyamide End Groups

8.5 Toughening Efficiency of Maleated Styrene-Ethylene/Butylene-Styrene (M-SEBS) Block Copolymer Rubbers

8.6 Effect of Mixtures of Reactive and Non-Reactive (Maleated and Unmaleated) Rubbers

8.7 Reactive Toughening of PA6 with Acylactam-Grafted EP Rubbers

8.8 Toughening of Polyamides with Maleated LDPE

8.9 High Impact Polyamide/ABS Blend

8.10 Toughening Mechanisms in Rubber Modified Polyamides

8.10.1 Role of Rubber Particle Size on Polyamide Toughness

8.10.2 Role of Rubber Particle Cavitation on the PA Matrix Toughening

8.11 Rubber Toughening of Reinforced Polyamides

8.12 Applications of Rubber Toughened Polyamide

8.13 High Rubber/Polyamide Blends

8.14 Polyamide/Reactive Rubber Blending Process

8.15 Future Directions in Rubber Toughened Polyamides

References

9 Compatibilization Using Low Molecular Weight Reactive Additives

9.1 Introduction

9.2 Free Radical Reactivity and Compatibilization of Polyolefins

9.3 Polyethylene/Polystyrene Compatibilization

9.4 Compatibilization of Polyolefin/Polyamide Blends

9.5 Development of the Vector Fluid Compatibilization Concept

9.6 Special Peroxide

9.7 Inorganic Catalyst for PE/PS Compatibilization

9.8 A Recent Example

9.9 Summary

References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Major advancement has occurred in preparing useful polymer blends, in most cases using some form of compatibilization. While physical compatibilization using block copolymers was the technique of choice in the past, increasingly, reactive approaches have been used. Much enabling technology is required to produce commercially viable blends including compatibilization chemistry, blend rheology, process equipment, and morphology control. This volume

is particularly suitable for practitioners trying to optimize these products and processes and for students as a graduate level textbook.

Contents

- Types of Reactive Polymers Used in Blending
- Reactive Blending with Immiscible Functional Polymers
- Key Role of Structural Features of Compatibilizing Polymer Additives
- Morphological and Rheological Aspects
- Reactive Blending in Screw Extruders
- Extrusion Equipment for Reactive Blending
- Rubber Toughening of Polyamides by Reactive Blending
- Compatibilization Using Low Molecular Weight Reactive Additives

PREFACE:

This volume was written to support an area of very significant technical and industrial interest in the field of polymer development. Over the last 30 years polymer blends of many types have become the dominant material class of polymers in commercial practice. From infant beginnings in the 1970s, the use of carefully designed chemistry has grown to augment physical blending strategies and several good volumes have been written which cover "Polymer Blends" in general. However, none have focused specifically on reactive blending and the material and process issues involved. This is an attempt to do just that.

Polymer blends have grown to take on a very significant role in the major application areas for polymers. A plethora of applications in the packaging, electronics/electrical, transportation, and construction industries have been instrumental in allowing polymeric materials to expand against other, more traditional materials. Many of these blends are phase separated, which leads to the need to control morphology and hence properties. Cleverly designed di-block and tri-block copolymers, which had no chemical functionality, were developed which aided in improving the performance of blends. However, their complexity of design and difficulty of use led to the innovations starting in the 1970s to use selective chemistry to enhance performance by controlling and stabilizing preferred morphologies and influencing interfacial adhesion. Some of the first applications and developments related to polyamide blends, but now reactive blending and compatibilization extends to essentially all polymeric material classes.

This volume covers a wide range of the issues important in reactive blending. It starts in Chapter 1 with an overview of some of the basic fundamental issues in polymer blending in general and feeds into a brief overview of the historical developments in reactive blending. Chapter 2 is a comprehensive review and bibliography of the many classes of chemistry, which have been reported in reactive blending. Chapter 3 deals with the dynamics and interfacial issues, which are at play and Chapter 4 discusses the design and function of reactive compatibilizers. Chapter 5 focuses in on the topic of morphology development and the rheological factors that are so influential in reactive blending. Chapters 6 and 7 deal with the processing issues and process equipment involved. Chapter 8 takes the most extensively investigated reactive blend material, polyamide, and follows it through the many developments as an example of a particular class. Chapter 9 makes a departure and deals with a new, possibly emerging approach to blending, using low molecular weight reactive additives. While we have not covered all aspect of reactive blending, we trust that this will be a useful contribution to the field for both fundamental researchers and industrial practitioners.

In keeping with the philosophy and membership of the Polymer Processing Society this volume is the collaboration of authors from Europe, the Americas, and Asia. We believe this diversity of views and inputs is important in disseminating the latest of technical developments. Many authors have assisted in this project but we are particularly indebted to N. C. Liu, G. Groeninckx, R. Jerome, T. Sakai, and K. Akkapeddi for co-ordinating their chapters. Several individuals provided helpful reviews of the chapters including C. Tzoganakis, C. K. Shih, J. Curry, L. Geotler and S. Balke. We hope this volume will further contribute to the field of polymer blending.

FOREWARD:

Since World War II, the industry based on polymeric materials has developed rapidly and spread widely. The polymerization of new polymeric species advanced rapidly during the sixties and the seventies, providing a wide range of properties. A plethora of specialty polymers have followed as well, many with particularly unique characteristics. This evolution has been invigorated by the implementation of metallocene catalyst technology. The end-use of these materials has depended on the development of new techniques and methods for forming, depositing, or locating these materials in advantageous ways, which are usually quite different from those used by the metal or glass fabricating industries. The importance of this activity, "Polymer Processing", is frequently underestimated when reflecting on the growth and success of the industry.

Polymer processes such as extrusion, injection molding, thermoforming, and casting provide parts and products with specific shapes and sizes. Furthermore, they must control, beneficially, many of the unusual and complex properties of

these unique materials. Because of their high molecular weights and, in many cases, tendency to crystallize, polymer processes are called upon to control the nature and extent of orientation and crystallization, which in turn have a substantial influence on the final performance of the products made. In some cases, these processes involve synthesizing polymers within a classical polymer processing operation, such as reactive extrusion. Pultrusion and reaction injection molding both synthesize the polymer and form a finished product or part all in one step, evidence of the maturing of the industry. A new family of polymer blends is prepared by reactive polymer blending processes. For these reasons, successful polymer process researchers and engineers must have a broad knowledge of fundamental principles and engineering solutions.

Some polymer processes have flourished in large industrial units, synthetic fiber spinning for example. However, the bulk of the processes are rooted in small- and medium-sized entrepreneurial enterprises in both developed and new developing countries. Their energy and ingenuity have sustained growth to this point, but clearly the future will belong to those who progressively adapt new scientific knowledge and engineering principles, which can be applied to the industry. Mathematical modeling, online process control and product monitoring, and characterization based on the latest scientific techniques will be important tools in keeping these organizations competitive in the future.

The Polymer Processing Society was founded in Akron, Ohio, in 1985 with the aim of providing a focus, on an international scale, for the development, discussion, and dissemination of new and improved polymer processing technology. The Society facilitates this by sponsoring several conferences annually and by publishing the journal *International Polymer Processing*, and the volume series *Progress in Polymer Processing*. This series of texts is dedicated to the goal of bringing together the expertise of accomplished academic and industrial professionals. The volumes have a multi-authored format, which provides a broad picture of the volume topic viewed from the perspective of contributors from around the world. To accomplish these goals, we need the thoughtful insight and effort of our authors and volume editors, the critical overview of our Editorial Board, and the efficient production of our Publisher.

This volume deals with the reactive polymer blending in the development of new polymer materials, which attain the specific mechanical properties due to unique combination of their component polymers. These processes have developed into what is arguably the best route to prepare new materials by combining different, existing polymers while most monomers cannot be easily copolymerized to gain intermediate properties. Many excellent polymer blends have been developed economically for the major applications in the transportation, electronic, appliances and packaging area with proper ties important in each application. Therefore, most important in this volume are the extensive discussions on the unique aspects of reactive blending in the developments of polymer blends, and morphology changes and how these lead to improvements in properties especially mechanical properties. Therefore this volume covers all aspects, from fundamentals of interfacial reactions and morphology developments, compatibilizer chemistry and design, reactive blending process fundamentals, to the process equipment and present major classes of commercially significant blends. This volume includes numerous contributions, industrial and academic, from Europe as well as Asia and North America and, as such, forms a very useful contribution to the plastics industries. This volume was initiated by Dr. Warren Baker, my predecessor and one of the volume editors, and became the third volume in this series with which I had the pleasure to be associated.

Title	Location	Edition / Series / Misc.
644 Relating Materials Properties to Structure: Handbook and Software for Polymer Calculations and Mat		<i>Edition:</i>
<i>Author:</i> David, D. J. (Donald Joseph), 1930-	<i>Dynix:</i> 90422	<i>Series:</i>
<i>Publish.:</i> Technomic Publishing Company, Inc.	<i>Call No.:</i> 620.1 Da	
<i>- place:</i> Lancaster, PA	<i>ISBN:</i> 1587160889	
<i>- date:</i> ©1999	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1999
<i>Subject:</i> Polymers -- Mechanical properties		<i>Price:</i> \$25.00
<i>Desc:</i> xxviii, 689 p., illus., 23 cm. + 1 computer optical disc (4¾ in.)		

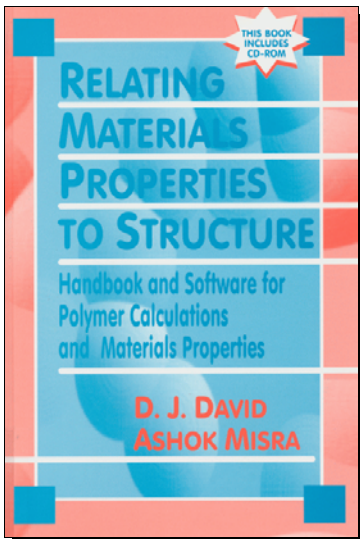


Table of Contents

Preface

1. Structural Considerations / Why Materials Differ
2. Morphology of Materials, Thermodynamics, and Relationship to Properties
3. Polymer Orientation and Rubber Elasticity
4. Effective Use of Spreadsheets for Scientific Applications and Estimation of Materials Properties and Miscibility
5. Polymer Property Estimation and Estimated Properties of Selected Polymers
6. Molecular Forces and Volumetric Properties
7. Calorimetric Properties
8. Structure / Transition Temperature Relationships
9. Cohesive Properties and Solubility Parameter Concepts
10. Interfacial Properties
11. Solution Property Relationships
12. Optical Properties of Polymers
13. Electrical Properties
14. Magnetic Properties
15. Viscoelasticity and Mechanical Properties
16. Acoustic Properties
17. Rheological Properties of Polymer Melts
18. Transfer Properties of Materials
19. Formation and Decomposition Properties of Materials
20. Processing of Thermoplastics
21. Miscibility and Estimation of Polymer Blends Miscibility
22. Composites: Concepts and Properties

Index
About the Authors

Subjects

546 .	Polymers -- Mechanical properties
547 .	Ceramics -- Mechanical properties

Reviews - Synopsis - Dust Jacket

PREFACE:

Over the years, we observed that, for the most part, little attempt was made to convey the commonalties or explicit distinctions between different classes of materials. As a consequence, a study of one field leaves the impression that much of the body of knowledge is unique to that field or class of materials. In many instances, this is indeed the case, while in others useful parallels are ignored or forgotten.

The myriad of new materials we see around us enrich all of our lives and make possible the creature comforts of television, automobiles, communication devices, and health benefits of new medical devices. These materials are engineered into a given application taking into account their chemical, physical, and mechanical properties. In this way fundamental knowledge from first class research and engineering are joint partners. This has been, and will continue to be an evolutionary process. There are exceptions to this, as in the case of the transistor which was revolutionary, but even this device continues to evolve. Much of this evolution is dependent upon an understanding of how the properties of a material depend upon the structure. Without this understanding, the costs and time to arrive at new materials that meet the requirements of a given application would be daunting.

This book is arranged to provide a comparison between the structure of different classes of materials and their attendant properties where appropriate, but largely concentrates on the structural differences between individual polymers and the resultant properties, since this is the only class of materials where data and techniques allow properties to be estimated. It is with these thoughts in mind that the accompanying software for this book was developed. However, as an easy, comprehensive reference, and approach to appreciating the differences between classes of materials, we have included physical and mechanical properties databases for a wide range of metals, ceramics, and organic polymers, which are included with the software. We hope that this integrated approach will indeed make this book valuable and unique.

A number of methods and techniques have appeared in recent years for estimating the properties of polymers, two outstanding texts of which are those by Van Krevelen [1] and Bicerano [2]. There is no easy, straightforward way to

estimate the properties of polymers. It is our intention to provide such a technique via simple software that permits one to see the effects of changing a structure, and also to estimate the properties of a polymer which might not otherwise be available, at the most, or very time consuming to find, at the least. We also consider the ability of the software to estimate the miscibility of various polymer blends to be a cornerstone of the software and therefore one of its more valuable aspects. Unfortunately, most methods that are extremely easy make simplifying assumptions that adversely affect accuracy. Although that is the case here, we believe that the inaccuracies introduced do not obviate the usefulness of the software or techniques.

In this way, the software for estimating the properties of polymers should prove to be valuable for obtaining properties not available, understanding the relationship of structure to properties, and asking any number of "What if we change the structure from this to that..." questions. We leave the follow-up on "So What" questions to the reader.

Title	Location	Edition / Series / Misc.
763 Rheology Author: Schoff, Clifford K. Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1997 Subject: Coatings -- Periodicals Desc: 42 p., illus., 28 cm.	Dynix: 55947-17 Call No.: 667.9 Fe ISBN: 0934010390 Shelf Reference	Edition: Reprint Series: Federation Series on Coatings Technology: No. FS17 Year: 1997 Price: \$50.00



Table of Contents

- I. INTRODUCTION
 - A. Historical Perspective
 - B. Basic Definitions and Units
- II. BASIC RHEOLOGY
 - A. Viscosity
 - 1. Types of Flow Behavior
 - 2. Flow Models
 - 3. Effect of Temperature
 - B. Thixotropy
 - C. Shear Rates
 - D. Dilute Polymer Solutions
 - E. Concentrated Polymer Solutions and Polymer Melts
 - F. Dispersed Systems
 - G. Extensional Viscosity
 - H. Viscoelasticity
 - 1. Mechanical Models
 - 2. Dynamic Behavior
 - 3. Normal Stress (Weissenberg Effect)
 - I. Influence of Solvents on Rheology
- III. VISCOSITY MEASUREMENT AND PLOTTING
 - A. Viscometers
 - 1. Capillary Viscometers
 - 2. Moving Body Viscometers
 - 3. Rotational Viscometers
 - 4. Other Viscometers
 - 5. Viscometer Accuracy and Precision
 - 6. Choice of a Viscometer
 - B. Viscosity Plots and Their Use
 - 1. Viscosity vs. Shear Rate Plots
 - 2. Shear Stress vs. Shear Rate Plots
 - 3. Casson-Asbeck Plots
 - 4. Viscosity-Time Plots
- IV. MEASUREMENT OF FLUID VISCOELASTICITY
- V. PAINT PROCESSES, VISCOSITY AND CONTROL
 - A. Correlation of Viscosity and Shear Rate with Application and Processing Behavior
 - B. Application Viscosity (Shear Forces)
 - 1. Test Techniques
 - 2. Control of Application
 - C. Sagging (Gravity Driven Shear Forces)
 - 1. Test Techniques
 - 2. Control
 - D. Leveling (Surface Tension Forces)
 - 1. Test Techniques
 - 2. Control
 - E. Surface Defect Formation (Unwanted Surface Tension Driven Flow)
 - 1. Surface Defects
 - 2. Control

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

VI. Low POLLUTION COATINGS

- A. High Solids
 - 1. Application
 - 2. Sagging and Leveling
- B. Waterborne Coatings
- C. Powder Coatings

VII. SUMMARY AND CONCLUSIONS

VIII. REFERENCES

IX. BIBLIOGRAPHY

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Rheology is the science of the deformation and flow of matter. In the coatings industry, the control of flow is essential to most operations and processes, including transfer of raw materials, manufacture of resins and paints, and storage, handling, and application of the finished products. Such control may be achieved by trial and error or through careful design based on an understanding of rheology and knowledge of the viscosity requirements for the given type of coating. Regardless of which strategy is chosen (and the latter is highly recommended), it also is very important to be able to effectively characterize viscosity behavior. The aim of this monograph is to aid in the formulation of coatings and the solution of flow problems by providing information on the principles and measurement of rheology.

Although the term rheology stems only from 1929, the study of flow dates back to antiquity. Practical rheology existed for centuries before Newton proposed the basic law of simple viscous flow in the seventeenth century. Further advances in understanding came in the mid nineteenth century when Hagen and Poiseuille proposed models for viscous flow in round tubes. The introduction of the first practical rotational viscometer by Couette in 1890 was another milestone. The word "rheology" was coined by Bingham in 1929. In recent years, the science of rheology has grown rapidly which has led to the production of a great body of literature.

Coatings rheology has been an integral part of the science of rheology for many years and a number of fine industrial rheologists have worked with coatings, the most prominent being Henry Green. In addition to carrying out excellent research and providing a number of important rheological insights, Green was the first rheologist to apply a microscope to rheological problems and the characterization of dispersed systems. Another giant in the field of coatings rheology is Temple Patton. His papers and the two editions of his book, *Paint Flow and Pigment Dispersion*, have aided countless paint and ink chemists and engineers in improving their formulations and solving their flow problems.

Title	Location	Edition / Series / Misc.
149 Rheology Modifiers Handbook: Practical Use and Application Author: Braun, David B. and Meyer R. Rosen Publish.: William Andrew Publishing Company - place: Norwich, NY - date: [1999?] Subject: Rheology Desc: ix, 505 p., illus., 25 cm.	Dynix: 82249 Call No.: 660 Br ISBN: 0815514417 Shelf Adult Non-Fiction	Edition: Series: Year: 1999 Price: \$285.00

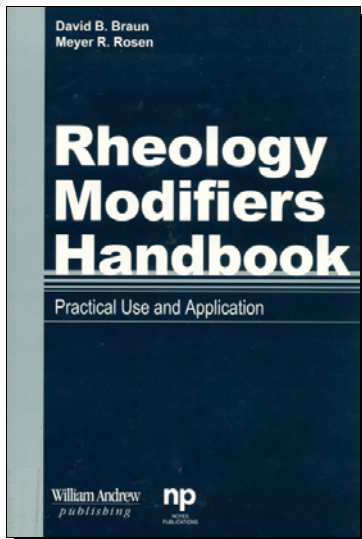


Table of Contents

Part 1: Practical Rheology
 Special Characteristics of Dispersions and Emulsions
 Three Schools of Rheological Thinking
 Thinking Rheo-logically
 Definitions
 Types of Flow Behavior
 Characterization of Non-Newtonian Flow: Mathematical Models and Experimental Methods
 Viscometry; Instrumentation and Use
 Symbols and Abbreviations

Part 2: Commercially Available Rheology Modifiers
 Acrylic Polymers
 Cross-linked Acrylic Polymers
 Alginates
 Associative Thickeners
 Carrageenan
 Microcrystalline Cellulose
 Carboxymethylcellulose Sodium
 Hydroxyethylcellulose
 Hydroxypropylcellulose
 Methylcellulose
 Guar and Guar Derivatives
 Locust Bean Gum
 Organoclay
 Polyethylene
 Polyethylene Oxide
 Polyvinyl Pyrrolidone
 Silica
 Water-swellable Clay
 Xanthan Gum

Part 3: Selecting the Best Candidates
 Food Applications
 Pharmaceutical Applications
 Personal Care Applications
 Household/Institutional Applications

Part 4: Formulary
 Food Formulations
 Pharmaceutical Formulations
 Personal Care Formulations
 Household/Institutional Formulations

Appendix A: Suppliers of Viscometers and Other Rheological Instruments
 Appendix B: Trade Name Directory
 Appendix C: Suppliers of Rheology Modifiers

Subjects

326 . Rheology

Reviews - Synopsis - Dust Jacket

This is the first single-volume handbook with the information a researcher needs to select the best rheology modifiers for

their project. This book contains information on 20 different types of rheology modifiers manufactured by 26 companies worldwide. These range from Acrylic Polymers to Xanthan Gum.

A single source guide to selecting and using the right rheology modifiers, for engineers, research scientists and technicians in food, pharmaceutical, cosmetic, and household/industrial applications. This book will enable readers to easily identify the best candidates for an application with a minimum investment of time.

Features:

Highly practical book containing ready-to-use information on rheology modifiers

Step-by-step guide provides all the information needed to select the right agent for each type of application - and shows how to use it

Saves valuable research time by eliminating the need to contact multiple suppliers and peruse their catalogs and product sheets

Appendix contains addresses, telephone and fax numbers, email addresses, and websites of manufacturers, plus a trade name directory

PREFACE:

Rheology: A science dealing with the deformation and flow of matter (fluids in this text)
(Merriam Webster's Collegiate Dictionary, 10th Edition)

Rheology Modifier: A material that alters the rheology of a fluid composition to which it is added
(Authors)

Rheology modifiers seem to be almost as ubiquitous as plastics. Most of us regularly consume them in the food and pharmaceuticals we use. Cosmetic creams, lotions, nail polish and liquid make-up also usually, contain rheology modifiers to achieve proper application characteristics. We clean our kitchens, baths, floors and automobiles with products that frequently contain these important ingredients. Even the paint we apply to walls and woodwork contains these useful additives. These are only a few of the applications of rheology modifiers.

They may be multi-functional agents in these applications, providing such desirable effects as viscosity, the ability to suspend insoluble ingredients, emulsion stability, anti-sag and vertical surface cling, for example.

During our lengthy careers in the Research and Development Departments of major chemical companies, we were frequently confronted with the need to select a rheology modifier for use in the application we were working on. This was invariably a long, arduous task requiring review of the technical literature of numerous suppliers of rheology modifiers to determine which types of products would be suitable for the application. This was followed by contact with those companies that supplied the desired products to obtain their latest technical literature and product recommendations. Finally, we would pare the list of potential candidates from hundreds to perhaps a few dozen.

But we often wondered why there existed no rheology modifier sourcebook, i.e., a single volume that would enable me to easily identify the best candidates for the application with a minimum investment of time. This handbook is our attempt to correct that deficiency. Our goal is to bring together, in one volume, the information that a researcher needs to select the best rheology modifier candidates for his/her project, whether it is a food, pharmaceutical, cosmetic or household/industrial application. It includes information on twenty different chemical types of rheology modifiers, from acrylic polymers to xanthan gum, manufactured by twenty-six chemical companies around the world.

This handbook is divided into four major parts:

Part I reviews of the basic concepts of rheology and its measurement from a practical standpoint. This is information the researcher needs to compare the performance of various rheology modifiers in the intended application.

Part II presents details about the many commercial products of each chemical type that are available from the twenty-six companies represented in this book. The products are arranged alphabetically, first by chemical type, then by supplier's name and finally by trade name. An attempt has also been made to differentiate products in a given product line. Over 1000 commercial products are included in this Part.

Part III focuses on the important step of selecting the most suitable rheology modifier candidates. It summarizes the applications for which each type of rheology modifier is recommended so that the user of this handbook can immediately identify which types are recommended for the intended application. It also covers regulatory issues that the user should be familiar with when choosing a product for use in a food or pharmaceutical application. At this point, it is prudent for the

user to contact the suppliers of the best candidates to get their recommendation for the products in their line which are the most suitable for the intended application.

Part IV is a formulary containing the contributions of the product suppliers. These 227 starting formulations are arranged by industry; food, pharmaceutical, cosmetic and household/industrial. They are designed to show which rheology modifiers are recommended for various applications and how they are normally incorporated into a formulation.

Following these four major parts, are three appendixes that provide the names, addresses, telephone and FAX numbers, Internet Web Page locations and E-mail addresses for the suppliers of rheological instruments and suppliers of rheology modifiers represented in this book. Also appended is a trade name directory indicating the owners of trade names that appear in this handbook.

Title	Location	Edition / Series / Misc.
931 Sax's Dangerous Properties of Industrial Materials		Edition: 10th edition
Author: Lewis, Richard J., Sr. (editor) [Sax, N. Irving (Newton Irving)]	Dynix: 105720	Series:
Publish.: John Wiley & Sons	Call No.: 604.7 Sa	
- place: New York, NY	ISBN: 0471354074	Year: 2000
- date: ©2000	Shelf Reference	Price: \$475.00
Subject: Hazardous substances -- Handbooks, manuals, etc.		
Desc: 3 v. (v1: xxvi, 950 p.; v2: xxvi, 1-1900p.; v3: xxvi, 1901-3735), 29 cm.		

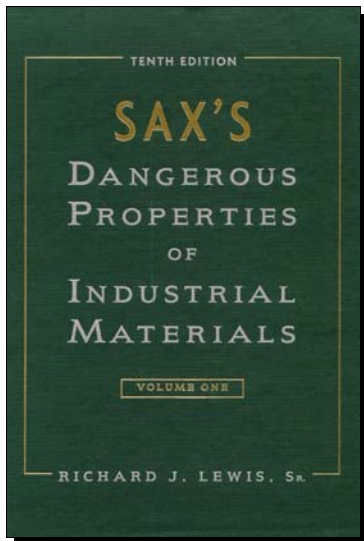


Table of Contents

Volume I:
 Preface
 Introduction
 Key to Abbreviations
 Section 1 - DOT Guide Number Cross-Index
 Section 2 - CAS Number Cross-Index
 Section 3 - Synonym Cross-Index
 Section 4 - References

Volume II: General Chemicals: Entries A—G

Volume III: General Chemicals: Entries H—Z

Reviews - Synopsis - Dust Jacket

PREFACE:

This tenth edition of Dangerous Properties of Industrial Materials includes comprehensive hazard information on the substances encountered in the workplace. The objective of the work is to promote safety by providing the most up-to-date hazard information available.

Over two-thirds of the entries have been revised for this edition. There are 23,500 entries in this volume, 21,334 contain GAS numbers. Preference was given in selection of new entries to those listed in the EPA TSCA Inventory. These are reported to be used in commerce in the United States.

Subjects

578 . Hazardous substances -- Handbooks, manuals, etc.

Numerous synonyms have been added to assist in locating the many materials that are known under a variety of systematic and common names. The synonym cross-index contains 108,000 entries consisting of the entry name as well as each synonym. This index should be consulted first to locate a material by name. Synonyms are given in English as well as other major languages such as French, German, Dutch, Polish, Japanese, and Italian.

Many additional physical and chemical properties have been added. Whenever available, physical descriptions, formulas, molecular weights, melting points, boiling points, explosion limits, flash points, densities, autoignition temperatures, and the like have been supplied.

A court order has vacated the OSHA Air Standards set in 1989 and contained in 29CFR 1910.1000. OSHA has decided to enforce only pre-1989 air standards. We have elected to include both the Transitional Limits that went into effect on December 31, 1992, and the Final Rule limits, that went into effect September 1, 1989. These represent the current best judgment as to appropriate workplace air levels. While they may not be enforceable by OSHA, they are better guides than the OSHA Air Standards adopted in 1969. OSHA has stated that it "continues to believe that many of the old limits which it will now be enforcing are out of date (they predate 1968) and are not sufficiently protective of employee health based on current scientific information and expert recommendations. In addition, many of the substances for which OSHA has no PELs present serious health hazards' to employees."

The following classes of data are new or have been updated for all entries for which they apply:

1. ACGIH TLVs and BEIs reflect the latest recommendations and now include intended changes.
2. German MAK and BAT reflect the latest recommendations.
3. NTP 8th Annual Report on Carcinogens entries are identified.
4. CAS numbers are provided for additional entries.

Each entry concludes with a Safety Profile, a textual summary of the hazards presented by the entry. The discussion of human exposures includes target organs and specific effects reported. Carcinogenic and reproductive assessments have been completely revised for this edition.

Fire and explosion hazards are briefly summarized in terms of conditions of flammable or reactive hazard. Where feasible, firefighting materials and methods are discussed. Materials that are known to be incompatible with an entry are listed here.

Also included in the safety profile are comments on disaster hazards that serve to alert users of materials to the dangers that may be encountered on entering storage premises during a fire or other emergency. Although the presence of water, steam, acid fumes, or powerful vibrations can cause the decomposition of many materials into dangerous compounds, of particular concern are high temperatures (such as those resulting from a fire) because these can cause many otherwise mild chemicals to emit highly toxic gases or vapors such as NOx, SOx, acids, and so forth, or evolve vapors of antimony, arsenic, mercury, and the like.

Every effort has been made to include the most current and complete information. The author welcomes comments or corrections to the data presented.

INTRODUCTION:

The list of potentially hazardous materials includes drugs, food additives, preservatives, ores, pesticides, dyes, detergents, lubricants, soaps, plastics, extracts from plant and animal sources, plants and animals that are toxic by contact or consumption, and industrial intermediates and waste products from production processes. Some of the information refers to materials of undefined composition. The chemicals included are assumed to exhibit the reported toxic effect in their pure state unless otherwise noted. However, even in the case of a supposedly pure chemical, there is usually some degree of uncertainty as to its exact composition and the impurities that may be present. This possibility must be considered in attempting to interpret the data presented because the toxic effects observed could in some cases be caused by a contaminant. Some radioactive materials are included but the effect reported is the chemically produced effect rather than the radiation effect.

For each entry the following data are provided when available: the DPIM code, hazard rating, entry name, GAS number, DOT number, molecular formula, molecular weight, line structural formula, a description of the material and physical properties, and synonyms. Following this are listed the toxicity data with references for reports of primary skin and eye irritation, mutation, reproductive, carcinogenic, and acute toxic dose data. The Consensus Reports section contains, where available, NTP 8th Annual Report on Carcinogens notation, IARC reviews, NTP Carcinogenesis Testing Program results, EPA Extremely Hazardous Substances List, the EPA Genetic Toxicology Program, and the Community Right-to-Know List. We also indicate the presence of the material in the update of the EPA TSCA inventory of chemicals in use in the United States. The next grouping consists of the U.S. Occupational Safety and Health Administration's (OSHA) permissible exposure levels, the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLVs), German Research Society's (MAK) values, National Institute for Occupational Safety and Health (NIOSH) recommended exposure levels, and U.S. Department of Transportation (DOT) classifications. Each entry concludes with a Safety Profile that discusses the toxic and other hazards of the entry. The Safety Profile concludes with the OSHA and NIOSH occupational analytical method, referenced by method name or number.

Title	Location	Edition / Series / Misc.
173 Science of Powder Coatings: Chemistry, Formulation and Application (Vol. 1)		Edition:
Author: Bate, David A.	Dynix: 23727	Series:
Publish.: SITA (Selective Industrial Training Associates) Technology, Ltd.	Call No.: 667.9 Ba	
- place: London, UK	ISBN: 0947798005	
- date: ©1990	Shelf Adult Non-Fiction	Year: 1990
Subject: Powder coatings		Price: \$25.00
Desc: viii, 321 p., illus., 24 cm.		

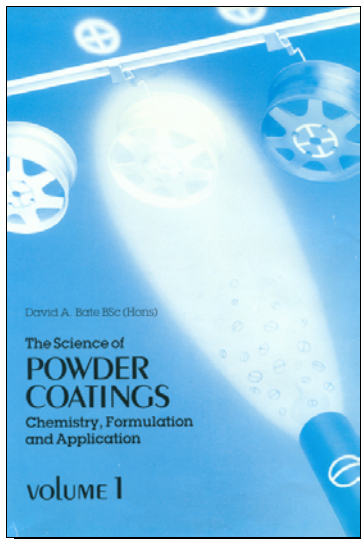


Table of Contents

Chapter 1: INTRODUCTION
 INTRODUCTION
 TYPES OF POWDER AVAILABLE
 THE ADVANTAGES OF POWDER PAINT
 THE ECONOMIC ADVANTAGES OF POWDER PAINT
 Fewer Rejects
 Reduced Packaging Costs
 Savings via Materials
 Fuel and Energy Savings
 Lower Production Costs
 THE DISADVANTAGES OF POWDER COATING
 Contamination
 Changing Colour
 Tinting-on-site
 Changing Powder
 Thin Films
 THE MARKET FOR POWDER COATINGS
 The Major Appliance Industry
 General Metal Coatings
 The Automotive Components Industry
 Industrial Machinery
 The Metal Fabrication Industry
 References

Subjects

283 .	Paint materials
320 .	Powder coatings
360 .	Coatings technology

Chapter 2: THE RAW MATERIALS
 INTRODUCTION
 RESINS (BINDERS)
 EPOXY RESINS
 DGEBA Resins
 DGEBA Resin Production
 — A Review of the Process
 — Process Description
 Epoxy Novolac Resins
 Epoxy Novolac Production
 — A Review of the Process
 — Process Description
 Specialized Resins for use in Powder Coatings
 POLYESTER RESINS
 The Basic Chemistry
 — Direct Esterification
 — Polyesterification
 — Side Reactions
 Common Raw Materials for Polyester Synthesis
 — Polyfunctional Acids
 — Polyfunctional Alcohols
 — Alcohols of Functionality Greater than Two (Polyols)
 — Mono Basic Acids
 — Principles of Polyester Formulation
 — Calculation of the Characteristics of Polyester 1
 — Calculation of the Quantity of TMA
 Polyester Processing

- Fusion Process
- Solvent Process
- Methods of Improving Processing Time
- Polyester Formulation
 - Polyester for Hybrid Systems
 - Exterior Grade Polyester — TGIC cured
 - Hydroxyl Polyester for Urethane Systems
 - Methods of Producing Low Bake Hybrid Systems
 - Methods of Producing High Level Polyester Hybrids
 - Methods of Producing Low Level TGIC Exterior Systems
 - Methods of Producing Trimellitic Anhydride Free Systems
 - Methods of Producing Flow Control Agents
- ACRYLIC RESINS
- The Basic Chemistry
- The Raw Materials
 - Monomers
 - Initiators
- The Principles of Acrylic Resin Manufacture
 - Methods of Molecular Weight Control
 - Monomer Concentration Effects
 - Glass Transition Temperature
- Acrylic Processing
 - One Shot Process
 - Dried Feed Process
 - Glycidyl Acrylic Resin
 - Hydroxyl Acrylic Resin
- CURING AGENTS
- Solid Aliphatic Amines
 - Dicyandiamide Chemistry
 - Dicyandiamide Production
 - Accelerated DICY'S
 - Substituted DICY'S
- Solid Amine Derivatives
 - Low or Rapid Curing Derivatives
 - Low Gloss Curing Derivatives
- Solid Phenolic Compounds
- Solid Anhydride Compounds
- Solid Isocyanate Adducts
- Solid Polyepoxides
- Solid Diacids
- FILLERS
- Barytes
- Blanc Fixe
- Calcite
- Dolomite
- Mica
- Talc
- Whiting
- Wollastonite
- EXTENDERS
- Aluminium Silicate
- Lithopone
- PIGMENTS — INORGANIC
- Cadmium Pigments
- Chromium Oxide Pigments
- Iron Oxide Pigments
- Lead 'Chrome' Pigments
- Nickel Titanate Pigments
- Cobalt and Titanium Pigments
- Ultramarine Pigments
- PIGMENTS — ORGANIC
- Indanthrone Blues
- Phthalocyanine Blues
- Phthalocyanine Greens

Benzidine Oranges
Red 2B Toners
Red 4B Toners
Thioindigo Reds
Toluidine Reds
Quinacridone Reds
Dioxazine Violets
Quinacridone Violets
Benzidine Yellows
VAT Yellows
PIGMENTS — Carbon Black
PIGMENTS — Titanium Dioxide
ADDITIVES
Accelerators
Benzoin
Dry Flow Additives
Flow Agents
Matting Agents
Texturing Agents
Wax
References

Chapter 3: THE CHEMISTRY
EPOXY RESIN CHEMISTRY
Basic Curing Agents
— Lewis Bases
— Secondary Amines
— Primary Amines
— Quarternary Bases
— Dicyandiamide
— Imidazoles
Acidic Curing Agents
— Lewis Acids
— Phenols
— Carboxylic Acids
— Anhydrides
— Novolac Resins
— Carboxyl Terminated Polyesters
POLYESTER RESIN CHEMISTRY
Carboxyl Functional Polyesters
Hydroxyl Functional Polyesters
ACRYLIC RESINS CHEMISTRY
Hydroxyl Functional Acrylics
Epoxy Functional Acrylics
References

Chapter 4: FORMULATION
INTRODUCTION
Epoxy Full Gloss
Epoxy Polyester Full Gloss
Polyester Full Gloss
Urethane Full Gloss
RESIN — CURING AGENT STOICHIOMETRY
SPECIAL POWDER COATING FINISHES
Leatherette Finishes
Hammer Finishes
Antique Finishes
Clear Lacquer Finishes
Tinted Lacquer Finishes
Metallic Finishes
Texture Finishes
Stipple Finishes
References

Chapter 5: TEST METHODS AND PROCEDURES
SECTION A. — ROUTINE TESTS FOR POWDER COATING PRODUCTS
Stoving Schedule
Gloss
Flow
Adhesion
Flexibility
Impact Resistance
Conical Mandrel
Scratch Resistance
Hardness
Heat Resistance
Gel Time
Chemical Resistance
SECTION B. — MORE STRINGENT REQUIREMENTS OF A POWDER COATING
Humidity Resistance
Salt Spray
Detergent Resistance
Artificial Weathering
Storage Stability
Abrasion Resistance
Differential Scanning Calorimetry
Glass Transition Point
Specific Gravity
Kesternich Test
Florida Exposure
The Gradient Oven
Differential Scanning Calorimetry
THE APPLICATION OF DSC TECHNIQUES TO POWDER COATINGS
Tg Determination via DSC
Enthalpy Measurements
References

Chapter 6: TROUBLESHOOTING
To Improve Edge Coverage
To Improve Adhesion
To Improve Flexibility
To Improve Solvent Resistance
To Improve Heat Resistance and — Reduce Discolouration
To Improve Light Resistance
To Improve Chemical Resistance
To Improve Water Resistance
To Improve Exterior Durability
References

Chapter 7: INSTRUMENTAL COLOUR MEASUREMENT AND PREDICTION
COLOUR
Refraction of Light
Reflection of Light
Scattering of Light
THE TRICHROMATIC COLOUR SYSTEM — AND C.I.E.
METAMERISM
Illuminant Metamerism
Observer Metamerism
Field Size Metamerism
Geometric Metamerism
VISUAL COLOUR MATCHING TECHNIQUES
COLOUR COMPUTER SYSTEMS
The Spectrophotometer
The Computer
Data Storage
Information Supply
Software
THE EQUIPMENT

COMMERCIALY AVAILABLE COLOUR MATCHING SYSTEMS
DATA BASE PREPARATION
THE KUBELKA MUNK EQUATION
USING A COLOUR COMPUTER
USING A COLOUR COMPUTER FOR COLOUR CONTROL
USING THE COLOUR COMPUTER ON METALIC FINISHES
IMPROVEMENTS IN MATCHING AVERAGES VIA COMPUTER MATCH PREDICTION
COMPARISON OF LABORATORY MANUAL AND COMPUTER MATCHING
ECONOMIC REVIEW
References

Chapter 8: APPENDICES
APPENDIX ONE: Basic Powder Coating Formulations
APPENDIX TWO: Epoxy Resins
APPENDIX THREE: Novolac Resins
APPENDIX FOUR: Polyester Resins — Hybrids
APPENDIX FIVE: Polyester Resins — Exteriors
APPENDIX SIX: Polyester Resins — Urethanes
APPENDIX SEVEN: Dicyandiamide Curing Agents
APPENDIX EIGHT: Amine Curing Agents
APPENDIX NINE: Phenolic Curing Agents
APPENDIX TEN: Anhydride Curing Agents
APPENDIX ELEVEN: Isocyanate Based Curing Agents
APPENDIX TWELVE: Polyepoxide Curing Agents
APPENDIX THIRTEEN: Addresses of Resin Suppliers
APPENDIX FOURTEEN: Addresses of Curing Agent Suppliers
APPENDIX FIFTEEN: Addresses of Pigment Suppliers
APPENDIX SIXTEEN: Addresses of Filler and Extender Suppliers
APPENDIX SEVENTEEN: Addresses of Additive Suppliers
Index

Reviews - Synopsis - Dust Jacket

INTRODUCTORY NOTE

This textbook has been written for Chemists, Technologists and Coaters for Powder Coatings, in order to give a detailed coverage for the up to date chemistry and formulation of a comprehensive range of powder coatings and their application. It also covers instrumental colour matching and includes detailed appendices for raw materials, their properties and international Suppliers.

INTRODUCTION

Thermosetting powder coatings were first developed in the United States in the late 1950's. These initial products were merely dry blends of a powdered, pigmented epoxy resin, a small proportion of flow agent, and a powdered curing agent, which were compounded batchwise in ball mills, mixing rollers and sigma-(or Z-) blade mixers.

It was not until 1961 that a West German company had the notion of compounding paints continuously by using an extruder. Because all the resin/ curing agent systems available in those days reacted slowly, these efforts proved fairly successful and led to the first breakthrough for powder coatings.

At the time the only method of application was by fluidised bed, a technique which involved immersing a pre-heated article into a bath of aerated powder. Consequently this resulted in heavy film builds with a minimal practical thickness of approximately 200 microns. Such coatings were of course expensive and therefore limited to specialized applications e.g. corrosion resistance or electrical insulation work.

During the same year the technology of powders for electrostatic application was developed by 'Shell' in England.

The choice of using Epoxy resins for the first thermosetting powders was due to two main issues (both fortuitous):—
(i) in the range of commercialised resins, one existed (Epikote 1004) with the right melting point (95°C), i.e. not too low as to suffer from pressure blocking, if stored under high ambient temperatures, and not too high as to give poor flow properties in the final film.

(ii) Epoxies could be crosslinked by polyaddition mechanisms, (in particular by using dicyandiamide) which did not involve the liberation of volatiles or by products, thereby avoiding the probability of extremely porous films (as generally occurs with polycondensation systems at high film builds).

There was also a third reason which became apparent with the introduction of electrostatic spray equipment. It was found that epoxy based powders had good spraying characteristics since they accepted and retained electrostatic

charge given during spraying.

From 1962, the year when thermosetting powder was first applied by electrostatic spraying on an industrial scale, the growth was extraordinary, particularly when compared with other new technologies in the field. The table below outlines the growth over the first ten years.

TABLE 1: POWDER PRODUCTION FIGURES OVER THE FIRST TEN YEARS

YEAR	1962	1966	1969	1972
TONNAGE	8	50	1300	5800

Although the market for epoxy based powders was growing rapidly, the resin systems upon which they were based did have distinct disadvantages particularly for exterior applications since the coating suffered from ultra violet light degradation with resultant loss of gloss and subsequent chalking.

As a result of this many of the large chemical manufacturers undertook research to develop resins and systems suitable for powder coating application which would not have these deficiencies. The most promising developments were in the fields of polyester and acrylic resins.

The first polyester resins were developed in 1969, with stoving schedules of at least 30 minutes at 200°C. (compared with 5-7 minutes at 200°C for epoxy systems, then cured by accelerated amines) These polyester systems were based on long chain polyester polyols, i.e. hydroxyl functional.

However, owing to the nature of the beast, these resins suffered from viscosity, and storage stability problems. Moreover on application these resins also lead to gassing effects. This boiling phenomena was associated with the release of entrapped degradation products liberated during the manufacture of the polyester resin itself.

By 1972, a second generation of polyester resins had been developed. These were based on polymers with acid functionality. This made them far more suitable for powder production and eliminated the problems associated with gassing:

The first fast curing polyester resins were launched in 1974, although it was not until 1976 that the market for these products began to grow. The main reasons for this were the lack of batch-to-batch consistency, and the rapid development and almost immediate obsolescence of the resins available.

In 1983, against the background of known toxicological problems, the first TMA-free polyester resins were produced.

Currently, the market for polyesters and particularly those for use in epoxy/polyester hybrid systems continues to grow rapidly.

Acrylic resins began to be developed in the late 1960's particularly in Japan, where there was an attempt to produce a powder replacement for the popular melamine-alkyd and acrylic stoving enamel systems. These resins proved to be very popular in the Far East, because the powders subsequently produced were found to have good exterior durability and excellent gloss properties.

The acrylic based systems were introduced into Europe in the early 1970's but failed to gain acceptability due to incompatibility problems with the existing marketable epoxy and polyester systems, and their comparatively high price.

At present, the Far East is gradually converting to the more popular European powder technology and is experiencing similar compatibility problems.

Title	Location	Edition / Series / Misc.
764 Sealants and Caulks		<i>Edition:</i>
<i>Author:</i> Prane, Joseph W.	<i>Dynix:</i> 55947-13	<i>Series:</i> Federation Series on Coatings
<i>Publish.:</i> Federation of Societies for Coatings Technology	<i>Call No.:</i> 667.9 Fe	<i>Technology:</i> No. FS13
<i>- place:</i> Philadelphia, PA	<i>ISBN:</i> 0934010404	
<i>- date:</i> ©1989	<i>Shelf</i> Reference	<i>Year:</i> 1989
<i>Subject:</i> Coatings -- Periodicals		<i>Price:</i> \$50.00
<i>Desc:</i> 28 p., illus., 28 cm.		

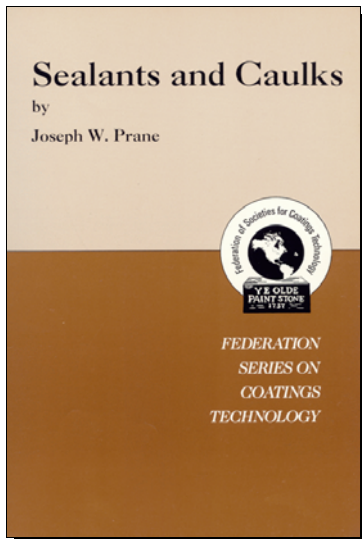


Table of Contents

- I. INTRODUCTION
 - A. Importance of Sealants and Caulks in Construction and Maintenance
 - B. Relationship to the Coatings Industry
- II. TERMINOLOGY
 - A. Sealants
 - B. Caulks
 - C. Extruded Tapes
 - D. Putties and Glazing Compounds
 - E. Bedding Compounds
 - F. Package Forms
 - G. Back-up Materials
 - H. Primers
 - I. Curtainwall Construction
- III. JOINT DESIGN
- IV. JOINT PREPARATION AND SEALANT APPLICATION
 - A. Cleaning
 - B. Back-up Materials
 - C. Priming
 - D. Sealant Application
 - E. Tooling
- V. SEALANT AND CAULK CLASSIFICATION
 - A. Polymer Type
 - 1. Asphaltic (Bituminous) Materials
 - 2. Oleoresinous
 - 3. Polybutene
 - 4. Polyisobutylene
 - 5. Butyl Rubber
 - 6. Neoprene
 - 7. Hypalon
 - 8. SBR and Related Elastomers
 - 9. Thermoplastic Elastomers
 - 10. PVC—Pressure Sensitive Tapes
 - 11. Polyvinyl Acetate
 - 12. Acrylic—Solution
 - 13. Acrylic—Emulsion
 - 14. Epoxy
 - 15. Polysulfides
 - 16. Polymercaptans
 - 17. Urethanes
 - 18. Silicones
 - 19. Fluoropolymers
 - 20. Others
 - B. Physical Form of Components
 - 1. One-Component
 - 2. Two-Component
 - 3. Extruded Tapes
 - 4. Hot Melts

Subjects

243 .	Coatings -- Periodicals
281 .	Paint -- Periodicals
339 .	Varnish and varnishing -- Periodicals

- 5. Foamable Compositions
 - C. Application Method
 - 1. Knife, Spatula
 - 2. Caulking Guns — Hand and Power-Driven
 - 3. Motionless Mixer/Extrusion
 - 4. Hot Melt
 - 5. Robotics
 - D. Cure Mechanism
 - 1. Noncure
 - 2. Evaporation — Solvent or Water
 - 3. Oxidative
 - 4. Chemical Cure
 - E. Packaging, Color Choices
- VI. MANUFACTURING OPERATIONS
- A. Change Can Mixers
 - B. Dispersion Equipment
 - C. Twin-Screw Extruders
- VII. SEALANT SELECTION
- VIII. SEALANT SPECIFICATIONS
- A. TT-C-00598c
 - B. TT-S-00227c
 - C. TT-S-00230c
 - D. TT-S-001543A
 - E. ASTM C 920-79
- IX. SUMMARY AND FUTURE TRENDS
- X. REFERENCES

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

A. Importance of Sealants and Caulks In Construction and Maintenance

Sealants and caulks are important consumer, architectural, construction, and engineering compounds. They are used to fill gaps or joints between two or more similar and/or dissimilar surfaces or contours. Common applications involve the functions of sealing, waterproofing, and weatherproofing. In addition, sealing materials are required to adhere tenaciously to the mating joint surfaces over a wide range of temperatures, joint movements, and environmental stress conditions.

Joints may vary in width from as little as 0.125 in. to 2 in. or more. Depth is approximately one half of the width for optimum dynamic performance. If necessary, preformed joint fillers, e.g., expanded butyl rod, or bond breakers such as polyethylene slip sheets, are preinserted to decrease and establish the designed joint depth.

Many types of building materials come in contact with the sealant or caulk, e.g., glass, concrete, masonry, wood, steel, aluminum, and various plastics. These surfaces must be clean and dry and primers are applied if necessary (see Section II-H "Primers").

The materials with the highest quality and best overall performance are the elastomeric sealants, i.e., those based on polysulfides, urethanes, and silicone polymers. Following these are a series of caulks with somewhat lower elastomeric properties, e.g., butyls, acrylics, and others. Of lower performance capability are the older materials, such as architectural caulking compounds, putties, glazing compounds, bedding compounds, construction mastics, and nondrying sealants. Mastics are low cost, heavily-filled, thick, pasty compositions which may be water-borne or solvent-borne; they are often used in installing flooring and wallboards.

B. Relationship to the Coatings Industry

The treatment of joints between similar and/or dissimilar construction materials is of significant importance to coatings technologists. While many of the modern elastomeric sealants do not receive a field coat of paint (since they are often color-matched to their mating surfaces, or are supplied in a transparent or translucent form), most of the lower performance caulks and glazing compounds are painted in the field.

The coatings supplied have to hide the joint surface, be compatible with the sealant material, and adhere well to it and the mating surfaces during the life of the structure. The coating should not alligator, crack, fade, chalk, or fail in any way while protecting the sealant surface during expansion and contraction of the joint.

Furthermore, coatings, adhesives, and sealants share many common characteristics, e.g., raw materials, intermediates, processing equipment, rheology, cure systems, etc. However, they also have significant differences, which influence their delivery systems and performance characteristics.

Coatings are usually applied in thin films, ranging up to 10 mils or higher, averaging 1-3 mils. Sealants are applied to much higher film thicknesses, ranging from 0.125 in. to 2 in. The interfacial considerations also differ. Coatings usually have one substrate/coating and one coating/air interface, while sealants have two substrate/sealant interfaces (which may differ) and one sealant/air interface. The stresses and morphology of these interfaces will often be different as well.

This monograph is designed to acquaint coatings scientists and technologists with sealant and caulk basics so that they may design and test suitable coatings for these surfaces.

Title	Location	Edition / Series / Misc.
150 Shellac: Its Origin and Applications Author: Hicks, Edward Publish.: Chemical Publishing Company, Inc. - place: New York, NY - date: ©1961 Subject: Shellac Desc: 272 p., illus., 23 cm.	Dynix: 34099 Call No.: 667.79 Hi ISBN: Shelf Adult Non-Fiction	Edition: Series: Year: 1961 Price: \$25.00

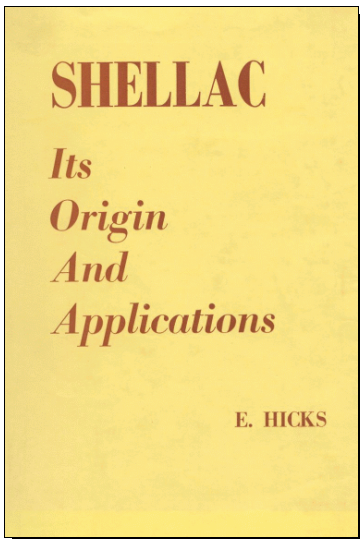


Table of Contents

FOREWARD

1. THE ORIGIN AND HISTORY OF SHELLAC
2. INDIAN METHODS OF MANUFACTURE OF ORANGE SHELLAC GUMS
3. THE BLEACHING OF SHELLAC GUMS IN THE UNITED STATES
4. LIQUID OR CUT SHELLACS
 White and Orange Shellac Varnish in Alcohol
 Alkaline Aqueous Solutions of Shellac
5. PHYSICAL AND CHEMICAL EXAMINATION
 Specifications
 Orange shellac
 Seed lac
 Dry bleached shellac
 Shellac varnish
 Methods for Sampling and Testing Shellac Color
 Specific gravity
 Moisture
 Insoluble matter
 Matter soluble in water
 Ash
 Arsenic sulfide
 Rosin
 Wax
 Acid number
 Saponification number
 Hydroxyl number
 Chlorine
 Softening point
 Orpiment
 Methods of Sampling and Testing Shellac Varnishes
 Color
 Nonvolatile matter
 Insoluble matter
 Ash
 Copal
 Rosin
 Iodine number
 Wax
 Acid, saponification, and hydroxyl numbers
 Chlorine
 Weight per gallon
 Drying-time test
 Nature of volatile matter
 Viscosity
 Moisture resistance
 Flash test
 Compatibility

Subjects

327 . Shellac

Physical and Chemical Constants
Calculated Weight for Various Cuts of Shellac Varnish
Methods of Calculating the Dilution of Shellac Varnish
Thermal Properties of Shellac
Determination of the Fluidity or Flow of Shellac
Life of Shellac
United States Government Shellac Uses and Specifications
Navy Department Formulas Employing Shellac

6. THE USE OF SHELLAC IN PARTICULAR INDUSTRIES

Records
Electrical Insulating Materials
Hats
Grinding Wheels
Paper
Printing Inks
No-Rub Floor Waxes
Leather Finishes
Lacquer Solutions
Rubber

7. SHELLAC AS A PROTECTIVE AND DECORATIVE FINISH FOR WOOD

Furniture Finishing
Reconditioning Antiques
Piano Finish
Repairing and Patching Damaged Finishes
Application of Shellac by Brush
Shellac on Floors
Shellac for Bowling Alleys
Colored and Pigmented Shellac
Tumbling with Shellac
Shellac as a Knot and Stain Sealer
How to Avoid Trouble in Finishing
Bleeding
Blooming
Blushing
Bubbles
Checking
Chipping
Glossy effect after rubbing
Grain raising
Greenish tinge
Orange peeling
Turning dark
General suggestions

8. SHELLAC FOR THE MASTER PAINTER

9. SHELLAC IN THE HOME WORKSHOP

10. MISCELLANEOUS APPLICATIONS OF SHELLAC

Mirror Backings
Enteric Coatings and Candy Glaze
Hair Lacquers
Lamp-Base Cement
Brewers' Vats
Patterns
Lead-Pencil Finishes
Broom-Handle Finishes
Smoking Pipes
Movies

APPENDIX

Solubility of Shellac in Various Organic Solvents

Glossary
Periodicals
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This is the only book in the English language covering every aspect of the manufacture and applications of shellac from its harvesting in India to its uses in industry. It gives a comprehensive treatment of the industry and its relationship to current finishing operations and their applications.

It will be of profitable use to the chemist, technician, and other scientific workers in the shellac field. The book will also be of great value to finishing superintendents, manual training schools, purchasing agents, production executives, etc., where shellac has its unique application and utility. In addition, it will be of considerable aid and interest to the merchandiser, those in professional and trade capacities of furniture and floor finishing, the painter, and related personnel. The consuming public will also find much useful information in this volume.

The data on the physical and chemical examination of shellac are invaluable. These discuss the specification field, in which the authorities in the industry are quoted, as to specifications and methods, including the American Bleached Shellac Manufacturers Association, the United States Shellac Importers Association, the United States Navy, and many others. Numerous literature references, figures, tables and illustrations are also given.

It also includes an appendix which covers shellac solubility in various organic solvents, a glossary, a list of periodicals, and a comprehensive index.

PREFACE

This volume is published posthumously.

The writing of a book of one's own can be a fascinating task, even though an especially enervating and often puzzling one for an unpracticed writer, and, in this case, for a business executive whose hours were crowded with the responsibilities of desk and home, and the affairs of local government. For my father this fascination was, in many ways, impelling. He conceived this volume, I think, as a kind of handbook for which, to his knowledge, there was no precedent. Inescapably, the book at the same time became a summing-up gesture of a business career from which he soon intended to withdraw. This book, then, represents the importance and dignity that my father found in the occupation of his choice. More significantly, perhaps, it represents the fruitfulness and the integrity of his many associations throughout the industry.

Except for minor details necessary to prepare the book for print, the manuscript is identical with that left at the date of my father's untimely death. Its publication will be gratifying to his many friends; to his family it will be much more than that.

FOREWORD

In writing this book, the author has attempted to give an over all picture of the shellac industry and its relation to modern industrial finishing operations by discussing the sources of shellac, its manufacture, physical and chemical properties, and its application in major industries.

With the exception of comparatively few publications of the Indian Lac Research Institute and small contributions by individuals closely associated with the industry in India, there is no literature dealing with every aspect of shellac from its harvesting in India to its use in industry.

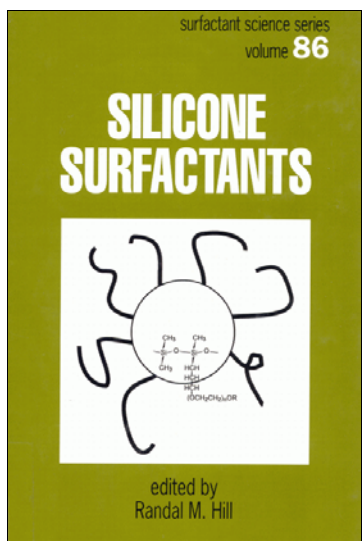
The author has compiled, during his many years in the shellac industry, a varied supply of information concerning this ancient yet little-known product. This book is designed to present in readable form the core of this information, and it includes material collected from technical and scientific sources as well as from trade publications. A list of trade publications will be found at the end of this volume.

The uses of shellac in America and Europe are so varied that an exhaustive treatment of every detail is beyond the scope of this book. In addition, every industry guards the details of its manufacturing processes as trade secrets. Therefore, in certain specific industries, only general information is available. The reader should understand that in adapting shellac to his particular application, the information in this book should be used primarily as a basis for experiment and further research. Since actual experience will involve improvements and variations in the processes used, each industrial finishing operation is an individual problem.

The technical information in this book should be helpful in solving individual problems for industries that are using shellac. The methods of testing and analysis, described in Chapter 5, are those appearing in the Official Methods of Analysis prepared by the U.S. Shellac Importers Association under the supervision of expert chemists closely associated with the shellac industry.

The ever-increasing imports of lac into America and the growing annual consumption of shellac throughout the industrial world, in spite of the development of synthetic finishes, molding compounds, and shellac substitutes, indicate a potentially expanding market for this product. The many useful properties peculiar only to shellac justify this expansion. The author has, therefore, prepared this book not only for the chemist and the industrial technician, but also for finishing superintendents, manual training schools, production executives, purchasing agents, and all who are interested in the uses of a product which has served mankind since the days of Marco Polo. It will also be of particular interest to the seller of shellac, the professional furniture and floor finisher, the painter, and the consuming public.

Title	Location	Edition / Series / Misc.
151 Silicone Surfactants Author: Hill, Randal M. (editor) Publish.: Marcel Dekker, Inc. - place: New York, NY - date: ©1999 Subject: Surface active agents Desc: viii, 360 p., illus., 24 cm.	Dynix: 89762 Call No.: 668.1 Si ISBN: 0824700104 Shelf Adult Non-Fiction	Edition: Series: Surfactant Science Series: Vol. 86 Year: 1999 Price: \$128.00

**Table of Contents**

- Preface
 Contributors
 1. Siloxane Surfactants (Randal M. Hill)
 2. Silicone Polyether Copolymers: Synthetic Methods and Chemical Compositions (Gary E. LeGrow and Lenin J. Petroff)
 3. Novel Siloxane Surfactant Structures (Gerd Schmaucks)
 4. Surface Activity and Aggregation Behavior of Siloxane Surfactants (H. Hoffmann and W Ulbricht)
 5. The Science of Silicone Surfactant Application in the Formation of Polyurethane Foam (Steven A. Snow and Robert E. Stevens)
 6. Silicone Polymers for Foam Control and Demulsification (Randal M. Hill and Kenneth C. Fey)
 7. Silicone Surfactants: Applications in the Personal Care Industry (David T Floyd)
 8. Silicone Surfactants: Emulsification (Burghard Grüning and Andrea Bungard)
 9. Use of Organosilicone Surfactants as Agrichemical Adjuvants (Donald Penner, Richard Burow, and Frank C. Roggenbuck)
 10. Polymer Surface Modifiers (Iskender Yilgor)
 11. Surfactant-Enhanced Spreading (T Stoebe, Randal M. Hill, Michael D. Ward, L. E. Scriven, and H. Ted Davis)
 12. Ternary Phase Behavior of Mixtures of Siloxane Surfactants, Silicone Oils, and Water (Randal M. Hill, X. Li, and H. Ted Davis)

Index

Subjects

332 .	Surface active agents
414 .	Silicones

Reviews - Synopsis - Dust Jacket

PREFACE:

Although silicone surfactants are a commercially important class of novel surfactants with numerous applications—ranging from their use in the manufacture of polyurethane foam to applications in coatings, household and personal care products, and foam control and as exceptional wetting agents—the literature on their properties and applications is limited and widely scattered among many journals, patents, and trade publications. Judging from the rapidly growing number of recent publications, the interest in this class of surfactants is increasing dramatically. The intent of the current volume is to bring together in one place a comprehensive introduction to the preparation, uses, and physical chemistry of silicone surfactants. As such, it should be of value both as an introduction to and as a reference source for this fascinating class of surfactants.

Polydimethyl siloxane and many copolymers containing dimethyl siloxane groups are surface active in a variety of aqueous and nonaqueous media. This book focuses primarily on those silicone polyoxyalkylene copolymers that are surface active in aqueous systems, but also includes chapters on two important nonaqueous systems—polyurethane foam and polymer blend compatibilizers. The book begins with an introductory chapter that overviews the preparation, physical chemistry, and applications of silicone surfactants. This broad perspective is followed by detailed discussions of each of these areas. Chapters 2 and 3 cover the synthesis and analysis of silicone surfactants including a number of novel silicone surfactants. Chapter 4 details the surface activity and aggregation behavior of silicone surfactants. Chapters 5-10 discuss specific applications including polyurethane foam manufacture, personal care, coatings, fabric finishes and polymer surface modifiers, foam control, and agricultural adjuvancy. Chapters 11 and 12 deal with two areas of significant recent activity—the unusual wetting behavior of the trisiloxane surfactants and the ternary phase behavior of mixtures of silicone surfactants with water and silicone oils. The emphasis throughout the volume is on understanding and insight rather than formulaic presentations.

A variety of authors were enlisted to contribute different perspectives to the work, including representatives from each of the major manufacturers and academic specialists who have studied the surfactancy of silicone surfactants. Thus the work represents the collective effort and knowledge of an international group of scientists and technologists. I hope it will be valuable to those seeking to make use of silicone surfactants in diverse applications as well as to researchers seeking to better understand fundamental surfactancy phenomena by examining the differences and similarities between hydrocarbon and silicone surfactants.

INTRODUCTION:

Siloxane surfactants consist of a permethylated siloxane group coupled to one or more polar groups. This class of surfactants finds a variety of uses in applications where other types of surfactants are relatively ineffective. Siloxane surfactants have certain unique properties:

1. Their hydrophobic group is silicone, so that
 2. They are able to lower surface tension to 20 dyn/cm compared with 30 dyn/cm for typical hydrocarbon surfactants, causing them to be
 3. Surface active in both aqueous and nonaqueous media.
- In addition,
4. They are prepared by different chemistries, yielding molecular structures of different types and ranges, which are often fluid to very high molecular weights.

Siloxane surfactants were introduced to the marketplace in the 1950s for the manufacture of polyurethane foam. Soon afterward other applications were invented for them. Nonaqueous surface activity is the basis for their use in polyurethane foam manufacture, as demulsifiers in oil production, and as defoamers in fuels. Their ability to lower surface tension leads to wetting and spreading applications. Different molecular structures and high molecular weights make them useful as novel emulsifiers. Silicones impart a unique dry-lubricity feel to surfaces such as textiles, hair, and skin. Since siloxane surfactants incorporate silicone in a water-soluble or water-dispersible form, they represent a convenient means for putting silicone on a surface by way of an aqueous formulation.

The surface active character of siloxane surfactants is due to the methyl groups, the —O—Si—O—Si— backbone simply serves as a flexible framework on which to attach the methyl groups. The surface energy of a methyl-saturated surface is about 20 dyn/cm, and this is also the lowest surface tension achievable using siloxane surfactants. In contrast, most hydrocarbon surfactants consist of alkyl, or alkylaryl hydrophobes, which contain mostly $\text{—CH}_2\text{—}$ groups, and pack loosely at the air-liquid interface. The surface energy of such a surface is dominated by the methylene groups, and for this reason hydrocarbon surfactants typically achieve surface tensions of about 30 dyn/cm or higher. Thus, the lower surface tensions given by siloxane surfactants can be traced directly to molecular structure, the unusual flexibility of the siloxane backbone, and the different surface energies of —CH_3 versus $\text{—CH}_2\text{—}$.

Siloxane surfactants are similar to hydrocarbon surfactants in many common features of surfactancy:

1. There is a break in their surface tension versus log concentration curve reflecting the onset of self-association (such as micelle formation).
2. Critical aggregation concentrations (cac) vary with molecular structure in the same way—within a homologous series, proportionately larger hydrophobic groups lead to smaller cac values.
3. They show similar patterns of self-association in aqueous solution, forming aggregates and liquid crystal phases, of the same types and following the same trends with molecular structure.
4. Siloxane surfactants incorporating polyoxyalkylene groups also show inverse temperature solubility and cloud points.

This last point requires some clarification: in the dilute concentration range, many siloxane surfactants form cloudy lamellar phase dispersions that are unrelated to the existence of a cloud point as it is usually understood.

Substantial advances in our understanding of this class of surfactants in recent years have covered their aqueous aggregation behavior, their ternary phase behavior with silicone oils, and their ability to promote rapid wetting of hydrophobic substrates. This chapter attempts to describe the structure, preparation, and surfactancy properties of this fascinating class of surfactants incorporating these recent advances. A brief discussion of some common applications also is given to illustrate how the unusual properties of siloxane surfactants are used. Detailed treatments of synthesis, superwetting, aqueous aggregation, and ternary phase behavior, and selected application topics are given elsewhere in this volume.

Title	Location	Edition / Series / Misc.
765 Silicones in Coatings Author: Finzel, William A. and Harold L. Vincent Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1996 Subject: Coatings -- Periodicals Desc: 34 p., illus., 28 cm.	Dynix: 55947-25 Call No.: 667.9 Fe ISBN: 0934010412 Shelf Reference	Edition: Series: Federation Series on Coatings Technology: No. FS25 Year: 1996 Price: \$50.00

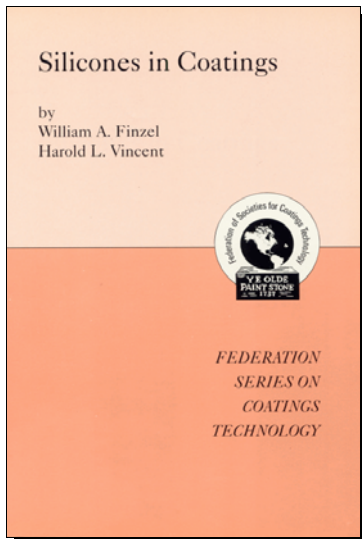


Table of Contents

- I. HISTORY
- II. TERMINOLOGY
- III. TECHNOLOGY/CHEMISTRY OF SILICONE FILM FORMERS
- IV. SILICONE RESINS
 - A. Solvent-Based
 - B. Water-Based
- V. REACTIVE INTERMEDIATES
 - A. Silanol Functional Intermediates
 - B. Alkoxy Functional Intermediates
- VI. WATER REPELLENTS
 - A. WATER-BASED
 - 1. Siliconates
 - 2. Emulsions
 - 3. Aqueous Solutions and Microemulsions
 - B. Solvent-Based
 - 1. Alkoxy Silanes
 - 2. Silicone Resins
- VII. ADDITIVES
 - A. Polydimethylsiloxane
 - B. Polyether Modified Siloxanes
 - C. Other Siloxane Products
 - D. Alkoxy Silicon Chemicals
 - E. Silane Coupling Agents
- VIII. APPLICATIONS
 - A. Heat Resistance
 - B. Weather Resistance
 - 1. Industrial Maintenance
 - 2. Coil Coating
 - C. Food Contact Release Coatings
 - D. Abrasion Resistant Coatings
- IX. FOULING RELEASE COATINGS
 - A. Background
 - B. History of Silicone Fouling Release Coatings
 - C. Unique Properties of Polydimethylsiloxane
 - D. Proposed Fouling Control Mechanisms of Silicone Coatings
 - E. Technology of PDMS Coatings
 - 1. Basic One-Component Formulation
 - 2. Two-Component Coatings
- X. SUMMARY AND FUTURE TRENDS
- XI. REFERENCES

Subjects

239 .	Coatings
414 .	Silicones

XII. BIBLIOGRAPHY

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Although silicones are based on silicon dioxide, the most abundant constituent of the earth's crust, they are a relatively recent development compared to polymers of carbon compounds. In terms of electronegativity, silicon is assigned a value of 1.8 compared with 2.5 for carbon. The result is that all silicon compounds tend to revert to the oxide, and no organosilicon compounds are found in nature.

Friedel and Crafts in 1863 prepared the first compounds with silicon-carbon bonds by the reaction of diethylzinc with silicon tetrachloride. Ladenburg, an organic chemist, joined with Friedel to continue this work and concluded that "the so-called inorganic elements are capable of forming compounds which are analogous to those of carbon." He later showed that hydrolysis of $(C_2H_5)_2Si-(OC_2H_5)_2$ gave a stable oil instead of a simple volatile compound analogous to diethyl ketone formed from $(C_2H_5)_2C-(OC_2H_5)_2$, but the term "silicone" has been retained for all siloxanes even though there is no silicon analog of a ketone $R_2Si=O$.

A great thrust to silicone chemistry came from Kipping's 54 papers published during the period 1899 to 1944. He made use of the Grignard reagents to prepare organosilicon compounds. A theoretical organic chemist, he was interested in pure compounds that could be isolated by distillation or crystallization. The oils and glues that he often obtained seemed uninviting to him, but he correctly described them as macromolecules.

Corning Glass Works employed Dr. J. F. Hyde to investigate hybrid polymers — a cross of organic polymers and glass — in 1940. He used the reactions developed by Kipping to prepare many new organosilicon compounds that could be converted into polymers that had outstanding heat stability. At the same time, Corning was developing fiberglass and needed a polymeric binder to impregnate glass tape for high-temperature electrical insulation. Similar studies were soon underway at the General Electric Laboratories under E. G. Rochow and W. I. Patnode, and at Mellon Institute under R. R. McGregor. In 1942, the work at Corning had progressed to the point where commercial production was considered. Since Corning was in the glass business, The Dow Chemical Company was approached for assistance in manufacturing. The result was the formation of Dow Corning Corporation in 1943 as a joint venture by The Dow Chemical Company and the Corning Glass Works. In 1946, the General Electric Company announced their first production of silicones. The Plaskon Division of Libby-Owens-Ford Glass Company advertised silicone products for sale in 1949 — especially in the area of silicon-modified alkyd coatings. About the same time, Linde Air Products Company, a division of Union Carbide Corporation, was in full production in 1954. The Stauffer Chemical Company decided to build a plant some 10 years later. Several European and Japanese manufacturers are currently selling silicon-based products.

The first commercial uses for silicones were in military applications as damping fluids for aircraft instruments and greases in aircraft engine electrical systems to prevent corona discharge at high elevations. Resinous silicones prepared from trifunctional organosilicon intermediates were used with glass tapes as insulating media in electric motors. In 1945, both Dow Corning and General Electric announced the development of silicone rubber that was useful at both high and low temperatures. When hostilities concluded in the summer of 1945, and military demands ceased, silicones were left without a market. It wasn't long, however, before the unique properties of silicones were soon adapted to a peacetime economy. Demand for peacetime applications soon surpassed the earlier requirements for military use, and expansion of facilities became necessary for all producers. As production increased, prices dropped until silicone fluids and certain silicone resins are now commonly used products with wide ranges of applications. The early days of silicone manufacture and their many uses were well documented by Rochow, McGregor, and Warrick.

Skeptical Environment: Measuring the Real State of the World

LASCT Holdings -
maximum detail by Title

S

Title	Location	Edition / Series / Misc.
932 Skeptical Environment: Measuring the Real State of the World		<i>Edition:</i> Revised and updated edition
<i>Author:</i> Lomborg, Bjorn, 1965-	<i>Dynix:</i> 105702	<i>Series:</i>
<i>Publish.:</i> Cambridge University Press	<i>Call No.:</i> 363.7 Lo	
<i>- place:</i> Cambridge, UK	<i>ISBN:</i> 0521010683	
<i>- date:</i> ©2001	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 2001
<i>Subject:</i> Global environmental change		<i>Price:</i> \$21.50
<i>Desc:</i> xxiii, 515 p., illus., 26 cm.		

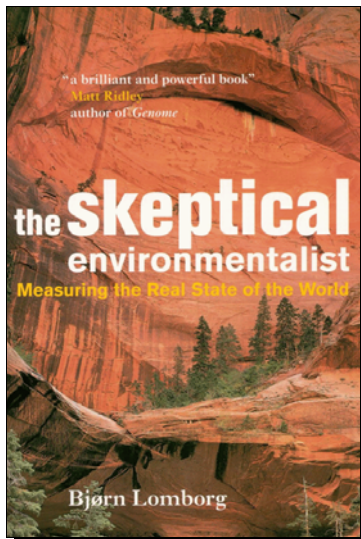


Table of Contents

- List of figures
- List of tables
- Preface
- Language and measures
- Acknowledgements
- Permissions
- Part : The Litany
 - 1 - Things are getting better
 - The Litany
 - Things are better — but not necessarily good
 - Exaggeration and good management
 - Fundamentals: trends
 - Fundamentals: global trends
 - Fundamentals: long-term trends
 - Fundamentals: how is it important?
 - Fundamentals: people
 - Reality versus myths
 - Reality: Worldwatch Institute
 - Reality: World Wide Fund for Nature
 - Reality: Greenpeace
 - Reality: wrong bad statistics and economics
 - Reality: water problems
 - Reality: Pimentel and global health I
 - Reality: Pimentel and global health II
 - Reality versus rhetoric and poor predictions
 - Reality
 - Reality and morality
- 2 - Why do we hear so much bad news?
 - Research
 - The file drawer and data massage
 - Organizations
 - The media
 - Lopsided reality: sporadic but predictable
 - Lopsided reality: bad news
 - Lopsided reality: conflict and guilt
 - The consequences
- Part II: Human welfare
- 3 - Measuring human welfare
 - How many people on earth?
 - The changing demographics
 - Overpopulation
- 4 - Life expectancy and health
 - Life expectancy
 - Life expectancy in the developing world
 - Infant mortality
 - Illness

Subjects

451 .	Pollution
576 .	Global environmental change
577 .	Human ecology

Conclusion

5 - Food and hunger
Malthus and everlasting hunger
More food than ever
Lower prices than ever
The Green Revolution
 Relative or absolute improvement?
Regional distribution: Africa
Regional distribution: China
Conclusion
 Is inflation-adjusted GDI a reasonable measure of wealth?

6 - Prosperity
Poverty and distribution
Ever greater inequality?
Poorer still?
More consumer goods
More education
More leisure time
More safety and security
Fewer catastrophes and accidents

7 - Conclusion to Part II: unprecedented human prosperity

Part III: Can human prosperity continue?

8 - Are we living on borrowed time?
Resources — the foundation for welfare

9 - Will we have enough food?
At least grain per capita is declining
Declining productivity
Limits to yields?
 Biomass
What about ordinary peasants?
Do we still need the high growth?
Grain stocks are dropping!
What about China?
Should we worry about erosion?
What about fish?
Conclusion

10 - Forests — are we losing them?
Forests and history
Deforestation: a general view
Deforestation: how much?
How much forest?
Conclusion

11 - Energy
We are a civilization built on energy
Do we have enough energy to go on?
The oil crisis
How much oil left?
Optimists and pessimists arguing
Ever more oil available
Other fossil energy sources
Nuclear energy
Renewable energy
Solar energy
Wind energy
Storage and mobile consumption
Conclusion

12 - Non-energy resources
The pessimists bet on resources running out - and lost
Falling prices
Cement
Aluminum
Iron
Copper
Gold and silver
Nitrogen, phosphorus and potassium
Zinc
Other resources
Why do we have ever more resources?
Conclusion

13 - Water
How much water in the world?
The three central problems
Not enough water?
Will it get worse in the future?
Will we see increased conflict?
Conclusion

14 - Conclusion to Part III: continued prosperity

Part IV: Pollution: does it undercut human prosperity?

15 - Air pollution
Air pollution in times past
What is dangerous?
Particles
Lead
SO₂
Ozone
NO_x
CO
And the developing world? Both growth and environment
Conclusion

16 - Acid rain and forest death

17 Indoor air pollution
Indoor air pollution in the developing world
Indoor air pollution in the developed world

18 - Allergies and asthma

19 - Water pollution
Oil pollution in the oceans
Oil in the Gulf
Exxon Valdez: still a catastrophe?
Pollution in coastal waters
Suffocation in coastal waters
Health effects from fertilizer
Pollution in rivers

20- Waste: running out of space?

21 - Conclusion to Part IV: the pollution burden has diminished

Part V: Tomorrow's problems

22 - Our chemical fears
Cancer: death

Cancer: incidence
1-in-8 and other lifetime risks
The fear of pesticides
Establishing thresholds through risk analysis
Pesticides and cancer
Cancer in animal experiments
Natural and synthetic pesticides
Synthetic estrogens
Synthetic estrogens: a fall in sperm quality
Organic farmers
Synthetic estrogens: the 'cocktail effect'
Synthetic estrogens: breast cancer
Synthetic estrogens: should we worry?
Conclusion: should we use pesticides?

23 - Biodiversity
How many species are there?
Is biodiversity important?
How many go extinct?
The claim of 40,000 species
A model backup
What do we lose?
Models and reality
The biologists' reaction
Check the 'data'
The biologists' response
Conclusion: what are the consequences of seriously overstating the extinctions?

24 - Global warming
The basic greenhouse effect
The long-term development of the climate
The climate, 1856-2100
How much does CO2 affect the temperature?
How much does CO2 affect the temperature? Particles
How much does CO2 affect the temperature? Water vapor
How much does CO2 affect the temperature? Clouds
The ozone hole
Are there other causes?
Are the scenarios realistic?
Are the scenarios realistic? The 40 new scenarios
Consequences: agriculture
Consequences: sea level rise
Consequences: human health
Consequences: extreme weather
Consequences: present and future weather
The cost of warming
The cost of cutting CO2
Then what should we do?
The double dividend: improve the environment and make money?
Objections: cut CO2 and make money
Objections: the price of the future
Objections: the fear of catastrophe
Summing up
More than meets the eye
Conclusion: scares and sound policy

Part VI: The Real State of the World

25 - Predicament or progress?
The Great Fable of the Litany
The Real State of the World
Yet we worry ever more
Setting priorities and risks
Weighing risks

The costs of the Litany
Genetically modified foods - the encapsulation of the Litany
Caution when invoking the principle
Continued progress

Notes
Bibliography
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

"The Skeptical Environmentalist" should be read by every environmentalist so that the appalling errors of fact the environmental movement has made in the past are not repeated. A brilliant and powerful book.- Matt Ridley , author of Genome

"At last a book that gives the environment the scientific analysis it deserves, and provides understanding of the problems, the risks and the solutions. Essential reading." - Professor Lewis Wolpert, Department of Anatomy and Biology, University College London

"Bjorn Lomborg is an outstanding representative of the 'new breed' of political scientists — mathematically-skilled and computer-adept. In this book he shows himself also to be a hard headed, empirically-oriented analyst. Surveying a vast amount of data and taking account of a wide range of more and less informed opinion about environmental threats facing the planet, he comes to a balanced assessment of which ones are real and which over-hyped." - Professor Jack Hirshleifer, Department of Economics, University of California, Los Angeles

When Lomborg concludes that '...the loss of the world's rain forests, of fertile agricultural land, the ozone layer and of the climate balance are terrible...' I agree. But we also need debate, and this book provides us with that in generous amounts. If you, like I do, belong to the people who dare to think the world is making some progress, but always with mistakes to be corrected, this book makes important reading." - Professor Lars Kristoferson, Secretary General, World Wildlife Fund, Sweden

"The well-publicized, but failed doomsday predictions made by some well-known environmentalist writers have inspired a number of rejoinders. This is the best one, by a wide margin..." - Nils Petter Gleditsch Editor, Journal of Peace Research and Research Professor, International Peace Research Institute, Oslo (PRIO)

"The Skeptical Environmentalist" challenges widely held beliefs that the environmental situation is getting worse and worse. The author, himself a former member of Greenpeace, is critical of the way in which many environmental organizations make selective and misleading use of the scientific evidence. Using the best available statistical information from internationally recognized research institutes, Bjorn Lomborg systematically examines a range of major environmental problems that feature prominently in headline news across the world. His arguments are presented in non-technical, accessible language and are carefully backed up by over 2,900 notes allowing readers to check sources for themselves. Concluding that there are more reasons for optimism than pessimism, Bjorn Lomborg stresses the need for clear-headed prioritization of resources to tackle real, not imagined problems.

The Skeptical Environmentalist offers readers a non-partisan stocktaking exercise that serves as a useful corrective to the more alarmist accounts favoured by campaign groups and the media. It is essential reading for anybody with a serious interest in current environmental debates.

Advance praise for The Skeptical Environmentalist:

"Bjorn Lomborg raises the important question whether the costs of remedying the damage caused by environmental pollution are higher than the costs of the pollution itself. The answer is by no means straightforward. He has written a pioneering book." - Professor Richard Rosecrance, Department of Political Science, University of California, Los Angeles

"The well-publicized, but failed doomsday predictions made by some well-known environmentalist writers have inspired a number of rejoinders. This is the best one, by a wide margin. Its author teaches statistics in the Department of Political Science at Aarhus University in Denmark. He has marshaled an extremely impressive array of data to buttress his optimism about long-term and current trends in environment and development. On the environmental side, the book covers traditional problems like food, energy, water, and pollution, but also future problems like biodiversity and the greenhouse effect. In each of these areas, he argues that environmental problems can be managed (and in many cases have been managed already), and that trying to turn the clock back will be costlier in economic as well as human terms. On the development side, Lomborg points to encouraging trends in life expectancy, welfare, the decline of population growth, and the reduction of hunger. While he may occasionally make things difficult for himself by insisting that the world is making progress in virtually every area, this is also what makes the book such an impressive tour de force. This volume is a revised version of a much-debated Danish book from 1998, but the documentation is truly international —

much more so than in the extensive US literature that promotes a similar message. Since theories of environmental conflict are generally predicated on a premise of scarcity, Lomborg's argument is of great potential importance to peace research." - Nils Petter Gleditsch, Editor, Journal of Peace Research, Research Professor, International Peace Research Institute, Oslo (PRIO), Professor of International Relations, Norwegian University of Science and Technology (NTNU), Trondheim

"For many scientists working with developing country issues it has long been difficult to reconcile findings from our field studies in Africa, Asia and Latin America with the pronouncements from environmental pressure groups in the industrialized world. With much better access to media and politicians a number of influential institutes and individuals have created images of a rapidly deteriorating world which is not always apparent to a significant section of the world population. What is even more disturbing is that much of the negative statements on environmental issues and on the global food situation seem to stem from relatively short-term time series, with apparent bias in selection of begin-points and end-points to make development look gloomy. There seems a sharp reluctance in some media and political circles to accept that much progress has been made in providing food for a population which is twice the size of what it was when the Club of Rome issued its doomsday scenarios. Indeed there is reluctance in the North to accept that poor people in the South have mostly done it themselves. It seems almost universally accepted in the North that the forests of the South are disappearing, depriving the globe of its green lungs, whilst serious study of forestry data indicate a much more mixed picture, with India arguably having more forests than 50 years ago.

Lomborg's book is a warning to scientists who have abandoned statistical prudence in their work. Anecdotal science can become biased science or lead to wrong conclusions. The magnifying glass of crisis-focused media, the scramble for competitive grants funding among scientists, and the need for pressure groups to sustain themselves, obscure less obvious and often less dramatic trends. And in particular they obscure a great deal of good news for the poor.

The concern for the environment and for the global food situation is honourable. We are all for a better environment and high biodiversity, and against food insecurity. There is a general consensus against pollution of the environment, wasteful food production methods, and inequalities in access to food. There is a growing awareness of the dangers of global climate change. Lomborg does not argue against these legitimate concerns. He argues against lax and biased use of data, particularly of time series. He warns that it is degrading science by allowing bits to be picked out of context. He is afraid that pompous statements based on flimsy evidence that also attract the media and the politicians constitute a threat to the integrity of science itself. If, in the long run, opportunistic behaviour of scientists leads to disregard of some of the basic tools of science — and statistical analysis is certainly one of them — then science itself will ultimately be the loser.

Lomborg's book questions the scientific basis why good news is suppressed and bad news amplified. But given that the environment is under pressure, it also questions whether we apply the correct remedies. In a world where around 1.5 billion people live on less than one US dollar a day and 2.5 probably on less than two dollars a day, we should be seriously concerned about the human dimension of our interactions with the environment. In our efforts to rescue the environment Lomborg suggests that exorbitant sums may be invested in environmental efforts that mean little to the poor, whilst only a handful of countries set aside as much as 0.7% of their GDP for development aid. If we are developing a setting, based on flawed data analysis, where rich people let butterflies count more heavily in their budgets than hungry and sick people, then we are morally on very thin ice. In a long string of examples Lomborg suggests that there is growing evidence that we may not have got our priority setting right, and that poor people may suffer from our careless handling of scarce data sets.

Lomborg questions most of our common views on the environment, the global food situation, and strategies for development assistance to the poor. He may not be right on all issues, but his plea for scientific stringency in analysis, and his exposure of false environmental prophets, are all very credible." - Stein W. Bie, Director General, International Service for National Agricultural Research (ISNAR)

"Those who feel strongly about poverty always emphasize how deep and widespread it is. But they seldom mention the great amount of people who have been lifted out of poverty over the last few hundred years or, especially, over the last few decades. A similar observation applies to those who care deeply about the environment. They tell us about the inroads of degradation and pollution all over the world, but seldom direct our attention to the results achieved in turning this process around, at least in significant parts of the world.

These attitudes have always amazed me. Although it is important to know the depth and width of a problem, it is no less important to know how it is being met and what results are thus being achieved. It is only in light of that knowledge that we can move forward with force and confidence. Such a view from both sides is the essential asset of Bjorn Lomborg's book. It presents the nature and extension of the problems we are faced with, as well as the ways along which they are being challenged and the results that are being obtained. The outcome is a hopeful view which should hearten all those who feel anxious about poverty and environment." - Jonas H. Haralz, Former Executive Director of the World Bank for the Nordic Countries.

"Based on facts and figures that are common ground to all sides of the ecological debate, this book will change forever the way you think about the state of the world. It is a remarkable, no, an extraordinary achievement." - Toger Seidenfaden, Executive Editor-in-Chief, Politiken

PREFACE:

The idea for this book was born in a bookstore in Los Angeles in February 1997. I was standing leafing through Wired Magazine and read an interview with the American economist Julian Simon, from the University of Maryland. He maintained that much of our traditional knowledge about the environment is quite simply based on preconceptions and poor statistics. Our doomsday conceptions of the environment are not correct. Simon stressed that he only used official statistics, which everyone has access to and can use to check his claims.

I was provoked. I'm an old left-wing Greenpeace member and had for a long time been concerned about environmental questions. At the same time I teach statistics, and it should therefore be easy for me to check Simon's sources. Moreover, I always tell my students how statistics is one of science's best ways to check whether our venerable social beliefs stand up to scrutiny or turn out to be myths. Yet, I had never really questioned my own belief in an ever deteriorating environment — and here was Simon, telling me to put my beliefs under the statistical microscope.

In the fall of 1997 I held a study group with ten of my sharpest students, where we tried to examine Simon thoroughly. Honestly, we expected to show that most of Simon's talk was simple, American right-wing propaganda. And yes, not everything he said was correct, but — contrary to our expectations — it turned out that a surprisingly large amount of his points stood up to scrutiny and conflicted with what we believed ourselves to know. The air in the developed world is becoming less, not more, polluted; people in the developing countries are not starving more, but less, and so on.

I asked myself why I was so definitely convinced that the environmental situation is bad and ever deteriorating. And if I was wrong in my beliefs about the environment, I was probably not the only one. Thus, I contacted one of the leading Danish newspapers, the centre-left, Guardian-like Politiken, and suggested to them that I write some articles about our understanding of various environmental problems. The outcome was four articles that gave rise to one of the biggest Danish debates, spreading to all newspapers, and covering well over 400 articles, commentaries and critiques. Later, I tried to follow up on the debate with a book, covering a much wider area and attempting to address all our main worries.

However, the entire debate seemed peculiarly incomplete. To begin with, I was surprised that the only reaction from many environmental groups was the gut reaction of complete denial. Sure, this had also been my initial response, but I would have thought as the debate progressed that refusal would give place to reflection on the massive amounts of supportive data I had presented, and lead to a genuine reevaluation of our approach to the environment. Surprisingly, I met many, even amongst my close friends, who had only read the critical commentaries and drawn the simple conclusion that I was wrong, and that we could comfortably go on believing in the impending doomsday. This suggested that doomsday-visions are very thoroughly anchored in our thinking.

I teach statistics at the University of Aarhus and basically my skills consist in knowing how to handle international statistics. Normally you associate statistics with a boring run-through of endless rows of numbers — a problem I must every term convince new students is not necessarily true. Actually, statistics can be thoroughly exciting exactly because it confronts our myths with data and allows us to see the world more clearly. This excitement, I hope, is also apparent throughout the book. Though it contains much quantitative information, knowing the state of our world should be stimulating and invigorating, the challenge to our world view healthy and rewarding.

If I mention my profession at a party, it is seldom that I avoid a comment which rightly or wrongly builds on something which the English Prime Minister Benjamin Disraeli (1804-81) is supposed to have said: "There are three kinds of lies: lies, damned lies and statistics." And it's actually true that statistics can be used to manipulate the truth. But used judiciously statistics is the best source of information about our world.

Why? Because the small part of the world that we see amongst our friends and acquaintances and in the media seldom shows a balanced picture of the whole world. For many different reasons our friends and acquaintances are much more similar to ourselves than the average population. Thus, basing our impressions of the world from friends alone will bias our views. Likewise, on TV we often get to hear stories which are twisted and sensationalized in many different and predictable ways (see chapter 2 on the problems of truth and the media).

In this way, statistics offers us a way to see the world more clearly. Indeed, statistics is in many areas the only way we can make a scientifically sound description of the world.

I have let experts review the chapters of this book, but I am not myself an expert as regards environmental problems. My aim has rather been to give a description of the approaches to the problems, as the experts themselves have presented them in relevant books and journals, and to examine the different subject- areas from such a perspective as allows us to evaluate their importance in the overall social prioritization.

The key idea is that we ought not to let the environmental organizations, business lobbyists or the media be alone in presenting truths and priorities. Rather, we should strive for a careful democratic check on the environmental debate, by knowing the real state of the world — having knowledge of the most important facts and connections in the essential areas of our world. It is my hope that this book will contribute to such an understanding.

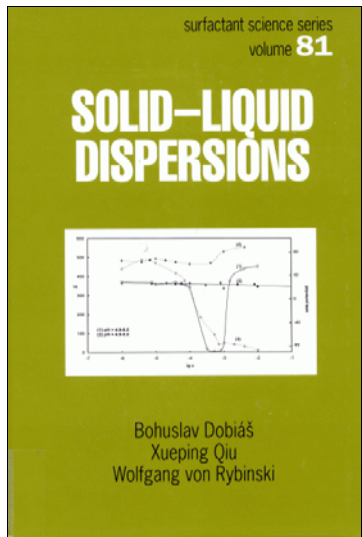
LANGUAGE AND MEASURES:

This book presents a lot of data. In making complete sentences out of specific data, I have often selected fluency over cumbersome accuracy, which nevertheless should be available through the endnotes or the figure captions. When I write 'today' it typically implies the most recently available data, which could be anywhere from 1997 to 2001, depending on the speed of data collection and the time span involved.

Any data book in the English market has to consider the question of measures. This book mainly uses metrics, but whenever 'human-size' data are involved, I try also to indicate the imperial measures. Thus, when discussing the American waste production (Figure 114, p. 207), the national waste is denoted in million metric tons. (I doubt if anyone truly has a feel for the magnitude of 150 million tons of landfill waste, and it would probably not help much to say 330 billion pounds instead.) Here, the important comparison is with the — equally incomprehensible — figures from 1960 or from 2005. However, when talking about the average daily waste per American, a change from 3 pounds in 1985 to 2.5 pounds in 2000 is readily comprehensible.

Timing throughout the book is in Common Era (CE) and Before Common Era (BCE). Energy is denoted by Joule (J) or kilo-watt-hours (kWh). Exponentials are used to denote large numbers, i.e. 5e6 means 5×10^6 or a five followed by six zeros (5 million). The conventional prefixes are used throughout, with k (kilo, thousand), M (mega, million), G (giga, billion), and for really large numbers E (eta, $1e^{18}$) and Z (zeta, $1e^{21}$). Celsius is used for temperature, with one degree Celsius being 1.8 degrees Fahrenheit, and 0°C being 32°F .

Title	Location	Edition / Series / Misc.
641 Solid-Liquid Dispersions		<i>Edition:</i>
<i>Author:</i> Dobias, Bohuslav, Xueping Qiu and Wolfgang von Rybinski	<i>Dynix:</i> 88635	<i>Series:</i> Surfactant Science Series: Vol. 81
<i>Publish.:</i> Marcel Dekker, Inc.	<i>Call No.:</i> 541.345 Do	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0824700147	
<i>- date:</i> 1999	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1999
<i>Subject:</i> Colloids		<i>Price:</i> \$195.00
<i>Desc:</i> vii, 562 p., illus., 24 cm.		



Subjects

433 . Colloids

Table of Contents

- Preface
1. INTRODUCTION TO SOLID-LIQUID DISPERSIONS (Bohuslav Dobias and Wolfgang van Rybinski)
 - I. Classification and Characterization of Colloidal Dispersions
 - II. Technical and Biological Aspects
 References
 2. PREPARATION OF DISPERSIONS (Xueping Qiu and Wolfgang van Rybinski)
 - I. Introduction
 - II. Dispersion of Powders in Liquids
 - III. Pigment Dispersions for the Paper Industry
 - IV. Formation of Particles by Condensation Processes 41
 References
 3. BEHAVIOR OF COLLOIDAL DISPERSIONS (Xueping Qiu)
 - I. Brownian Motion
 - II. Diffusion
 - III. Applications
 References
 4. HYDRODYNAMICS OF COLLOIDAL DISPERSIONS (Xueping Qiu)
 - I. Basic Equations
 - II. A General Solution of the Navier-Stokes Equation
 - III. Applications
 References
 5. COLLOIDAL DISPERSION FORCES (Xueping Qiu)
 - I. General Description
 - II. Microscopic Theory of Dispersion Forces
 - III. Macroscopic Theory of Dispersion Forces
 References
 6. ELECTRICAL PHENOMENA AT THE SOLID-LIQUID INTERFACE (Bohuslav Dobias)
 - I. Surface Charge
 - II. Structure of Electrical Double Layer
 - III. Electrokinetic Phenomena and Methods
 - IV. Structure of Adsorbates
 References
 7. STRUCTURAL FORCES AND ADHESIVE CONTACT THEORY (Xueping Qiu)
 - I. Classical DLVO Theory
 - II. Extended DLVO Theory
 - III. Adhesive Contact Theory
 References
 8. STABILITY OF DISPERSIONS (Bohuslav Dobias and Wolfgang von Rybinski)
 - I. Introduction
 - II. Stabilization of Dispersions
 - III. Destabilization Mechanisms
 - IV. Formation and Destruction of Aggregates
 - V. Selective Flocculation
 - VI. Shear Flocculation
 References
 9. THERMODYNAMICS OF COLLOIDAL DISPERSIONS (Xueping Qiu)
 - I. Classical Thermodynamics
 - II. Flory-Huggins Theory
 - III. Self-Consistent Field Models for Polymer Adsorption
 References
 10. ADSORPTION AT THE SOLID-LIQUID INTERFACE (Bohuslav Dobias and Wolfgang van Rybinski)

- I. Introduction
- II. Adsorption Phenomena
- III. Adsorption Models
- IV. Adsorption of Polyelectrolytes
- References
- 11. STRUCTURE OF ADSORBATE (Eero Suoninen)
 - I. Introduction
 - II. Tasks of Characterization
 - III. Choice of Method
 - IV. Infrared Spectroscopy
 - V. X-Ray Photoelectron Spectroscopy
 - VI. Auger Electron Spectroscopy
 - VII. Secondary Ion Mass Spectroscopy
 - VIII. Low Energy Electron Diffraction
 - IX. Tunneling Microscopies
 - X. Indirect Methods
 - XI. Application to Characterization of Adsorbates
 - XII. Conclusion
 - References
- 12. CONCENTRATED DISPERSIONS (Bohuslav Dobias and Wolfgang van Rybinski)
 - I. Introduction
 - II. Microscopic Properties
 - III. Macroscopic Properties
 - IV. Sedimentation
 - V. Optical Methods
 - References

Index

Reviews - Synopsis - Dust Jacket

This versatile reference reviews a wide range of fundamental concepts, recent developments, and practical applications in dispersion theory, along with relevant insights from colloidal and interfacial science.

Focusing on topics as varied as electrostatics, hydrodynamics, and rheology, Solid-Liquid Dispersions introduces never-before-published results on the Navier-Stokes equations, surface forces, Lifshitz theory, adhesive contact theory, and stabilization of fine-particle dispersions...provides general descriptions and classifications of colloidal dispersions...analyzes the interparticle, electrostatic, and structural forces at work within colloids...details processes such as coagulation, flocculation, sedimentation, and filtration...addresses adsorption phenomena in aqueous and nonaqueous systems...discusses adsorption theories involving electrolytes, surfactants, and polymers...describes suitable additives for dispersions...and more.

Solvent Waste Reduction Alternatives Symposia: Conference Proceedings

LASCT Holdings -
maximum detail by Title

S

Title	Location	Edition / Series / Misc.
152 Solvent Waste Reduction Alternatives Symposia: Conference Proceedings		<i>Edition:</i>
<i>Author:</i> Solvent Waste Reduction Alternatives Symposia (1986: Santa Clara an	<i>Dynix:</i> 41635	<i>Series:</i>
<i>Publish.:</i> ICF Consulting Associates, Inc.	<i>Call No.:</i> 363.728 So	
<i>- place:</i> Los Angeles, CA	<i>ISBN:</i>	
<i>- date:</i> [1986?]	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1986
<i>Subject:</i> Solvents -- Congresses		<i>Price:</i> \$25.00
<i>Desc:</i> vi, 186 p., illus., 28 cm.		

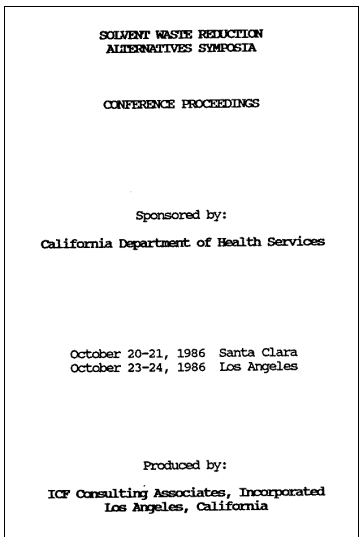


Table of Contents

Jo Anne Aplet	
The South Coast Air Quality Management District's Approach to Controlling Solvent Use and Disposal	1
David Brooks	
Solvent Waste Reduction: Case Studies	12
Gary Carlton	
Utilizing Air Stripping Technology for Pretreatment of Solvent Waste	14
Patrick Dennis	
Legal Incentives for the Reduction of Solvent and Other Hazardous Wastes	33
Larry J. Durr	
VOC Emission Control by Means of Activated Carbon Adsorption	39
Stephen Kahane	
Waste Minimization Audits	57
Ray Kerby	
Liquid Waste Minimization at IBM San Jose	67
Donald Koepp	
Ventura County's Hazardous Waste Volume Reduction/Alternative Technology Program	73
Philip Lo	
Pretreatment of Solvent-Contaminated Wastewater for Sewer Disposal	75
Edward L. Meyer	
Waste Minimization and Alternative Technology	85
Warren R. Muir	
Hazardous Solvent Wastes Can be Reduced	95
Walter J. Mundy	
Solvent Waste Management at Northrop Corporation - Advanced Systems Division	102
Jan Radimsky	
State Regulatory overview	110
Sy Schwartz	
Recycling and Incineration of Hazardous Waste Solvents: Economic and Policy Aspects	111
Richard Sklar	
Use of Recyclene Machines for Solvent Recovery in Industrial or Military Applications	124
Steve Weil	
EPA's Land Disposal Restriction Program	131
Katy Wolf	
Chlorinated Solvents: The Regulatory Dilemma	132
Jack Zeff	
UV - Oxidation Systems for Controlling Chlorinated and Other Solvents in Water and Air	165

Subjects

331 .	Solvents -- Congresses
380 .	Hazardous wastes -- California -- Congresses

Reviews - Synopsis - Dust Jacket

The California Department of Health Services is pleased to present these Symposia Proceedings on Solvent Waste Reduction Alternatives. These Proceedings are a compilation of the papers presented at two symposia sponsored by the Department of Health Services in October 1986. The Proceedings have a companion volume, Guide to Solvent Waste Reduction Alternatives, a study of source reduction, recycling, and treatment technologies published in 1986.

The Symposia, its Proceedings, and the Guide have been produced by ICF Consulting Associates, Incorporated under contract with the California Department of Health Services.

Under the 1984 Amendments to the Resource Conservation and Recovery Act, the Environmental Protection Agency is scheduled to implement new regulations restricting use of land disposal for solvent wastes. Recent and proposed state environmental regulations contain additional restrictions.

Responding to the changing regulatory environment will be a challenge for firms which generate or manage solvent wastes. These Proceedings and the Guide provide practical tools to assist industry in:

- Complying with applicable regulations;
- Developing and implementing an overall solvent waste minimization strategy, including conducting waste audits

- Identifying cost-effective on-site/off-site solvent waste reduction alternatives;
- Minimizing liabilities; and
- Understanding present and planned government solvent waste program objectives

Solventless and High Solids Industrial Finishes: Recent Developments

LASCT Holdings -
maximum detail by Title

S

Title	Location	Edition / Series / Misc.
616 Solventless and High Solids Industrial Finishes: Recent Developments		Edition:
Author: Gillies, M. T. (editor)	Dynix: 13013	Series: Chemical Technology Review: No. 179
Publish.: Noyes Data Corporation	Call No.: 667.9 So	
- place: Park Ridge, NJ	ISBN: 081550828X	
- date: ©1980	Shelf Adult Non-Fiction	Year: 1980
Subject: High solids coatings -- Patents		Price: \$48.00
Desc: x, 342 p., illus., 24 cm.		

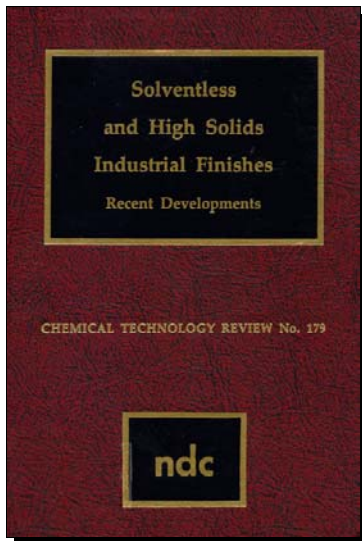


Table of Contents

INTRODUCTION

CHAPTER 1. RADIATION-CURABLE COMPOSITIONS

- Epoxy Resins
 - Cured with Group V-A Onium Salts
 - Epoxy Acrylate Esters
 - Unsaturated, Nitrogen-Containing Polyepoxides
 - Cured with Certain Dicarboxylic Chelates
- Polyurethane Resins
 - For "Wet Look" Finishes
 - Cured by Addition Polymerization
 - For Overprint Coatings on Metal Before Forming Operations
- Wood Coating
 - With Improved Weather Resistance for Thermoplastics
- Ethylenically-Unsaturated Resins
 - Containing Two Photopolymerization Initiators
 - Diels-Alder Reaction Products
 - Use of Aliphatic Saturated Ether as Promoter
 - For Use with Titanium Pigments
 - Plus Unsaturated Photopolymerizable Compounds
- Opaque Coatings with Good Coverage
 - Coatings Having Resistance to High Temperatures
 - Polyester plus Saturated Acid or Anhydride
 - Onium Salt as Photoinitiator
 - High Tg Solid Polymer Additive as Adhesion Promoter
 - Addition of 3-Acryloxypropionic Acid for Promoting Adhesion
- Photocurable Inks and Coatings
 - Epoxy Composition of Dimer Acid-Modified Vinyl Ester Resin
 - Addition of Rosin-Modified Epoxy Resins
 - Containing Certain Polymerizable Monomers for Fast Curing
- Miscellaneous Resins
 - Condensation Products of Aldehydes and Ketones
 - Cellulose Esters Containing Certain Amino Carboxylate Groups

CHAPTER 2. COATINGS CURED WITH LOW ENERGY

- Autoxidizable Compositions
 - From Dicyclopentenyl (Meth)Acrylate
 - Liquid Butadiene Polymers
 - Polyurethanes Containing Esters of Glycol Monodicyclopentenyl Ethers
 - Containing an Epoxide and a Carboxyl Group-Containing Substance
 - Polyurethane from Dicyclopentenyl (Meth)Acrylate
- Baked at Low Temperatures
 - Glycidyl Esters with Certain Polyamines
 - Glycidyl Ester-Based Binder Cured with Carboxylic Acid Anhydrides
 - Polyalkylaromatic Polysulfonic Acid Catalysts
 - Polyepoxides with Monocarboxylic Acid Initiator and Stannous Salt Catalyst
 - Alkoxyethylaminotriazines and Polyols
 - With Added Polyhydroxy Oligomers
 - With Added Polyether Triols
 - Epoxy Resins with Improved Cure Rates

Subjects

589 .	High solids coatings -- Patents
590 .	Finishes and finishing -- Patents

CHAPTER 3. AUTOMOTIVE AND APPLIANCE FINISHES

- Metallic Automobile Topcoats
- Oligomeric Hydroxyphosphate Catalyst
- Hydroxy Functional Acrylic Organophosphate Catalyst
- Esters of Certain Phosphoric Acids as Catalysts
- Hydroxyesters of Certain Phosphoric Acids as Catalysts
- Other Automotive Topcoats
- Polyurethane Compositions
- Containing an Ester Diol Binder
- Iron Pyrophosphate for Improved Gloss Retention
- Based on Unsaturated Polyesters
- Air-Drying Lacquers for Touch-Up Work
- Automotive Primers
- Acrylate and Epoxy Resins with Special Solvent
- Polyisocyanate Coating
- For Automotive Components
- For Corrosion- and Abrasion-Resistant Coatings on Vapor-Deposited Metal Trim
- Crosslinkable Coatings Based on Hydroxyl-Containing Polymers
- Highly Pigmentable Coatings Based on Aminoplasts and Polyesters
- Organic Polymer Bonded to Steel for Automotive Ball Studs
- Corrosion-Resistant Coatings
- Asphalt-Based System with a Petroleum Sulfonate
- Polyvinyl Chloride Plastics with Good Adhesion to Metals
- For Use as Automobile Undercoater
- Appliance Coatings
- Polyester-Modified Vinyl Polymer
- Containing Tetrahydic Adduct
- Based on Polyester, an Epoxy, and a Crosslinker
- Containing Liquid Bishydroxy Ether of a Bisphenol

CHAPTER 4. COATINGS FOR ELECTRICAL APPLICATIONS

- Thermoparticulating Coatings
- Organosulfur Compositions
- Carboxylic Acid Compositions
- Cyanoethylated Compositions
- N-Thiophthalimide Compositions
- Insulating Coatings
- Flame-Retardant Wax Compositions
- Copolymers of Ethylene and Vinyl Acetate
- Strippable Insulation Shielding for Electrical Conductors
- Photosensitive, Oil-Free, Low Viscosity Compositions
- Plasticized Vinyl Chloride Polymer Cable Sheathing
- Coating for High Voltage Insulators
- Wire Coatings
- Containing Heat Crosslinkable Blocked Polyisocyanates
- Lacquer Which Does Not Interfere with Soldering
- Thermoplastic Ionomers
- Miscellaneous Uses
- PVC Additives for Sensor Conductors at Elevated Temperatures
- Highly Crosslinked, Ladder-Type Polymeric Film
- Organopolysiloxane Shrinkproof Coatings
- For Improving Adhesion of Photoresistant Polymers to Inorganic Oxides
- Flame-Retardant Covercoats for Printed Circuits
- Polybutadiene Resin Coating for Thin Film Resistor

CHAPTER 5. MISCELLANEOUS COATINGS FOR METALS

- Polyester-Based Compositions
- Coatings for Unprimed Coil and Can Stock
- Rapid-Curing, Thermosetting Coil Coating
- Tough, Flexible Coatings for Can Stock
- Coatings with Excellent Peel- and Corrosion-Resistance
- Epoxy-Phenolic Systems
- Having Low Viscosity at 25 Volume Percent Solvent
- Showing Good Drawn and Ironed Formability

- Epoxy-Based Compositions
 - Solid Epoxy Coating with Good Weatherability
 - Two-Package Anticorrosion Coating
 - Coating Having Good Metal Adhesion
- Other Compositions
 - Corrosion-Resistant Coating Containing an Organic Silicate
 - Polycaprolactone Derivatives plus Methylolated Melamine and Polyol
 - Aminoplast-Alkyd Can Coating
 - Urethane-Phenolic Resin Coil Coating

CHAPTER 6. SOLID AND HOT MELT COMPOSITIONS

- Hot Melt Compositions
 - Wire Insulation Containing Fluorocarbon Polymers
 - Ethylene-Tetrafluoroethylene Copolymers plus Copper Compound
 - Diisocyanate-Modified Polyesters as Glass Coatings
 - Hot Melt Coatings for Carbonless Copy Paper
 - Highly-Pigmented Coating for Cellulosic Substrates
 - Polystyrene-Polypropylene Compositions for Extrusion Coating
- Solid Paints
 - For Decoration and Protection of Structural Components

CHAPTER 7. USE OF SPECIAL SOLVENTS

- Unreactive Diluents
 - Monoalkyl Ethers of Mono- or Diethylene Glycol
 - Low-Boiling Alcohol and/or Ketone Vehicle
 - Orthosilicate Compounds
 - Alkoxyethanol as Part of Solvent
 - Ethoxyethyl Acetate
- Reactive Diluents
 - Uron Ether as Cosolvent
 - Solvent Medium of Nonvolatile Trihydric Alcohol
 - Lactam-Hydroxyl Compound

CHAPTER 8. SPECIAL APPLICATIONS

- Aircraft Coatings
 - Finishes with Metallic Fibers
 - Urethane Finishes with Good Weatherability
 - Polyurethane Topcoat
- Cookware Finishes
 - Coating Composition Requiring No Primer
 - Containing a Particulate Organic Modifier for Craze Resistance
- Abrasion-Resistant Coatings
 - Epoxy-Terminated Silanes Cured with PF5, SbF5 or HSbF6
 - Containing Epoxy-Terminated Silanes
 - Containing Silane for Optical Plastics
- Inks and Coatings
 - Polycaprolactone Derivatives plus a Polyepoxide Curing Agent
 - Radiation or Heat-Curable Resin
 - Synthetic Oil to Replace Drying Oil
- Asphalt-Containing Compositions
 - Pipe Coating with Polyisocyanate
 - Pipe Coating with Synthetic Organic Fibers
 - Bitumen-Block Polymer Industrial Finishes
 - Laminated Insulation for Underground Pipelines
- Other Uses
 - Metallic Coating
 - Curable Organopolysiloxanes for Silicone Substrates
 - Drag Reduction Coatings for Torpedoes
 - Intumescent-Ablator Coatings Using Endothermic Fillers
 - Flamboyant Finishes for Motorcycles and Bicycles
 - Protective Hydrophobic Coating for Aluminum
 - Low Surface Energy Coating for Metal or Oxide Surface
 - Coating for Rubberizing Steel Cords for Tires
 - Anticorrosive Paint for Oil Containers

Epoxy Coating for Highway Marking

CHAPTER 9. PROCESSES

- For Coating Metal Sheets or Foils
Rust Preventing Coating for Sheet Steel
Injectable and Pressable Coating to Stabilize Foil
Hot Stamp Foil with Textured Surface
Gas-Barrier Coating
Textured Protective Coating for Metal Sheet
- Special Apparatus
Apparatus for Ultraviolet Coating Processor
Method for Coating Wire with Liquid Polymer System
Safety Device for Use in Electrostatic Spraying
Atomizing Device for Liquid Paint
- Extrusion Coating
Insulating the Central Core of a Submarine Coaxial Cable
Method of Extruding Enamel-Type Insulation
Coated Electrical Conductor Cable
Wire Coated with a Cellular Thermoplastic Resin
- Photocuring Processes
Applying and Curing More than One Coating Simultaneously.
Process for Wet-on-Wet Metal Coating System
Multistage Irradiation with Actinic Light
Two-Step Curing Process
- For Special Applications
Coating for an Electrode for Arc Welding
Applying a Coating System to an Underwater Steel Surface
Method for Applying a Spectral-Selective Coating on a Plate
Thermoplastic Resinous Protective Wire Coating
Deposition of Aluminum on Lead Strips for Electronic Use
Mar- and Abrasion-Resistant Coatings of Low Gloss
Coating a Fiber Mat of Open Structure

COMPANY INDEX

INVENTOR INDEX

U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents, issued since January 1978, that deal with solventless and high solids industrial finishes.

This book is a data-based publication providing information retrieved and made available from the U.S. patent literature. It thus serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of recent developments in solventless and high solids industrial finishes.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a

sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have by-passed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The table of contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION

The purpose of this volume is to acquaint the reader with the considerable amount of work which has been done in the industrial finish field on coatings having little or no volatile hydrocarbon or toxic organic solvent content. The coatings covered in this book are those which are generally applied in the factory by the manufacturer of the coated articles. The vast majority of them are designed for coating metals.

The presence of large amounts of volatile organic solvents in coatings is becoming less and less attractive, both economically and ecologically. In the first place, since the solvents are petroleum derivatives, their prices have risen sharply. Then again, since they are, in the end, simply waste products, their use has become increasingly unjustifiable in light of present petroleum shortages. And, as many of them have been shown to be toxic to a greater or lesser degree, government regulations are increasingly restrictive concerning amounts and types of organic volatiles which may be discharged into the atmosphere.

Recent coatings research has attacked this problem in various ways. One is through the formulation of water-soluble or water-dispersible coatings. This subject has been covered in a recent Noyes publication *Water-Based Industrial Finishes—Recent Developments*. Much emphasis has been put on powder coatings. This subject will be covered in a forthcoming Noyes publication. This book covers, then, those formulations which can be made using much smaller amounts of volatile organic solvents than used to be thought necessary. Many, indeed, use none at all.

Most of the processes described in this book have been patented with the primary objective of providing high solids or solventless finishes. The whole range of industrial coatings patented between January 1, 1978 and January 1, 1980 has, however, been reviewed, and all those patents have been included in this book which can be used to formulate coatings in high solids form, even if that was not the chief objective of the inventor.

The first chapter deals with special high solids coatings cured by systems such as radiation and electron beam. The second chapter deals with coatings curable at temperatures varying from ambient to about 100°C. In Chapters 3, 4, 5 and 8, coatings are classified by end use, because they were designed to fulfill particular objectives. Chapter 7 covers the use of special solvents, some of which are actually reactants in the formulation.

Chapter 6 covers the use of hot melt compositions and Chapter 9 reviews special processes useful in the employment of high solids coatings.

Title	Location	Edition / Series / Misc.
766 Solvents Author: Stout, Ron L. and William H. Ellis Publish.: Federation of Societies for Coatings Technology - place: Philadelphia, PA - date: ©1998 Subject: Solvents Desc: 36 p., illus., 28 cm.	Dynix: 55947-28 Call No.: 667.9 Fe ISBN: 0934010439 Shelf Reference	Edition: 2nd edition Series: Federation Series on Coatings Technology: No. FS28 Year: 1998 Price: \$50.00

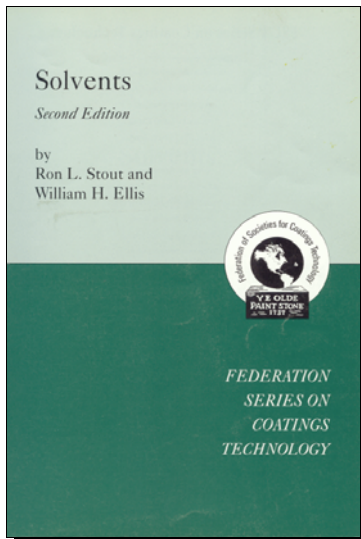


Table of Contents

- I. Introduction
- II. Solubility and Solvency
 - A. Solubility Parameters
 - B. Viscosity Reduction
- III. Evaporation Rate
 - A. Evaporation Rate Measurement
 - B. Solvent Evaporation Data
 - C. Factors Affecting Evaporation
 - D. Evaporation from Solution
- IV. Other Properties
 - A. Surface Tension
 - B. Electrical Resistance
 - C. Odor
- V. Solvent Molecular Structures
- VI. Petroleum Hydrocarbons Solvents
 - A. Aliphatic Hydrocarbon Solvents
 - B. Aromatic Hydrocarbon Solvents
 - C. "Odorless" Isoparaffinic Solvents
 - D. Hydrocarbon Solvent Specifications and Test Methods
- VII. Terpene Solvents
 - A. Turpentine
 - B. Dipentene
 - C. Pine Oil
- VIII. Oxygenated Solvents
 - A. Ketones
 - B. Esters
 - C. Monohydric Alcohols
 - D. Glycol Ethers and Their Acetates
 - 1. Glycol Ethers
 - 2. Glycol Ether Acetates
- IX. Miscellaneous Solvents
 - A. Halogenated Hydrocarbons
 - B. Nitroparaffins
 - C. Methylsiloxanes
- X. Solvents for Various Solventborne Resins
 - A. Alkyd Resins
 - B. Cellulosic Resins
 - C. Acrylic Resins
 - D. Vinyl Solution Resins
 - E. Epoxy Resins
 - F. Urea and Melamine Resins
 - G. Rubber-Based Resins

Subjects

330 . Solvents

- H. Urethane Resins
- XI. Co-Solvents for Various Waterborne Coatings
 - A. Latex-Based Coatings
 - B. Water-Reducible Coatings
- XII. Solvent Identification and Analysis
- XIII. Health, Safety and Environmental Issues
 - A. Health
 - B. Safety
 - C. Environmental
- XIV. Computer Programs for Solvent Reformulation
- XV. Summary
- XVI. References
- XVII. Bibliography

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Although the solvent component is a transient ingredient in paint, its quality and appropriateness will be apparent for the life of the coating. Film integrity, appearance, and application are significantly affected by the nature of the solvent. Thus, the solvent plays a very important role in film formation and durability even though it is not a permanent component.

Two properties that are of the utmost importance when selecting the proper solvent for any end use are solvency and evaporation rate. In paints, the solvent must dissolve the resin and reduce its viscosity so that the paint can be applied. Evaporation is subsequently necessary, not only as a part of the drying process, but to control the coating viscosity at various stages of drying.

Initial coating viscosity depends on the solubility of the resin(s) and the solvency of the solvent(s). Viscosity at various stages of drying depends, additionally, upon the solvent evaporation rate. As the solvent evaporates, film viscosity increases. The solvent must evaporate relatively quickly during initial drying to prevent excessive flow, but it must evaporate slowly enough to provide sufficient leveling and adhesion. In lacquer coatings, this is accomplished by varying the levels of fast, medium, and slow evaporating solvents.

The most widely used solvents in the coatings industry are hydrocarbons and oxygenated solvents.

**Specialized Curing Methods for Coatings and Plastics:
Recent Advances**

LASCT Holdings -
maximum detail by Title

S

Title	Location	Edition / Series / Misc.
153 Specialized Curing Methods for Coatings and Plastics: Recent Advances		<i>Edition:</i>
<i>Author:</i> Ranney, Maurice William, 1934-	<i>Dynix:</i> 13011	<i>Series:</i> Chemical Technology Review: No. 88
<i>Publish.:</i> Noyes Data Corporation	<i>Call No.:</i> 667.9 Ra	
<i>- place:</i> Park Ridge, NJ	<i>ISBN:</i> 0815506600	
<i>- date:</i> ©1977	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1977
<i>Subject:</i> Curing -- Patents		<i>Price:</i> \$25.00
<i>Desc:</i> xi, 244 p., illus., 25 cm.		

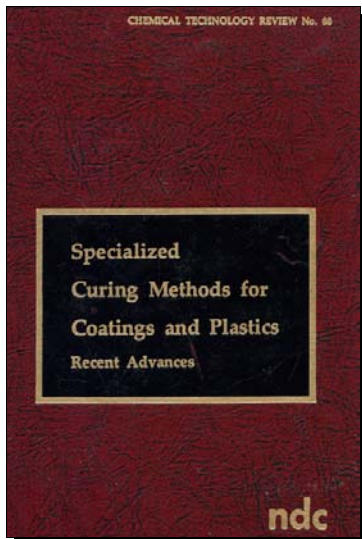


Table of Contents

INTRODUCTION

PART I. ULTRAVIOLET CURING
COATINGS

- Coating Compositions
- Glycidyl Ester of a,b-Unsaturated Carboxylic Acid and Anhydride
- Oligoacrylates
- Isocyanate-Containing Prepolymers
- Air-Dryable Polyesters
- Acrylyl-Terminated Prepolymer plus Alkyl Acrylate Melamine Ether
- Polyene-Polythiol Overcoat
- Opacifying Gas Bubbles
- Silicone-Modified Polyester
- Pyromellitic Acid Dianhydride plus Polyol
- Epoxide plus Carboxylic Acid Anhydride
- Hydrophilic Nitrite Copolymers
- Cycloacetal
- Flexible Vinyl Ester Resin
- Epoxide Blend
- Low Viscosity Vinyl Acetate Polymers
- Hydantoin Glycol Derived Polyene-Polythiol
- Dyes as Photosensitizers
- Unsaturated Polyester with Epoxy Diacrylate
- Modified Acrylate Resin
- Polybutadiene in Two-Step Reaction
- Opaque Coatings
- Modified Prepolymer plus Acrylate Monomer Ester
- Opaque Coating from Normally Transparent Polyester Paste Filler
- Inks
- Solvent-Free Printing Ink
- Tertiary Beta Amine as Oxygen Scavenger
- Built-In Sensitizer
- Synergistic Mixture of Sensitizers
- Conductive Ink for Circuit Board
- Special Additives and Solvent
- Acrylic Acid as Flattening Agent
- Sulfones as Solvent for Diazonium Catalyst
- Antioxidants for High Vinyl Butadienes
- Processes
- Two-Step Process
- Two Phase Flash Photolysis Process
- Flash Lamp to Initiate Curing

IMAGING COMPOSITIONS AND PROCESSES

- Compositions for General Use
- Polymers Containing Stilbene Moiety
- Dye Crosslinking Agent
- Benzoate- and Furoate-Esterified Polyvinyl Alcohol
- Acrylic Esters of Tetraalcohols
- Alpha-Substituted Maleimido Groups
- Polymers with Urethane Groups Crosslinkable by Vinyl Polymerization.

Subjects

248 . Curing -- Patents

Beta-Vinyloxyethyl 5-Furyl-2,4-Pentadienate
Styrene-Allyl Alcohol Copolymer Based Polythiol and Polyene Compositions
Vinyl Crosslinking Without Protective Foil
Beta-Thienylacrylic Acid Ester or Amide
Pullulan Compositions
Epoxy-Acrylate Compositions
- Printing Plate Compositions
Polyamide with Pendant Sulfonate Salt Groups
Bis-Acrylic Derivatives Compatible with Polyamides
Polymer Containing Quinone Diazide Moiety
N-Allyl-Maleimide Units
Polyurethane Using 1-Butene-3,4-diol
Vinyl Urethane Monomers from Xylylene Diisocyanate
Polyester-Based Polyurethanes as Binding Agent
Degradable Polyaldehydes
Tetraallylsulfonamide and Polythiol
Aromatic ortho-Nitrocarbinol Ester Groups
Graft Polymer
Composition Developed with Aqueous Alcoholic Alkali
Arylglyoxyacrylate Groups
3-Sorboxyloxy-2-Hydroxypropyl Groups
Polyester-Polyether Block Copolymer
Alkoxyaromaticglyoxy Groups
- Resist Compositions
Gold Compositions
Arylated Polysulfones
Preformed, Alkali-Soluble Binder
Photoelectropolymerization Using Zinc and Alkali Metal Sulfite
Specific Glass Transition Temperature
Anhydride-Containing Group
Depolymerizable Aromatic 1,2-Dialdehyde
Cyclization Product of Butadiene plus Organic Solvent
Keto-Olefin-SO₂ Copolymers
Polymerizable Siloxaries
- Additives
Diacetone Acrylamide to Improve Adhesion
Maleic Anhydride and Dye to Intensify Image
Latent Catalyst Precursor for Epoxy Resist
Divinyl Urethane plus Carboxylic Polymer as Development Aid
Nitroso Dimer plus Cr as Inhibitor System
Increasing Polysulfone Sensitivity
Cyclic Amide as Gelation Inhibitor in Epoxide
- Processes
Two-Exposure Process Using Nitroso Dimer
Two-Exposure Process Yielding Reverse Image
Variable Depth Contour Images
Bicyclic Amidine
Support for Liquid Photosensitive Resin

PLASTICS

- Plastic Compositions
Polyene plus Polythiol
Fatty Acid Modified Vinylated Polyester
Polyester-Polythiol Compositions
Solid Polythioethers
- Special Applications
Orthopedic Cast
Nail-Coating Preparation
Filament Wound Article
Steel Strip Composite for Transformer Core Laminate
Low-Pilling Polyester Fiber Products
Contact Lens with Improved Wettability
Lamp Base Using UV Curable Adhesive
- Additives

Quaternary Ammonium Compound
Stabilizer for Unsaturated Polyester

PHOTOINITIATORS

- For Coating and Molding Compositions
Butyric Acid Derivatives
Benzoyl Derivatives of Diphenyl Sulfide plus Amine
Haloalkyl Benzoxazoles, Benzimidazoles and Benzothiazoles
Halogenated Naphthalene Derivative
Carboxy-Substituted Benzophenones
Polyhaloacyl Aromatic Compounds
Three Component System
Activated Halogenated Azine
2-Methyl-Substituted Benzimidazole
Alcohol or Mercaptan Adducts of Triketone
N,N'-Oxalyl Indigo
- For Imaging Compositions
Complex of Porphyrin-SO
Uranyl Salt plus Aminimide
Diazo-N-Sulfonate plus Aromatic Hydroxy Compound
Diazonium Salt with No Basic Groups in Cation
Aromatic Nitro Compounds as Epoxy Catalysts
Cyclic cis-a-Compounds
Acid Salt of an Indolinobenzospiropyran
Diazine-Electron Donor Catalyst
a,w-Diarylpolyene for Sulfonylazide Polymers

PART II. ELECTRON BEAM CURING

COATINGS

- Coating Compositions
Crosslinking of Polyvinylidene Fluoride for Wire Coating
Terminal Vinyl Ester Groups
Unsaturated Polyesters and N-3-Oxohydrocarbon-Substituted Acrylamides
Halogen-Containing Olefinically Unsaturated Esters
Hot Melts with Reduced Mixing Times
Alkyd Resin
Modified Polyester and Blends
Nonglossy Coatings
Unsaturated Polyesters
Acrylated Epoxidized Soybean Oil Amine
Epoxy Ester-Saturated Alkyd
Chlorinated Paraffin and Acrylate
Acrylic Acid Solvent for Radiation Curable Oil
Radiation Curable Epoxy
Polyol-Carbamate with Unsaturated Monomer
Unsaturated Poly(Amide-Esters) and Reactive Monomer
High Boiling Polyvinyl Monomer
Polyester Type Oligo(Meth)Acrylate
Linear Copolymers of Glycidol
Aromatic Polysulfones with Increased Flow Resistance
Stain-Resistant Diacrylates
Unsaturated Olefin plus Unsaturated Olefin with Urethane Groups
- Resists
Polymers Containing Epoxy Groups
Olefin-SiO₂ Copolymers
1,4-Diphenyl-1,3-Butadiene to Increase Sensitivity
Crack-Resistant Terpolymers
Methyl Methacrylate-Acrylonitrile Copolymers with Improved Sensitivity
Scanning Speed Increase Using Epoxy-Polymer Mixture
Polydialdehydes
Adding Acetate to Poly(Methyl Methacrylate)
Plural Layers for Metal Lift-Off
Thermally Stable Polycarbonates

Polymer Containing Dimethylglutarimide Units
Nitrocellulose
- Additives
Amines as Dosage Reducing Agents
Thermoplastic Vinyl Polymer to Improve Adhesion
Vinyl Phosphate as Anticorrosive
Silicon Carbide as Dosage Reducing Agent
Unsaturated Phosphoric Ester
Metal Oxide or Hydroxide

PLASTICS

- Elastomers
Heat-F lowable Material in Elastomer
Acrylonitrile-Butadiene
Phosphonitrilic Fluoroelastomers
- Additives and Catalysts
Phosphite Ester Antioxidants for Styrene-Butadiene Elastomers
Aluminum Chloride Catalyst for Beta-Acryloyloxypropanoic Acid
Fluorocarbon Polymer Crosslinking Agent
Additives to Accelerate Polyethylene Crosslinking
Propargyl-Containing Crosslinking Agent to Lower Radiation Dosage
Additives to Prevent Bubble Formation and Odor
Inorganic Additive to Promote Curing
Silicone Frothing Agents
- Processes
Irradiating Strand Material
High-Melting Polyethylene by Irradiating and Orienting
Curing Intermediate Articles
Batch/Continuous Process for Tetrafluoroethylene-Propylene Polymers
Silicone Rubber Coated with Collagen
Surface Treatment of Tires to Reduce Flash

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed, descriptive information in this book is based on U.S. patents issued since early 1975 that deal with specialized curing methods for coatings and plastics.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, technically oriented review of specialized curing methods as depicted in U.S. patents. To round out the complete technological picture, we have included seven reissues and four applications published under the trial voluntary protest program initiated by the Commissioner of Patents and Trademarks in January 1975.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a

sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring our new durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION

Interest in ultraviolet and electron beam curing techniques is evidenced by the number of patents issued in this field. Over two hundred such patents, issued since April 1975, are excerpted in this book.

Among the advantages of these energy sensitive curing systems are speed of curing, freedom from pollution and improved products.

Although ultraviolet systems are initially more expensive than conventional equipment, savings are realized in costs of pollution control systems and in costs of fuel for solvent evaporation and heat curing necessary in conventional systems. In some instances, particularly the labeling of cans and cartons, ultraviolet is said to be the more economical system.

Electron beam curing techniques offer the same advantages as ultraviolet but the initial cost is much higher and more extensive and expensive safety shielding for workers is required. Electron beam curing is, however, in use in the manufacture of heat- and abrasion-resistant plastic wrap, plastic insulation of wire and cable and in the curing of paint.

In the ultraviolet curing section of this book there are chapters on coatings, imaging systems, plastics intended for uses other than coatings and photoinitiators. The electron beam section has a chapter on coatings and one on plastics which includes processes for specific applications.

In many of the patents examples of both ultraviolet and electron beam curing are given. These patents were usually assigned to the ultraviolet or electron beam section according to the technique used-in the larger number of examples.

Title	Location	Edition / Series / Misc.
1501 Structure - Performance Relationships in Surfactants		Edition: 2nd edition, Revised and expanded
Author: Esumi, Kunio and Minoru Ueno (editors)	Dynix: 111655	Series: Surfactant Science Series: Vol. 112
Publish.: Marcel Dekker, Inc.	Call No.: 668 St	
- place: New York, NY	ISBN: 0824740440	
- date: ©2003	Shelf Adult Non-Fiction	Year: 2003
Subject: Surface active agents		Price: \$171.50
Desc: viii, 802 p., illus., 24 cm.		

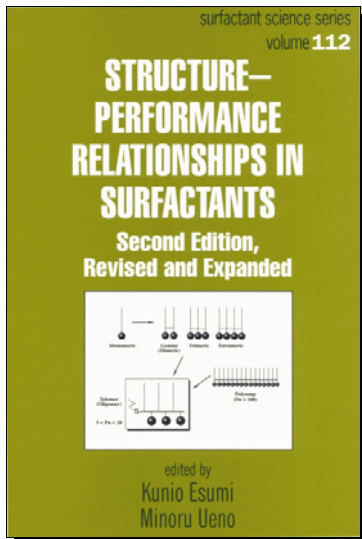


Table of Contents

Preface
Contributors

Part I: Theoretical Studies of Surfactants

1. Theory of Micelle Formation: Quantitative Approach to Predicting Micellar Properties from Surfactant Molecular Structure
2. Modeling Association and Adsorption of Surfactants

Part II: Physicochemical Properties of Surfactants at the Air-Liquid Interface and in Solutions

3. Adsorption of Vesicle-Forming Surfactants at the Air-Water Interface
4. Physicochemical Properties of Bile Salts
5. Characterization and Functionalization of Biosurfactants
6. Physicochemical Properties of Ring-Structured Surfactants
7. Dimeric (Gemini) Surfactants
8. Fluorinated Surfactants Having Two Hydrophobic Chains
9. Surface-Active Properties of Telomer-Type Surfactants Having Several Hydrocarbon Chains
10. Viscoelastic Surfactant Solutions
11. Microstructures of Nonionic Surfactant-Water Systems: From Dilute Micellar Solution to Liquid Crystal Phase
12. Association Behavior of Amphiphilic Dendritic Polymers
13. Polymer/Surfactant Systems
14. Highly Concentrated Cubic Phase-Based Emulsions

Part III: Surfactant Behaviors at the Solid-Liquid Interface

15. Adsorbilization and Related Phenomena
16. Adsorption of Polymer and Surfactant from Their Binary Mixtures on an Oxide Surface
17. Dispersion of Particles by Surfactants
18. Arrangement of Adsorbed Surfactants on Solid Surfaces by AFM Observation

Subjects

332 .	Surface active agents
333 .	Surface chemistry

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This volume has been revised and expanded to reflect intensifying interest in surfactant research and to incorporate the most recent innovations in the field.

ABOUT THE FIRST EDITION...

"[Esumi and Ueno] are well-known in the field and have assembled other leaders in the area as authors...."

"This book should be in the library of anyone doing research into the effects of surfactant structure on properties or applications." — Journal of Surfactants and Detergents

"...a highly interesting work." — Centro Español de Plásticos

"a fundamental tool" — Revista de Plásticos Modernos

ABOUT THE SECOND EDITION...

In response to intensifying interest on surfactant research brought on by recent innovation, Esumi and Ueno spearhead an international effort to examine novel developments in our understanding of the properties and performance of surfactants at air-liquid, liquid-liquid, and solid-liquid interfaces — highlighting seven new chapters and carefully updated material to reflect current trends.

The Second Edition presents new material on the adsorption of vesicle-forming surfactants at the air-water interface...fluorinated surfactants having two hydrophobic chains...surface-active properties of telomer-type surfactants having several hydrocarbon chains...the association behavior of amphiphilic dendritic polymers...polymer and surfactant systems...adsolubilization and related phenomena...and the arrangement of adsorbed surfactants on solid surfaces by AFM observation.

—

PREFACE:

Surfactant molecules can self-assemble in water, in oil, and in oil-water or solid-liquid mixtures to give a large variety of colloidal structures. Structure-performance relationships in surfactants are of great importance in nearly all fundamental studies and practical applications of surfactants. Six years ago, the first edition of this book was published as Volume 70 in the Surfactant Science series. Its aim was to examine properties and performance of surfactants at various interfaces, such as air-liquid, liquid-liquid, and solid-liquid. Research on new surfactants has been intense in recent years. Now, greatly expanded interest and additional important work in this field have led us to update the book to reflect current trends.

This volume has 18 chapters, which can be classified into three parts: theoretical studies of surfactants (Chapter 1 and 2), physicochemical properties of surfactants at the air-liquid interface and in solutions (Chapters 3 through 14), and surfactant behavior at the solid-liquid interface (Chapters 15 through 18). In Chapter 1, Nagarajan presents the quantitative approach to predicting the aggregation properties of surfactants and surfactant-polymer mixtures. Chapter 2, by Koopal, reviews the thermodynamic models for micellization/adsorption and discusses the self-consistent-field lattice model (SCFA) for association and adsorption of surfactants.

Aratono, Villeneuve, and Ikeda's discussion in Chapter 3 focuses on the surface tension and adsorption behavior of spontaneously vesicle-forming surfactants. In Chapter 4, Ueno and Asano outline the mixed properties of bile salts and some nonionic surfactants and give examples for application of these systems. In Chapter 5, Ishigami describes the molecular design and characterization of biosurfactants, along with applications of multifunctional structure of biosurfactants. Chapter 6, by Koide and Esumi, deals with the physicochemical properties of ring-structured surfactants, including those of crown ether type, those of polyamine type, cyclodextrin, and calix[n]arene. Zana's Chapter 7 discusses the physicochemical properties of dimeric surfactants, such as adsorption at the air-solution and solid-solution interfaces, micelle formation, solubilization, micelle size and shape, rheology, phase behavior, and some applications. In Chapter 8, Yoshino compares the synthesis and properties of two series of double chain-type fluorinated anionic surfactants. One of these is a series of surfactants with two fluorocarbon chains in their molecules; the other is a series of hybrid-type surfactants having both fluorocarbon and hydrocarbon chains in one molecule.

Chapter 9, by Yoshimura and Esumi, describes the physicochemical properties of telomer-type surfactants having several hydrophobic groups and several hydrophilic groups; these surfactants often exhibit properties of both polymer-type and conventional surfactants. In Chapter 10, Hoffmann analyzes various types of viscoelastic surfactant systems, describing rheological properties and presenting models for understanding the different flow behaviors based on the different microstructures. Kato's Chapter 11 presents the micelle structure of nonionic surfactants in dilute, semi-dilute, and concentrated solutions and discusses the thermodynamic models for micellar solutions and the phase transitions in liquid crystal phases. In Chapter 12, Imae reviews the amphiphilic properties and association behavior of concentric dendrimers and hybrid copolymers. Chapter 13, by Zana, describes how polymer hydrophobicity and the surfactant head group affect polymer-surfactant interactions; the chapter also addresses microstructural aspects, solubilization, and dynamic behaviors of polymer-surfactant aggregates. In Chapter 14, Uddin, Kunieda, and Solans describe the preparation and properties of highly concentrated cubic phase-based emulsions, as well as the correlation between D-phase emulsification and cubic phase-based emulsions.

In Chapter 15, Treiner outlines the adsolubilization and related phenomena at solid-solution interfaces and presents some applications. Esumi's Chapter 16 focuses on the adsorption of polymers and surfactants from their binary mixtures on oxide surface, also discussing the conformation of polymers adsorbed on particles. Chapter 17, also by Esumi, deals with the dispersion of particles by surfactants as well as the properties of surfactant-adsorbed layers. In Chapter 18, Fujii reviews the AFM techniques for the study of surfactant molecules, especially those relating to the morphology of the surfactant aggregations on solid-liquid interfaces.

Title	Location	Edition / Series / Misc.
154 Successful Product Development: Speeding from Opportunity to Profit Author: Rosenau, Milton D., 1931- Publish.: John Wiley & Sons - place: New York, NY - date: ©2000 Subject: New products Desc: xi,151 p., illus., 24 cm.	Dynix: 89748 Call No.: 658.5 Ro ISBN: 047131532X Shelf Adult Non-Fiction	Edition: Series: Year: 2000 Price: \$38.50

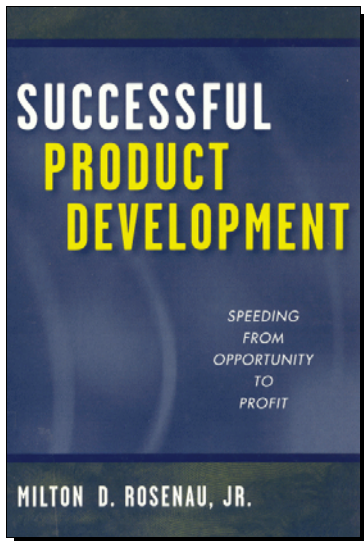


Table of Contents

PREFACE

PART 1: INTRODUCTION
 1. Overview.

PART 2: THE NEW PRODUCT DEVELOPMENT PROCESS.
 2. The Fuzzy Front End Interval.
 3. The Stages and Gates Interval.
 4. After Launch: The Preprofit and Continued Sales Intervals.

PART 3: IMPROVING YOUR PROCESS.
 5. Implementation.
 6. Continuous Improvement.

APPENDICES
 A. Abbreviations
 B. References
 C. Recent Helpful Books on Aspects of New Product Development

INDEX

Subjects

275 . New products

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

GO FROM CONCEPT TO CASH IN RECORD TIME!

When you're working hard on a new product development project, you don't have time for abstract theoretical concepts. You need concise, practical advice that will help you make things happen-now! You need quick access to clear, proven procedures aimed at producing revenue and profit growth fast. You need Successful Product Development: Speeding from Opportunity to Profit.

This unique hands-on guide leads you step-by-step through the product development process, from the creation of ideas, through concurrent design and engineering, to just-in-time delivery of a superior product to the customer ahead of the competition. Every step of this process is driven by one guiding principle: the faster you can move from initial concept to product launch, the sooner you will generate income for your business and achieve your firm's profit objective.

- Filled with invaluable time-saving guidance, Successful Product Development:
- * Focuses on the most important product development topic, rapid profit growth
 - * Takes an event and interval approach tailored for industry professionals
 - * Features a concise format designed for quick reference and easy reading

Successful Product Development is the ultimate handbook for professionals in new product development, marketing, engineering, and senior and general management in both service and manufacturing firms.

FROM THE PREFACE:

WHY ANOTHER BOOK ON NEW PRODUCT DEVELOPMENT?

A multitude of books on aspects of new product development have been written for practitioners and published in the 1990s. Many of the books have been concerned with accelerating time-to-market. Some books have dealt with particular functions (such as marketing), specialized aspects (such as market research), or separate tools (such as quality function

deployment). Why another one? In short, this book aims to provide:

A general overview of the entire new product development cycle

Practical guidance on how to cash in more quickly on your firm's investment in new product development

This is not the same thing as getting to market faster, because that achievement -- although obviously important -- does not assure enough income to repay the development investment. This book is about how to reap profits quickly or, at least, soon enough to justify the investment. However, keep in mind that new product development is an idiosyncratic process. What works well in your company or your business unit may be unsuitable in another company or business unit. And any process you adopt can become bureaucratic, confining, and potentially, a bottleneck if it is not continually adjusted and carefully managed. Thus, you want to read this book to gain a perspective rather than a prescription. The lessons you choose to implement in your company will depend on your situation.

WHY IS NEW PRODUCT DEVELOPMENT SO CHALLENGING?

Despite the availability of much knowledge (and some firmly held opinions), more than one wag has commented that "many new product development projects are indistinguishable from hunting ducks at midnight without a moon. . . there's lots of shooting and squawking with only random results and a high probability of damage." This produces a tension in many companies. The tension between a business focus and a new product development focus arises because these two foci are fundamentally different.

The business focus, for which executives are normally compensated, is to produce existing products and services efficiently and reliably. This requires discipline, control, and predictability. A common focus for new product development is to produce a useful new product or service as quickly as possible. This frequently demands adaptability, flexibility, and the need to cope with the unexpected. Executives in companies that are consistently very successful at developing new products and services manage to balance these disparate emphases.

WHO THIS BOOK IS FOR

The intended audience is:

All practitioners who are involved with any aspect of developing new products and services

Managers of such practitioners

Executives with responsibility for businesses that require new products and services

THIS BOOK'S APPROACH TO SPEEDING FROM IDEA TO PROFIT

I propose that there are five time-sequenced events and four intervals (or periods) between these events that must be mastered and understood to reap profits quickly from an investment in a new product effort. This is illustrated in Figure P-1. The central message of this book is that what is done-or not done-in the fuzzy front end (FFE) and stages and gates (S&G) intervals determines profitability after launch when product shipments start. In particular, it is advantageous for any company to shorten the length of time required to achieve their profit objective, that is, the duration of the preprofit sales (PPS) interval. (Options for defining the profit objective are discussed in, more detail in Chapter 1.) Conversely, it is desirable to sustain or continue profitable sales as long as this is practical, to lengthen the continued sales (CS) interval. The first three intervals (FFE, S&G, and PPS) are potentially time consuming, and practical actions to shorten these intervals are described in the book.

USEFUL AND UNIQUE FEATURES OF THIS BOOK

My goal is to provide you with:

A unified coverage of the new product development (NPD) process, from beginning to end

A deliberately brief book, because busy practitioners have little time for a lengthy treatise

Many figures to illustrate key ideas

Summary points that are set at the page margins for emphasis and ease of recall

A book that is based on the latest practical knowledge and research

Numerous illustrative examples, mostly from current media

HOW THIS BOOK IS ORGANIZED

This book covers what you can do to shorten the overall time to profit and indicates some ways to cash in more quickly

on your new product development investment. In it I discuss all four intervals, especially the FFE and S&G intervals. Although there may be some temporal overlap of the activities carried out in each of the four intervals, I separate their discussion in the book. There are six chapters, which are logically grouped into three parts:

Part 1: Introduction

1. Overview

Part 2: The New Product Development Process

2. The Fuzzy Front End Interval
3. The Stages and Gates Interval
4. After Launch: The Preprofit Sales and Continuing Sales Intervals

Part 3: Improving Your Process

5. Implementation
6. Continuous Improvement

In the overview we frame the issue, exploring what profit means and why a lack of clarity may make it elusive, and then define three intervals of time, from inception to profit. In Part II, Chapters 2 to 4, we explore the first three intervals and indicate key elements and actions that may be helpful in shortening time-to-profit. In Chapter 4 we also discuss actions that may be attractive after achieving the profit objective, that is, enjoying "gravity" and expanding on the product's profit.

Part III, Chapters 5 and 6, is about ways you can put some of the ideas into practice in your company. The fifth chapter covers implementing the lessons of the book. It deals heavily with resource allocation, which ultimately, is the key to accelerating your new product development payoff. Although resource allocation is also mentioned briefly in other chapters, the full discussion is deferred until Chapter 5. In Chapter 6 we explore the value of and ways to conduct continuous improvement reviews (often called post mortems), since these are the sine qua non upon which long-term improvement may be achieved. Supplemental information is provided in three appendixes: a list of abbreviations used in the book, the reference citations for each chapter, and a bibliography of other recent books on innovation and new product development.

SUMMARY

The book details four important actions for your firm to consider:

1. Clarifying and agreeing on the profit goals that are your objective.
2. Managing the first three intervals (FFE, S&G, and PPS) to minimize the overall time-to-profit.
3. Allocating your necessarily limited resources to accelerate the highest- priority efforts.
4. Insisting on continuous improvement reviews so that future new product development efforts can be carried out better and faster.

Title	Location	Edition / Series / Misc.
155 Surface Activity: Principles, Phenomena and Applications		Edition:
Author: Tsujii, Kaoru	Dynix: 82250	Series: Series in Polymers, Interfaces and Biomaterials
Publish.: Academic Press	Call No.: 668 Ts	
- place: San Diego, CA	ISBN: 0127022805	
- date: ©1998	Shelf Adult Non-Fiction	Year: 1998
Subject: Surface active agents		Price: \$79.00
Desc: x, 245 p., illus., 24 cm.		

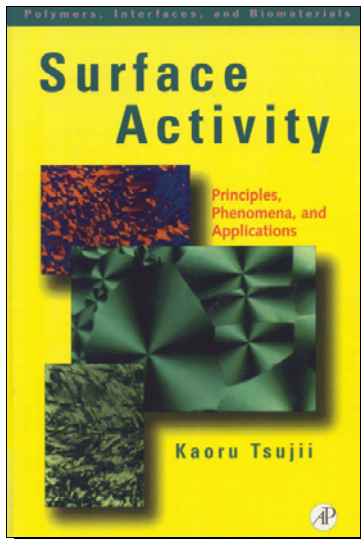


Table of Contents

Preface by the Series Editor
 Preface by the Author

1 Surface Activity and Surface and Interfacial Tension
 1.1 Origin of Surface and Interfacial Tension
 1.2 What Is Surface Activity?
 1.3 Surface Activity in Aqueous Systems and Hydrophobic Interaction

2 Surface Active Substances
 2.1 Characteristic Molecular Structure of Surface Active Compounds
 2.2 Surfactants and Their Characteristic Properties
 2.3 Naturally Produced Surface Active Compounds

3 Properties and Functions of Surface Activity
 3.1 Characteristic Properties of Aqueous Solutions of Surfactants
 3.2 Adsorption and Related Phenomena
 3.3 Aggregation of Surface Active Substances and Related Phenomena

4 Applications of Surface Active Substances
 4.1 Interactions of Surfactants and Their Synergistic Effects
 4.2 Detergency and Surface Activity
 4.3 Applications Utilizing Adsorption Phenomena
 4.4 Applications Utilizing Aggregation Phenomena
 4.5 Environmental Problems in the Consumer Products and Surfactant Industry

5 Surface Active Substances in Biological Systems
 5.1 Self-Organization—A Key Phenomenon in Biological Systems
 5.2 Biomembranes—Self-Assembled System of Lipids and Proteins
 5.3 Surface Active Compounds Working in Biological Systems

References
 Index

Subjects

332 .	Surface active agents
333 .	Surface chemistry

Reviews - Synopsis - Dust Jacket

GENERAL DESCRIPTION

The first book in a new series edited by Toyochi Tanaka, Surface Activity illustrates the fundamentals and principles of surfactants, and describes the applications of surface activity to our everyday life and industry. It is written to display the most essential concepts and up-to-date research results on surface activity phenomenon. The book covers the concepts of surface (interfacial) tension and its characteristic properties. Surface Activity presents conventional and potential applications, and proposes creative and original ideas for future research and development for consumer products such as detergents, toiletries and cosmetics. The book also discusses potential applications for lyotropic liquid crystals, new drug delivery systems, molecular electronics, and environmental concerns. This book will be of value to researchers, yet beginners in this field will also be able to understand the essential concepts.

KEY FEATURES

- Describes surface activity from basic principles to practical applications
- Presents the applications of wetting, foaming and defoaming, emulsions, etc., for detergents, toiletries, cosmetics and other industrial uses
- Describes environmental problems
- Gives potential future applications for drug delivery systems, sensors, and molecular electronics

Dr. Kaoru Tsujii is one of the pioneers and leaders in science and technology of the surfactants. He has long explored the field covering both theory and industrial applications. Tsujii received both his Master of Science degree and his Ph.D. from Osaka University. He has been employed by Kao Corporation, a leading manufacturer of consumer products in Japan, since 1970, where he is currently a Research Fellow. His areas of research include ididescent solutions resulting from periodic structure of bilayer membranes, super water- and oil-repellent surfaces utilizing their fractal structure, hybrid polymer gels with bilayer membranes, and interactions of surfactants with polymer gels. Dr. Tsujii has published over 50 papers and has authored 14 books and chapters. He has applied for 76 patents.

FROM THE DUST JACKET:

Surfaces and interfaces are concepts of fundamental importance in materials science and technology. All materials have surfaces. When two or more materials are put together, interfaces appear. In composite materials, interfaces play a crucial role in determining mechanical, optical, and electronic properties.

Surfaces and interfaces can be dramatically altered when surfactant molecules are applied to them, modifying not only the interactions between two materials at the interface, but also the bulk properties of a composite. Surfactants are key materials in processes involving adhesion, coating, mixing, domain formations, and many other phenomena in the medical, pharmaceutical, chemical, and electronic industries.

Surfactants exhibit a variety of interesting phenomena such as formations of micelles, vesicles, layers, and gels. They provide a fascinating example of self-assembly. Surfactants have many phases and undergo phase transitions between them. Understanding these phenomena is a great challenge for physics and chemistry, and is of increasing technological importance.

PREFACE BY THE SERIES EDITOR:

Surfaces and interfaces are a concept of fundamental importance in materials science and technology. All materials have surfaces. When two or more materials are put together, interfaces appear. In composite materials, the interfaces play a crucial role in determining their mechanical, optical, and electronic properties.

The surfaces and interfaces can be drastically altered when surfactant molecules are applied to the area. They not only modify the interactions between two materials at the interface, but also the bulk properties of the composite. Surfactants are a key material in processes involving adhesion, coating, mixing, domain formations, and many other phenomena in medical, pharmaceutical, chemical, and electronics industries.

Surfactants exhibit a variety of interesting phenomena such as formations of micelles, vesicles, layers, and gels. It is a fascinating example of self-assembling. Surfactants have many phases and undergo phase transitions between them. Understanding these phenomena is a great challenge for physics and chemistry and is of increasing technological importance.

Dr. Kaoru Tsujii is one of the pioneers and leaders in science and technology of surfactants. He has long explored the field, both theoretically and in industrial applications. This book illustrates the fundamentals and principles behind these phenomena and their applications to our everyday life and industry. It will serve as an excellent text and reference for researchers and students who wish to know more about surfactants, one of the key materials in twenty-first century technology.

PREFACE BY THE AUTHOR:

Surface activity is an important phenomenon in our daily life as well as in many kinds of industry. So much phenomena are governed by surface activity that understanding its principles, phenomena, and applications can help one to live wisely and to work creatively. Some examples of familiar products that are surface-active materials are the soap and shampoo used on your body and the detergent and fabric softener used on your clothing. When you cook, you may use a surface-modified (Teflon-coated) frying pan that can be easily cleaned up; this too is a product of the technology of surface activity.

The scientific field of surface activity is now in a new stage of progress. Technology that will enable us to arrange or assemble molecules as we want will be one of the most far-reaching technologies of the twenty-first century. For instance, the concept of molecular electronics perfectly depends on this technology. Already we have the technology to assemble atoms to form molecules in terms of (synthetic) organic chemistry due to the contributions of quantum mechanics, which provides the principles for this chemistry. The next epoch will be technology for artificially assembling molecules to make some thing useful in our social life. Thus, the science of surface activity—the only technique at present for molecular assembling or construction—is now in the spotlight.

This book is written to contribute to the up-to-date understandings of the science and technology of surface activity from

basic principles to practical applications. The book is intended for company research scientists and engineers, university professors and graduate students, and even undergraduate students who are working or want to work in the field of surface and colloid science. Distinctive features of this book are (1) it is written with one logical philosophy from basic principles to applications, (2) basic principles, interesting phenomena, and useful applications of surface activity are discussed clearly and can be easily understood even by beginners in this field, and (3) potential future applications—such as lyotropic liquid crystals, liposomes and vesicles, bilayer membranes, and LB-films—are discussed together with conventional ones.

The author would like to express his sincere gratitude to Professor Toyochi Tanaka of MIT for providing the chance to write this book. He also appreciates Dr. Zvi Ruder, Ms. Elizabeth Voit, and Abby Heim of Academic Press for their kind help in publishing the book. He is indebted to his wife, Yukiko, for her continuous encouragement during the writing of this book.

Title	Location	Edition / Series / Misc.
156 Surface Characterization Methods: Principles, Techniques and Applications		<i>Edition:</i>
<i>Author:</i> Milling, Andrew J. (editor)	<i>Dynix:</i> 89763	<i>Series:</i> Surfactant Science Series: Vol. 87
<i>Publish.:</i> Marcel Dekker, Inc.	<i>Call No.:</i> 541.3 Su	
<i>- place:</i> New York, NY	<i>ISBN:</i> 0824773365	
<i>- date:</i> ©1999	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1999
<i>Subject:</i> Surface chemistry		<i>Price:</i> \$138.50
<i>Desc:</i> viii, 412 p., illus., 24 cm.		

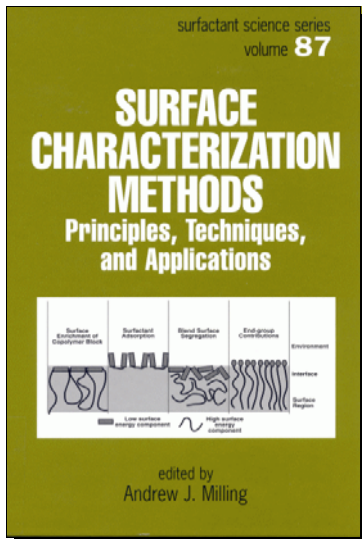


Table of Contents

- Preface
- Contributors
- 1. Measurement of the Surface Tension and Surface Stress of Solids (Hans-Jurgen Butt and Roberto Raiteri)
- 2. Contact Angle Techniques and Measurements (Daniel Y. Kwok and A. W. Neumann)
- 3. Measurement of Ion-Mediated and van der Waals Forces Using Atomic Force Microscopy (Ian Larson and Andrew J. Milling)
- 4. Measurement of Electro-osmosis as a Method for Electrokinetic Surface Analysis (Norman L. Burns)
- 5. X-Ray Photoelectron Spectroscopy (XPS) and Static Secondary Ion Mass Spectrometry (SSIMS) of Biomedical Polymers and Surfactants (Kevin M. Shakesheff, Martyn C. Davies and Robert Langer)
- 6. Evanescent Wave Scattering at Solid Surfaces (Adolfas K. Gaigalas)
- 7. Characterizing Colloidal Materials Using Dynamic Light Scattering (Leo H. Hanus and Harry J. Ploehn)
- 8. Light Scattering Studies of Microcapsules in Suspension (Toshiaki Dobashi and Benjamin Chu)
- 9. Three-Dimensional Particle Tracking of Micronic Colloidal Particles (Y. Grasselli and Georges Bossis)
- 10. Low-Mass Luminescent Organogels (Pierre Terech and Richard G. Weiss)
- 11. Chromatographic Methods for Measurement of Antibody-Antigen Association Rates (Claire Vidal-Madjar and Alain Jaulmes)
- 12. The Acid-Base Behavior of Proteins Determined by ISFET's (Wouter Olthuis and Piet Bergveld)

Index

Subjects

333 .	Surface chemistry
383 .	Interfaces (Physical sciences)

Reviews - Synopsis - Dust Jacket

This book, comprised of a series of monographs by leading experts in their respective fields, outlines the scientific basis and experimental methods for a broad sample of surface analysis techniques, drawing heavily from established principles of physical and analytical chemistry -- and sketches a simple low-cost method of tracking particles in three dimensions!

Fashioned for the active researcher and surveying characterization practices currently in use and in development in laboratories. Surface Characterization Methods considers procedures for recognizing molecules and processing particulate materials for a wide range of surface and interfacial properties...describes surface energies, electrokinetic characterization, van der Waals interactions, and wetting behavior...covers scanning probe methodologies, light scattering techniques, and chromatography...explains the commonly used experimental techniques for measuring contact angles...addresses the preparation of suitable solid surfaces for energetics calculations...outlines the use of the atomic force microscope (AFM) in the study of IM and vdW surface forces...details the measurement of electro-osmosis in cylindrical and rectangular chambers...considers the role of x-ray photoelectron spectroscopy (XPS) and static secondary ion mass spectrometry (SSIMS)...examines the formation of thermally reversible gels...and more!

Focusing on techniques that use commercially available or easily assembled equipment to characterize surface behavior, and including over 1000 references and more than 400 equations, drawings, tables, photographs, and micrographs, Surface Characterization Methods, is designed for physical, surface, colloid, analytical, inorganic, and materials chemists; chemical engineers; materials physicists; spectroscopists; and upper-level undergraduate and graduate students in these disciplines.

- Measurement of the Surface Tension and Surface Stress of Solids
Hans-Jürgen Butt and Roberto Raiteri
- Contact Angle Techniques and Measurements
Daniel Y. Kwok and A. W. Neumann
- Measurement of Ion-Mediated and van der Waals Forces Using Atomic Force Microscopy
Ian Larson and Andrew J. Milling
- Measurement of Electro-osmosis as a Method for Electrokinetic Surface Analysis
Norman L. Burns

X-Ray Photoelectron Spectroscopy (XPS) and Static Secondary Ion Mass Spectrometry (SSIMS) of Biomedical Polymers and Surfactants
Kevin M. Shakesheff, Martyn C. Davies, and Robert Langer
Evanescent Wave Scattering at Solid Surfaces
Adolfas K. Gaigalas
Characterizing Colloidal Materials Using Dynamic Light Scattering
Leo H. Hanus and Harry J. Ploehn
Light Scattering Studies of Microcapsules in Suspension
Toshiaki Dobashi and Benjamin Chu
Three-Dimensional Particle Tracking of Micronic Colloidal Particles
Y. Grasselli and Georges Bossis
Low-Mass Luminescent Organogels
Pierre Terech and Richard G. Weiss
Chromatographic Methods for Measurement of Antibody–Antigen Association Rates
Claire Vidal-Madjar and Alain Jaulmes
The Acid–Base Behavior of Proteins Determined by ISFETs
Wouter Olthuis and Piet Bergveld

Title	Location	Edition / Series / Misc.
158 Surface Coatings <i>Author:</i> Oil and Colour Chemists' Association, Australia <i>Publish.:</i> Chapman and Hall <i>- place:</i> New York, NY <i>- date:</i> ©1983 <i>Subject:</i> Protective coatings <i>Desc:</i> viii, 408 p., illus., 25 cm.	<i>Dynix:</i> 00866 <i>Call No.:</i> 667.9 Su <i>ISBN:</i> 0412256606 <i>Shelf:</i> Adult Non-Fiction	<i>Edition:</i> 2nd edition, Revised <i>Series:</i> <i>Year:</i> 1983 <i>Price:</i> \$25.00



Table of Contents

TABLE OF CONTENTS (Volume One)

- Foreword
- Preface
- 1 The Past, Present and Future of the Surface Coatings Industry
- 2 Introduction to Polymer Science
- 3 Vegetable Oils
- 4 Oleoresinous Media
- 5 Alkyd Resin Technology
- 6 Manufacture of Alkyd Resins
- 7 Applications of Alkyd Resins
- 8 Polyesters
- 9 Amino Resins
- 10 Phenolic Resins
- 11 Polyurethane Resins
- 12 Epoxy Resins
- 13 Water Dispersible Epoxy Coatings
- 14 Silicone Resins
- 15 Acrylic Solution Resins
- 16 Emulsion Polymerization Theory
- 17 Emulsion Properties 1: Effect of Monomer Composition
- 18 Emulsion Properties 2: Effect of Water Phase and Particle Size
- 19 Emulsion Properties 3: Film Formation
- 20 Emulsion Polymers: Manufacture and Testing
- 21 Applications of Emulsion Polymers
- 22 Water-Reducible Resins
- 23 Water-Soluble Polymers
- 24 Solvents
- 25 Inorganic Pigments
- 26 Titanium Dioxide Pigments
- 27 Organic Pigments
- 28 Extender Pigments
- 29 Paint Driers
- 30 Paint Additives
- Contributors and Reviewers
- Appendix: Useful Data and Conversion Tables
- Index

Subjects

239 .	Coatings
283 .	Paint materials
324 .	Protective coatings
437 .	Finishes and finishing

Volumes

Paints and Their Applications - vol. 2
Raw Materials and Their Usage - vol. 1

TABLE OF CONTENTS (Volume Two)

- Preface
- 31 Rheology
- 32 Formulating Principles
- 33 Paint Manufacture: Pigment Dispersion
- 34 Paint Manufacture: Processing Operations
- 35 Architectural Coatings
- 36 Heavy-duty Protective Coatings
- 37 Anti-fouling Paints
- 38 Industrial Coatings
- 39 Automotive Coatings
- 40 Lacquers
- 41 Conversion Coatings
- 42 Powder Coatings

43 Ultraviolet-cured Coatings
44 Printing Inks
45 Components and Technical Aspects of a Paint-tinting System
46 Colour Matching (Using Computerised Techniques)
47 Testing and Quality Control
48 The Substrate and its Preparation
49 Metal Cleaning and Pretreatment
50 The Selection of Decorative Paints
51 Corrosion and Prevention
52 Industrial Coatings: Application and Curing Methods
53 Surface Coatings Defects
54 Analysis of Polymeric Materials
55 Technical Service in the Surface Coatings Industry
56 Computers in the Surface Coatings Industry
57 Standardisation, Inspection and Accreditation in Australia
58 Statutory Requirements of the Paint Industry
Appendix: Paint Calculations
Glossary of Terms
Useful Data and Conversion Tables
List of Contributors
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

"Surface Coatings" is now published in two volumes. Volume 1 deals with raw materials and how they are used; Volume 2 with paints and their application.

Since "Surface Coatings" first appeared in 1974, the industry has undergone dramatic and rapid changes both in direction and emphasis, and this new edition mirrors these changes. The move towards aqueous systems, for instance, is acknowledged in Volume 1 by doubling the number of chapters on emulsions and adding new chapters on aqueous resins while at the same time still providing an excellent introduction to polymer science, pigments, solvents and additives. Volume 2 now covers lacquers, powder coatings, UV-cured coatings and decorative paint selection in addition to the foundation chapters devoted to manufacture, application and technology. Further, sections on computer technology as applied to automated colour matching, and resin and coating formulation have been included.

The new and expanded format of "Surface Coatings" makes it an indispensable and up-to-date reference book for the surface coatings industry. In addition, chemists and technologists employed in related industries such as inks, adhesives, ceramics, building, cosmetics, and raw material suppliers, will find it very useful.

FOREWORD

Arising from an examination in 1969 of the education and training opportunities for paint industry technicians, it was recognized that the various courses available at that time did not fully serve their needs.

While a few large companies had developed in-house training arrangements, the many medium and smaller firms in the raw material supply, paint manufacturing or paint user industries, were unable to provide their own comprehensive training programs.

With a view to improving this situation, an advisory committee comprising of representatives of the Australian Paint Manufacturers' Federation and the Oil and Colour Chemists' Association Australia was established to liaise directly with the New South Wales Department of Technical and Further Education. As a result plans were developed for the introduction of a Special Course in 'Surface Coatings Technology' in 1971, conducted by the Sydney Technical College. The scope of the course was designed to cover all aspects of surface coatings technology ranging from raw materials and formulations to the production, testing, evaluation, application and use of finished products.

The course proved to be highly successful and in 1973 a similar syllabus was introduced by the Melbourne School of Painting, Decorating and Signcrafts in Victoria. In 1980, New Zealand followed suit with a similar course conducted by the Auckland Technical Institute.

Following interest displayed in the initial course it was decided to publish the lectures. The book was well received and, as predicted by the executive director of the Australian Paint Manufacturers' Federation, it served 'as a valuable guide and reference document for future students and other readers'.

As a consequence of the comments and criticism of the first edition, it was decided to produce a second edition with a different approach. While it has again been designed to serve as a guide and a reference document for students, it is also intended to provide an up-to-date, in-depth treatment of all relevant areas of paint technology.

To achieve this, many additional subject areas have been included, and Australian industry experts have provided the specialist chapters as well as their technical editing expertise.

It is hoped that the years of planning and effort will serve the needs of the paint and related industries.

PREFACE TO VOLUME ONE

"Some books are to be tasted, others to be swallowed, and some few to be chewed and digested." - Francis Bacon

I would like to review briefly not only the scope of this second edition of Surface Coatings, but also its background and preparation.

The Technical Education sub-committee of the Australian Federal Committee of the Oil and Colour Chemists' Association, Australia (OCCAA) elected to start essentially from scratch rather than attempt revision of the previous edition. Approaches were therefore made to some sixty potential authors, judged to possess the necessary expertise to make the best possible contributions to the new book. As with many OCCAA initiatives, the response was extremely gratifying; it consisted of over 1500 typed pages covering basic surface coatings technology from the viewpoint of the Australian industry.

The Textbook Editing Committee was co-opted with the responsibility of integrating the individual contributions for publication as a coherent textbook.

Wherever practical, each chapter was initially submitted for a technical review, in order to reduce bias, omission and inappropriate emphasis. The assumption was that two experts are better than one, the only difficulty being the location of a second authority. Many reviewers considered changes unnecessary, reflecting the high quality of the initial contributions; others recommended that substantial revision of several chapters was needed to adequately cover the topic. The wealth of constructive criticism has in our view improved the text immeasurably. Bibliographical details of all our contributors, as some recognition of those whose book this is, can be found on the pages following Chapter 30 of this volume.

The next stage was to examine groups of inter-related chapters for duplication and omissions. This activity required a third technical reviewer, usually a Committee member. One particularly diligent committee member was required to appraise eleven major chapters in this way, and we appreciate the effort involved. Very few omissions were evident and repetition was minimal.

The major problem was to convert a large number of individually written chapters into an acceptable textbook. An exhaustive editing process was involved, attempting to retain the character of the originals whilst adopting consistent format, conventional spellings and grammar, SI units, and overall presentation. The guidelines in the Australian Government Printing Service Style Manual were especially useful.

The adoption of the preferred IUPAC spelling for sulfur and its compounds will please our North American readers but may offend traditionalists. Selection of preferred terms for synthetic polymer dispersions made by emulsion polymerization, and paints based thereon, was a contentious issue. Emulsion is widely used, especially by USA and UK connected companies; the large German companies prefer dispersion, and the terms latexes and latices also have proponents. Emulsion was finally adopted, based mainly on common usage. Latex paint was chosen as the only unambiguous name for this class of paints. The widespread use of terms such as plastic paint, water paint, vinyl paint and PVA paint, is deprecated. Similarly the use of acrylic, urethane or silicone for products with negligible modification is considered deceptive.

The indexes were prepared professionally; and one of the Committee team undertook the unenviable preliminary task of key-wording each chapter, for which we are most grateful. We are similarly indebted for the work done to ensure compliance with the SI units of measurement quoted in AS 1000—1979. Note in particular the use of mass rather than weight, and density rather than spec gravity or weight per gallon. The retention of some obsolescent units, especially for viscosity, was considered unavoidable.

The work is presented in two volumes, the first extensively reviewing the raw materials used in surface coatings, and the second the technology of the products that use them. Volume I will also be of considerable benefit to students, technologists and others in related industries such as inks, adhesives, ceramics, textiles and cosmetics, and raw material

suppliers. It provides an excellent introduction to polymer science, pigments, solvents and additives. This edition reflects the movement towards aqueous systems: the chapters on alkyds have been reduced in this edition from six to three, and the four solvent chapters combined. Conversely the emulsion chapters have been doubled to six, and three new chapters on aqueous resins added. Volume II, whilst retaining the basic manufacture, application and technology coverage, is based on completely updated contributions. There are additional chapters on lacquers, powder coatings, UV-cured coatings and decorative paint selection. Reflecting the increasing impact of computers, there are new chapters on automated colour matching and applications in resin and coating formulation.

All readers, both in Australia and overseas, are reminded that Surface Coatings is very much an evolving dynamic text, written by your industry for your industry. Despite our collective best efforts, there may be errors remaining, and inadequate coverage of some topics due to advances in technology. Any suggestions for improvement should be sent to Mr. Douglas Howie of New South Wales University Press, P0 Box I, Kensington, NSW, Australia 2033. Your co-operation will be invaluable.

As Chairman of this Committee, I have had the opportunity to work with an outstanding group of professionals, who by dedication, skill and sheer hard work have completed the present edition. I wish to express on behalf of the Association my very deep gratitude, and I hope that our readers will enjoy the same sense of satisfaction that has been the hallmark of this exciting project.

PREFACE TO VOLUME TWO

Volume 2 of Surface Coatings provides a comprehensive overview of the technology and utilisation of decorative and industrial paints in Australia. The diverse range of raw materials employed in the surface coating and allied industries is examined in considerable detail. Readers of Volume I will find this introductory text invaluable; cross references to appropriate chapters in Volume II are provided and the index covers both volumes.

The Editorial Committee decided, as with Volume 1, to omit references unless the nature of the relevant chapter was such that direction of the reader to additional information sources was essential—for example, where an overview of a subject not directly connected with paint technology was included for completeness.

Note that proprietary trade names in this volume are indicated by an asterisk; attempts have been made, however, to replace these as far as possible by chemical descriptions.

Suggested amendments and improvements should be directed to the NSW University Press for the attention of Mr. D. Howie, who will ensure that these receive the attention of the Editorial Committee.

Title	Location	Edition / Series / Misc.
159 Surfaces, Interfaces and Colloids: Principles and Applications Author: Myers, Drew, 1946- Publish.: Wiley - VCH, Verlag GmbH & Co. - place: New York, NY - date: ©1999 Subject: Surface chemistry Desc: xx, 501 p., illus., 24 cm.	Dynix: 82251 Call No.: 541.3 My ISBN: 0471330604 Shelf Adult Non-Fiction	Edition: 2nd edition Series: Year: 1999 Price: \$94.95

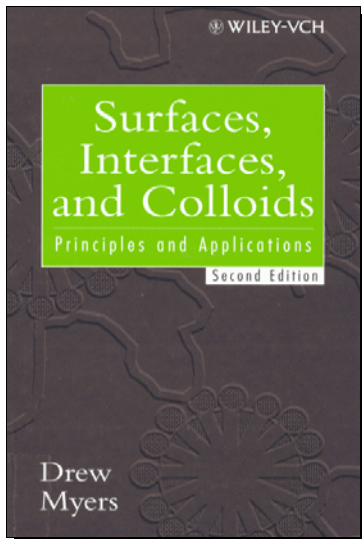


Table of Contents

1. Surfaces and Colloids: The Twilight Zone.
2. Surfaces and Interfaces: General Concepts.
3. Surface Activity and Surfactant Structures.
4. Attractive Forces.
5. Electrostatic Forces and the Electrical Double Layer.
6. Capillarity.
7. Solid Surfaces.
8. Liquid-Fluid Interfaces.
9. Adsorption.
10. Colloids and Colloidal Stability.
11. Emulsions.
12. Foams.
13. Aerosols.
14. Polymers at Interfaces.
15. Association Colloids: Micelles, Vesicles, and Membranes.
16. Solubilization, Micellar Catalysis, and Microemulsions.
17. Wetting and Spreading.
18. Friction, Lubriation, and Wear.
19. Adhesion.

Bibliography.

Index.

Subjects

333 .	Surface chemistry
383 .	Interfaces (Physical sciences)
433 .	Colloids

Reviews - Synopsis - Dust Jacket

From the reviews of the First Edition: "The book has admirably met its stated goal. The whole gamut of surface and colloid science has been presented in a comprehensive manner without any undue oversimplification. The author should be congratulated for his clarity." -Advanced Materials

Now in its second edition, this work remains the single most useful introduction available to the complex area of surface and colloids science. Industry expert Drew Myers walks readers through concepts, theories, and applications-keeping the mathematics to a minimum and presenting real-world case studies to illustrate key technological and biological processes. He substantially reorganizes and updates the material to reflect the current state of knowledge in the field, offering new chapters on absorption and biological systems in addition to the important areas of colloid stability, emulsions and foams, monolayer films, surfactants, and wetting. This revision also boasts an improved index, more than 200 new line drawings, general and specific chapter bibliographies, and end-of-chapter problems. Geared to scientists, technologists, and students dealing with colloidal and surface systems and their numerous industrial applications, the book imparts an understanding of the fundamental aspects of surfaces, interfaces, and colloids, which is essential for effective solutions in diverse areas of chemistry, physics, biology, medicine, engineering, and material sciences.

Overall the book is very wordy, which may appeal to some readers, and in many cases the very qualitative approach may be useful to those coming to the subject from a very non-mathematical background.

--Journal of Surfactants and Detergents Vol. 4, Issue 1 January 2001

Title	Location	Edition / Series / Misc.
160 Surfactants and Polymers in Aqueous Solution		<i>Edition:</i>
<i>Author:</i> Jonsson, Bo	<i>Dynix:</i> 82252	<i>Series:</i>
<i>Publish.:</i> John Wiley & Sons	<i>Call No.:</i> 668.1 Jo	
<i>- place:</i> Chichester, [West Sussex], UK / New York, NY	<i>ISBN:</i> 0471974226	
<i>- date:</i> 1999	<i>Shelf</i> Adult Non-Fiction	<i>Year:</i> 1999
<i>Subject:</i> Surface active agents		<i>Price:</i> \$75.00
<i>Desc:</i> xii, 438 p., illus., 23 cm.		

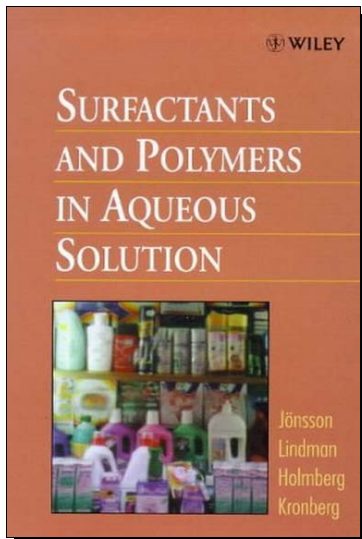


Table of Contents

Preface to the second edition
 Preface to the first edition

1. INTRODUCTION TO SURFACTANTS
 Surfactants Adsorb at Interfaces
 Surfactants Aggregate in Solution
 Surfactants are Amphiphilic
 Surface Active Compounds are Plentiful in Nature
 Surfactant Raw Materials May be Based on Petrochemicals or Oleochemicals
 Surfactants are Classified by the Polar Head Group
 Dermatological Aspects of Surfactants are Vital Issues
 The Ecological Impact of Surfactants is of Growing Importance
 The Rate of Biodegradation Depends on Surfactant Structure
 Environmental Concern is a Strong Driving Force for Surfactant Development
 Bibliography

2. SURFACTANT MICELLIZATION
 Different Amphiphile Systems
 Surfactants Start to Form Micelles at the CMC
 CMC Depends on Chemical Structure
 Temperature and Cosolutes Affect the CMC
 The Solubility of Surfactants may be Strongly Temperature Dependent
 Driving Forces of Micelle Formation and Thermodynamic Models
 The Association Process and Counterion Binding can be Monitored by NMR Spectroscopy
 Hydrophobic Compounds can be Solubilized in Micelles
 Micelle Size and Structure may Vary
 A Geometric Consideration of Chain Packing is Useful
 Kinetics of Micelle Formation
 Surfactants may Form Aggregates in Solvents other than Water
 General Comments on Amphiphile Self-Assembly
 Bibliography

3. PHASE BEHAVIOUR OF CONCENTRATED SURFACTANT SYSTEMS
 Micelle Type and Size Vary with Concentration
 Micellar Growth is Different for Different Systems
 Surfactant Phases are Built Up by Discrete or Infinite Self-Assemblies
 Micellar Solutions can Reach Saturation
 Structures of Liquid Crystalline Phases
 How to Determine Phase Diagrams
 Binary and Ternary Phase Diagrams are Useful Tools: Two Components
 Binary and Ternary Phase Diagrams are Useful Tools: Three Components
 Surfactant Geometry and Packing Determine Aggregate Structure: Packing Parameter and Spontaneous Curvature of the Surfactant Film are Useful Concepts
 Polar Lipids Show the same Phase Behaviour as other Amphiphiles
 Liquid Crystalline Phases may Form in Solvents other than Water
 Bibliography

4. PHYSICO-CHEMICAL PROPERTIES OF SURFACTANTS AND POLYMERS CONTAINING OXYETHYLENE GROUPS
 Polyoxyethylene Chains make up the Hydrophilic Part of many Surfactants and Polymers
 CMC and Micellar Size of Polyoxyethylene-Based Surfactants are Strongly Temperature Dependent

Subjects

313 .	Polymers
329 .	Solution (Chemistry)
332 .	Surface active agents

Temperature Dependence can be Studied using Phase Diagrams
The L3 or 'Sponge' Phase
Sequence of Self-Assembly Structures as a Function of Temperature
The Critical Packing Parameter and the Spontaneous Curvature Concepts are Useful Tools
Clouding is a Characteristic Feature of Polyoxyethylene-Based Surfactants and Polymers
Physicochemical Properties of Block Copolymers Containing Polyoxethylene Segments Resemble those of
Polyoxyethylene-Based Surfactants
Temperature Anomalies of Oxyethylene-Based Surfactants and Polymers are Ubiquitous
Temperature Anomalies are Present in Solvents other than Water
Bibliography

5. MIXED MICELLES

Systems of Surfactants with Similar Head Groups Require no Net Interaction
General Treatment of Surfactants Mixtures Requires a Net Interaction
The Concept of Mixed Micelles can also be Applied to Amphiphiles not Forming Micelles
Mixed Surfactant Systems at Higher Concentrations Show Interesting Features
Mixed Surfactant Systems are used Technically
Appendix
Bibliography

6. MICROEMULSIONS

The Term Microemulsion is Misleading
Phase Behaviour of Oil-Water-Surfactant Systems can be Illustrated by Phase Diagrams
The Choice of Surfactant is Decisive
Ternary Phase Diagrams can be Complex
How to Approach Microstructure?
Molecular Self-Diffusion can be Measured
Confinement, Obstruction and Solvation Determine Solvent Self-Diffusion in Microemulsions
Self-Diffusion Gives Evidence for a Bicontinuous Structure at Balanced Conditions
The Microstructure is Governed by Surfactant Properties
Bibliography

7. INTERMOLECULAR INTERACTIONS

Pair Potentials Act between Two Molecules in a Vacuum
The Intermolecular Interaction can be Partitioned
Effective Pair Potentials Act between Two Molecules in a Medium
Bibliography

8. COLLOIDAL FORCES

Electric Double-Layer Forces are Important for Colloidal Stability
Other Types of Forces Exist
Colloidal Forces can be Measured Directly
Bibliography

9. POLYMERS IN SOLUTION

Polymer Properties are Governed by the Choice of Monomers
The Molecular Weight is an Important Parameter
Dissolving a Polymer can be a Problem
Polymers in Solution can be Characterized by Viscosity Measurements
Polymer Solutions may Undergo Phase Separation
Polymers Containing Oxyethylene Groups Phase-Separate Upon Heating in Aqueous Systems
Solvents and Surfactants have Large Effects on Polymer Solutions
The Solubility Parameter Concept is a Useful Tool for Finding the Right Solvent for a Polymer
The Theta Temperature is of Fundamental Importance
There are Various Classes of Water-Soluble Polymers
Polyelectrolytes are Charged Polymers
Polymer Configurations Depend on Solvent Conditions
Bibliography

10. REGULAR SOLUTION THEORY

Bragg-Williams Theory Describes Non-ideal Mixtures
Flory-Huggins Theory Describes the Phase Behaviour of Polymer Solutions
Bibliography

11. NOVEL SURFACTANTS

Gemini Surfactants have an Unusual Structure
Cleavable Surfactants are Environmentally Attractive but are of Interest for other Reasons as well
Polymerizable Surfactants are of Particular Interest for Coatings Applications
Polymeric Surfactants Constitute a Chapter of their Own
Special Surfactants Give Extreme Surface Tension Reduction
Bibliography

12. SURFACE ACTIVE POLYMERS

Surface Active Polymers can be Designed in Different Ways
Polymers may have a Hydrophilic Backbone and Hydrophobic Side Chains
Polymers may have a Hydrophobic Backbone and Hydrophilic Side Chains
Polymers may Consist of Alternating Hydrophilic and Hydrophobic Blocks
Polymeric Surfactants have Attractive Properties
Bibliography

13. SURFACTANT-POLYMER SYSTEMS

Polymers can Induce Surfactant Aggregation
Attractive Polymer-Surfactant Interactions Depend on both Polymer and Surfactant
Surfactant Association to Surface Active Polymers can be Strong
The Interaction between a Surfactant and a Surface Active Polymer is Analogous to Mixed Micelle Formation
Phase Behaviour of Polymer-Surfactant Mixtures Resembles that of Mixed Polymer Solutions
Phase Behaviour of Polymer-Surfactant Mixtures in Relation to Polymer-Polymer and Surfactant-Surfactant Mixtures
Polymers may Change the Phase Behaviour of Infinite Surfactant Self-Assemblies
There Are Many Technical Applications of Polymer-Surfactant Mixtures
DNA is Compacted by Cationic Surfactants, which gives Applications in Gene Therapy
Bibliography

14. SURFACTANT-PROTEIN MIXTURES

Proteins are Amphiphilic
Surfactant-Protein Interactions have a Broad Relevance
Surface Tension and Solubilization give Evidence for Surfactant Binding to Proteins
The Binding Isotherms are Complex
Protein-Surfactant Solutions may have High Viscosities
Protein-Surfactant Solutions may give rise to Phase Separation
Surfactants may Induce Denaturation of Proteins
Bibliography

15. AN INTRODUCTION TO THE RHEOLOGY OF POLYMER AND SURFACTANT SOLUTIONS

Rheology Deals with how Materials Respond to Deformation
The Viscosity Measures how a Simple Fluid Responds to Shear
The Presence of Particles Changes the Flow Pattern and the Viscosity
The Relationship between Intrinsic Viscosity and Molecular Mass can be Useful
The Rheology is often Complex
Viscoelasticity
The Rheological Behaviour of Surfactant and Polymer Solutions Shows an Enormous Variation: Some Further Examples
Bibliography

16. SURFACE TENSION AND ADSORPTION AT THE AIR-WATER INTERFACE

Surface Tension is due to Asymmetric Cohesive Forces at a Surface
Solutes Affect Surface Tension
Dynamic Surface Tension is Important
The Surface Tension is Related to Adsorption
Surfactant Adsorption at the Liquid-Air Surface is Related to the Critical Packing Parameter
Polymer Adsorption can be Misinterpreted
Measurement of Surface Tension
The Surface and Interfacial Tensions can be Understood in Terms of Molecular Interactions
Surface Tension and Adsorption can be Understood in Terms of the Regular Solution Theory
Bibliography

17. ADSORPTION OF SURFACTANTS AT SOLID SURFACES

Surfactant Adsorption is Governed both by the Nature of the Surfactant and the Surface
Model Surfaces and Methods to Determine Adsorption
Analysis of Surfactant Adsorption is Frequently Carried out in Terms of the Langmuir Equation

Surfactants Adsorb on Hydrophobic Surfaces
Surfactants Adsorb on Hydrophilic Surfaces
Competitive Adsorption is a Common Phenomenon
Bibliography

18. WETTING AND WETTING AGENTS, HYDROPHOBIZATION AND HYDROPHOBIZING AGENTS

Liquids Spread at Interfaces
The Critical Surface Tension of a Solid is a Useful Concept
The Critical Surface Tension can be Applied to Coatings
Surface Active Agents can Promote or Prevent Wetting and Spreading
Measuring Contact Angles
Bibliography

19. INTERACTION OF POLYMERS WITH SURFACES

The Adsorbed Amount Depends on Polymer Molecular Weight
The Solvent has a Profound Influence on the Adsorption
Electrostatic Interactions Affect the Adsorption
Polyelectrolyte Adsorption can be Modelled Theoretically
Polyelectrolytes Change the Double-Layer Repulsion
Polymer Adsorption is Practically Irreversible
The Acid-Base Concept can be Applied to Polymer Adsorption
Measurement of Polymer Adsorption
Bibliography

20. FOAMING OF SURFACTANT SOLUTIONS

There are Transient Foams and Stable Foams
Two Conditions must be Fulfilled for a Foam to be Formed
There are Four Forces Acting on a Foam
The Critical Packing Parameter Concept is a Useful Tool
Polymers might Increase or Decrease Foam Stability
Particles and Proteins can Stabilize Foams
Various Additives are Used to Break Foams
Bibliography

21. EMULSIONS AND EMULSIFIERS

Emulsions are Dispersions of One Liquid in Another
Emulsions can be Very Concentrated
Emulsions can Break Down According to Different Mechanisms
The Emulsion Droplets Need a Potential Energy Barrier
The DVLO Theory is a Cornerstone in the Understanding of Emulsion Stability
Emulsifiers are Surfactants that Assist in Creating an Emulsion
The HLB Concept
The HLB Method of Selecting an Emulsifier is Crude but Simple
The PIT Concept
The PIT Method of Selecting an Emulsifier is often Useful
Different Types of Non-Ionic Surfactants can be Used as Emulsifiers
Bancroft's Rule may be Explained by Adsorption Dynamics of the Surfactant
Bancroft's Rule may be Related to the Surfactant Geometry
Hydrodynamics may Control what Type of Emulsion will Form
Bibliography

22. MICROEMULSIONS FOR SOIL AND OIL REMOVAL

Surfactant-Based Cleaning Formulations may act by in situ Formation of a Microemulsion (Detergency)
Microemulsion-Based Cleaning Formulations are Efficient
Microemulsions were once Believed to be the Solution to Enhanced Oil Recovery
Bibliography

23. CHEMICAL REACTIONS IN MICROHETEROGENEOUS SYSTEMS

Microemulsions can be used as Minireactors for Chemical Reactions
Surface Active Reagents may be Subject to Micellar Catalysis
Microemulsions are Good Solvents for Organic Synthesis
Microemulsions are Useful as Media for Enzymatic Reactions
Microemulsions can be Used to Prepare Nanosized Lattices
Nanosized Inorganic Particles can be Prepared in Microemulsions

Mesoporous Materials can be Prepared from Surfactant Liquid Crystals
Bibliography

Appendices
Index

Reviews - Synopsis - Dust Jacket

A unique book which discusses the solution chemistry of surfactants and polymers, presenting both the theory of surfactant and polymer interactions and also giving practical help for workers in this area.

Surfactants are used together with polymers in a wide range of applications such as detergents, paints, paper coatings, food, pharmacy and cosmetics. Together the surfactant and polymer provide the stability, rheology, etc., needed for specific application. Hence the need for knowledge about physicochemical properties of both surfactants and polymers and polymer-surfactant interactions, to enhance formulation work. This book, based on successful courses run by the authors, brings the two topics together to enable readers to gain a good understanding of the solution behaviour of surfactant-polymer combinations.

It includes a thorough description of surfactant types, including their main synthetic routes, and discusses physicochemical phenomena such as self-assembly, adsorption, gel formation and foaming. Particular attention is paid to the solution behaviour of surfactants and polymers containing polyoxyethylene chains. Surface-active polymers are then presented and their interaction with surfactants is a core topic of the book. The choice of surfactant for emulsions and microemulsions is treated in depth and important applications of microemulsions, such as detergency and enhanced oil recovered are presented.

This book will be invaluable for scientists and engineers involved in surfactant production and formulation as well as students.

FROM THE DUST JACKET:

Many industrial formulations such as detergents, paints, foodstuff and cosmetics contain both surfactants and polymers and their interaction governs many of the properties. This book is unique in that it discusses the solution chemistry of both surfactants and polymers and also the interactions between the two. The book, which is based on successful courses given by the authors since 1992, is a revised and extended version of the first edition that became a market success with six reprints since 1998. *Surfactants and Polymers in Aqueous Solution* is broad in scope, providing both theoretical insights and practical help for those active in the area.

This book contains a thorough discussion of surfactant types and gives information of main routes of preparation. A chapter on novel surfactants has been included in the new edition. Physicochemical phenomena such as self-assembly in solution, adsorption, gel formation and foaming are discussed in detail. Particular attention is paid to the solution behaviour of surfactants and polymers containing polyoxyethylene chains. Surface active polymers are presented and their interaction with surfactants is a core topic of the book. Protein-surfactant interaction is also important and a new chapter deals with this issue. Microemulsions are treated in depth and several important applications such as detergency and their use as media for chemical reactions are presented. Emulsions and the choice of emulsifier is discussed in some detail. The new edition also contains chapters on rheology and wetting.

PREFACE TO THE SECOND EDITION

The basic concept behind '*Surfactants and Polymers in Aqueous Solution*', i.e. to combine in one book the physicochemical behaviours of both surfactants and water-soluble polymers, has evidently been attractive. The first edition of this book has sold well and has found a place as a course book at universities and as a reference book for researchers in the area. We, ourselves, use it extensively in our own teaching and research and receive constant feedback from course participants and from research colleagues. The additions and revisions made in this new edition of '*Surfactants and Polymers in Aqueous Solution*' are based on suggestions that we have obtained through these years and also from our own ambition to keep the content up-to-date with respect to recent developments in the field.

The interaction between surfactants and polymers is a core topic of the book and constituted one chapter in the previous edition. Surfactant-protein interaction is a related theme of major importance in the life sciences area and one new chapter now deals with this issue. Rheology related to the behaviour of amphiphiles in solution is a subject of practical interest in many areas. This issue was only marginally covered in the first edition but is now the topic of a complete chapter.

Surfactants are widely used as wetting agents and we have received many comments on the fact that the first edition did not cover this aspect. A chapter treating both the wetting of a liquid on another liquid and on a solid, and also discussing the role of the wetting agent, has now been included.

In order to keep up with recent developments in the surfactant area, a contribution on novel surfactants has now been added. This chapter includes polymerizable surfactants, which were also covered in the first edition, but now contains, in addition, new sections on gemini surfactants and cleavable surfactants.

All of the chapters from the first edition that reappear in this second volume have been fully up-dated and revised. In most of these, new material has been added, usually describing the results obtained from recent research. A section on the dermatological aspects of surfactants has been included in the general chapter on surfactants. The chapter dealing with polymers in solution has been extended to include a section which describes different types of water-soluble polymers. In the chapter on interaction of polymers with surfaces the polyelectrolyte adsorption has been restructured. Within the chapter that deals with emulsifiers a general treatment of emulsions has been included, while in the chapter discussing chemical reactions in microheterogeneous media a section has been added on mesoporous materials made via surfactant self-assembly.

Finally, mistakes and indistinct descriptions in the first edition that have been brought to our attention have been taken care of. We believe that this second edition is a more complete and a more coherent book than the first edition. However, we also realize that there is still a long way to go until the book is 'perfect' and therefore encourage comments and suggestions for further improvements.

Title	Location	Edition / Series / Misc.
933 Surfactants and Polymers in Aqueous Solution		Edition: 2nd edition
Author: Holmberg, I. Krister, Bo Jonsson, Bengt Kronberg and Bjorn Lindman	Dynix: 105703	Series:
Publish.: John Wiley & Sons, Ltd.	Call No.: 668 Su	
- place: Chichester, [West Sussex], UK	ISBN: 0471498831	
- date: ©2003	Shelf Adult Non-Fiction	Year: 2003
Subject: Surface active agents		Price: \$111.50
Desc: xvi, 545 p., illus., 24 cm.		

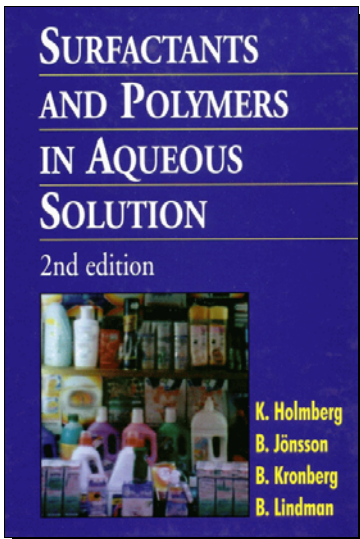


Table of Contents

Preface to the second edition
 Preface to the first edition

1. INTRODUCTION TO SURFACTANTS
 Surfactants Adsorb at Interfaces
 Surfactants Aggregate in Solution
 Surfactants are Amphiphilic
 Surface Active Compounds are Plentiful in Nature
 Surfactant Raw Materials May be Based on Petrochemicals or Oleochemicals
 Surfactants are Classified by the Polar Head Group
 Dermatological Aspects of Surfactants are Vital Issues
 The Ecological Impact of Surfactants is of Growing Importance
 The Rate of Biodegradation Depends on Surfactant Structure
 Environmental Concern is a Strong Driving Force for Surfactant Development
 Bibliography

2. SURFACTANT MICELLIZATION
 Different Amphiphile Systems
 Surfactants Start to Form Micelles at the CMC
 CMC Depends on Chemical Structure
 Temperature and Cosolutes Affect the CMC
 The Solubility of Surfactants may be Strongly Temperature Dependent
 Driving Forces of Micelle Formation and Thermodynamic Models
 The Association Process and Counterion Binding can be Monitored by NMR Spectroscopy
 Hydrophobic Compounds can be Solubilized in Micelles
 Micelle Size and Structure may Vary
 A Geometric Consideration of Chain Packing is Useful
 Kinetics of Micelle Formation
 Surfactants may Form Aggregates in Solvents other than Water
 General Comments on Amphiphile Self-Assembly
 Bibliography

3. PHASE BEHAVIOUR OF CONCENTRATED SURFACTANT SYSTEMS
 Micelle Type and Size Vary with Concentration
 Micellar Growth is Different for Different Systems
 Surfactant Phases are Built Up by Discrete or Infinite Self-Assemblies
 Micellar Solutions can Reach Saturation
 Structures of Liquid Crystalline Phases
 How to Determine Phase Diagrams
 Binary and Ternary Phase Diagrams are Useful Tools: Two Components
 Binary and Ternary Phase Diagrams are Useful Tools: Three Components
 Surfactant Geometry and Packing Determine Aggregate
 Structure: Packing Parameter and Spontaneous Curvature of the Surfactant Film are Useful Concepts
 Polar Lipids Show the same Phase Behaviour as other Amphiphiles
 Liquid Crystalline Phases may Form in Solvents other than Water
 Bibliography

4. PHYSICO-CHEMICAL PROPERTIES OF SURFACTANTS AND POLYMERS CONTAINING OXYETHYLENE GROUPS
 Polyoxyethylene Chains make up the Hydrophilic Part of many Surfactants and Polymers
 CMC and Micellar Size of Polyoxyethylene-Based Surfactants are Strongly Temperature Dependent

Subjects

313 .	Polymers
329 .	Solution (Chemistry)
332 .	Surface active agents

Temperature Dependence can be Studied using Phase Diagrams
The L3 or 'Sponge' Phase
Sequence of Self-Assembly Structures as a Function of Temperature
The Critical Packing Parameter and the Spontaneous Curvature Concepts are Useful Tools
Clouding is a Characteristic Feature of Polyoxyethylene-Based Surfactants and Polymers
Physicochemical Properties of Block Copolymers Containing Polyoxethylene Segments Resemble those of
Polyoxyethylene-Based Surfactants
Temperature Anomalies of Oxyethylene-Based Surfactants and Polymers are Ubiquitous
Temperature Anomalies are Present in Solvents other than Water
Bibliography

5. MIXED MICELLES

Systems of Surfactants with Similar Head Groups Require no Net Interaction
General Treatment of Surfactants Mixtures Requires a Net interaction
The Concept of Mixed Micelles can also be Applied to Amphiphiles not Forming Micelles
Mixed Surfactant Systems at Higher Concentrations Show Interesting Features
Mixed Surfactant Systems are used Technically
Appendix
Bibliography

6. MICROEMULSIONS

The Term Microemulsion is Misleading
Phase Behaviour of Oil-Water-Surfactant Systems can be Illustrated by Phase Diagrams
The Choice of Surfactant is Decisive
Ternary Phase Diagrams can be Complex
How to Approach Microstructure?
Molecular Self-Diffusion can be Measured
Confinement, Obstruction and Solvation Determine Solvent Self-Diffusion in Microemulsions
Self-Diffusion Gives Evidence for a Bicontinuous Structure at Balanced Conditions
The Microstructure is Governed by Surfactant Properties
Bibliography

7. INTERMOLECULAR INTERACTIONS

Pair Potentials Act between Two Molecules in a Vacuum
The Intermolecular Interaction can be Partitioned
Effective Pair Potentials Act between Two Molecules in a Medium
Bibliography

8. COLLOIDAL FORCES

Electric Double-Layer Forces are Important for Colloidal Stability
Other Types of Forces Exist
Colloidal Forces can be Measured Directly
Bibliography

9. POLYMERS IN SOLUTION

Polymer Properties are Governed by the Choice of Monomers
The Molecular Weight is an Important Parameter
Dissolving a Polymer can be a Problem
Polymers in Solution can be Characterized by Viscosity Measurements
Polymer Solutions may Undergo Phase Separation
Polymers Containing Oxyethylene Groups Phase-Separate Upon Heating in Aqueous Systems
Solvents and Surfactants have Large Effects on Polymer Solutions
The Solubility Parameter Concept is a Useful Tool for Finding the Right Solvent for a Polymer
The Theta Temperature is of Fundamental Importance
There are Various Classes of Water-Soluble Polymers
Polyelectrolytes are Charged Polymers
Polymer Configurations Depend on Solvent Conditions
Bibliography

10. REGULAR SOLUTION THEORY

Bragg-Williams Theory Describes Non-ideal Mixtures
Flory-Huggins Theory Describes the Phase Behaviour of Polymer Solutions
Bibliography

11. NOVEL SURFACTANTS

Gemini Surfactants have an Unusual Structure
Cleavable Surfactants are Environmentally Attractive but are of Interest for other Reasons as well
Polymerizable Surfactants are of Particular Interest for Coatings Applications
Polymeric Surfactants Constitute a Chapter of their Own
Special Surfactants Give Extreme Surface Tension Reduction
Bibliography

12. SURFACE ACTIVE POLYMERS

Surface Active Polymers can be Designed in Different Ways
Polymers may have a Hydrophilic Backbone and Hydrophobic Side Chains
Polymers may have a Hydrophobic Backbone and Hydrophilic Side Chains
Polymers may Consist of Alternating Hydrophilic and Hydrophobic Blocks
Polymeric Surfactants have Attractive Properties
Bibliography

13. SURFACTANT-POLYMER SYSTEMS

Polymers can Induce Surfactant Aggregation
Attractive Polymer—Surfactant Interactions Depend on both Polymer and Surfactant
Surfactant Association to Surface Active Polymers can be Strong
The Interaction between a Surfactant and a Surface Active Polymer is Analogous to Mixed Micelle Formation
Phase Behaviour of Polymer-Surfactant Mixtures Resembles that of Mixed Polymer Solutions
Phase Behaviour of Polymer-Surfactant Mixtures in Relation to Polymer-Polymer and Surfactant-Surfactant Mixtures
Polymers may Change the Phase Behaviour of Infinite Surfactant Self-Assemblies
There Are Many Technical Applications of Polymer-Surfactant Mixtures
DNA is Compacted by Cationic Surfactants, which gives Applications in Gene Therapy
Bibliography

14. SURFACTANT-PROTEIN MIXTURES

Proteins are Amphiphilic
Surfactant-Protein Interactions have a Broad Relevance
Surface Tension and Solubilization give Evidence for Surfactant Binding to Proteins
The Binding Isotherms are Complex
Protein Solutions may have High Viscosities
Protein-Surfactant Solutions may give rise to Phase Separation
Surfactants may Induce Denaturation of Proteins
Bibliography

15. AN INTRODUCTION TO THE RHEOLOGY OF POLYMER AND SURFACTANT SOLUTIONS

Rheology Deals with how Materials Respond to Deformation
The Viscosity Measures how a Simple Fluid Responds to Shear
The Presence of Particles Changes the Flow Pattern and the Viscosity
The Relationship between Intrinsic Viscosity and Molecular Mass can be Useful
The Rheology is often Complex
Viscoelasticity
The Rheological Behaviour of Surfactant and Polymer Solutions Shows an Enormous Variation: Some Further Examples
Bibliography

16. SURFACE TENSION AND ADSORPTION AT THE AIR-WATER INTERFACE

Surface Tension is due to Asymmetric Cohesive Forces at a Surface
Solutes Affect Surface Tension
Dynamic Surface Tension is Important
The Surface Tension is Related to Adsorption
Surfactant Adsorption at the Liquid-Air Surface is Related to the Critical Packing Parameter
Polymer Adsorption can be Misinterpreted
Measurement of Surface Tension
The Surface and Interfacial Tensions can be Understood in Terms of Molecular Interactions
Surface Tension and Adsorption can be Understood in Terms of the Regular Solution Theory
Bibliography

17. ADSORPTION OF SURFACTANTS AT SOLID SURFACES

Surfactant Adsorption is Governed both by the Nature of the Surfactant and the Surface

Model Surfaces and Methods to Determine Adsorption
Analysis of Surfactant Adsorption is Frequently Carried out in Terms of the Langmuir Equation
Surfactants Adsorb on Hydrophobic Surfaces
Surfactants Adsorb on Hydrophilic Surfaces
Competitive Adsorption is a Common Phenomenon
Bibliography

18. WETTING AND WETTING AGENTS, HYDROPHOBIZATION AND HYDROPHOBIZING AGENTS

Liquids Spread at Interfaces
The Critical Surface Tension of a Solid is a Useful Concept
The Critical Surface Tension can be Applied to Coatings
Surface Active Agents can Promote or Prevent Wetting and Spreading
Measuring Contact Angles
Bibliography

19. INTERACTION OF POLYMERS WITH SURFACES

The Adsorbed Amount is on Polymer Molecular Weight
The Solvent has a Profound Influence on the Adsorption
Electrostatic Interactions Affect the Adsorption
Polyelectrolyte Adsorption can be Modelled Theoretically
Polyelectrolytes Change the Double-Layer Repulsion
Polymer Adsorption is Practically Irreversible
The Acid-Base Concept can be Applied to Polymer Adsorption
Measurement of Polymer Adsorption
Bibliography

20. FOAMING OF SURFACTANT SOLUTIONS

There are Transient Foams and Stable Foams
Two Conditions must be Fulfilled for a Foam to be Formed
There are Four Forces Acting on a Foam
The Critical Packing Parameter Concept is a Useful Tool
Polymers might Increase or Decrease Foam Stability
Particles and Proteins can Stabilize Foams
Various Additives are Used to Break Foams
Bibliography

21. EMULSIONS AND EMULSIFIERS

Emulsions are Dispersions of One Liquid in Another
Emulsions can be Very Concentrated
Emulsions can Break Down According to Different Mechanisms
The Emulsion Droplets Need a Potential Energy Barrier
The DVLO Theory is a Cornerstone in the Understanding of Emulsion Stability
Emulsifiers are Surfactants that Assist in Creating an Emulsion
The HLB Concept
The HLB Method of Selecting an Emulsifier is Crude but Simple
The PIT Concept
The PIT Method of Selecting an Emulsifier is often Useful Different Types of Non-Ionic Surfactants can be Used as Emulsifiers
Bancroft's Rule may be Explained by Adsorption Dynamics of the Surfactant
Bancroft's Rule may be Related to the Surfactant Geometry
Hydrodynamics may Control what Type of Emulsion will Form
Bibliography

22. MICROEMULSIONS FOR SOIL AND OIL REMOVAL

Surfactant-Based Cleaning Formulations may act by in situ Formation of a Microemulsion (Detergency)
Microemulsion-Based Cleaning Formulations are Efficient Microemulsions were once Believed to be the Solution to Enhanced Oil Recovery
Bibliography

23. CHEMICAL REACTIONS IN MICROHETEROGENEOUS SYSTEMS

Microemulsions can be used as Minireactors for Chemical Reactions
Surface Active Reagents may be Subject to Micellar Catalysis
Microemulsions are Good Solvents for Organic Synthesis
Microemulsions are Useful as Media for Enzymatic Reactions

Microemulsions can be Used to Prepare Nanosized Lattices
Nanosized Inorganic Particles can be Prepared in Microemulsions
Mesoporous Materials can be Prepared from Surfactant Liquid Crystals
Bibliography

Appendices
Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Many industrial formulations such as detergents, paints, foodstuff and cosmetics contain both surfactants and polymers and their interaction governs many of the properties. This book is unique in that it discusses the solution chemistry of both surfactants and polymers and also the interactions between the two. The book, which is based on successful courses given by the authors since 1992, is a revised and extended version of the first edition that became a market success with six reprints since 1998. "Surfactants and Polymers in Aqueous Solution" is broad in scope, providing both theoretical insights and practical help for those active in the area.

This book contains a thorough discussion of surfactant types and gives information of main routes of preparation. A chapter on novel surfactants has been included in the new edition. Physicochemical phenomena such as self-assembly in solution, adsorption, gel formation and foaming are discussed in detail. Particular attention is paid to the solution behaviour of surfactants and polymers containing polyoxyethylene chains. Surface active polymers are presented and their interaction with surfactants is a core topic of the book. Protein-surfactant interaction is also important and a new chapter deals with this issue. Microemulsions are treated in depth and several important applications such as detergency and their use as media for chemical reactions are presented. Emulsions and the choice of emulsifier are discussed in some detail. The new edition also contains chapters on rheology and wetting.

"Surfactants and Polymers in Aqueous Solution" is aimed at those dealing with surface chemistry research at universities and with surfactant formulation in industry.

PREFACE TO THE SECOND EDITION:

The basic concept behind "Surfactants and Polymers in Aqueous Solution", i.e. to combine in one book the physicochemical behaviours of both surfactants and water-soluble polymers, has evidently been attractive. The first edition of this book has sold well and has found a place as a course book at universities and as a reference book for researchers in the area. We, ourselves, use it extensively in our own teaching and research and receive constant feedback from course participants and from research colleagues. The additions and revisions made in this new edition of 'Surfactants and Polymers in Aqueous Solution' are based on suggestions that we have obtained through these years and also from our own ambition to keep the content up-to-date with respect to recent developments in the field.

The interaction between surfactants and polymers is a core topic of the book and constituted one chapter in the previous edition. Surfactant—protein interaction is a related theme of major importance in the life sciences area and one new chapter now deals with this issue. Rheology related to the behaviour of amphiphiles in solution is a subject of practical interest in many areas. This issue was only marginally covered in the first edition but is now the topic of a complete chapter.

Surfactants are widely used as wetting agents and we have received many comments on the fact that the first edition did not cover this aspect. A chapter treating both the wetting of a liquid on another liquid and on a solid, and also discussing the role of the wetting agent, has now been included.

In order to keep up with recent developments in the surfactant area, a contribution on novel surfactants has now been added. This chapter includes polymerizable surfactants, which were also covered in the first edition, but now contains, in addition, new sections on gemini surfactants and cleavable surfactants.

All of the chapters from the first edition that reappear in this second volume have been fully up-dated and revised. In most of these, new material has been added, usually describing the results obtained from recent research. A section on the dermatological aspects of surfactants has been included in the general chapter on surfactants. The chapter dealing with polymers in solution has been extended to include a section which describes different types of water-soluble polymers. In the chapter on interaction of polymers with surfaces the polyelectrolyte adsorption has been restructured. Within the chapter that deals with emulsifiers a general treatment of emulsions has been included, while in the chapter discussing chemical reactions in microheterogeneous media a section has been added on mesoporous materials made via surfactant self-assembly.

Finally, mistakes and indistinct descriptions in the first edition that have been brought to our attention have been taken care of. We believe that this second edition is a more complete and a more coherent book than the first edition.

However, we also realize that there is still a long way to go until the book is 'perfect' and therefore encourage comments and suggestions for further improvements.

Title	Location	Edition / Series / Misc.
1510 Surfactants in Polymers, Coatings, Inks, and Adhesives		Edition:
Author: Karsa, David R. (editor)	Dynix: 111654	Series: Applied Surfactant Series: Vol. 1
Publish.: Blackwell Publishing / CRC (Chemical Rubber Company) Press	Call No.: 668 Su	
- place: Oxford, England / Boca Raton, FL	ISBN: 084932808X	
- date: ©2003	Shelf Adult Non-Fiction	Year: 2003
Subject: Surface active agents		Price: \$135.00
Desc: xi, 306 p., illus., 24 cm.		

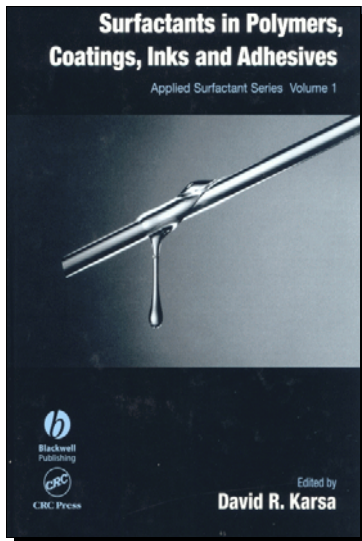


Table of Contents

Preface
List of contributors

1. Surfactants and emulsion polymerization: an industrial perspective
 - 1.1 Introduction
 - 1.2 Commercial polymers
 - 1.3 The industrial process
 - 1.3.1 Batch process
 - 1.3.2 Semi-batch process
 - 1.3.3 Continuous processes
 - 1.4 Surfactants and polymers
 - 1.4.1 Particle size control
 - 1.4.2 Stabilization of particles
 - 1.5 Industrial applications
 - 1.5.1 General properties
 - 1.5.1.1 Water resistance
 - 1.5.1.2 Foam
 - 1.5.1.3 Filler compatibility
 - 1.5.2 Adhesives
 - 1.5.2.1 General adhesives
 - 1.5.2.2 Pressure-sensitive adhesives (PSAs)
 - 1.5.3 Construction
 - 1.5.3.1 Caulks/sealants
 - 1.5.3.2 Bitumen modification
 - 1.5.4 Paper coatings
 - 1.5.4.1 Bonded paper
 - 1.5.5 Printing applications
 - 1.5.6 Paint
 - 1.5.7 Dipping
 - 1.5.8 Non-woven fabrics
 - 1.5.9 Textile applications
 - 1.5.10 Synthetic rubber
 - 1.5.11 Carpets
 - 1.5.12 Thickeners
 - 1.5.13 Structured particles
 - 1.6 Choice of surfactant
 - 1.7 Types of surfactant
 - 1.7.1 Alkyl sulfates
 - 1.7.2 Alkyl aryl sulfonates
 - 1.7.3 Mono- and diester sulfosuccinates
 - 1.7.4 Carboxylates
 - 1.7.5 Non-ionic surfactants
 - 1.8 Conclusion
- References
2. The role of emulsifiers in the kinetics and mechanisms of emulsion polymerization
 - 2.1 Introduction
 - 2.1.1 Emulsion polymerization
 - 2.1.2 Emulsifiers
 - 2.2 Emulsifiers and emulsion polymerization
 - 2.2.1 History

Subjects

332 .	Surface active agents
503 .	Surfactants

- 2.2.2 General remarks
 - 2.2.3 Solubilization
 - 2.2.4 Stabilization
 - 2.2.5 Sustainability
 - 2.2.6 Suitability and support
 - References
3. Polymerizable surfactants (surfmers) for emulsion polymerization production
- 3.1 Introduction
 - 3.2 Maleic and related surfmers
 - 3.2.1 Synthesis and characterization
 - 3.2.1.1 Procedure
 - 3.2.1.2 Characterization
 - 3.2.2 Applications in emulsion polymerization
 - 3.2.2.1 Simple hemiesters and hemiamides
 - 3.2.2.2 Hemiesters derivatives
 - 3.2.2.3 Bifunctional derivatives of maleic surfmers
 - 3.2.3 Commercial exploitation of maleic surfmers
 - 3.3 Non-ionic block copolymers of oxiranes
 - 3.3.1 Synthesis and characterization
 - 3.3.1.1 From commercial polyethylene glycol monomethyl ether
 - 3.3.1.2 From a two-step ring-opening polymerisation
 - 3.3.2 Behaviour in heterophase polymerisations
 - 3.3.3 Commercial exploitation
 - 3.4 Conclusion
 - References
4. Uses of anti-foaming agents in paints and surface coatings
- 4.1 Introduction
 - 4.2 Theory of foam and foam control
 - 4.2.1 Physicochemical fundamentals of surfaces with regard to foam and defoaming
 - 4.2.2 Theory of foam inhibition and foam destruction
 - 4.2.3 Mechanical defoaming
 - 4.3 Compositions of defoamers
 - 4.3.1 Mineral oil defoamers
 - 4.3.2 Emulsion defoamers
 - 4.3.3 Powder defoamers
 - 4.3.4 Silicone-based defoamers
 - 4.3.5 Block copolymer defoamers
 - 4.4 Defoamers for coatings, inks and polymerization
 - 4.4.1 Defoamers in polymerization
 - 4.4.2 Defoamers in paint and ink manufacture
 - 4.4.3 Defoamers in paint and ink application
 - 4.4.3.1 Defoamers in water-based architectural paints and in construction materials
 - 4.4.3.2 Re-dispersible powder paints
 - 4.4.3.3 High-gloss paints
 - 4.4.3.4 Aqueous wood coatings
 - 4.4.3.5 Industrial coatings
 - 4.4.3.6 Automotive coatings
 - 4.4.3.7 Radiation curing systems
 - 4.4.3.8 Inks
 - 4.4.3.9 Defoamers in paper coating
 - 4.4.2 Defoamers in paint and ink manufacture
 - 4.5 Defoamer testing and selection
 - References
5. Applications of oligomeric surfactants in polymer systems
- 5.1 Introduction
 - 5.2 Coatings
 - 5.2.1 Wetting
 - 5.2.2 Dispersing
 - 5.2.3 Aqueous systems
 - 5.2.4 Foaming/defoaming
 - 5.2.5 Developments in water-based surfactants
 - 5.2.6 Non-aqueous coatings

- 5.2.7 Tinting systems
 - 5.2.7.1 Aqueous-based universal tinters
 - 5.2.7.2 Aqueous multi-compatible tinters
 - 5.2.7.3 Non-aqueous multi-media tinters
- 5.2.8 Radiation-cured coatings
- 5.3 Effect surfactants
 - 5.3.1 Acetylenediols
 - 5.3.2 Fluoro surfactants
 - 5.3.3 Silicones
- 5.4 Plastic and polymer systems
 - 5.4.1 Emulsion polymerization
 - 5.4.1.1 Coatings
 - 5.4.1.2 Polishes
 - 5.4.1.3 Adhesives
 - 5.4.2 Inverse emulsion polymerization
 - 5.4.3 Siloxanes in polymer systems
 - 5.4.4 Antistatic agents
 - 5.4.5 Thermoset composite systems
 - 5.4.6 Plastics
- Acknowledgements
- References
- 6. Applications of surfactants in paints
 - 6.1 Introduction
 - 6.2 Surfactants as dispersant for the pigment
 - 6.2.1 Pigment properties
 - 6.2.2 Dispersants for waterborne formulations
 - 6.2.3 Dispersants for solvent-borne formulations
 - 6.3 Surfactants as emulsifiers for the binder
 - 6.3.1 Binders made by emulsion polymerization
 - 6.3.2 Post-emulsified binders
 - 6.4 Surfactants as wetting agents
 - 6.4.1 Effect of the critical surface tension
 - 6.4.2 The wetting agent
 - 6.5 Surfactants as antifoaming agents
 - 6.6 Rheology control agents
 - 6.7 Effect of surfactants in the dry film
 - References
- 7. Surfactant-waterborne polymer interactions in coating applications
 - 7.1 Introduction
 - 7.2 Interaction in dilute solutions
 - 7.2.1 General aspects
 - 7.2.2 Non-ionic polymers and non-ionic surfactants
 - 7.2.3 Non-ionic polymers and ionic surfactants
 - 7.2.4 Oppositely charged polymers and surfactants
 - 7.2.5 Hydrophobically modified polymers and non-ionic and ionic surfactants
 - 7.3 Interaction in concentrated solutions
 - 7.4 Interaction at interfaces
 - 7.4.1 Surfactant adsorption
 - 7.4.2 Polymer adsorption
 - 7.5 Competitive adsorption of polymers and surfactants on surfaces
 - 7.6 Conclusion
 - References
- 8. Surfactants in ink-jet inks
 - 8.1 Introduction
 - 8.2 Properties of surfactants
 - 8.3 Dynamic surface tension
 - 8.4 Micellization
 - 8.5 The theory of surfactant-induced wetting
 - 8.6 Ink-jet printing
 - 8.7 Ink formulations
 - 8.8 Selected groups of performance surfactants

- 8.8.1 Gemini surfactants
- 8.8.2 Fluorinated surfactants
- 8.8.3 Polymerizable surfactants
- 8.8.4 Polymeric surfactants
- 8.8.5 Silicone surfactants
- 8.8.6 Alkylxypropylamines
- 8.8.7 Phospholipids
- 8.8.8 2-Alkylimidazolines
- 8.8.9 Polyamines
- Notes
- Acknowledgements
- References
- 9. Process aids and additives for latexes and thermoplastics
 - 9.1 PVC plastisols
 - 9.1.1 Plastisol manufacturing processes
 - 9.1.1.1 Spread coating
 - 9.1.1.2 Reverse roll coating
 - 9.1.1.3 Screen coating
 - 9.1.1.4 Coil coating
 - 9.1.1.5 Spraying
 - 9.1.1.6 Dipping
 - 9.1.1.7 Moulding
 - 9.1.1.8 Mechanical foaming
 - 9.1.2 Plastisol additives
 - 9.1.2.1 Viscosity modifiers
 - 9.1.2.2 Antistatic agents
 - 9.1.3 Wetting and dispersing agents
 - 9.1.4 Foaming agents
 - 9.1.5 Heat stabilizers
 - 9.1.5.1 Organotin stabilizers
 - 9.1.5.2 Liquid mixed metal soap stabilizers
 - 9.1.5.3 Kicker stabilizers
 - 9.1.5.4 Solid and paste stabilizers
 - 9.1.6 Epoxy co-stabilizers
 - 9.1.7 Textile bonding agents
 - 9.1.8 Microbiocides
 - 9.1.9 Deaeration agents
 - 9.2 Foaming agents for water-based polymers
 - 9.2.1 Foamed latex carpet backings
 - 9.2.1.1 Foaming agents
 - 9.2.1.2 Typical no-gel compound formulations
 - 9.2.2 Foamed anchor coats
 - 9.2.2.1 Wetting agents
 - 9.2.2.2 Surfactants to reduce process odors from 'cure' chemicals
 - 9.2.3 Foamed polymer coatings for curtaining and upholstery
 - 9.2.3.1 Foam production
 - 9.2.3.2 Foam application
 - 9.2.3.3 Typical formulations
 - 9.3 Foam control agents
 - 9.3.1 Foam formation
 - 9.3.2 Foam control using a defoamer
 - 9.3.3 Foam control using an antifoam
 - 9.3.4 The composition of foam control agents Acknowledgements
- 10. The role of surfactants in phosphate conversion coatings
 - 10.1 Introduction
 - 10.1.1 Chemistry of phosphating
 - 10.1.2 Applications
 - 10.1.3 Developments and implications
 - 10.2 Surfactants in phosphating
 - 10.3 Effect of surfactants on phosphate film epitaxy
 - 10.4 Effect of long-chain amines on phosphate coating weight
 - 10.5 Effect of long-chain amines on the properties of phosphate coatings

10.6 Effect of long-chain amines on the corrosion resistance of phosphate coatings
10.7 Conclusion
Acknowledgements
References

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Surface active agents are used as process aids in the production of polymers — as additives to modify polymer properties — and in the formulation and further processing of polymeric systems for a variety of applications. In all these uses, surfactants are employed as 'effect chemicals', to impart specific performance characteristics or properties to the base polymer or enhance its performance when formulated for a specific end use.

This volume focuses on those surfactant areas incorporating the greatest number of supplier and user companies. Authors have been selected from leading industrial and academic laboratories around the world.

This is a book for surfactant researchers and for manufacturers and users of surfactants: in particular, surfactant chemists; analytical chemists; environmental chemists; users of surfactant formulations in the fields of specialty chemicals, polymers and detergents; and health and safety personnel.

PREFACE:

This is the first book in a new series focusing on major surfactant areas and issues.

The polymers, coatings, inks and adhesives sector accounts for approximately 8% of the global use of surfactants. Surfactants are used as process aids in the production of polymers, as additives to impart or modify polymer properties, and in the formulation and further processing of polymeric systems for a variety of applications. In all these applications, the surfactants are used as 'effect chemicals', to impart specific performance characteristics or properties to the base polymer or to enhance its performance when formulated for a specific end use.

Surfactants are used extensively in the production of water-based emulsion polymers. The surfactants act as emulsifiers to facilitate the reaction between monomers and free radical initiators in different phases, but they also stabilize the latex particles as they are formed. The finished polymer emulsions are used in applications such as paints, inks, adhesives and textile coatings, and in non-wovens.

In many of these end uses, residual surfactants may detract from the properties of the product concerned, e.g. poorer scrub resistance in an emulsion paint. Recent work has focused on the development of emulsifiers which themselves copolymerize into the polymer backbone as the emulsion polymer reaction progresses. These are the so-called 'surfmers'.

Surfactants are widely used in the processing and formulation of polymer and resin-based systems, whether as a foaming agent for cellular foam production (SBR, acrylics, etc.), as antistatic agents or as property modifiers in thermoplastics, especially PVC.

Surfactants may also be incorporated into polymers, coatings and adhesives to provide biocidal protection, anti-corrosive properties, better film wetting and the dispersal of other material within the polymer matrix. The latter include polymeric and oligomeric surfactants, which possess excellent dispersal properties and lack the often unwanted tendency to foam.

In many polymer applications, surfactants are used in combination with both natural and synthetic water-soluble polymers, to achieve optimum dispersion stability and/or rheological behavior. Surfactant—waterborne polymer interactions are currently being studied widely.

This book, directed at surfactant researchers and at manufacturers and users of surfactants, provides an introduction to the underlying chemistry and technology in these industrial areas, while at the same time highlighting important current developments.

INTRODUCTION:

Emulsion polymerization is one of the most common industrial manufacturing processes, with some 1.5 million tonnes of polymer produced per annum in Europe alone. If we assume, in the resulting polymer dispersions, a surfactant level of 0.5% on polymer weight, it can be seen that the polymerization industry is also an appreciable consumer of surfactants.

Generally, the polymer manufacturer would prefer to omit surfactants, which are usually more expensive than the monomers and can have deleterious effects on the properties of the final polymer. This chapter sets out to show how and why emulsion polymer manufacturers overcome their inhibitions over surfactant use and to discuss some of the factors relevant to the choice of surfactants and surfactant levels.

Emulsion polymerization is reviewed extensively in Chapter 2 and in books by Gilbert and Lovell and El-Aasser. This chapter makes no contribution to the theory of emulsion polymerization but concentrates on the practical aspects.

From an industrial viewpoint, the principal advantages of the emulsion polymerization process are rapid polymerization, low viscosities and the presence of a dispersing medium that permits better heat dissipation during manufacture. In addition, the final product is in a usable and relatively environmentally friendly form for direct supply to customers. For those end applications using solid polymer, the product may be coagulated or spray dried.

Title	Location	Edition / Series / Misc.
824 Surfactants: A Practical Handbook Author: Lange, K.Robert (editor) Publish.: Hanser Gardner Publications, Inc. - place: Cincinnati, OH - date: ©1999 Subject: Surface active agents Desc: xiii, 237 p., illus., 25 cm.	Dynix: 99424 Call No.: 668.1 Su ISBN: 1569902704 Shelf Adult Non-Fiction	Edition: Series: Year: 1999 Price: \$73.50

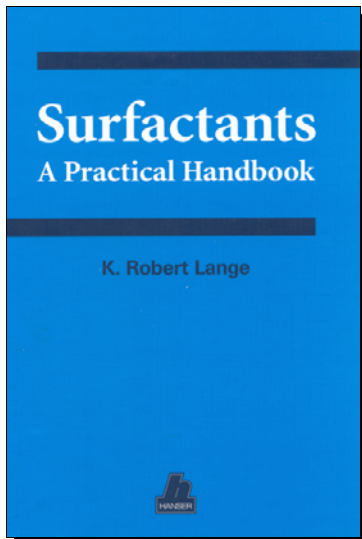


Table of Contents

Chapter 1: Characterization of Surfactants—John Texter, Consultant

- 1.1 Introduction
- 1.2 Classification of Surfactants
 - 1.2.1 Types
 - 1.2.2 Charge
 - 1.2.2.1 Anionic Surfactants
 - 1.2.2.2 Cationic Surfactants
 - 1.2.2.3 Zwitterionic Surfactants
 - 1.2.2.4 Non-ionic Surfactants
 - 1.2.3 Physical State
 - 1.2.3.1 Crystalline Surfactants
 - 1.2.3.2 Polymorphism
 - 1.2.3.3 Amorphous Solid
 - 1.2.3.4 Liquid Crystalline
 - 1.2.3.5 Liquid
 - 1.2.4 Hydrophile-Lipophile Balance (HLB)
 - 1.3 Properties in Aqueous Solution
 - 1.3.1 Packing in Aqueous Assemblies
 - 1.3.2 Critical Micelle Concentration
 - 1.3.2.1 Measurement of cmc
 - 1.3.2.2 cmc of Homologous Series
 - 1.3.2.3 Effect of Salt on cmc
 - 1.3.3 Solubility
 - 1.3.3.1 Kraft Point
 - 1.3.3.2 Cloud Point
 - 1.3.4 Binary Phase Diagrams
 - 1.3.4.1 Cubic Phases
 - 1.3.4.2 Hexagonal Phases
 - 1.3.4.3 Lamellar Phase
 - 1.3.4.4 Sponge Phase
 - 1.3.4.5 Binary Phase Diagram of Non-ionic Surfactants
 - 1.4 Micellization
 - 1.4.1 Normal and Reverse Micelles
 - 1.4.2 Thermodynamics of Micellization
 - 1.4.2.1 Aggregate Chemical Potential
 - 1.4.2.2 Aggregate Shape Effects
 - 1.4.3 Micelle Structure
 - 1.4.4 Solubilization
 - 1.4.5 Catalysis
 - 1.5 Adsorption from Solution
 - 1.5.1 Air-Water Interface
 - 1.5.1.1 Gibbs Adsorption
 - 1.5.1.2 Langmuir Trough Studies
 - 1.5.2 Liquid-Solid Interface
 - 1.5.2.1 Langmuir Adsorption isotherm
 - 1.5.2.2 Frumkin Adsorption Isotherm
 - 1.5.2.3 State of the Adsorbed Surfactant
 - 1.5.2.4 General Characteristics of Adsorption
 - 1.5.2.5 High Resolution Images of Micelles
 - 1.5.2.6 Dispersion Formation
 - 1.5.2.7 Photographic Chemistry incorporation

Subjects

332 . Surface active agents

- 1.5.3 Liquid-Liquid Interfaces
 - 1.5.3.1 Langmuir Trough Studies
 - 1.5.3.2 Second Harmonic Generation and Sum
- 1.5.4 Langmuir-Blodgett Films
- 1.6 Vesicles and Bilayers
 - 1.6.1 Prevalence of Bilayers
 - 1.6.2 Thin Films, Black Films
 - 1.6.3 Liposomes
 - 1.6.4 Other Vesicles
 - 1.6.4.1 Thermodynamically stable vesicles
 - 1.6.5 Encapsulation
 - 1.6.6 Compartmentalized Reactors
 - 1.7 Microemulsions
 - 1.7.1 Regular and Reverse Microemulsions
 - 1.7.2 Ternary and Quaternary Phase Diagrams
 - 1.7.2.1 Ternary Systems
 - 1.7.2.2 Quaternary Systems
 - 1.7.3 Isotropic Microstructure
 - 1.7.4 Enhanced Oil Recovery
 - 1.7.5 Microemulsion Polymerization
 - 1.7.6 Solubilization
 - 1.7.7 Precipitation
 - 1.7.7.1 Metal Colloids
 - 1.7.7.2 Semiconductor Nanoparticulates
 - 1.7.8 Transport
 - 1.7.8.1 Electrical Conductivity
 - 1.7.8.2 Redox Electron Transfer
 - 1.7.8.3 Molecular Self-Diffusion
 - 1.8 Emulsions
 - 1.8.1 Regular and Reverse Emulsions
 - 1.8.2 Emulsification
 - 1.8.3 Flocculation
 - 1.8.4 Coalescence
 - 1.8.4.1 Creaming
 - 1.8.5 Emulsion Polymerization
 - 1.8.6 Compartmentalized Chemistry
 - 1.8.6.1 Microencapsulation
 - 1.8.6.2 Drug Delivery
 - 1.9 Bibliographic Notes
 - References
 - Frequency
 - Methods

Chapter 2: Industrial Synthesis of Surfactants—Khalid Rasheed, Witco Corp.

- 2.1 Introduction
- 2.2 Industrial Synthesis of Raw Materials
 - 2.2.1 Fatty Acids
 - 2.2.2 Fatty Amines
 - 2.2.3 Low-Molecular Weight Amines
 - 2.2.4 Fatty Alcohols
 - 2.2.5 Olefins
 - 2.2.6 Branched Olefins
 - 2.2.7 Alkylbenzenes
 - 2.2.8 Alkylphenols
 - 2.2.9 Carbohydrates
 - 2.2.10 Alkene Oxides
 - 2.2.11 Silicon-based Materials
 - 2.3 Synthesis of Surfactants
 - 2.3.1 Non-ionic Surfactants
 - 2.3.1.1 Alkoxyates
 - 2.3.1.2 Alkanolamides
 - 2.3.1.3 Fatty Acid Esters of Sorbitol
 - 2.3.1.4 Sugar-based Surfactants
 - 2.3.1.5 Alkyl Glucamides

- 2.3.2 Anionic Surfactants
 - 2.3.2.1 Carboxylic Acids
 - 2.3.2.2 Carboxylated Ethoxylates
 - 2.3.2.3 Alkylbenzenesulfonates
 - 2.3.2.4 α -Olefin sulfonates
 - 2.3.2.5 Alkanesulfonates
 - 2.3.2.6 Alkyl naphthalenesulfonates
 - 2.3.2.7 Sulfonated Fatty Acid Esters
 - 2.3.2.8 Sulfosuccinates
 - 2.3.2.9 Phosphate Esters
 - 2.3.2.10 Sulfates and Ethersulfates
- 2.3.3 Cationic Surfactants
 - 2.3.3.1 Quaternary Surfactants
 - 2.3.3.2 Amineoxides
- 2.3.4 Amphoteric Surfactants
- 2.3.5 Silicone-based Surfactants
- 2.3.6 Fluorosurfactants
- 2.4 Conclusions
- References

Chapter 3: Analytical Methods—Dennis Anderson, Witco Corp.

- 3.1 Introduction
- 3.2 Anionic Surfactants
- 3.3 Non-ionic Surfactants
- 3.4 Cationic Surfactants
- 3.5 Amphoteric Surfactants
- References

Chapter 4: Industrial Applications of Surfactants—K. R. Lange, Consultant

- 4.1 Introduction
- 4.2 Paper Industry Applications
 - 4.2.1 Continuous Felt Cleaning
 - 4.2.2 Batch Cleaning of Felts
 - 4.2.3 Paperboard Wetting
 - 4.2.4 Pulp and Tissue Softeners, Debonders, and Antistats
 - 4.2.5 Defoamers
 - 4.2.6 Deinking Recycled Paper
 - 4.2.7 Pulp Fiber Fractionation
- 4.3 Surfactants in the Textile Industry
- 4.4 Commercial Laundering
- 4.5 Industrial Hard Surface Cleaning
 - 4.5.1 Paper Mills
 - 4.5.2 Steel Mills
 - 4.5.3 Cleaning for Metal Electroplating
 - 4.5.4 Other Plating Systems
- 4.6 Surfactants and Corrosion Inhibition
- 4.7 Surfactants and Metalworking
- 4.8 Surfactants and Enhanced Oil Recovery
- 4.9 Asphalt Emulsions
- 4.10 Surfactants in Emulsion Polymerization
- 4.11 Emulsion Breaking
- 4.12 Coal Transport
- 4.13 Surfactants and Ore Flotation
- 4.14 Surfactants and Firefighting
- 4.15 Cement Hardening
- 4.16 Surfactants and the Food Industry
- 4.17 Agricultural Application of Surfactants
- 4.18 Pharmaceutical Uses
- 4.19 Summary
- References

Chapter 5: Domestic Cleaning Applications—Olina Raney, Consultant

- 5.1 Introduction
- 5.2 Household Laundry Detergents

- 5.2.1 Powder Laundry Detergents
 - 5.2.1.1 High Anionic Spray-Dried Laundry Detergent Powder
 - 5.2.1.2 High Nonionic Spray-Dried Laundry Detergent Powder
 - 5.1.2.3 High Anionic Agglomerated Laundry Detergent Powder
 - 5.2.1.4 High Nonionic Agglomerated Laundry Detergent Powder
 - 5.2.1.5 Agglomerated Laundry Detergent Powder with Bleach
 - 5.2.1.6 Agglomerated Compact Laundry Detergent Powder
- 5.2.2 Liquid Laundry Detergents
 - 5.2.2.1 Detergents for Energy-saving Washing Machines
- 5.2.3 Prespotters
- 5.2.4 Fabric Softeners
 - 5.3 Hard Surface Cleaners for Living Areas, Bathroom and Kitchen.
- 5.3.1 Liquids
- 5.3.2 Powders
- 5.3.3 Sanitizing Cleaners
- 5.4 Dishwash Detergents
 - 5.4.1 Hand Dishwash Detergents
 - 5.4.2 Automatic Dishwash Detergents
 - 5.4.3 Rinse Aids
- 5.5 Carpet Cleaners
- 5.6 Personal Care Products
 - 5.6.1 Bubble Baths and Body Washes
 - 5.6.2 Hand Soaps and Cleaners
 - 5.6.3 Hair Shampoos
 - 5.6.4 Oral Care Products References

Chapter 6: Properties of Surfactant Mixtures — P. Somasundaran & Lei Huang, Langmuir Center for Colloids and Interfaces, Columbia University

- 6.1 Introduction
- 6.2 Application of Surfactant Mixtures
 - 6.2.1 Surfactants in Agrochemical Formulations
 - 6.2.2 Surfactants in Foam Control
- 6.3 Behavior of Surfactant Mixtures
 - 6.3.1 Ideal Mixing of Surfactants
 - 6.3.2 Non-ideal Mixing of Surfactants
 - 6.3.3 Synergism in Surfactant Mixtures
 - 6.3.4 Antagonism in Surfactant Mixtures
 - 6.3.5 Solubilization in Mixed Micelles
 - 6.3.6 Mixtures Containing Anionic Surfactants
 - 6.3.7 Mixtures Containing Cationic Surfactants
 - 6.3.8 Mixtures of Fluorocarbon and Hydrocarbon Surfactants
- 6.4 Characterization of Surfactant Mixtures
 - 6.4.1 Pseudo-phase Separation Approach for Treating Non-ideal Mixed Micellization
 - 6.4.2 Hydrophile-Lipophile Balance of Mixed Surfactants References

Appendix I
Appendix II Glossary
Index

Reviews - Synopsis - Dust Jacket

This book covers the fundamental surface chemical factors governing the use of surfactants and their basic properties through chapters discussing the background and current state-of-the-art applications as practiced in the U.S. and Canada. It includes extensive chapters on characterization and synthesis, while also addressing analytical methods and a variety of other topics. Appendices include charts summarizing the analysis of surfactants, their commercial synthesis, and the major suppliers.

Target Audience: Industrial chemists, engineers, and marketers involved with surfactant applications and product development.

PREFACE:

Early researchers worried about capillarity, then about wetting and eventually about what it might be that gave rise to some of the phenomena, such as the break point when plotting surface tension against concentration. From this came micelles, followed eventually by hemimicelles and now various structures are considered that have biological

implications as well as being useful in the study of emulsions and other systems. Along the line a theoretical basis was provided by such as Gibbs, Langmuir or Helmholtz which stimulated workers to further explorations of systems. New experimental methods were introduced by McBain, on adsorption, Griffin of the HLB method and the countless synthetic organic chemists who developed, and continue to develop, novel compounds with surface activity.

Surface activity may or may not be synonymous with surfactancy. Traditionally, a surfactant has a characteristic head and tail structure, a view overthrown often just by examining available surfactants. But, whatever the structure, surface activity is generally recognized as involving surface tension lowering, when dealing with solutions. Yet we can all quote compounds that influence surfaces without lowering surface tension. The field has areas of indifferent definition and many observations lacking in basic explanations. The first and the last chapters of this book cope with many of these areas. The middle chapters are more down-to-earth.

This book is designed to be an aid to anyone faced with the task of working with surfactants, or their derivative detergents. There are many books on this topic, rich with detail and theory. Why yet another? This question bothered me when first I was approached to put it together, and it still does. To be able to offer a fresh approach I felt that the key lay with the authors of the individual chapters. At this point, having read each submission at least four times, I am satisfied that the authors have done their readership proud. All the authors have had intimate industrial experience, either as corporate employees or as long term consultants to industry. This is important for a book intended to be practical, as the subtitle indicates. Yet, too, several of the chapters are rich in theory, where the theory can enrich the facts.

Putting together a book like this offers many positive experiences. In particular, searching out authors gives one the opportunity to encounter interesting and talented people, who are also expert in their fields. Working with them is delightfully productive. Besides these contributors, whose work you are about to study, I would also like to single out a colleague with whom I have been acquainted since secondary school, Ed Immergut. Besides being a prolific author on polymers, in particular, he has represented Hanser very well in the U.S. and is responsible for my involvement in both my books. To him my thanks and best wishes. Please read and enjoy this book, and find it useful, above all.

| Title | Location | Edition / Series / Misc. |
|----------------------------------------|--------------------|---------------------------------------|
| 161 Technology for Waterborne Coatings | | Edition: |
| Author: Glass, Edward J. (editor) | Dynix: 72301 | Series: ACS Symposium Series: No. 663 |
| Publish.: American Chemical Society | Call No.: 667.9 Te | |
| - place: Washington, DC | ISBN: 0841235015 | |
| - date: ©1997 | Shelf Reference | Year: 1997 |
| Subject: Emulsion paint -- Congresses | | Price: \$115.00 |
| Desc: viii, 304 p., illus., 24 cm. | | |

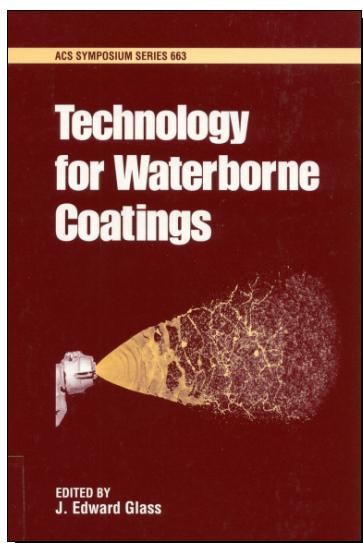


Table of Contents

Preface

1. Waterborne Coatings with an Emphasis on Synthetic Aspects: An Overview
Melissa A. Grunlan, Lin-Lin Xing, and J. Edward Glass
2. A Perspective on Resins for Aqueous Coatings
John L. Gardon
3. Progress in Predicting Latex-Particle Morphology and Projections for the Future
Yvon G. Durant and Donald C. Sundberg
4. Particle Coalescence
Peter T. Elliott, Wylie H. Wetzel, Lin-Lin Xing,
5. Two-Component Waterborne Epoxy Coatings
Frederick H. Walker and Michael I. Cook
6. Particle Interactions and Dispersion Rheology
J. W. Goodwin and R. W. Hughes
7. Waterborne Radiation-Curable Coatings
Kurt A. Wood
8. The Application of Carbodiimide Chemistry to Coatings
J. W. Taylor and D. R. Bassett
9. Synthesis and Coating Properties of Novel Waterborne Polyurethane Dispersions
Valentino J. Tramontano, Michael E. Thomas, and Robert D. Coughlin
10. Making Paint from Alkyd Emulsions
A. Hoffand
11. Application of Electrosterically Stabilized Latex in Waterborne Coatings
D. D. Huang, S. Nandy, and E. J. Thorgerson
12. Spectroscopic Studies of Surfactant Mobility and Stratification in Films from Homopolymer Latex Blends
Amy P. Chu, Lara K. Tebelius, and Marek W. Urban
13. Development of Porous Structure During Consolidation of Pigmented Paper Coatings
Anna Stanislawski and Pierre LePoutre
14. The Drying of Waterborne Coatings
Edgar B. Gutoff
15. Spray Application of Waterborne Coatings
Lin-Lin Xing, J. Edward Glass, and Raymond H. Fernando

Author Index

Affiliation Index

Subjects

257 . Emulsion paint --
Congresses

Subject Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book presents both background material and state-of-the-art research on waterborne coatings. It analyzes the most likely developments in resins chemistry, and examines application properties and in situ methods of cross-linking applied films. It also discusses the primary parameters in drying and spray applications.

PREFACE:

Many industrial suppliers in the mid-1960s, even those supplying solvent to the coating industry, were actively engaged in research in zero volatile organic component (VOC) UV and powder coatings. For most suppliers, this effort declined significantly or was terminated by the early 1970s because growth in these areas was slow and demanded new equipment. However, even with growth, the number of surfaces to which UV and powder coatings can be applied is limited. Much of the research in the 1970s and 1980s was devoted to the high-solids area. Some of this research suggested that elimination of the solvent in high-solids formulations was achievable by replacing the solvent with nonpolluting supercritical fluids such as carbon dioxide. After a short time, it was concluded that nearly half of the solvent used in high solids had to be added back in the critical fluid approach. In the 1990s, the emphasis in coatings research has turned strongly to the waterborne area.

In accordance with the rapid changes in technology, the Polymeric Materials: Science and Engineering, Inc. (PMSE), division of the American Chemical Society (ACS) abandoned its general practice of holding broad symposia that included all areas of coatings technology. In the 1990s, symposia have focused on specific areas of coatings science. The first symposium on waterborne coatings was held at the 203rd National Meeting of the ACS in San Francisco, California, April 5-10, 1992. This book originates from the second symposium in this important field, presented at the 210th National Meeting of the ACS in Chicago, Illinois, August 20-24, 1995.

The 15 chapters in this book discuss conventional latices of the type used in architectural, photographic, and paper coatings, and aqueous epoxy and polyurethane dispersions used in original equipment manufacturer coatings. Topics include their synthesis from the view of their chain-growth or step-growth mechanism, the type of stabilizer employed in the production of the disperse phase, and the compositional influences of the resin particle on their interfacial energies and morphology. Chapters are also included on the radiation curing of applied aqueous dispersions, on the curing of films through carbodiimide chemistry, and on polyurethane films formed from nonisocyanate precursors. The dispersions and film properties of the different resin types are discussed, as well as surfactant orientations at the film substrate and air interfaces.

The prior art of particle coalescence and film formation of latex particles is reviewed, and recent studies on the particle coalescence of step-growth oligomer dispersions (polyurethanes and epoxies) are discussed. The phenomenon of film formation is presented from uniquely different perspectives in the chapters on waterborne alkyd dispersions and high-clay-content paper coatings.

Drying is an important part in the film formation process, and a chapter devoted to this subject is included in this text. Chapters devoted to the interactions of dispersions and dispersion rheology and to the spray application of waterborne coatings are also included.

FORWARD:

The ACS Symposium Series was first published in 1974 to provide a mechanism for publishing symposia quickly in book form. The purpose of this series is to publish comprehensive books developed from symposia, which are usually "snapshots in time" of the current research being done on a topic, plus some review material on the topic. For this reason, it is necessary that the papers be published as quickly as possible.

Before a symposium-based book is put under contract, the proposed table of contents is reviewed for appropriateness to the topic and for comprehensiveness of the collection. Some papers are excluded at this point, and others are added to round out the scope of the volume. In addition, a draft of each paper is peer-reviewed prior to final acceptance or rejection. This anonymous review process is supervised by the organizer(s) of the symposium, who become the editor(s) of the book. The authors then revise their papers according to the recommendations of both the reviewers and the editors, prepare camera-ready copy, and submit the final papers to the editors, who check that all necessary revisions have been made.

As a rule, only original research papers and original review papers are included in the volumes. Verbatim reproductions of previously published papers are not accepted.

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------|-------------------------|--------------------------|
| 162 Technology of Paints, Varnishes and Lacquers | | Edition: |
| Author: Martens, Charles R. (editor) | Dynix: 12995 | Series: |
| Publish.: Robert E. Kreiger Publishing Company | Call No.: 667.6 Te | |
| - place: Huntington, NY / Malabar, FL | ISBN: 0882751549 | |
| - date: 1974 [©1968] | Shelf Adult Non-Fiction | Year: 1968 |
| Subject: Paint | | Price: \$36.50 |
| Desc: viii, 744 p., illus., 24 cm. | | |

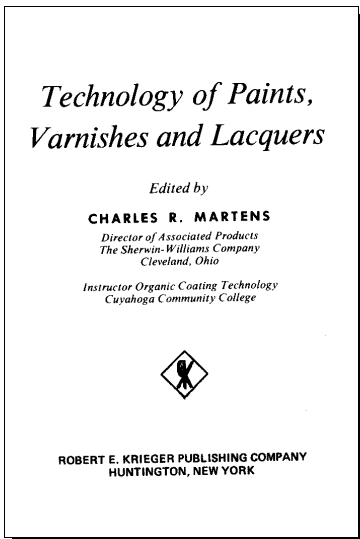


Table of Contents

PREFACE

1. INTRODUCTION TO THE COATING INDUSTRY, C. R. Martens
2. FILM FORMATION, David M. Gans
3. RAW AND PROCESSED OILS, C. R. Martens
4. ALKYD RESINS, C. R. Martens
5. AMINOPLAST RESINS, F. A. Bonzagni and F. J. Hahn
6. PHENOLIC RESINS, S. H. Richardson and K. V. McCullough
7. EPOXY RESINS, John M. Klarquist
8. HYDROCARBON RESINS, C. R. Martens
9. ACRYLIC RESINS, W. M. Edwards
10. CELLULOSIC FILM FORMERS, F. Sieslow
11. VINYL RESINS FOR COATINGS, W. H. McKnight and G. S. Peacock
12. CHLORINATED RUBBER, D. L. Davies
13. URETHANE COATINGS, E. R. Wells
14. SILICONES, Harold L. Cahn
15. MISCELLANEOUS RESINS, F. J. Martinek
16. PLASTICIZERS, C. R. Martens
17. HYDROCARBON SOLVENTS, E. C. Larson
18. OXYGENATED SOLVENTS, R. H. Duzy
19. PIGMENTS—GENERAL CLASSIFICATION AND DESCRIPTION, Robert S. Radcliffe
 - PART A: PIGMENT CLASSIFICATION
 - PART B: SUPPLEMENTAL PIGMENTS
20. WHITE PIGMENTS, F. B. Stieg
21. COLORED PIGMENTS, M. Malaga
22. METALLIC SOAPS: DRIERS, SUSPENDING AGENTS, FLOW MODIFIERS, FLATTING AGENTS AND SANDING AIDS, Siegfried Meinstein and H. Russell Spielman
23. PRESERVATIVES AND FUNGICIDES, Nathaniel Grier
24. TESTING OF RAW MATERIALS FOR COATINGS, Morton L. Levy
25. COLOR IN PAINT, S. J. Huey
26. PAINT FORMULATION, W. H. Tomc
27. PIGMENT DISPERSION, R. G. Hummeldorf
28. EMULSION PAINTS, C. R. Martens
29. TRADE SALES PAINTS, H. Roy Hicks and D. F. Householder
30. INDUSTRIAL FINISHES, Floyd C. Bertsch
31. MAINTENANCE PAINTS, Kenneth Tator
32. ALUMINUM PIGMENTS AND PAINTS, Alex F. Knoll
33. AEROSOL COATINGS, Joseph Marchbank
34. PAINT AND VARNISH REMOVERS, C. R. Martens
35. SURFACE PREPARATION, Kenneth C. Waldo
36. APPLICATION
 - PART A: BRUSH, ROLLER, DIP AND FLOW COAT, Kenneth C. Waldo
 - PART B: SPRAY PAINTING, Irvin B. Thomas
 - PART C: ELECTROSTATIC SPRAYING AND ELECTRODEPOSITION, Emery P. Miller
37. PRODUCTION
 - PART A: RESIN AND VEHICLE MANUFACTURE, C. R. Martens
 - PART B: PAINT MANUFACTURING, Gordon Mutersbaugh
38. PAINT TESTING, K. Schreiber
39. FIRE PROTECTION, SAFETY AND HEALTH, C. R. Martens
40. GLOSSARY
- INDEX

Subjects

| | |
|-------|------------------------|
| 276 . | Paint |
| 423 . | Varnish and varnishing |
| 441 . | Lacquer and lacquering |

Reviews - Synopsis - Dust Jacket

Preface

The technology of paints, varnishes and lacquers is changing rapidly and becoming more complex each day. Whereas fifty years ago the protective coating industry field was principally an art, today it has become a science. The paint industry is an important segment of the chemical industry. Paint technology utilizes the sciences of chemistry, physics and engineering. Paint technology overlaps into such fields as inks, plastics, rubber, adhesives, etc. This book is intended to present the latest technical information in this field.

During the past few years emphasis has been on the development of non-polluting coatings. The lead and mercury content of coatings has been reduced. In order to reduce air pollution, coatings have been developed using non-photo active solvents, water borne systems, high solid systems and powder coatings. Recently, because of the energy crisis, reduction in the amount of energy used in curing coatings has become very important.

The technology of raw materials, formulation, production, testing and application of protective coatings is covered. The performance of specific coatings for trade sales, industrial usage and maintenance is detailed. Topics such as color science, aerosols, paint and varnish removers, and safety are included in the book.

There are many excellent publications available in this field such as the Journal of Paint Technology, Paint and Varnish Production, American Paint Journal, Industrial Finishing and the Journal of Oil and Colour Chemists' Association to supplement this book.

I would like to express my deep appreciation to the many technical experts and their companies who have contributed the excellent chapters to this book.

| Title | Location | Edition / Series / Misc. |
|----------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------|
| 825 Technology, Formulation and Application of Powder Coatings | | Edition: |
| Author: Howell, David M. | Dynix: 99420 | Series: Wiley/SITA Series in Surface Coatings Technology [Volume 1: Powder Coatings] |
| Publish.: John Wiley & Sons - SITA Technology Limited | Call No.: 660 Ho | |
| - place: Chichester, [West Sussex], UK | ISBN: 047197899X | Year: 2000 |
| - date: ©2000 | Shelf Adult Non-Fiction | Price: \$118.50 |
| Subject: Plastic powders | | |
| Desc: xx, 361 p., illus., 24 cm. | | |

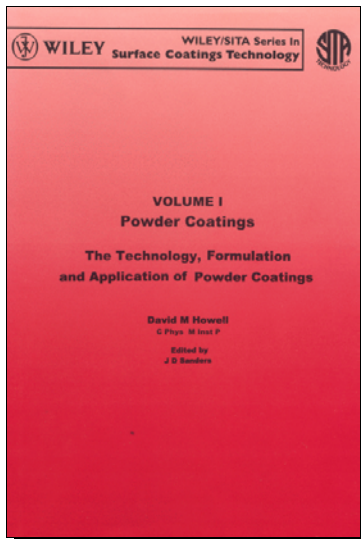


Table of Contents

- Chapter 1: Introduction
- Chapter 2: Resins for Thermosetting Powder Coatings
- Chapter 3: Curing Agents and Curing Reactions
- Chapter 4: Raw Materials
- Chapter 5: The Formulation of Powder Coatings
- Chapter 6: Formulating for Specific Applications and Finishes
- Chapter 7: UV-Curing Powder Coatings
- Chapter 8: Film Formation and Cure
- Chapter 9: Test Methods and Procedures
- Chapter 10: Colour Measurement and Matching
- Chapter 11: The Future of Powder Coatings
- References
- Index

Reviews - Synopsis - Dust Jacket

This volume is intended to provide the reader with an account of the chemistry and technology of coating powders and the information required to formulate them. Developments in new materials have given the opportunity to present recent advances and to summarize the current state of the art. The subjects of film formation, measurement and testing procedures, and color science are all included as an indication of the ways in which contemporary scientific techniques can aid the manufacture of high quality products and generally make the process of formulation more efficient.

Subjects

| | |
|-------|------------------|
| 297 . | Plastic coatings |
| 538 . | Plastic powders |

From the Preface: "...The technology of powder coatings encompasses a wide range of disciplines, of which chemistry, physics, polymer science, powder technology, process engineering, and colour science are only a few. This book is dedicated to the experts in all these fields who have contributed to the success and growth of powder coatings..."

Target Audience: Formulators, chemists, technologists, quality control personnel, and others interested in the formulation and use of powder coatings.

Note: Powder Coating, Volume II: A Practical Guide to Equipment, Processes and Productivity at a Profit is a companion volume to this title.

PREFACE:

It is over 35 years since the introduction of the continuous extruder in the manufacture of thermosetting coating powders and the development of the electrostatic spray gun put powder coatings firmly on the road to growth. Today exciting new markets not originally contemplated are becoming a reality, for example clear automobile powder coatings, and interest in the UV curing of coating powders has never been higher. However, only a few books devoted to the subject of powder coatings have so far been published.

This book is intended to provide the reader with an account of the chemistry and technology of coating powders and the information required to formulate them. Developments in new materials have given the opportunity to present recent advances and to summarize the current position. The subjects of film formation, measurement and testing procedures, and color science are included as an indication of the ways in which contemporary scientific techniques can aid the manufacture of high quality products and generally make the process of formulation more efficient.

The technology of powder coatings encompasses a wide range of disciplines, of which chemistry, physics, polymer science, powder technology, process engineering and color science are only a few. This book is dedicated to the experts in all these fields who have contributed to the success and growth of powder coatings, of whom only a few are ever acknowledged.

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------|
| 615 Testing of Organic Coatings
Author: Gaynes, Norman I.
Publish.: Noyes Data Corporation
- place: Park Ridge, NJ
- date: ©1977
Subject: Protective coatings -- Testing
Desc: viii, 275 p., illus., 25 cm. | Dynix: 13007
Call No.: 667.9 Ga
ISBN: 0815506503
Shelf Adult Non-Fiction | Edition:
Series:
Year: 1977
Price: \$25.00 |

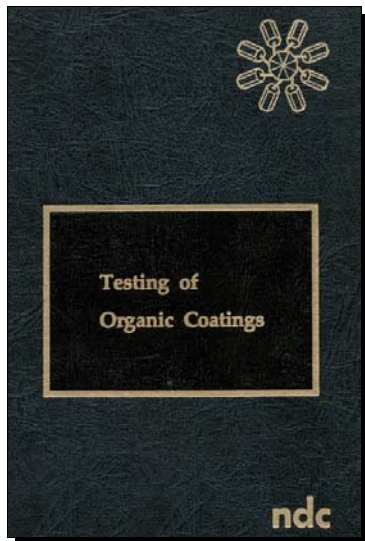


Table of Contents

INTRODUCTION.
 ELEMENTS IN THE TESTING OF EXTERIOR FINISHES
 EXTERIOR DURABILITY AND ACCELERATED TESTS
 THE SALT FOG TEST ON ORGANIC COATINGS
 COATING ADHESION IS BASIC AND MOLECULAR
 FLEXIBILITY
 HARDNESS
 COLD CHECK TEST — WOOD
 LOW TEMPERATURE FLEXIBILITY
 ABRASION
 SCRUBBABILITY AND WASHABILITY
 CHIP OR IMPACT RESISTANCE
 WATER RESISTANCE
 FILIFORM CORROSION
 MATHEMATICS OF FINISHING
 TESTS ON LIQUID COATING
 DRY FILM THICKNESS
 FUNGUS AND MILDEW
 FIRE RETARDANCY
 MISCELLANEOUS TESTS AND CONCLUSIONS

Subjects

324 . Protective coatings

Reviews - Synopsis - Dust Jacket

PREFACE

Testing organic coatings can be a complex procedure, requiring the proper equipment and a systematic procedure. Once the tests have been performed, it then becomes necessary to determine the meaning of the tests. The full test results should have some meaning to the consumer of finishing materials, that is, the coating applier. Since considerable sales effort is expended in merchandising chemical coatings or paints, it is important that some effort be directed to the practical finisher so that he can become knowledgeable regarding the commercial merits of the comparative coatings. Any volume on testing finishes, because of the complexity of the subject, must delve into some theoretical background. It then is even more important, however, to recognize the real value of the tests performed.

In the technical literature reference is often made to a "practical test." What may be a "practical test" for industrial laboratories and consumers of large amounts of coatings such as the automotive industry would be considered highly impractical by the large numbers of smaller finishers, remembering that for each company the size of General Motors there are thousands of finishing concerns whose consumption may be anywhere from one gallon to one hundred gallons per day. For this volume then, a test will be deemed practical only if it is economically feasible for the small finisher in terms of cost of equipment, numbers and types of untrained technical personnel necessary, and time required to perform the testing. It is hoped that the information contained in this book will also be useful for the more highly trained finishing engineer or architect.

The purpose of this book then is to provide some information for the "finisher," that is anyone concerned with finishing which would include the purchasing agent, the foreman, and ultimately the person who applies the coating. It is hoped that the translation of theory and theoretical data into useful information which characterizes this volume will also be useful in recognizing the superfluity of some testing requirements.

INTRODUCTION

When the cavemen first used paint for art or decoration, the fingernail was the prime testing instrument for the coated surface. Down through the ages, the fingernail has remained as "the" instrument.

Technology has reached a high level of sophistication, and while many new test methods and apparatus have been developed, the fingernail is still relied upon by many finishers in the field. As a start in discussing paint testing, and more importantly, the meaning and significance of testing, one must review what the fingernail method purports to prove. If the coating film completely resists the attack of even the strongest fingernail, it has hardness and mar resistance. Thus, it is felt, it would be durable on items such as hardware and tool

s.

Possibly, for the purposes intended, one could (and many finishers do) place a service life value on the implement based strictly on this method of testing. But obviously, this method of testing cannot compare the relative merits of one coating against another if they both pass the test, and the degree of failure would also be a purely subjective rating. Adhesion, toughness and flexibility can also be judged subjectively; however, this also could not be considered a reliable rating. For example, to conclude that no marring or penetration of the film by finger nail signifies that the coating will last 71/2 years would indeed be ludicrous. However, this is actually done on occasion.

Tests and test methods are constantly being devised and developed in varying degrees of sophistication. The ASTM, the American Society for Testing and Materials, is probably the leader in the development of test methods. The federal government follows closely with Federal Test Method Standard 141a. There has been an attempt at coordination between ASTM Subcommittee D-01 and the GSA (General Services Administration) to combine some of their test procedures. Other organizations such as NACE (National Association of Corrosion Engineers), SAE (Society of Automotive Engineers) and AES (American Electroplaters Society), to name a few, are also involved in this type of activity.

Since there is always the danger of misinterpretation of data by taking test results out of context by unknowing consumer advocate groups, many vendors shy away from putting a meaning on tests. The organizations developing testing procedures spell out as specifically as possible standard methods to provide reproducible results within prescribed precision limits. What remains to be done however, once the test has been performed is to determine the exact meaning of the test results, for example, how much more valuable is a finish which will withstand eight cycles over one that withstands only five. These are important questions which must be asked and answered.

The purpose of this volume then, is to attempt to explain the tests in their basic principles, and to provide a comprehension of them. Thus, it may be possible to avoid ascribing arbitrary meanings to test results. Unless the data is used wisely, testing of organic coatings or for that matter testing of any coatings may be an exercise in futility. It should be noted specifically, that up until now the term "evaluation" has not been mentioned. Unfortunately, all too often the terms "testing" and "evaluation" have erroneously been used interchangeably. "Testing" is merely the physical or chemical procedure. Interpretation and use of the data would constitute "evaluation," and this is a very necessary adjunct to testing.

Furthermore, testing must tie in and coordinate with specification writing. Unfortunately there is possibly more overspecification than there is overtesting. Both should be avoided. A striking case in point can be found in U.S. military specification MIL-P-46102. The coating described therein is for a wood alkyd oil primer coating intended for use primarily on wooden components which are to be further topcoated.

In Section 3.4.5 of the specification there appears the requirement for "Adhesion" using adhesive tape which on the surface, would seem to be reasonable. However, the specification further refers to Section 4.4.11 for the test procedure wherein the specification requires an application of the coating on a steel panel, and for the tape test to be conducted on the coated steel panel. Remembering that this is a primer coating for wood, it becomes obvious that there is no relevance for this requirement—adhesion on wood and adhesion on metal simply do not correlate.

In this same specification a flexibility test is described. But here again a metal panel is used, in this case a tin panel. It is understandable that a specification would require some degree of flexibility in a coating, but certainly not the flexibility on a metal panel for a wood coating. Given the problem of moisture in the pores of the wood and the continuous expansion and contraction with changes in temperature, only the cold check test can show some justification. The coating on metal panels may pass the 1/8 inch mandrel test for flexibility but fail badly in the cold check test on wood. Further, the type of wood substrate involved has a vital bearing on the value of the tests required.

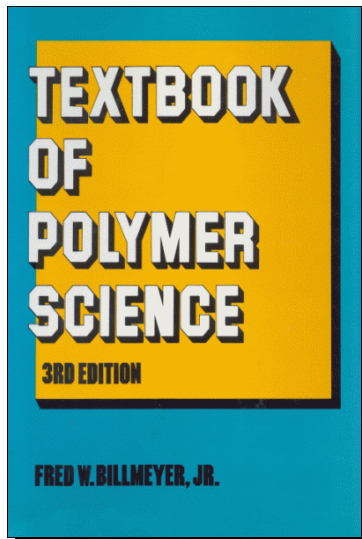
Two additional requirements of MIL-P-46102 are for accelerated weathering and water resistance tests, which both require the testing to be done on steel panels. The latter test does not take into consideration the possible rusting of the steel panels in the weatherometer test, nor does it take into consideration the possibility of cracking which occurs on wood finishes. While the water test may show some softness on steel, what would it show on a wood substrate? Federal specification TT-P-526 for an alkyd oil paint intended for use on exterior wood shakes, rough siding and similar surfaces which also calls for a flexibility panel of tin-is another case in point.

This apparent confusion leads to the need to define philosophy of coatings and coating testing. A specification is nothing more than a purchase description which describes a number of individual tests by which it is hoped that one can predict

the performance of the coating in actual service. The testing can also provide comparative information on various coating materials. Unfortunately, this has at times led to the point where, once a maximum performance of a coating has been reached, it becomes meaningless, as manufacturers then attempt to provide coatings which exceed the maximum useful rating.

As a result, the finisher is confronted with much information and misinformation. It is thus necessary to provide an understanding of ratings within the context of commercial and economic feasibility. Otherwise the finisher must resort to the old reliable fingernail test.

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 163 Textbook of Polymer Science
Author: Billmeyer, Fred W.
Publish.: John Wiley & Sons
- place: New York, NY
- date: ©1984
Subject: Polymers and Polymerization
Desc: xviii, 578 p., illus., 24 cm. | Dynix: 07933
Call No.: 541.7 Bi
ISBN: 0471031968
Shelf Adult Non-Fiction | Edition: 3rd edition
Series:
Year: 1984
Price: \$25.00 |



Subjects

316 . Polymers and polymerization

Table of Contents

PART ONE. INTRODUCTION

1. The Science of Large Molecules

PART TWO. POLYMERIZATION

2. Step-Reaction (Condensation) Polymerization
3. Radical Chain (Addition) Polymerization
4. Ionic and Coordination Chain (Addition) Polymerization
5. Copolymerization
6. Polymerization Conditions and Polymer Reactions

PART THREE. CHARACTERIZATION

7. Polymer Solutions
8. Measurement of Molecular Weight and Size
9. Analysis and Testing of Polymers

PART FOUR. STRUCTURE AND PROPERTIES

10. Morphology and Order in Crystalline Polymers
11. Rheology and the Mechanical Properties of Polymers
12. Polymer Structure and Physical Properties

PART FIVE. PROPERTIES OF COMMERCIAL POLYMERS

13. Hydrocarbon Plastics and Elastomers
14. Other Carbon-Chain Polymers
15. Heterochain Thermoplastics
16. Thermosetting Resins

PART SIX. POLYMER PROCESSING

17. Plastics Technology
18. Fiber Technology
19. Elastomer Technology

APPENDIXES

- Appendix 1: List of Symbols
- Appendix 2: Table of Physical Constants
- Appendix 3: Trade Names and Generic Names
- Author Index
- Subject Index

Reviews - Synopsis - Dust Jacket

PREFACE TO THE THIRD EDITION

"I am inclined to think that the development of polymerization is, perhaps, the biggest thing chemistry has done, where it has had the biggest effect on everyday life. The world would be a totally different place without artificial fibers, plastics, elastomers, etc. Even in the field of electronics, what would you do without insulation? And there you come back to polymers again." (Lord Todd, President of the Royal Society of London)

And indeed one does. From the lowly throwaway candy wrapper to the artificial heart, polymers touch our lives as does no other class of materials, with no end to new uses and improved products in sight. Yet, many instances of the need for better education in the polymer field, both in our universities and for the public, remain unchanged. Some of these were discussed at length in the Preface to the second edition of this book, which follows, and I shall not repeat them.

The present revision has two major directions. The first is to improve its value as a textbook. To this end I have rearranged the text to consider polymerization before describing the properties of polymers, a change that several of my colleagues feel has pedagogical advantages. I have also drawn on my files from 25 years of teaching polymer science, at the University of Delaware, the Massachusetts Institute of Technology, and Rensselaer Polytechnic Institute, to provide material for a section on Discussion Questions and Problems at the end of each chapter.

The second objective of the revision is the more common one, to bring the contents up-to-date by judicious addition, deletion, and revision, and in this I hope I have been successful. Many sections have been changed little, reflecting the maturity of certain aspects of polymer science, but the reader will find new material inserted in every chapter. A few additions of particular note are a section on polymerization reaction engineering in Chapter 6, a discussion of scaling concepts in Chapter 7, and expansion of the sections on polymer processing in Chapter 17. I have tried to include brief descriptions of the new polymer materials in the marketplace in Chapters 13-16 and in a section on composite materials in Chapter 17. Unfortunately, some discussion of less timely topics had to be eliminated to prevent undue expansion of the text.

My approach to referencing the literature had to remain essentially the same as that adopted in the second edition, despite some dissenting opinions. The explosion of the literature in polymer science makes it totally impossible to provide full coverage of original articles, as was possible 20 or 25 years ago. I have therefore cited many new books, and many articles from the Encyclopedia of Polymer Science and Technology, the Kirk-Othmer Encyclopedia of Chemical Technology, third edition, and the Modern Plastics Encyclopedia. Each of these sources (save the last, which provides information on current commercial products and processes) was selected to provide detailed citation of the original literature, as well as more complete coverage of the topic for which it was cited.

With retirement imminent, I look back with pleasure on the preparation of this volume and its predecessors. They have brought me much pleasure, more in the friendship of many readers and colleagues than in the accomplishment. I hope that the usefulness of this last revision will surpass that of those before it.

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------------------------------------------------------------------|--------------------|--------------------------|
| 174 Thesaurus of Paint and Allied Technology: A Guide to Technical Terms Employed in the United State | | Edition: |
| Author: Federation of Societies for Paint Technology | Dynix: 36216 | Series: |
| Publish.: Federation of Societies for Paint Technology | Call No.: 667.9 Fe | |
| - place: Philadelphia, PA | ISBN: | |
| - date: [1968] | Shelf Reference | Year: 1968 |
| Subject: Technology | | Price: \$50.00 |
| Desc: 264 p., 22 cm. | | |

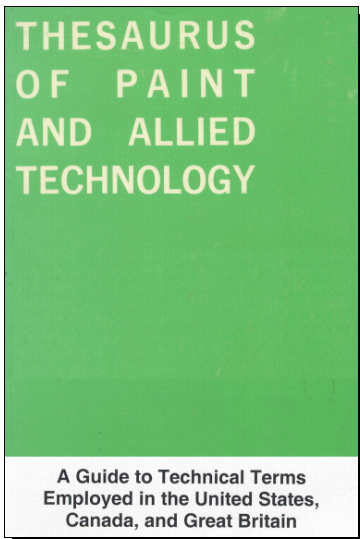


Table of Contents

FOREWORD

INTRODUCTION

DEVELOPMENT OF A THESAURUS FOR COATINGS

ORGANIZATION AND ARRANGEMENT

DESCRIPTION OF SECTIONS, CODES AND NOTATIONS

CLASSIFIED SECTION I

ALPHABETIC SECTION II

Reviews - Synopsis - Dust Jacket

FOREWORD:
This first thesaurus of the paint and allied industries is the product of broad inter-society (and international) cooperation with our contractor, The Knowledge Availability Systems Center, University of Pittsburgh. It is the culmination of work which was started in the Cleveland Society for Paint Technology's COROTI group nearly five years ago.

Rarely has a technical thesaurus been developed by such an extensive group of practical technologists and specialists in documentation. We extend our most sincere appreciation to the 469 Federation members who developed an original bank of over 105,000 terms and to the following organizations and individuals who helped to reduce that formidable list to the form of this first edition.

Subjects

| | |
|-------|----------------------------------------|
| 417 . | Technology |
| 444 . | Paint -- Abstracting and indexing |
| 491 . | Technology -- Abstracting and indexing |
| 513 . | Paint industry and trade |

INTRODUCTION:

What is a Thesaurus?

A thesaurus may be defined as "a book of words applicable to a particular field." Specifically, a thesaurus should show explicit relationships among the words it contains. These relationships may be those of:

- (1) Synonymy — to indicate terms that may be used interchangeably to represent a single concept., e.g., lead peroxide and red lead
- (2) Specific to Generic Relationship — to identify terms that are part of a broader class, e.g., ethanol and butanol may both be considered to belong to the class alcohol
- (3) Generic to Specific Relationship — to identify a term that may represent a group of more specific words, e.g., spraying equipment includes airless spraying equipment
- (4) General Non-specific Relationships — to indicate terms which are related to other terms but not in a totally synonymous or generic-specific manner, e.g., Fire retardant coating may have meaning related to nonflammable coating

It is perhaps obvious that none of these relationships among terms can be defined in a totally unambiguous way, since different people think of (and use) words differently in various contexts. So, what is the purpose of developing such books of words when there can never be total agreement as to how words relate one to another?

Why a Thesaurus?

Information retrieval systems, especially machine systems, exist only because it is "impractical," inconvenient, or too expensive to use other means for finding desired records in a file. Usually the "size" of the file (as measured by the number of records, depth of analysis of each record, and complexity of subject matter covered) has reached the point where an existing storage system is not expected to provide adequate service in response to the average inquiry.

Given a file of this size, we may assume that the number of records being incorporated into the file exceeds the ability of a potential "inquirer" to read and to remember the contents of every record that is incorporated. This assumption plays an important part in the routine of analyzing new records for the file. The analyst cannot be sure that a person who may later want to see the record will have read it previously or even have seen it before. Therefore, requests for records may be based on clues drawn from the requester's background and not necessarily from the text of records stored in the file.

It is extremely important that the analyst, while indexing material for storage, use language which is available to, and understandable by the requester. An analyst reading a document may be tempted to use words found in that document. However, words used by any individual author are not necessarily those that are most likely to be used in information requests. So the analyst (or designer of codes, or compiler of subject-authority lists) is faced with the task of providing and/or selecting clues to the subject matter to anticipate any way in which a searcher's point of view might be expressed.

How can anyone predict the exact words that will come to a searcher's mind when he desires information on some subject? Here are some approaches to be considered:

- (1) The decision may be made to operate the retrieval activity as a "closed" system wherein the designer of the system also operates it, that is, the designer is responsible for the input and output; the questioner cannot operate the system personally. This relieves the analyst of the responsibility of predicting which words will be used by "outsiders" in searching the file. All searches must then be performed by operating personnel of the retrieval system who are in a position to interpret requests in the familiar terms of the language used by analysts.
- (2) The decision may be made to operate the retrieval activity as an "open" system. This decision requires the analyst to control his indexing vocabulary in a standard or consistent manner.

A thesaurus offers a basis for choosing a vocabulary to be used both in indexing material to be stored and when preparing a search question.

When to Use the Thesaurus

From a practical point of view, meaning is of no consequence in an information-retrieval system, except insofar as it helps a client to locate a record that he desires.

Suppose that a person desires to locate books on quicksilver by using a catalog in a library. Perusal of a subject catalog may be rewarding, since one or more suitable references will be listed that provide interesting information. In this case it is of no consequence whether or not the seeker of a document knows the meaning of the word quicksilver. He will in any case be rewarded by the discovery of a document bearing the label "quicksilver."

Nor is it of any consequence in this case whether or not the document analyst, who provided the subject entry quicksilver in the catalog, knew what the word meant. As long as the information seeker's search for information is rewarded quickly and economically, every standard of searching efficiency has been met.

But what happens when the searcher finds no information listed in the catalog under quicksilver? At this point the meaning of the word comes into play, along with its relationships to other words in language. Unless there are no books or documents on quicksilver in the library, we will assume that quicksilver has failed as a catalog heading for one of these reasons:

- (1) A document about quicksilver exists, but the metal is discussed in terms of a synonym, mercury. The document was therefore cataloged under the word mercury.
- (2) The analyst (the cataloger) did not include in the catalog a cross-reference between the two terms, such as: quicksilver: See mercury

since either he did not predict that anyone would look for the material under an alternate name, or he was not aware that such an alternate name existed.

Let us broaden our hypothetical search to include mercury and mercury-containing materials. Suppose that a file of records contains information on silver amalgam. A danger signal flashes, to be heeded by either the analyst or the searcher, or by both; mercury is an ingredient of silver amalgam. The analyst could "index" this mercury-containing

material under its own name. But he will serve a greater potential clientele if, at this point, he also provides a more generic index heading, such as mercury-containing materials. If the analyst fails to do this, then the searcher will have to draw up a list of every mercury-containing material so that he may look them up individually in the "index."

Information systems almost always use words to characterize the content of material stored in the system; and their relationships must be, made explicit and invariable if indexing, storage and retrieval operations are to be accomplished efficiently.

When designing an information system, the thesaurus provides a check list of concepts or classifications of subject matter which must be accommodated. It will also be useful in determining the limiting parameters for indexing and search-question formats.

When preparing material for storage (abstracting and indexing), consult the thesaurus to choose the least ambiguous terminology. You may not always find the suggested terms completely "comfortable" or compatible with your particular (organizational) viewpoint. If so, you are free to make additions or modifications to suit your specific needs. Such changes, entered directly in the thesaurus at all pertinent places, will thereafter control the vocabulary of your system. Note, however, that such local modifications make your system "unique" and will require that pre-indexed material from outside sources be re-edited before use in your system. So, extensive deviations should be avoided.

When performing retrieval operations, consult the thesaurus to make sure that the search question is phrased in terms which have been used for indexing the stored information. If retrieval fails to develop the required information, consult the thesaurus again, rephrasing the search question to utilize alternate terms by which, conceivably, the information might have been stored.

Development of a Thesaurus for Coatings

The Federation of Societies for Paint Technology, appreciating that our technology possessed no adequate listing of terminology, in 1965 established a thesaurus project and soon thereafter contracted the services of the Knowledge Availability Systems Center, University of Pittsburgh. The objective of the project was to develop a thesaurus capable of: (1) providing a basic point of reference for English-speaking paint technologists primarily in the United States, Great Britain and Canada; (2) providing the individual technologist with a pattern that he may employ or adapt in arranging his own information files; (3) providing technical journals with terms to consider for indexing purposes, and (4) providing a vocabulary base for future systems.

More than 450 members of the Federation volunteered to contribute words which they considered to be important to present-day paint technology. Each volunteer scanned selected current literature and marked each word or phrase which he felt was relevant. Over 105,000 terms thus collected were key-punched and processed to eliminate duplicate and variant forms. Each of the remaining 30,000 terms was then examined to identify its meaning as viewed from the field of paint technology. Many of these terms have import in other disciplines, e.g., chemistry and physics; and, therefore, adequate technical knowledge of the field was necessary to identify each term's specific significance for paint technology.

Preliminary analysis was accomplished by subjecting each term to a rather unique analysis technique developed specifically for this project. This technique can be described best as that of a "road map" by which the areas of the field were divided into five major headings: (1) material; (2) equipment; (3) supplies; (4) process or method; and, (5) property, characteristic or condition. (For those terms that did not fall into one of the five areas, a "miscellaneous" category was established to deal with:

(1) surfaces or structures to be coated; (2) terms of measurement; (3) terms not classifiable; (4) terms not known; and, (5) trade names. After the initial placement of terms in one of the above areas, subsequent decisions were made, by following the "road map," to reduce all materials or all equipment or all supplies, etc., into more specific locations.

While this analysis procedure was being performed, technologists in Britain and Canada reviewed listings of terms obtained from indexes of British and Canadian journals and performed the "road map" analysis for those terms they considered to be significant.

From the "road maps," the terms with their analysis were recorded on punch cards and then sorted into like groupings, i.e., all oils, all prime pigments, all driers, etc. Each section was then printed out and reviewed, with terms being added or deleted to develop a comprehensive listing for each category.

This consolidation reduced the list to 4,000 terms which were again key-punched and printed out by categories. A procedure was developed for displaying relationships among these to indicate synonymy and generic-specific relationships. After these explicit relationships had been established, a rough draft of the thesaurus was prepared.

This rough draft was again reviewed by technologists in the U. S., Canada and Britain. Their suggestions and criticisms

have been incorporated into this, the final draft of the first edition.

Organization and Arrangement

The Thesaurus of Paint and Allied Technology is divided into two sections, each easily distinguished by its color.

In Section I, Classified (yellow pages), terms are grouped into 11 general categories and 44 subcategories. With a few exceptions, all of the terms found in the alphabetic listing of the thesaurus (Section II) are listed in Section I and arranged alphabetically under the appropriate category.

Section II, Alphabetic (white pages), represents the heart of the thesaurus wherein the relationships that each term has for other terms in the field of paint technology have been established. In this section each term is displayed together with other terms which synonymous, generic-specific or general relationship to it.

It is possible for the user to begin with either section and to then move to the other section if more definition is needed. For example, if information on oils that are used as raw materials for coatings is desired, referral to the "Listing of Categories" at the beginning of Section I will show that this type of material is listed in category C/11. If the user desires further information for a particular oil, he may find it in Section II where he can see just how this particular oil relates to other oils used as raw materials for coatings.

Conversely, if the user first consults Section II for a particular oil, i.e., vegetable oil, he will find the category indication of C/11 following the term "vegetable oil." By turning to the "yellow pages" (Section I), category C/11 would provide a listing of all "oils", including "vegetable oils," used as "materials for coatings."

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------------------------|--------------------------------|----------------------------------------|
| 175 Toward Pollution-Free Manufacturing | | <i>Edition:</i> |
| <i>Author:</i> Institute for Local Self-Reliance | <i>Dynix:</i> 26250 | <i>Series:</i> AMA Management Briefing |
| <i>Publish.:</i> AMA Membership Publications Division, American Management Associ | <i>Call No.:</i> 363.72 To | |
| <i>- place:</i> New York, NY | <i>ISBN:</i> 0814423272 | |
| <i>- date:</i> ©1986 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1986 |
| <i>Subject:</i> Hazardous wastes -- Management -- United States | | <i>Price:</i> \$25.00 |
| <i>Desc:</i> 122 p., 23 cm. | | |

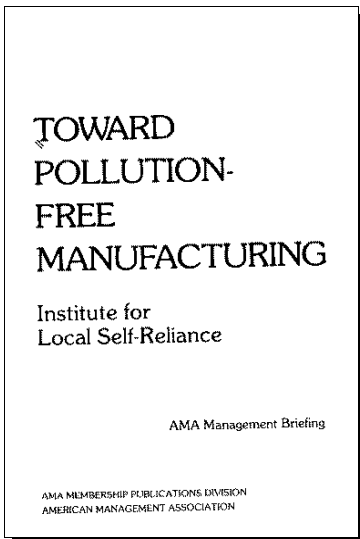


Table of Contents

| | |
|-----------------------------------------------------------------|-----|
| Introduction | 7 |
| 1 Meet Mr. Lee Thomas: Interview with the EPA Administrator | 17 |
| 2 What Is Waste Reduction? | 30 |
| 3 Chemicals and Allied Products (Standard Industrial Code 28) | 45 |
| 4 Fabricated Materials (Electroplating) Products (SIC 34) | 58 |
| 5 Nonelectric and Electric Machinery Manufacture (SICs 35 & 36) | 70 |
| 6 Electronic (Printed Circuit) Equipment (SIC 36) | 81 |
| 7 Electric, Gas, and Water Utilities (SIC 49) | 88 |
| 8 Financing a Waste Reduction Program | 103 |
| References and Resources | 120 |

Reviews - Synopsis - Dust Jacket

Introduction

It was lunchtime at the Office of Technology Assessment's workshop on hazardous waste avoidance. More than a dozen businessmen from small and medium-sized companies, most of them CEO's, were sitting around eating lasagna. I happened to find myself sharing a table with a group of electroplaters. One of them, reminded by the lasagna of his hazardous waste, started explaining how he got rid of his noxious brew:

"I have a treater come and haul off my hazardous sludge. He takes it back to his plant and mixes it with lime, or something. He says this neutralizes it so he can send it to the local landfill as ordinary waste. That's the advantage of this treater over the others: He'll charge me lower 'cause he doesn't have to use the hazardous landfill.

"Once I give him the drums, I'm done with it. My name is off and I don't have to worry about it anymore." He sat back, a contented smile across his face. Joel Hirschhorn, project director for the OTA and leader of the workshop, spoke up.

"You're completely wrong, you're not done with it," he said heatedly. "In fact, you are liable for two sites: the plant where he treats the waste and the landfill that he sends it to."

The plater's face dropped. His voice had a new tone of concern. "Really?" he said in disbelief. "I thought that once he took it away, that was it, the waste was off my hands."

Joel Hirschhorn was vigorously shaking his head. "I'm afraid it doesn't work that way. The generator is liable no matter how the waste is treated or where it goes. And you're liable for two sites. I'd be worried if I were you."

"Believe me, I am," was the plater's reply.

Subjects

269 . Hazardous wastes -- Management -- United States

Toxic Substances Controls Primer: Federal Regulation of Chemicals in the Environment

LASCT Holdings - maximum detail by Title

T

| Title | Location | Edition / Series / Misc. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------|
| 176 Toxic Substances Controls Primer: Federal Regulation of Chemicals in the Environment
Author: Worobec, Mary Devine
Publish.: Bureau of National Affairs, Inc.
- place: Washington, DC
- date: ©1984
Subject: Chemicals -- Law and legislation
Desc: xi, 224 p., 23 cm. | Dynix: 30112
Call No.: 344.73 Wo
ISBN: 0871794586
Shelf Adult Non-Fiction | Edition:
Series:
Year: 1984
Price: \$25.00 |

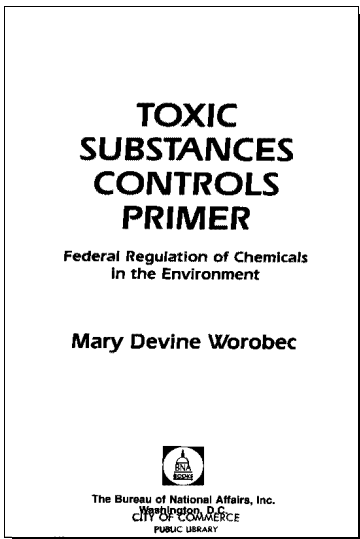


Table of Contents

- Introduction
- Part I Chemical Use and Assessment Laws
 - Toxic Substances Control Act (TSCA)
 - Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
 - Federal Food, Drug, and Cosmetic Act (FFDCA)
 - Occupational Safety and Health Act (OSH Act)
- Part II Chemical By-Product Laws
 - Clean Air Act (CAA)
 - Clean Water Act (CWA)
 - Safe Drinking Water Act (SDWA)
- Part III Chemical Waste and Disposal Laws
 - Resource Conservation and Recovery Act (RCRA)
 - Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- Part IV Chemical Transport Laws
 - Hazardous Materials Transportation Act (HMTA)
- Part V Other Laws Affecting Chemicals
 - Consumer Product Safety Act (CPSA)
 - Federal Hazardous Substances Act (FHSA)
 - Flammable Fabrics Act (FFA)
 - Poison Prevention Packaging Act (PPPA)
 - Ports and Waterways Safety Act (PWSA)
 - Pipeline Safety Act (PSA)

Subjects

| | |
|-------|---------------------------------------------|
| 228 . | Chemicals -- Law and legislation |
| 378 . | Hazardous substances -- Law and legislation |

Reviews - Synopsis - Dust Jacket

| Title | Location | Edition / Series / Misc. |
|------------------------------------------------------------|---------------------------------|--------------------------|
| 177 Toxicology: The Basic Science of Poisons | | <i>Edition:</i> |
| <i>Author:</i> Casarett, Louis J. and John Doull (editors) | <i>Dynix:</i> 14476 | <i>Series:</i> |
| <i>Publish.:</i> Macmillan Publishing Company, Inc. | <i>Call No.:</i> 615.9 Ca | |
| <i>- place:</i> New York, NY | <i>ISBN:</i> 0023199601 | <i>Year:</i> 1975 |
| <i>- date:</i> [1975] | <i>Shelf:</i> Adult Non-Fiction | <i>Price:</i> \$25.00 |
| <i>Subject:</i> Toxicology | | |
| <i>Desc:</i> xiii, 768 p., illus., 26 cm. | | |

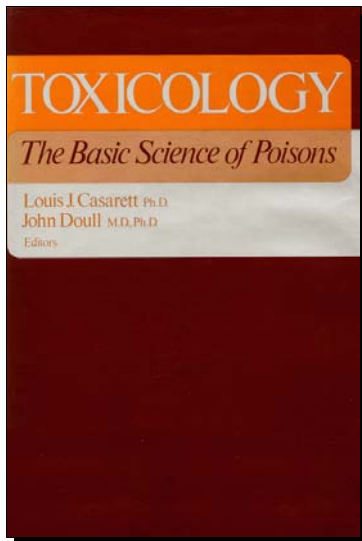


Table of Contents

UNIT I -- General Principles of Toxicology
 1 Origin and Scope of Toxicology
 2 Toxicologic Evaluation
 3 Absorption, Distribution, and Excretion of Toxicants
 4 Metabolism of Toxic Substances
 5 Factors Influencing Toxicology

UNIT II -- Systemic Toxicology
 6 Toxicology of the Central Nervous System
 7 Toxicology of the Liver
 8 Toxicology of the Kidney
 9 Toxicology of the Respiratory System
 10 Toxicology of the Formed Elements of the Blood
 11 Toxicology of the Skeletal System
 12 Toxicology of the Reproductive System
 13 Toxicology of the Eye

UNIT III -- Toxic Agents
 14 Teratogens
 15 Chemical Carcinogenesis
 16 Radiation and Radioactive Materials
 17 Pesticides
 18 Metals
 19 Solvents and Vapors
 20 Air Pollutants
 21 Food Additives
 22 Toxins of Animal Origin
 23 Phytotoxicology
 24 Toxicology of Plastics
 25 Social Poisons

UNIT IV -- Applications of Toxicology
 26 Clinical Toxicology
 27 Forensic Toxicology
 28 Industrial Toxicology
 29 Veterinary Toxicology
 30 Toxicology and the Law

Index

Subjects

| | |
|--------------|------------|
| 336 . | Toxicology |
| 399 . | Poisoning |
| 400 . | Poisons |

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Designed primarily as a textbook for courses in toxicology, this volume can also serve as a source of concepts and modes of thought for those concerned with community health, agriculture, food technology, pharmacy, veterinary medicine, and related fields. For persons further removed from the field of toxicology, the book presents a selectively representative view of the many facets of the subject.

Toxicology: The Basic Science of Poisons is organized to facilitate its use by these different types of users. The first section (Unit I) describes the elements of method and approach that identify the science. It includes those principles most frequently invoked in a full understanding of toxicologic events, such as dose-response, and is primarily mechanistically oriented. Mechanisms are also stressed in the subsequent sections of the book, particularly when these

are well identified and extend across classic forms of chemicals and systems. However, the major focus in the second section (Unit II) is on the systemic site of action of toxins. The intent therein is to provide answers to two questions: What kinds of injury are produced in specific organs or systems by toxic agents? What are the agents that produce these effects?

A more conventional approach to toxicology has been utilized in the third section (Unit III), in which the toxic agents are grouped by chemical or use characteristics. In the final section (Unit IV) an attempt has been made to illustrate the ramifications of toxicology into all areas of the health sciences and even beyond. This unit is intended to provide perspective for the non-toxicologist in the application of the results of toxicologic studies and a better understanding of the activities of those engaged in the various aspects of the discipline of toxicology.

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------------------------|-------------------------|--------------------------|
| 178 Trademark: Legal Care for Your Business & Product Name | | Edition: 5th edition |
| Author: Elias, Stephen | Dynix: 89740 | Series: |
| Publish.: Nolo Press | Call No.: 346.73 EI | |
| - place: Berkeley, CA | ISBN: 0873375793 | |
| - date: ©2001 | Shelf Adult Non-Fiction | Year: 2001 |
| Subject: Trademarks -- Law and legislation -- United States | | Price: \$39.95 |
| Desc: 1 v. (various pagings) illus., forms, 28 cm. | | |

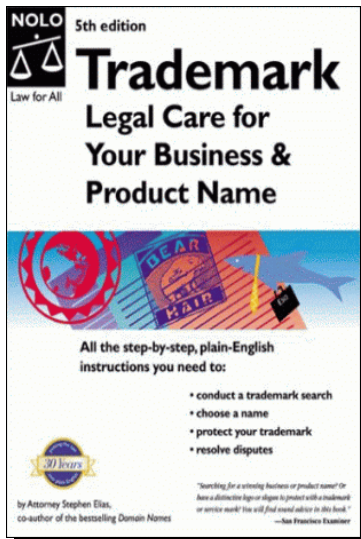


Table of Contents

- I Introduction: How to Use This Book
- 1 A Trademark Primer
- 2 Trademarks, Domain Names and the Internet
- 3 How to Choose a Good Name for Your Business, Product or Service
- 4 Trademark Searches--What They Are and Why You Should Do One
- 5 How to Do Your Own Trademark Search
- 6 How to Evaluate the Results of Your Trademark Search
- 7 Federal Trademark Registration
- 8 How to Use and Care for Your Trademark
- 9 Evaluating Trademark Strength
- 10 Sorting Out Trademark Disputes
- 11 If Someone Infringes Your Mark
- 12 If Someone Claims That You Infringed Their Trademark
- 13 International Trademark Protection
- 14 Help Beyond the Book
- Appendixes
- A Class Descriptions
- B Patent and Trademark Depository Libraries
- C Tear-Out Forms
- I Index

Subjects

| | |
|-------|----------------------------------------------------|
| 337 . | Trademarks -- Law and legislation -- United States |
| 348 . | Business names -- United States |

Reviews - Synopsis - Dust Jacket

Book Description

Trademarks, the names and symbols that identify your business, brand and products in the marketplace, are important assets that you need to choose carefully and vigilantly protect-especially in cyberspace. Online competitors around the world can profit from your good name, unless you act now and protect your brand equity.

With Trademark, the comprehensive Nolo handbook used by small business owners, lawyers, artists and Netheads, you get the most up-to-date information you need to defend your creations.

Learn how to:

- * choose distinctive marks that competitors can't copy
- * search for other marks that might conflict with your own
- * register your name or other mark with the U.S. Patent & Trademark Office
- * protect your marks from use by others and maintain their legal strength
- * understand and resolve trademark disputes outside the courtroom
- * apply trademark law to domain names and web pages

Thoroughly revised and updated, Trademark now includes a chapter on how the Web is affecting both trademark law and decisions on choosing a trademark.

The book also provides step-by-step instructions for using the Patent and Trademark Office's free Internet database to perform trademark searches, and information on the PTO's new online trademark application filing utility, eTEAS.

Includes all necessary forms and step-by-step instructions to register a trademark or service mark with the U.S. Patent & Trademark Office.

Ingram

Essential for all small business owners, this book shows how to choose, use and protect the names and symbols that identify their services or products. This newly revised third edition contains all necessary forms and instructions for

registering a federal trademark or servicemark with the U.S. Patent & Trademark Office. --This text refers to an out of print or unavailable edition of this title.

About the Author

Stephen R. Elias is an attorney, an editor at Nolo.com, and author of many Nolo titles, including: Patent, Copyright and Trademark; How to File for Chapter 7 Bankruptcy, Legal Research: How to Find and Understand the Law, and Nolo's Pocket Guide to Family Law. Steve has been interviewed by most major media including The New York Times, The Wall Street Journal, Newsweek, The Today Show, Good Morning America, 20/20, Money Magazine and more. He received his law degree from Hastings College of Law and practiced law in California, New York and Vermont before joining Nolo in 1980. In recent years much of Steve's time at Nolo has been devoted to the fields of self-help legal software and online legal information. He is one of the original authors/designers of Nolo's bestselling WillMaker program, as well as the software version of Nolo's Patent It Yourself.

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------------------------|-------------------------|--------------------------|
| 1195 Trademark: Legal Care for Your Business & Product Name | | Edition: 6th edition |
| Author: Elias, Stephen | Dynix: 111653 | Series: |
| Publish.: Nolo Press | Call No.: 346.730 EI | |
| - place: Berkeley, CA | ISBN: 0873379454 | |
| - date: ©2003 | Shelf Adult Non-Fiction | Year: 2003 |
| Subject: Trademarks -- Law and legislation -- United States | | Price: \$18.50 |
| Desc: 1 v. (various pagings), illus., 23 cm. | | |



Table of Contents

- 20 Frequently Asked Trademark Questions
- Introduction
 - A. What Parts of the Book Do You Absolutely Need to Read?
 - B. What This Book Doesn't Cover
 - C. When a Trademark Lawyer May Be Helpful
- 1. A Trademark Primer
 - A. Trademarks & Trademark Law
 - B. Basic Principles of Trademark Law
 - C. The Role of Federal Registration in Protecting Trademarks
 - D. Not All Business Names Are Trademarks
 - E. Trade Name Formalities
 - F. Trade Dress and Product Designs
 - G. Sources of Trademark Law
 - H. The Difference Between Trademark and Copyright
 - I. The Difference Between Trademark and Patent
- 2. Trademarks, Domain Names and the Internet
 - A. How to Clear and Register Domain Names
 - B. What to Do If the Domain Name You Want Is Already Registered
 - C. Domain Names and Trademarks
 - D. Other Trademark Issues in Cyberspace
- 3. How to Choose a Good Name for Your Business, Product or Service
 - A. Anatomy of a Product or Service Name Trademark
 - B. Distinctive Names Make Legally Strong Trademarks
 - C. How Trademark Law Treats Marks With Common Terms
 - D. What Makes a Distinctive Trademark a Legally Strong Trademark?
 - E. Guidelines for Making a Mark Distinctive
 - F. Marketing Considerations When Choosing a Name Mark
- 4. Trademark Searches — What They Are and Why You Should Do One
 - A. What Is a Trademark Search?
 - B. Why Do a Trademark Search?
 - C. What Resources Are Used in a Trademark Search?
 - D. Where Are Trademark Search Resources Located?
 - E. Different Levels of Trademark Searches — What They Are; When They're Appropriate
 - F. Planning Your Trademark Search
 - G. Using a Professional Search Service
 - H. Using a Patent and Trademark Depository Library to Do Your Own Search
 - I. Does Your Failure to Search Mean You Acted in Bad Faith?
- 5. How to Do Your Own Trademark Search
 - A. Meet TESS — The Trademark Electronic Search System
 - B. Getting Started With TESS
 - C. Understanding the TESS Structured Form Search
 - D. Tips on Using the TESS Structured Form Search
 - E. Trademark Searching With TESS: A Real-Life Example
 - F. Understanding the TESS Free Form Search
 - G. Understanding the Results of Your Search

Subjects

| | |
|-------|----------------------------------------------------|
| 337 . | Trademarks -- Law and legislation -- United States |
| 348 . | Business names -- United States |

- H. An Introduction to SAEGIS—A Great Fee-Based Search System
 - I. Searching for Designs
 - J. Searching State Registered Trademarks and Trade Names
 - K. Searching for Trade Names and Unregistered Marks
6. How to Evaluate the Results of Your Trademark Search
- A. What's Involved in Evaluating Trademark Search Results?
 - B. What Is the Likelihood of Customer Confusion?
 - C. An Overview of How Marks Are Evaluated for Their Potential to Cause Customer Confusion
 - D. How Closely Related Are the Goods/Services?
 - E. Do the Goods or Services Compete?
 - F. How Similar Are the Marks?
 - G. Additional Factors
 - H. Final Factors
 - I. How to Read a Trademark Search Report
7. Federal Trademark Registration
- A. Brief Overview of Federal Registration
 - B. What Marks Qualify for Federal Registration
 - C. If You Haven't Started Using Your Mark, Should You File an Intent-to-Use Application?
 - D. What Examples of Your Mark Will You Submit With Your Application?
 - E. What International Class Is the Best Fit for Your Products or Services?
 - F. Deciding How Many Marks You Want to Register
 - G. Applying for Registration Online
 - H. If You Are Filing by Mail
 - I. What Happens Next?
 - J. Communicating With the PTO
 - K. If the Examiner Issues a Rejection Letter
 - L. Follow-Up Activity Required for Intent-to-Use Applications
 - M. Follow-Up Activity Required After Registration
8. How to Use and Care for Your Trademark
- A. Use of the Trademark Registration ® Symbol
 - B. Use of the TM or SM Symbol for Unregistered Trademarks
 - C. File Your Section 8 and 15 Declarations
 - D. File Your Section 8 Declaration and Section 9 Application for Renewal
 - E. Use It or Risk Losing It
 - F. Maintain Tight Control of Your Mark
 - G. Use the Mark Properly — Avoid Genericide
 - H. Transferring Ownership of a Trademark
9. Evaluating Trademark Strength
- A. A Brief Review of What Makes a Strong Mark
 - B. The First Step: For Marks Consisting of Words, Identify the Distinctive Part of the Mark
 - C. Assess the Legal Strength of the Trademark Aspect of Your Word Mark
10. Sorting Out Trademark Disputes
- A. Trademark Infringement
 - B. Determining Priority in an Infringement Dispute
 - C. Dilution
 - D. Cybersquatting
11. If Someone Infringes Your Mark
- A. What Litigation Costs
 - B. How Much Is Your Mark Really Worth to You?
 - C. Negotiate — Don't Litigate
 - D. How to Handle an Infringer
12. If Someone Claims That You Infringed Their Trademark
- A. What the Complaining Party Can Do to You
 - B. Steps You Should Take
13. International Trademark Protection
- A. A General Approach to International Trademark Protection

- B. Reciprocal Rights
- C. Deciding to Register Abroad

14. Help Beyond the Book

- A. Doing Your Own Research in a Law Library
- B. Finding Trademark Laws and Information on the Internet
- C. Finding a Lawyer

Appendixes

- A. Class Descriptions
 - International Schedule of Classes of Goods and Services
 - Descriptions of Goods and Services (From USTA—International Classes)
- B. Glossary of Terms
- C. Trademark Search Report

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

Trademarks — the names and symbols that distinguish your business and products in the marketplace — are important assets that you need to choose carefully and protect vigilantly, online and off. This comprehensive handbook describes how to choose distinctive marks that competitors can't copy; search for other marks that might have conflict with your own; register your mark with the U.S. Patent and Trademark Office; protect your marks from use by others; resolve trademark disputes outside the courtroom; create an Internet presence with an eye on trademark law; and more. The sixth edition includes new information on the Federal Dilution Act, a review of changes in the PTO's trademark programs, and the U.S.'s admission into the Madrid Protocol. It also features a new glossary of trademark terms. All necessary forms are included.

From the Introduction: "...Evaluating whether one mark legally steps on (infringes) another mark is not a science; it is an informed guessing game, an educated stab at how consumers will react to somewhat similar names, and how a judge in the future will rule on the issue. Although this book offers some sound guidelines for dealing with this question, it offers no guarantees. This is because infringement is decided on a case-by-case basis and clear-cut rules cannot be stated..."

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------|--------------------------------|--------------------------|
| 2 Treatise of Japanning and Varnishing: 1688 | | <i>Edition:</i> |
| <i>Author:</i> Stalker, John and George Parker | <i>Dynix:</i> 13005 | <i>Series:</i> |
| <i>Publish.:</i> Alec Tiranti, Ltd. | <i>Call No.:</i> 667.8 St | |
| <i>- place:</i> London, UK | <i>ISBN:</i> | |
| <i>- date:</i> ©1960 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1960 |
| <i>Subject:</i> Japanning | | <i>Price:</i> \$25.00 |
| <i>Desc:</i> xvi, 84 p., 24 plates, 26 cm. | | |

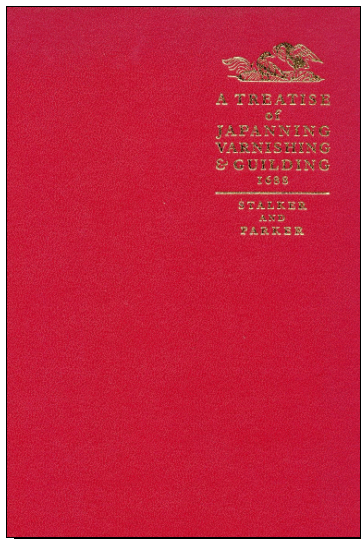


Table of Contents

- THE ART OF JAPANING, VARNISHING, &C.
 I. Character of the best Spirits, Gums, Metals, &c.
 II. How to make Varnishes
 III. General Rules. . . in all manner of Varnishing
 IV. Of varnishing Woods without Colour
 V. Of varnishing Woods with Colour
 VI. To work Metals or Colours with Gum-water
 VII. To make Gold-size
 VIII. To varnish Prints with White Varnish
 IX. How to lay Speckles or Strewings
 X. To lay Speckles on the drawing part of Japan-work
 XI. To make raised work in imitation of Japan, and of the Paste
 XII. To prepare ordinary, rough-grain'd woods, as Deal, Oak, &c. whereby they may be Japanned
 XIII. Of Bantam-work
 XIV. To take off any Japan-patterns in this Book
 XV. The manner of working and setting off some Draughts in this Book
 XVI. To work in Gold-size the Twentieth Print
 XVII. The work in Gold-size the Twentythird Print

- THE ART OF GUILDING, LACKERING, &C.
 XVIII. To guild any thing in Oyl, whereby it may safely be exposed to the weather
 XIX. To overlay Wood with burnisht Gold and Silver
 XX. To make good Paste, fit to mould or raise Carved work on Frames for Guilding
 XXI. Of Lackering
 XXII. Of Guilding Metals
 XXIII. Directions in Painting Mezzotintol-Prints
 XXIV. To lay Prints on Glass
 XXV. To Paint a piece of figures, as Men, Women, &c.
 XXVI. To imitate and counterfeit Tortoise-Shell and Marble
 XXVII. Of Dying or Staining Wood, Ivory, &c.

Subjects

| | |
|-------|------------------------|
| 272 . | Japanning |
| 423 . | Varnish and varnishing |

Reviews - Synopsis - Dust Jacket

Transcribed reprint of 1688 manual written by craftsmen of that period hence provides much insight into working practices, materials then in use with some illus of patterns Includes counterfeiting tortoiseshell, gilding, staining

INTRODUCTION

It is one of the delights of literature that every now and then a gifted and possibly rather eccentric specialist produces a book on his own subject that is a work of art in its own right. It may be by virtue of some especial felicity of expression, a liveliness of wit or the observation of an acute and different mind which makes the book as readily accept able for its literary content as for its technical information. Isaac Walton or Gilbert White are classic examples.

But in its own way Stalker and Parker's Treatise of Japaning, which Messrs. Tiranti are to be congratulated on for rescuing from oblivion, is just such a work. Here, on the one side, is an illuminating treatise on seventeenth century craftsmanship which is fascinating in itself; on the other is a literary gem as precious as gold of which the authors say in their notes on gilding that it is 'too precious to be lavishly consumed and improfitably puff'd away'.

A page of Stalker and Parker and one is back in the Pepysian world of baroque London with its engaging self-satisfaction, its provincial pomposity and its pretensions of classical learning. All this is here combined to present the 'Reader and Practitioner' with a technical handbook on lacquering, gilding and decorative painting which was all the rage

in fashionable London after the Restoration.

Who Stalker or Parker may have been we can at present merely hazard. Future research may perhaps tell us more but it is unlikely. From the intimate detailed technical knowledge one or other, if not both, must almost certainly have been a leading craftsman at some time. If only one of them, perhaps it was Stalker, whose address was at the Golden Ball in St. James's Market where he must have plied his trade or owned a shop. This suggestion is supported by the fact that it is he alone who signs the dedication to the 'Countess of Darby' in which he invites 'Ladies & Gentlemen who might have suffered disappointment with any of the receipts' to come to see them tried by the author—who in this and all other commands is their most ready and most humble servant'. In one edition also, his name alone appears as author. Mr. Parker, however, lived 'over against the Theater in Oxford'. He may also have practiced there and it may well have been the University contact which produced the delicious 'learned' declamations scattered throughout the book. Certainly the text, though gongoesque, may be less so than the dedication, possibly Mr. Parker was but an academic hack—a literary ghost. But perhaps we should not speculate too far, nor over-emphasise the literary and period charm, for this volume, its contents and the date of its publication have a very real significance for the study of furniture and decoration.

From very early times oriental objects had a curiosity value in Europe. With the development of shipping and maritime trade in the sixteenth and seventeenth centuries the interest widened and objects such as porcelain and lacquer could be imported in reasonable quantity. The rich indulged their fancy and, as embassies and traders went to and fro, travellers' tales combined with the mystery and wonder of distance to imbue these objects with an exotic delight which it is sometimes difficult for an air-travel age to appreciate.

It is not surprising that it was in the maritime powers like England, Holland and Portugal that the interest for oriental pieces chiefly developed, and by the middle of the seventeenth century several companies in the Far East were doing an extensive and important trade in lacquer of all sorts. Taste seems to have been fairly catholic. Even special orders or foreign patterns could be catered for as we know from examples in many collections, such as the inscribed Maria van Diemen chest in the Victoria and Albert Museum or a dish of European design in the same Museum. In the early stages it had been the hard Japanese lacquer that had been most admired. Hence no doubt the title 'Japanning'. Indeed, in their introduction the authors speak—from hearsay it would seem, and doubtless no little imagination—of the wondrous lacquer palaces of Japan, so finely finished that in them we are told 'no amorous Nymph need entertain a dialogue with her Glass or Narcissus retire to a fountain'.

During the seventeenth century the market for original Japanese lacquer was vitally affected by the bans which virtually closed the country to Western trade, while limited shipping facilities also helped to curtail the supply of original oriental pieces. All these factors combined with the costs, inevitably led to the development of local imitations to cater for the fashionable craze for lacquered furniture after the Restoration. In the words of our authors, 'That Island (Japan) not being able to furnish these parts the English and Frenchmen have endeavoured to imitate them'. The French did indeed produce lacquer, but generally of a finer quality in design and execution than the Dutch or English productions which were usually based on Chinese rather than the Japanese models.

It does not need a very long or intimate experience to realise just how bad a lot of this local 'japaned' work could be, nor indeed how tasteful and agreeable the best could be. But the differences between the home and the imported wares were not merely an issue of technique and material, but of the whole interpretation of the 'oriental taste' which had so marked an effect on European decoration during the following century. In this development Stalker and Parker's book must have played an important part both at home and abroad.

Although they admit to having 'help't' the designs 'a little' when they were 'lame', there seems no reason to doubt the authors' personal claim that (they thought) they were making exact reproductions of oriental originals. In some cases, as in the individual birds and flowers, if we make allowances for draughtsmanship, some reasonably close feeling for the originals is preserved. The moment that groups and scenes are created, however, the European taste and handling are strongly marked. In the subject matter the whole exciting fantasy of priests and potentates, executions and tortures in ballet style absorbs their interest and betokens the thrill and mystery which the East conjured up, and indeed continued to do until very recent times if we consider *The Mikado*, *Chu Chin Chow*, or even *Dr. Fu Manchu*.

Alongside this development of fairly directly adapted Chinese motifs many conceits in oriental and exotic designs were to be found in England during the late seventeenth and early eighteenth centuries, as witness the painted rooms by 'Robinson' and the closely similar groups and motifs in the Mortlake tapestries of the following decades. In these we seem to find a blend of the exotic with the traditional European grotesques and in particular the currently popular decorative creations of artists like Berain. Such a parentage was to produce the later eighteenth-century Continental Rococo. Here it is interesting to note that while England lagged behind none in her enthusiasm for Orientalia during the seventeenth century, the later fashion had fewer followers here than on the Continent.

Among the designs included in the illustrations are a number of patterns for boxes and toilet sets for which chinoiserie was rightly held to be particularly suitable. In addition to lacquer the designs could equally well be, and were, used in painting, engraved silver or embroidery. This adds notably to the past and present interest and value of this book. The

emphasis is throughout on amateurs and the general implication that the work is directed as much to them, including 'the ladies', as to professionals is an interesting sidelight on English pastimes of the seventeenth century.

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------------------|-------------------------|------------------------------------------|
| 826 Understanding Chemical Patents: A Guide for the Inventor | | Edition: 2nd edition |
| Author: Maynard, John T. and Howard M. Peters | Dynix: 100381 | Series: ACS Professional Reference Books |
| Publish.: American Chemical Society | Call No.: 660.027 Ma | |
| - place: Washington, DC | ISBN: 0841219982 | |
| - date: ©1991 | Shelf Adult Non-Fiction | Year: 1991 |
| Subject: Patents | | Price: \$40.00 |
| Desc: xvi, 183 p., illus., 24 cm. | | |

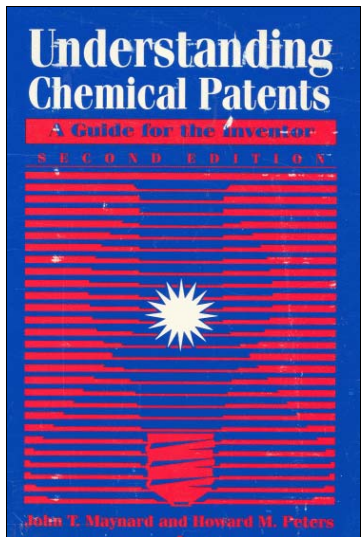


Table of Contents

Preface
 Ch 1: Introduction: The Purpose of Patents
 Ch 2: How to Read a Patent
 Ch 3: Patents as an Information Source
 Ch 4: Deciding Whether to File a Patent Application
 Ch 5: The Independent Inventor: Obtaining Patent Protection
 Ch 6: Preparation of the Patent Application
 Ch 7: Prosecuting the Patent Application
 Ch 8: Interferences and the Importance of Records
 Ch 9: Patent Infringement and Patent Claims
 Ch 10: Making Use of Patents: Enforcement
 Ch 11: The Employed Inventor: Assignments and Employment Agreements
 Ch 12: Copyrights, Trademarks and Trade Secrets: Design and Plant Patents
 Ch 13: Recent Biotechnology-Related Patent Law
 Ch 14: Changes in U.S. Patent Laws: 1980-1990
 Ch 15: Trends in U.S. and World Patent Law
 Ch 16: Representative U.S. Patent Fees and Payment of Money
 Glossary and Abbreviations
 Bibliography
 Organizations Mentioned
 Index

Subjects

| | |
|-------|----------------------|
| 542 . | Chemistry -- Patents |
| 543 . | Patents |

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This book gives a description of the U.S. patent system and a tutorial on how to read and understand patents, how to use patents as a source of information, how to recognize that an invention has been made, and how to work with attorneys or agents in seeking patent protection for inventions. Another main purpose of this book is to give the technical person enough familiarity with the special terminology of patents to be able to deal comfortably with patent attorneys, agents, and technical liaison personnel. It answers the questions not only of those who need to understand the patent system, not only practicing chemists and chemical engineers, but also people in other fields.

PREFACE:

Questions about patents most often concern those who are actively working in the chemical profession; consequently, this is a book for practicing chemists and chemical engineers. Much of the information will also be useful to people in other fields who need to understand our patent system. The first edition of this book, written by John T. Maynard alone, was an outgrowth of a short course offered to the technical staff of the On Pont Experimental Station in 1976. The attendance at that course was the largest of any course ever offered to that audience, and it underscored the widespread interest of chemical practitioners and their need to know more about patents.

This book is not about patent law or patent licensing and management. In this book, Maynard and I try to answer the immediate, practical questions of chemists and engineers about how to read and to understand patents, how to use patents as a source of information, how to recognize that an invention has been made, how to work with attorneys or agents in seeking patent protection for inventions, how to keep adequate notebook records, how to watch for infringement of patents, and so on. Another main purpose of this book is to give the technical person enough familiarity with the special terminology of patents to be able to deal comfortably with patent attorneys, agents, and technical liaison personnel.

Many points about the law and the business aspects of patents have been given only a paragraph or even a single sentence here but are the subject of entire books or journal articles in the literature. For those who want to pursue such matters, the Bibliography suggests a number of books and articles that can be consulted, and the references cited will lead to more.

This second edition of the book relies heavily on the first and updates those many areas that have undergone large changes over the past 12 years. Major changes are still being examined for U.S. and foreign patent law.

A Special Note:

To those who have just finished academic training and are starting their professional careers:

You are leaving a world of grades and grading in which a typical scale would rate a score of 70% as passing, 80% as good, 90% as excellent, and 100% as impossible. You are entering a world where the only creditable score, at least in matters of technical accuracy, is 100%. A score of 90% will receive a cool reception, and anything less is unsatisfactory. There is no reason for terror, however, because you are well prepared and you will find that many redundancies are provided in the procedures you will be following. It will be difficult to err very much.

Nowhere in your new activities are error-free results more important than in patent matters. By your efforts, important intellectual property rights are secured. By your acts, important patent rights can also be lost or weakened. Failure to secure sound patent protection for the inventions you will make can result in wasted research and development effort and even substantial liability for your organization if it should infringe the patents of others.

You should take patents seriously, take advantage of your patent information sources, and work closely with your patent advisors and legal representatives when their assistance is appropriate. Much of this book was written with your particular needs in mind. I hope it contributes to smoothing the path in your new career.

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------|
| 179 Understanding Paint
Author: Fuller, Wayne R.
Publish.: American Paint Journal Company
- place: St. Louis, MO
- date: ©1965
Subject: Paint
Desc: 135 p., 21 cm. | Dynix: 34096
Call No.: 667.6 Fu
ISBN:
Shelf Adult Non-Fiction | Edition:
Series:
Year: 1965
Price: \$25.00 |

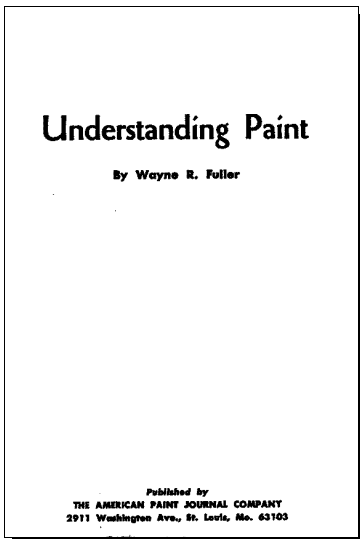


Table of Contents

- Chapter I —Introduction
- Chapter II —Oils for Paint
- Chapter III —Driers and the Drying Process
- Chapter IV —Oil Base House Paints—I
- Chapter V —Oil Base House Paints—II
- Chapter VI —Newer Type House Paints
- Chapter VII —Miscellaneous Exterior House Paints
- Chapter VIII—Metal Paints
- Chapter IX —Interior Wall Paints
- Chapter X —Miscellaneous Interior Architectural Finishes
- Chapter XI —Resins for Paint—Part I
- Chapter XII —Resins for Paint—Part II
- Chapter XIII—Solvents
- Chapter XIV—Plasticizers and Miscellaneous Materials
- Chapter XV —Finishes for Wood Furniture
- Chapter XVI—Finishes for Metal Products

Reviews - Synopsis - Dust Jacket

FORWARD

At present there is no book that is well suited for the first reading of a beginning paint chemist, technician or others who wish to gain a broad understanding of paint technology. This book is intended to fill the void. Consonant with its purpose, the book is broad in scope but neither deep nor exhaustive on any point. So far as feasible, discussion of raw materials has been related to the paint products in which they are used. Some portions may be completely clear to trained chemists only. However, these parts have been simplified so that others should be able to grasp their general meaning and significance.

Subjects

276 . Paint

INTRODUCTION

More than once outside callers have asked the writer on the telephone: "Are you the chemist?" After explaining that I am one of more than forty I have tried to give the inquirer the information wanted. Such incidents make painfully clear that many people have no true conception of the paint industry; envisioning it as it was fifty years ago rather than the highly advanced and complex chemical industry that it is today. Even chemists from other fields are likely to find their first trip through a modern paint laboratory more than a surprise, a revelation.

A few random facts may help to clarify the situation. The paint industry uses a greater number and wider variety of raw materials than any other segment of the chemical industry. A paint plant that makes a fairly comprehensive line of finishes, including paints for industrial products, uses a minimum of five hundred purchased raw materials and intermediates. Among these materials are such household words as vanilla, petrolatum (Vaseline), hydrogen peroxide, denatured alcohol, dry cleaner's naphtha, glycerine, talc, boric acid, borax, ammonia, formaldehyde (formalin), white mineral oil (Nujol), castor oil, sodium bicarbonate (baking soda), ethylene glycol (base for permanent anti-freeze), urea and tap water. At the other extreme are many chemicals with names that are understood only by the trained chemist: ethylene glycol monoethyl ether, styrene, vinyl toluene, phthalic anhydride, maleic anhydride, pentaerythritol, sorbitol, trimethylol ethane, methyl isobutyl ketone, epichlorhydrin, para toluene sulfonic acid, cumene hydro-peroxide, acrylic acid, methyl methacrylate—to mention a relatively few.

The technical complexity of the paint industry is reinforced by the unequalled variety of its finished products. The number made by a single factory may run well into thousands. Many of these products are tailored to do a specific job for a single customer.

There is a widespread notion that paints are simple products, made by merely mixing pigments with oils, varnishes and lacquers. This misconception would be quickly dispelled by a trip through a modern paint factory and the extensive laboratories that develop the formulas and test each batch of paint for conformance to standard. All reasonably informed people are aware of several of the synthetic plastics and some of the synthetic fabrics, synthetic rubbers and synthetic adhesives. However, few realize that synthetic resins or elastomers of the same chemical types are used in paints; in fact, they constitute the binder or film former in the larger part of paint made today. Paint companies develop and produce many of these synthetic resins by chemically reacting the basic building blocks or monomers. This is polymer chemistry. The paint industry has become so highly technical that it employs at least five thousand chemists and technicians, and the number is increasing rapidly.

When one goes to a store to buy paint he gets a liquid material in a can. His main interest, however, is in a dry film on the surface that he wants to paint. For the moment, we will skip the liquid and consider the film. The most surprising thing about it is its thickness, rather its thinness, considering the big job that it does. A good three coat exterior house paint job has a dry film thickness of not more than five one-thousandths of an inch, a two coat job three thousandths. (One thousandth of an inch is called a mil.) A three coat paint job on exterior metal is about five mils thick. Two coats of floor varnish give about one and a half mils. If you buy pre-painted aluminum siding, the paint film is about one mil thick. The clear varnish finish that protects a mahogany boat from the elements is only about two mils. The finish on your automobile is in the range of one and three quarters to two and a half mils. High grade kitchen appliances carry paint films of two to two and a half mils.

These very thin films serve many purposes. Everybody is aware of their two primary functions of decoration and protection, but many people have no conception of the numerous less obvious phases of protection. Among these hidden uses are electrical wires, underground pipe lines, interior lining of metal cans and drums for foods and chemicals, spinning bobbins, electro plating equipment, electronic and missile components. If denied industrial paints, industry would gradually chug to a standstill.

Probably first among the secondary functions of paint is lighting. Every body is generally aware that a room is lighter when painted with a white or light colored paint but seldom is there full appreciation of the extent to which the color of paint affects the lighting of interiors. The proportion of light that is reflected by a surface is expressed as a percentage of complete reflectance. Following are approximate reflectance values for various colors: white—88 to 80, very light tints—80 to 70, light tints—70 to 60, medium to dark tints—60 to 25, deep colors—15 to 3, aluminum paint—41, black—2 to 1. Because there is multiple reflection of light from one surface to another, the effect of color on actual lighting is much greater than indicated by the foregoing percentages. With modern illumination the ceiling color is especially important. The most economical way of obtaining the desired number of foot-candles of illumination at a working surface is by painting the ceiling white and side walls white or a light tint.

The recognized sanitary value of paint is related to color because light colors make dirt more visible. For this reason food processing plants are usually painted white, and some factories paint all corners white at the floor level. A hard, glossy paint surface is much easier to clean than concrete, brick, plaster or fiber board. Paints can be formulated to prevent or retard growth of molds, which might be considered a phase of sanitation. Some paints are claimed to have germicidal and insecticidal value, but one may question the degree and permanence of these properties.

Paint promotes safety in a variety of ways, most obviously in traffic line paints and in traffic signs. Paints reduce the fire hazard from use in building construction of wood and other combustible materials, especially when the paints are the fire-retardant type. For surfaces that create danger of slipping, there are high-friction, skid-proof paints. The hazard in the use of machinery such as presses and drills is greatly reduced by painting in color combinations that reduce eye strain and make the danger areas stand out. Factory pipes are color coded with paint to indicate the contents of each line, thus minimizing the chance of turning the wrong valve and of accidents during repairs.

Paint serves a valuable function in the control of temperatures inside structures. Most of the radiant energy from the sun comes as visible light and invisible infra-red rays, both of which are strongly reflected by white or very light colors but absorbed increasingly as colors become darker. Since absorbed energy is converted to heat, a light color on the exterior of structures promotes lower inside temperatures during summer months. A light colored roof can make a house noticeably more comfortable. The loss of volatile liquids from outside storage tanks is appreciably reduced by painting them white, a fact that is reflected in the practice of many petroleum companies.

Without attempting to note all of the myriad functions served by paint the following deserve brief mention. Paints that reduce friction are used on drawer slides and on the rubber grommets around automobile windows. Penetrating paints containing preservatives are employed to prevent rotting of wood. Especially formulated paints are used for electrical insulation and, in a few cases, for electrical conductance. Paints are employed to indicate temperature, through color change. Military camouflage is accomplished by paints that blend with the background, whether viewed or photographed by natural light or infra-red light. Poor acoustics in a room can be improved by specialty paints. A wide variety of surface appearances can be simulated by paints: wood grain, hammered metal, top grain leather, and suede leather. There are luminescent paints that impart visibility in the dark as well as glow and

brilliance by daylight.

At this point it seems advisable to cut in for something that is usually boresome, a definition of terms. So far the simple word "paint" has been used in the broadest possible meaning to cover all of the products that are normally made by paint manufacturers. The only alternative term that has been proposed is "organic surface coatings." This term is inaccurate because: (1) cement and silicate base paints are inorganic and (2) wood bleaches, penetrating stains and penetrating sealers are not surface coatings. Aside from accuracy length alone condemns the term. The manufacturers of industrial paints have coined the term "technical coatings" in the hope that it will glorify their products. Unless the word "organic" is added, "technical coatings" includes porcelain enamel, electroplating, galvanizing, hot metal spraying, anodizing and phosphatizing. If "organic" is included, the term becomes unwieldy. Throughout this book we will adhere to the unmodified word "paint" as the general term for all kinds of paint products. The various types will be indicated by modifying words, such as "flat wall" or by some well-understood word such as "stain", "varnish", or "lacquer".

With the exception of some penetrating stains, most paints have two things in common: (1) a film former or binder to hold them together, (2) a volatile solvent or dispersion medium to reduce them to a consistency that makes application practicable. A paint that contains these two essentials only is a clear varnish or clear lacquer. If dyes or semitransparent pigments are added, we have a color varnish or lacquer toner. If hiding pigments are added to a drying oil, a clear varnish or clear lacquer, we have a filler, surfacer, primer, undercoat, enamel or paint of some; specified type. Since the volatile solvent serves a secondary function, the more basic part of paint is the film former.

Film formers are of two general types: thermoplastic and conversion. A thermoplastic film former is one that undergoes no significant chemical or physical change in the process of drying. The simplest example is shellac. Shellac varnish is made by merely dissolving shellac in alcohol. After the varnish is applied, the alcohol evaporates leaving the unchanged shellac on the surface. Drying involves only the evaporation of the solvent. The process is the same for typical nitrocellulose lacquers, typical vinyl resins and acrylic resins, excepting the new thermosetting type. Most water emulsion or latex paints also are thermoplastic but drying involves an additional stage: as the water evaporates the minute, suspended particles of paint are crowded together until finally they touch and fuse or coalesce.

The majority of paints are the conversion type. With them drying occurs in two stages, which overlap to some extent: (1) evaporation of the solvent, leaving a wet or sticky surface, (2) conversion of this sticky condition to a hard, usable coating. This conversion is brought by a number of different agents, depending on the nature of the film former. The most common agent is the oxygen in the air, which acts on drying oils and on varnishes and resins containing oils. The drying is accelerated by the use of catalysts, usually compounds of lead, manganese and cobalt. Coatings that are converted by air are called oxygen convertible. The second most common agent is heat, hence heat convertible or thermosetting coatings, more commonly called baking varnish, baking enamel, etc. While the drying of oxygen convertible coatings can be greatly accelerated by heat, the term "convertible" is reserved for coatings that do not convert unless heated. The more important heat convertible resins are urea-formaldehyde, melamine formaldehyde, some phenolics, some epoxies, and some acrylics. There is an overlapping between heat-convertible and the next type, catalyst convertible, in that some resins can be converted either way. It is worth noting that these resins give better film properties when converted by heat. The most common examples of catalyst convertible resins are urea-formaldehyde, melamine-formaldehyde and some epoxies. There is a rather complicated question of true catalysts versus pseudo-catalysts or cross-linkers, which will be considered later. Although there are other processes of film conversion, they are too limited in application to merit specific mention here.

In many cases the process of film formation is made more complex by two or more types of conversion being involved in a single product. For example, a nitrocellulose lacquer may contain an alkyd resin of the oxygen convertible type or it may contain a urea-formaldehyde resin and a catalyst for this resin.

There is a significant relationship between the type of film former and film properties. It is obvious that a thermoplastic film is resolvable in the solvent from which it was deposited and frequently it can also be dissolved by other types of solvents. Moreover, the hardness of the film is limited to the hardness that characterizes the original thermoplastic material. In the case of conversion film formers, film properties are related to the method of conversion. This point will be developed later in discussing film formers in greater detail.

The broadest, most common classification of paints has small connection with film formation. It is based on how they are sold and who uses them. From this standpoint paints are classed as: (1) shelf goods or trade sales paints, retailed through stores, (2) industrial product paints, bought by manufacturers for use on their products, (3) maintenance paints, sold directly or sold to contracting painters for use on factories, other buildings and structures, such as bridges and storage tanks. Sometimes maintenance paints are difficult to differentiate because they may be referred to as industrial paints or purchased from a retail store.

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>936 Understanding Thermoplastic Elastomers</p> <p>Author: Holden, Geoffrey
 Publish.: Hanser Gardner Publications, Inc.
 - place: Cincinnati, OH
 - date: ©2000
 Subject: Elastomers
 Desc: vii, 110 p., illus., 23 cm.</p> | <p>Dynix: 105704
 Call No.: 678 Ho
 ISBN: 1569902895
 Shelf Adult Non-Fiction</p> | <p>Edition:
 Series: Hanser Understanding Books (A Series of Mini-Tutorials)
 Year: 2000
 Price: \$36.50</p> |

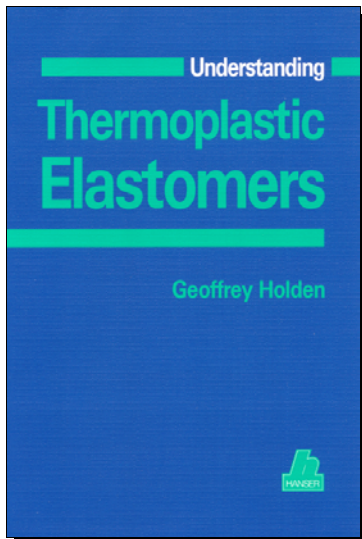


Table of Contents

1. Introduction and Historical Survey
 - 1.1 Overview
 - 1.2 Historical Survey
2. Classification and Structure
 - 2.1 Phase Structure
 - 2.2 Phase Properties
 - 2.3 Polymer Structure
 - 2.3.1 Nomenclature
3. Styrenic Block Copolymers
 - 3.1 Common Features
 - 3.1.1 Domain Theory
 - 3.1.2 Filler Effects
 - 3.1.3 Polystyrene/Elastomer Ratio
 - 3.1.4 Clarity
 - 3.1.5 Thermodynamics of Phase Separation
 - 3.1.6 Miscibility with Other Polymers
 - 3.1.7 Solubility
 - 3.2 Styrenic Block Copolymers Produced by Anionic Polymerization
 - 3.2.1 Polymerization
 - 3.2.2 Elastomer Segment
 - 3.3 Styrenic Block Copolymers Produced by Carbocationic Polymerization
 - 3.3.1 Polymerization
 - 3.3.2 Elastomer Block
 - 3.3.3 Styrenic End Block
4. Multi-Block Copolymers
 - 4.1 Thermoplastic Elastomers Based on Polyurethanes, Polyethers, and Polyamides
 - 4.1.1 Polymerization
 - 4.1.2 Monomers and their Effects on Polymer Properties.
 - 4.1.2.1 Polyurethane Thermoplastic Elastomers
 - 4.1.2.2 Polyester Thermoplastic Elastomers
 - 4.1.2.3 Polyamide Thermoplastic Elastomers
 - 4.1.3 Common Features
 - 4.2 Thermoplastic Elastomers Based on Polyolefins
 - 4.2.1 Segmental Structures
 - 4.2.2 Polymerization
 - 4.3 Miscellaneous Block Copolymers
5. Hard Polymer/Elastomer Combinations
 - 5.1 Simple Blends
 - 5.2.1 Dynamic Vulcanizates
6. Graft Copolymers, Ionomers, and Core-Shell Morphologies
 - 6.1 Importance
 - 6.2 Graft Copolymers
 - 6.2.1 Structure
 - 6.2.2 Chain Statistics
 - 6.2.3 Molecular Parameters
 - 6.2.4 Production

Subjects

| | |
|-------|----------------|
| 567 . | Copolymers |
| 568 . | Elastomers |
| 569 . | Thermoplastics |

- 6.2.5 Properties
- 6.3 Ionomers
- 6.4 Core-Shell Morphologies

- 7. Commercial Applications of Thermoplastic Elastomers
 - 7.1 Styrenic Block Copolymers
 - 7.1.1 Styrenic Block Copolymers as Replacements for Vulcanized Rubber
 - 7.1.2 Styrenic Block Copolymers as Adhesives, Sealants and Coatings
 - 7.1.2.1 Pressure Sensitive Adhesives
 - 7.1.2.2 Assembly Adhesives
 - 7.1.2.3 Sealants
 - 7.1.2.4 Coatings
 - 7.1.2.5 Oil Gels
 - 7.1.3 Styrenic Block Copolymers in Blends with Thermoplastics or Other Polymeric Materials
 - 7.1.3.1 Thermoplastics
 - 7.1.3.2 Thermosets
 - 7.1.3.3 Asphalt Blends
 - 7.1.3.4 Wax Blends
 - 7.2 Multi-Block Copolymers
 - 7.2.1 Replacements for Vulcanized Rubber
 - 7.2.2 Adhesives, Sealants, and Coatings
 - 7.2.3 Polymer Blends
 - 7.3 Hard Polymer/Elastomer Combinations
 - 7.3.1 Hard Polymer/Elastomer Combinations as Replacements for Vulcanized Rubber
 - 7.3.2 Polymer Blends

- 8. Economic Aspects, Tradenames and Glossary, Future Developments
 - 8.1 Economic Aspects
 - 8.1.1 Price
 - 8.1.2 Commercial Sales
 - 8.2 Tradenames and Glossary
 - 8.3 Future Developments

Subject Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

One of the outstanding advantages of TPE's can be summarized in a single phrase:

"They allow rubberlike articles to be produced using the rapid processing techniques developed by the thermoplastic industry."

The commercial development of TPE's enabled the rubber industry to utilize new processing techniques including blow molding, comolding and coextrusion, hot melt coating of pressure sensitive adhesives, and direct injection molding. New products, new processing techniques, new properties, and new applications have been experienced in the last decade. All this is reflected in this general introduction to the subject.

Contents:

- Introduction
- Classification and Structure
- Styrenic Block Copolymers
- Multi Block Copolymers
- Graft Copolymers, Ionomers, and Core-Shell Morphologies
- Commercial Applications of Thermoplastic Elastomers
- Economic Aspects, Tradenames and Glossary, Future Developments

INTRODUCTION:

Overview

Thermoplastic elastomers are a relatively new development in the rubber industry. If we could step back in time to about 1960, we would find almost all the conventional (i.e., vulcanizable) rubbers that we are familiar with today being sold and used. The only significant exception would be hydrogenated nitrile rubber (HNBR). However, while thermoplastic polyurethanes had just been introduced, in 1960 all the other types of thermoplastic elastomers were yet to be discovered. Since then, the rapid growth of thermoplastic elastomers that indicates that there was clearly an unmet need

for these products. Their worldwide annual consumption was estimated at 1,000,000 metric tons/year in 1995. This is expected to rise to about 1,400,000 metric tons/year in 2000, which amounts to a 7% annual growth rate.

Three books cover thermoplastic elastomers in detail. The first two concentrate mostly on the scientific aspects of these polymers, while the other concentrates on their end uses. Thermoplastic elastomers have also been the subject of recent articles in encyclopedias and reference books. The object of this book is to provide a short introduction and overview of the whole field, with the caveat that it is rapidly changing, so all that can be done in this text is to give a "snapshot" of the situation at the time of writing.

The outstanding advantage of thermoplastic elastomers can be summarized in a single phrase: they allow rubberlike articles to be produced by the rapid processing techniques developed by the thermoplastics industry.

All polymers are classified by two characteristics: how they are processed (as thermosets or as thermoplastics) and the physical properties (rigid, flexible, or rubbery) of the final product. All the commercial polymers used for molding, extrusion, etc., fit into one of the six resulting classifications; the thermoplastic elastomers are the newest. They have many of the physical properties of rubbers, e.g., softness, flexibility, and resilience. However, they achieve their properties by a physical process (solidification) compared with a chemical process (crosslinking) in vulcanized rubbers.

This solidification is accomplished in one of two ways: cooling or solvent evaporation, if the particular thermoplastic elastomer is soluble (most are not). In the terminology of the plastics industry, vulcanization is a thermosetting process. In other words, it is slow, irreversible, and usually requires heating. With thermoplastic elastomers, on the other hand, the transition from a processable melt to a solid, rubberlike, object is rapid, reversible, and takes place upon cooling. Thus, thermoplastic elastomers can be processed using conventional thermoplastic processing techniques, such as injection molding and extrusion. As with other thermoplastics, scrap can be recycled. Also, some thermoplastic elastomers are soluble in common solvents and can be processed as solutions.

Because they become soft and flow when heated, the high temperature properties of thermoplastic elastomers are usually inferior to those of conventional vulcanized rubbers. Thus, thermoplastic elastomers are usually not used in applications such as automobile tires. Instead, most of their applications are in areas where high temperature properties are less important, e.g., footwear, molded parts (including those used on automobiles), wire insulation, adhesives, and polymer blending.

Historical Survey

The history of thermoplastic elastomers is inevitably part of the development of the whole history of polymer chemistry. Although natural high polymers (e.g., cotton, wool, rubber) have been known for centuries, there was no understanding of the nature of these materials; essentially people used what was available. Probably the first significant attempt to improve on nature was the crosslinking (or vulcanization) of rubber, developed by Charles Goodyear in 1839. A few years before this, John Hancock reduced the molecular weight of rubber by milling. These two discoveries became the foundation of the rubber industry.

Note that both these discoveries were made pragmatically. There was no understanding of the principles involved. Williams and later, Harries, showed that natural rubber was derived from isoprene (C₅H₈). However, it was believed that rubber was some kind of aggregation or colloidal association, possibly of low molecular weight cyclic structures based on isoprene, what today would be called cyclic oligomers. Similar structures were proposed for proteins and cellulose. These and similar materials were considered low molecular weight compounds, held together by secondary valence forces. Very large molecules were thought to be impossible. Indeed, Emil Fischer, the famous organic chemist and Nobel Laureate, maintained that 5,000 was the upper molecular weight limit for organic compounds.

Despite this lack of fundamental understanding, important discoveries continued to be made. About 1870, Celluloid (a mixture of cellulose nitrate and camphor) was introduced. In 1910, Baekeland developed the first synthetic resin, Bakelite, derived from phenol and formaldehyde. In Germany during World War I, dimethyl butadiene was polymerized to produce a substitute for natural rubber.

The years before World War II saw two parallel developments. One was the introduction of more synthetic polymers polystyrene (PS), polyvinyl chloride (PVC), and styrene butadiene rubber (SBR) are outstanding examples. The second was the development of the fundamental theory of high polymers by Staudinger and later, Carothers. For the first time, workers in this field understood what was happening during polymer manufacture and processing. Carothers used this understanding to develop nylon and neoprene, the first a thermoplastic, and the second an elastomer.

The first developments in thermoplastic elastomers also occurred about this time. The first work was based on PVC, a rigid thermoplastic. It contains a significant amount of syndiotactic structure that can crystallize and also amorphous atactic structure. (Tacticity is described in more detail in Section 4.2). At room temperature, the syndiotactic structure is crystalline, and the amorphous atactic structure is above its glass transition temperature. Thus, both structures are hard and rigid at room temperature. However, as Semon discovered about 1930, plasticizers can be added (e.g., dioctyl

phthalate (DOP)) that swell the atactic polymer and reduce its glass transition temperature to well below room temperature. This converts it to a flexible product. The result is what we now know as the structure of most thermoplastic elastomers: a combination of a rigid phase (syndiotactic PVC) that becomes fluid at processing temperatures with a softer, flexible phase (plasticized atactic PVC).

However, plasticized PVC is not usually considered an elastomer. It lacks many elastomeric properties such as snapback, resilience, and high surface friction. But it was the first material that even came close to being a thermoplastic elastomer. In 1940, its elastic properties were improved by blending with another elastomer, nitrile rubber (NBR). PVC / NBR / DOP blends are now an important part of the thermoplastic rubber industry.

About 1937, workers in Germany at I. G. Farben developed the urethane reaction between an isocyanate and an alcohol. By using diisocyanates and glycols, the result was a long chain structure, similar in principle to nylon. By using two glycols (one short chain, the other long), blocks of two polyurethanes are produced. The first is crystalline the second amorphous. Again, they form the basic two-phase system characteristic of most thermoplastic elastomers. Starting about 1955, this principle was used by workers at DuPont and at B. F. Goodrich to produce elastic fibers and moldable rubbers. It was later extended to yield thermoplastic elastomers with both polyester and polyamide hard segments.

In the 1950s, anionic polymerization was developed. In this system, solution polymerization is initiated by a metallic anion, (e.g., sodium). Pure metals were used at first, but alkyl-metallics (e.g., butyl lithium) were found to give better results. The system is "living"; that is, in the absence of terminating agents, the polymeric product can initiate further polymerization. Thus, if a second monomer is added, the result is a block copolymer. Styrene, butadiene and isoprene are the only common monomers that can easily be polymerized in this way. The first commercial products were polybutadiene and polyisoprene (anionic production of polystyrene is not economic). In 1961, attempts at Shell Chemical to improve the cold flow properties of these two elastomers led to the development of styrenic block copolymers. These were important for two reasons:

1. They offered a low-cost route to the production of thermoplastic elastomers with many properties of conventional vulcanized rubbers.
2. Their simple and unequivocal structure gave a clear picture of how other thermoplastic elastomers (or at least, those based on block copolymers) gained their properties. In other words, they served as model polymers.

Later, about 1975, similar polymers with improved stability were produced by selective hydrogenation of the elastomer segments in these block copolymers.

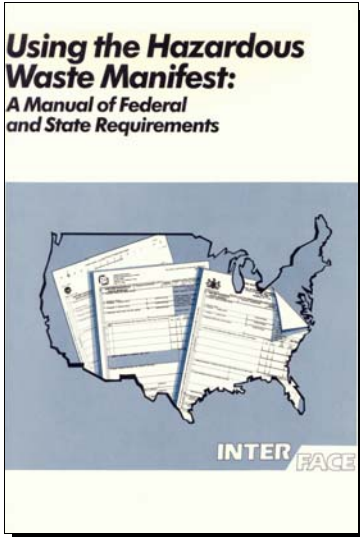
In the 1960s, other block copolymers, such as polycarbonate/polyether and poly (silphenylene siloxane) /polydimethylsiloxane, were found to have elastomeric properties without vulcanization, but the reasons were not clearly understood. Many other hard polymer/elastomer block copolymers have been investigated since then and have been shown to produce thermoplastic elastomers. For example, carbo cationic polymerization has been used to produce thermoplastic elastomers from block copolymers of styrene and isobutylene (see section 3.3), and metallone catalysts have been used to produce thermoplastic elastomers from block copolymers of olefins.

The basic requirements for a thermoplastic elastomer, a hard phase and an elastomeric phase, were now established. As well as hard polymer/elastomer block copolymers, there are several other ways of achieving this requirement. An obvious one is simple mixing. About 1960, two new polymers (both produced by Ziegler-Natta catalysts) were introduced. The first was a rubber, a copolymer of ethylene and propylene (EPR). The second was a thermoplastic, isotactic polypropylene. They are produced from low-cost monomers and should obviously be technically compatible with each other. At first only a small amount of EPR was mixed with the polypropylene to produce a high impact thermoplastic. When more EPR was added, often extended with oil, the result was a hard thermoplastic elastomer. Attempts to produce softer grades in this way were less successful the large proportion of the weak EPR phase resulted in poor properties.

However, this problem was solved around 1975, when the elastomer phase (in this case, EPDM) was crosslinked during the mixing process in a system called "dynamic vulcanization". The resulting thermoplastic elastomers can be quite soft and their properties are often better than those of simple mixtures.

Other systems investigated include graft copolymers (an elastomer chain on which is grafted several hard segments) and elastomeric ionomers (an elastomer chain containing acidic groups with associated metal cations). While they have many interesting properties, they have not developed into commercial products.

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------------------------------------------------------|-----------------------------|--------------------------|
| 180 Using the Hazardous Waste Manifest: A Manual of Federal and State Requirements | | <i>Edition:</i> |
| <i>Author:</i> Inter/Face Associates, Inc. | <i>Dynix:</i> 30439 | <i>Series:</i> |
| <i>Publish.:</i> Middleton, CT | <i>Call No.:</i> 363.728 Us | |
| <i>- place:</i> Middleton, CT | <i>ISBN:</i> | |
| <i>- date:</i> ©1985 | <i>Shelf</i> Reference | <i>Year:</i> 1985 |
| <i>Subject:</i> Hazardous wastes -- Law and legislation -- United States | | <i>Price:</i> \$50.00 |
| <i>Desc:</i> 1 v. (various pagings) illus., 30 cm. | | |



Subjects

| | |
|--------------|----------------------------------------------------------|
| 268 . | Hazardous wastes -- Law and legislation -- United States |
|--------------|----------------------------------------------------------|

Table of Contents

SECTION I: INTRODUCTION
 INTRODUCTION
 HOW TO USE THE MANUAL
 GLOSSARY OF MANIFEST TERMS

SECTION II: FEDERAL REQUIREMENTS
 PART A: THE FEDERAL HAZARDOUS WASTE MANAGEMENT PROGRAM
 RCRA: The Federal Hazardous Waste Management Law
 Authorized State Hazardous Waste Programs
 PART B: THE MANIFEST SYSTEM
 Purpose: Tracking from "Cradle to Grave"
 Key Features of the Manifest System
 Adoption of the Uniform Manifest Form
 Manifest Responsibilities of the Hazardous Waste Generator
 Determining Whether a Shipment Requires A Manifest
 Which Manifest to Use
 Manifest Information Requirements
 Manifest Copies
 Exception Reports
 Discrepancy Reports
 Conflicting Federal and State Requirements
 New Manifest Requirements for Small Quantity Generators
 Applicable Federal Regulations
 PART C: MANIFEST INFORMATION ITEMS
 Federally—Required Information Items
 Identification of the Generator and the Manifest
 Identification of the Transporter(s)
 Identification of the TSDf
 Description of the Waste
 Table US — 1: Types of Containers
 Table US — 2: Units of Measure
 Additional Information About the Waste Listed
 Generator's Certification of Compliance
 Receipt of the Shipment by the Transporter(s) and the Facility
 Information That States May Require
 State Identification of the Generator and the Manifest
 State Identification of the Transporter(s)
 State Identification of the Designated Facility
 Further Information about the Waste Listed
 Continuation Sheets — Federally Required Information
 Continuation Sheets — Items That States May Require
 Table US — 3: Manifest Information Items — Comparison of First Page and Continuation Sheet

SECTION III: STATE REQUIREMENTS
 INTRODUCTION TO THE STATE CHAPTERS
 TOPICS IN EACH STATE CHAPTER:
 Which Manifest to Use
 Additional Information Required
 Minimum Number of Manifest Copies Required
 Distribution of Manifest Copies
 Exception Report Requirements

Other Material Requiring the Manifest
Manifest Requirements for Small Quantity Generators
Additional State Requirements
State Agency Contact
US EPA State Program Authorization Status
Applicable State Regulations

SECTION IV: TABLES

INTRODUCTION

TABLE 1. US EPA STATE PROGRAM AUTHORIZATION STATUS
TABLE 2. WHICH MANIFEST TO USE
TABLE 3. STATE MANIFEST FORMS: ORDERING INFORMATION
TABLE 4. ADDITIONAL INFORMATION REQUIRED BY STATES
TABLE 5. NUMBER OF MANIFEST COPIES AND COPIES REQUIRED BY STATES
TABLE 6. EXCEPTION REPORT REQUIREMENTS
TABLE 7. OTHER MATERIAL REQUIRING THE MANIFEST
TABLE 8. MANIFEST REQUIREMENTS FOR SMALL QUANTITY GENERATORS
TABLE 9. ADDITIONAL STATE REQUIREMENTS
TABLE 10. US EPA REGIONS AND REGIONAL OFFICES
TABLE 11. STATE AGENCY CONTACTS

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Despite the federal government's adoption of a uniform hazardous waste manifest, there is still no manifest form that can be used throughout the country. Nor is there a single set of manifest requirements. Instead, two sets of federal regulations and up to fifty sets of state regulations may apply.

At the federal level, both the United States Environmental Protection Agency (US EPA) and the United States Department of Transportation (US DOT) have jurisdiction. Although these two agencies jointly adopted the uniform manifest, it is still necessary to consult two sets of regulations to use the manifest correctly. The form, the instructions, and other rules are in EPA regulations, but the required ship ping names and numbers are found only in US DOT regulations.

In addition to federal regulations, state regulations establish variations in the form, the information required, and other aspects of the manifest system.

It is not always easy to understand the federal manifest rules, let alone all the state requirements. The more states one must deal with, the more difficult and time — consuming it can be to comply with manifest regulations.

Compliance with all these manifest regulations requires understanding of many requirements including:

- which shipments must be manifested;
- which manifest form must be used;
- what information must be entered;
- how many copies of the form are needed and who gets them; and
- when reports of problems with particular shipments must be filed.

All of these topics are covered in detail in this Manual: the federal requirements in Section II and those of each state in Section III.

HOW TO USE THE MANUAL

The Manual is designed to save time for experienced manifest users while also making basic information available to those who have never used a manifest. Experienced users will be able to skip certain sections and refer only to the information they need, while others will need to study the entire Manual. The Manual will serve you either as a reference or as a training aid.

The Manual is written primarily for hazardous waste generators, who are responsible for most aspects of manifest use. Hazardous waste transporters and facility operators are also considered hazardous waste generators for manifest purposes when they initiate shipments. When they do, they must comply with manifest requirements for generators.

This Manual covers manifest requirements for waste shipped by highway transportation within the United States. It does not include the special requirements for rail or water transportation or those that apply to hazardous waste ex ports and imports.

The information in this edition of the Manual is current as of October 1, 1985. Updates will be available.

As you use the Manual, be aware that state and federal laws and regulations change and are also subject to interpretation by administrative agencies and courts. Although Inter/Face Associates, Inc. has made extensive efforts to check the information to ensure its accuracy, it is not possible to guarantee the absolute accuracy of the material in this Manual. Inter/Face Associates cannot, therefore, assume responsibility for omissions, errors, misprints or ambiguities found in the Manual and shall not be liable for any loss or injury caused by such omissions, errors, misprints or ambiguities. Readers are urged to bring such matters to the attention of Inter/Face Associates for correction.

Federal Manifest Requirements

The Manual is organized into four sections. Following this introductory section is Section II, which explains the manifest system and federal manifest requirements. Section II also includes step-by-step instructions for completing the federally—required manifest items and a description of the items that states may require.

Those who have little experience with manifests should read Section II carefully to familiarize themselves with the federal rules before turning to the state chapters in Section III. Very experienced manifest users, on the other hand, may wish to skip part or a.1 of Section II.

State Manifest Requirements

Individual state chapters in Section III summarize manifest requirements for each of the fifty states. These chapters are based on state laws and regulations as well as manifest instructions, and on information from direct contacts with state agencies.

In order to save you time, Section III is designed to make it unnecessary to refer frequently to state regulations. The state chapters include tables of state waste codes and other necessary data. They also alert you to special state requirements or problems you may encounter. For reference, the chapters include citations to state regulations and the name and telephone number of a state agency person who can answer questions about manifest use.

Some of the chapters point out instances in which state regulations appear to conflict with federal ones. We wish to caution that such instances are mentioned for your information, not as legal advice.

More detailed information on the topics covered in the state chapters can be found in the Introduction to Section III.

Comparative Tables

Section IV of the Manual presents summary tables for quick reference to key information and easy comparison of state requirements.

GLOSSARY OF MANIFEST TERMS

Alternate facility — a treatment, storage or disposal facility to which a transporter may deliver a shipment of hazardous waste if it cannot be delivered to the designated facility. An alternate facility may be identified in Item 15 on the manifest.

Authorized state — a state which US EPA has authorized to administer the federal hazardous waste management requirements as part of the state program, which may include requirements that are more stringent than the federal ones.

CFR — Code of Federal Regulations, the compilation of regulations of federal agencies. Volumes of the Code of Federal Regulations are available from the Superintendent of Documents, US Government Printing Office, Washington D. C. 20402.

Completed manifest — copy of manifest form which has been signed by the facility operator to indicate acceptance of the waste shipment.

Confirmation copy — copy of manifest form which has been signed by the facility operator to indicate acceptance of the waste shipment and which is returned to the generator by the facility operator.

Consignment state — the state to which the hazardous waste listed on the manifest is to be shipped for treatment, storage or disposal. Also referred to as TSDf state, disposer state, facility state or receiving state.

Continuation sheet — US EPA form 8700-22A. If used, continuation sheets become part of the manifest document. According to US EPA regulations, continuation sheets are to be used to list additional transporters or additional wastes beyond those listed on the first page of the manifest. Some states discourage the use of continuation sheets.

Cooperative agreement — as used in this Manual, an agreement between a state and US EPA in which the state agrees to administer parts of the federal hazardous waste program and US EPA provides funds for this purpose.

Cooperative arrangement — as used in this Manual, an agreement between a state and US EPA resulting in state administration of part of the federal hazardous waste program; similar to cooperative agreement, but federal funds may not be included.

Designated facility — the treatment, storage or disposal facility to which the hazardous waste listed on the manifest is being sent. The designated facility is identified in Item 9 on the manifest.

Discrepancy report — report to regulatory authorities of a significant difference between the waste as described on the manifest and as received by the facility.

EPA (also US EPA) — the United States Environmental Protection Agency.

EPA hazardous waste number — identification number assigned by EPA to each hazardous waste listed in 40 CFR Part 261, Subpart D and to each characteristic identified in Subpart C of Part 261. Each waste number consists of one letter and three numbers. Many states require these numbers to be entered in Item I on the manifest.

EPA identification numbers — 12-digit numbers assigned by EPA to hazardous waste generators, transporters, and facilities.

Exception report — report submitted by a generator who does not receive a signed copy of the manifest from the TSDF within 45 days of the date the waste was accepted by the initial transporter. The 45-day period has been modified by some states.

Facility (also TSDF) — treatment, storage or disposal facility.

Facility state — state in which the treatment, storage or disposal facility is located.

Generator — any person whose act or process produces hazardous waste identified or listed by EPA, or whose act first causes a hazardous waste to become subject to regulation. Each site at which hazardous waste is generated is a separate generator.

Generator state — the state in which a generator of hazardous waste is located.

Handling codes for waste — EPA or state designated codes which indicate the relevant treatment, storage or disposal process for hazardous wastes. EPA 3-digit codes may be found at 40 CFR Part 264, Appendix I.

Hazard class — US DOT classification for hazardous materials, e. g., flammable gas, corrosive material. See 49 CFR Part 172.

HSWA — Hazardous and Solid Waste Amendments of 1981, amendments to the federal hazardous waste statute, RCRA.

ID No. (UN/NA) — US DOT identification number for shipping purposes. Numbers beginning with the letters UN are considered appropriate for international shipments; those beginning with NA are not appropriate for such shipments, except to Canada.

Interim authorization status — state status granted by US EPA which permits state to administer the federal hazardous waste management program; indicates that state program is substantially equivalent to the federal one. Interim authorization status often, but not always, precedes final authorization status.

Manifest — the shipping document EPA Form 8700-22 (revised April, 1985) and, if necessary, EPA Form 8700-22A, originated and signed by the generator or the state version of the EPA form or forms. The term manifest is also some times used to refer to EPA Form 8700-22 alone (or a state version of that form). It is important to note that if a continuation sheet is used, it becomes part of the manifest.

Manifest document number — the US EPA 12-digit identification number assigned to the generator plus a unique 5-digit number assigned to the manifest by the generator for recording and reporting purposes.

Non-authorized state — state which has not met the statutory criteria for authorization to administer the federal hazardous waste program. Such a state may administer part of the program under a cooperative agreement or cooperative arrangement with US EPA.

Proper shipping name — name of hazardous material as specified in US Department of Transportation regulations (49

CFR Part 172).

RCRA — Resource Conservation and Recovery Act, federal hazardous waste management statute that required the development of a system of written manifests for all off-site shipments of hazardous waste.

Shipment date — the date on which the first transporter signs the manifest indicating acceptance of the waste shipment. Several important deadlines are calculated from the shipment date, including ones related to exception reporting.

Small quantity generator — under current federal regulations, one who generates less than 1000 kilograms (kg) of non-acutely hazardous waste and less than 1 kg of acutely hazardous waste in a calendar month and who accumulates less than those threshold amounts at any time. State definitions of small quantity generator may have lower threshold amounts.

Under proposed federal rules, the threshold quantity for small quantity generator status would be 100 kg of non-acutely hazardous waste per month. However, generators of 100 to 1000 kg of hazardous waste per month would be subject to less stringent waste management requirements. For details of these proposed rules, see the August 1, 1985 issue of the Federal Register (50 FR 31278) or contact the state regulatory agency or EPA Regional Office.

Small quantity generator manifest requirements — under current federal regulations, 100 to 1000 kg generators are subject to limited manifest requirements. Some states, however, have imposed more stringent manifest requirements on some or all small quantity generators. The proposed federal rules discussed in the definition of small quantity generator would affect manifest requirements for small quantity generators.

State manifest document number — a unique number assigned to a manifest, usually by the state agency responsible for hazardous waste management and usually preprinted on the state manifest form in Item A.

State hazardous waste number — identification number for state-regulated hazardous wastes, often required in Item I on the manifest.

TSDf — treatment, storage or disposal facility.

TSDf state — state in which the treatment, storage or disposal facility is located.

US DOT — United States Department of Transportation.

US EPA (also EPA) — United States Environmental Protection Agency.

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------------------------------------------|-------------------------|--------------------------|
| 934 Vinyl Acetate Emulsion Polymerization and Copolymerization With Acrylic Monomers | | Edition: |
| Author: Erbil, H. Yildirim | Dynix: 105705 | Series: |
| Publish.: CRC (Chemical Rubber Company) Press | Call No.: 668.4 Er | |
| - place: Boca Raton, FL | ISBN: 0849323037 | |
| - date: ©2000 | Shelf Adult Non-Fiction | Year: 2000 |
| Subject: Vinyl acetate | | Price: \$141.50 |
| Desc: 324 p., illus. 25 cm. | | |

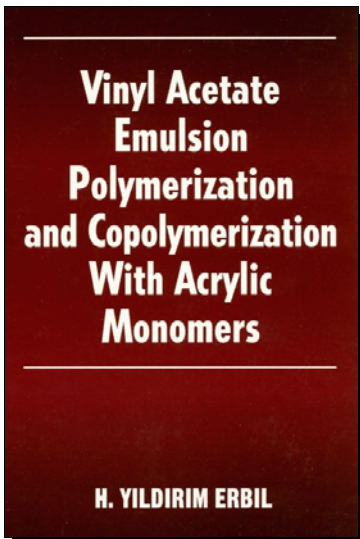


Table of Contents

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

The versatility of the emulsion copolymerization reaction and the ability to control the properties of the final lattices have led to rapid expansion both in the quantity of polyvinylacetate and vinyl acetate-acrylic copolymer lattices and in their applications. Until now, however, no one source has offered a comprehensive treatment of polyvinylacetate-based lattices. "Vinyl Acetate Emulsion Polymerization and Copolymerization with Acrylic Monomers" provides a collection and logical organization of the published data.

Integrating established knowledge with the latest research developments, this book provides the background for understanding the mechanism and kinetics of emulsion polymerization initiated in the aqueous phase and some of the practical problems of latex production. Avoiding theoretical controversies, the author presents an overview of industrial practices, new applications, and all of the fundamental material.

With in-depth discussion of the ingredients found in most industrial recipes, "Vinyl Acetate Emulsion Polymerization and Copolymerization with Acrylic Monomers" helps reduce costly and time-consuming "trial and error" practices. It serves not only as an introduction for those new to the field, but also as a valuable reference for researchers and applied scientists in both industry and academia.

FEATURES

- Allows speedy access to the open literature with a collection of almost 1,000 references
- Offers in-depth discussion of vinyl acetate homo- and acrylic copolymers
- Presents up-to-date experimental determinations of latex properties and colloidal stability results
- Eliminates much trial and error with details of the factors affecting the final properties of lattices

Subjects

| | |
|-------|-------------------------|
| 573 . | Emulsion polymerization |
| 574 . | Vinyl acetate |

PREFACE:

Polyvinyl acetate and vinyl acetate-acrylic copolymer lattices are very important in adhesives, paint, binders for nonwovens, paper and textile additive industries, and many related industries. Their production is growing steadily in both actual quantities and different applications. They also possess rather unique properties among emulsion polymers in general due to the high water-soluble nature of vinyl acetate monomer, its high monomer-polymer swelling ratio, and its high chain transfer constant. However, little work has been done on this subject outside of industrial laboratories, and comparatively few publications have been made in scientific periodicals. These publications have the disadvantage of presenting fragments of the field and never the total picture. Although many well-written texts have appeared on general emulsion polymerization in past years, no monograph devoted to poly vinyl acetate based lattices has been published; there is only a symposium proceeding edited by M. S. El-Aasser and J. W. Vanderhoff in 1981. The need for an introductory and clear text in the field for visitors from industry or university students is quite evident.

The main objective of this book is to fill the above mentioned gap and provide a general background on understanding the mechanism and kinetics of emulsion polymerization initiated in the aqueous phase, and some of the practical problems of the latex production. This book is written mostly for newcomers to the field. It is designed as an introduction to research, and as a guide to anyone who wishes to use its contents in productive work. Throughout the book, considerable attention is devoted to experimental aspects, the contents of which should also serve as useful reference sources.

Chapter 1 summarizes the history of emulsion polymerization in general and the emulsion polymerization of vinyl acetate in particular. A short review of free radical addition polymerization is also presented to help the understanding of the kinetics of emulsion polymerization in the following chapters.

Chapter 2 presents essential concepts for the description of emulsion polymerization in general and the emulsion polymerization of water-insoluble hydrophobic monomers in particular. Inverse emulsion polymerization is also covered

in this chapter.

Homopolymerization of vinyl acetate is treated in Chapter 3. A comprehensive survey on the open literature is conducted to enable readers to reach the related publications directly. Branching mechanisms of vinyl acetate homopolymerization, especially in the presence of polyvinyl alcohol protective colloid, are discussed. A survey of the literature on radiation-induced vinyl acetate emulsion homopolymerization is also presented.

Chapter 4 deals briefly with the role of the ingredients in vinyl acetate emulsion homo- and copolymerization. The properties of vinyl acetate monomer and polymer and the role and the properties of initiators, emulsifiers, protective colloids, process water, pH buffers, and ionic strength controllers are also discussed.

Chapter 5 presents the mechanism of vinyl acetate copolymerization with acrylic ester monomers, monomer reactivity ratios, and a literature survey on the emulsion copolymerization of vinyl acetate with selected acrylate monomers together with the results of the comonomer and emulsifier addition strategies and morphology of particles.

Chapter 6 reviews the most important aspects of the colloidal stability for both homo- and copolymers. Electrostatic as well as steric stabilization mechanisms and the reasons for undesired coagulations are discussed. Chapter 7 deals with the experimental determination of latex properties. Chapter 8 discusses the factors affecting the final properties of both homo- and copolymer lattices.

Extensive references to the original literature are cited whenever possible throughout the text. This contribution cannot claim to be completely comprehensive; it is an attempt to join the fragments in order to see the total picture and judge the importance of the related factors. I am greatly indebted to my colleagues who encouraged me to write this book, and to my wife Ayse and my children for their patience and understanding throughout its preparation.

INTRODUCTION:

The industrial production of polyvinyl acetate homopolymer lattices began in Germany around 1935 and has continued to the present, growing steadily over the years. In general, polyvinyl acetate emulsions are milk-white liquids containing 40-55% polymer solids, the balance being water and small amounts of emulsifiers, protective colloids, and other additives. Homopolymer lattices prepared with polyvinyl alcohol stabilizers are still among the main products of the adhesive industry. Vinyl acetate (VAc) copolymers with ethyl and butyl acrylate, dibutyl maleate, versatic acid esters, and ethylene are available at low cost and have good durability properties. Emulsion copolymers of VAc have found increasing use in more sophisticated adhesives, exterior and interior paints, carpet backing, adhesives for clay coatings on paper, and numerous other applications. The use of these emulsions for paints eliminates the need for expensive, flammable, odorous, or toxic solvents. They are easy to apply, and the equipment used in application is readily cleaned with water when done promptly. These emulsions also offer the advantage of high solids content with fluidity since the viscosity of the emulsion is independent of the molecular weight of the resin.

Nevertheless, there are disadvantages of VAc copolymerization processes. VAc is a polar and very reactive monomer and requires special treatment to copolymerize with less polar and reactive monomers. The high solubility of VAc monomer in water leads to difficulties during copolymerization with more hydrophobic monomers since the relative concentrations of the copolymerizing monomers in the polymer and water phases are significantly different. Various monomer feed methods are employed to force random copolymerization with less reactive monomers. In addition, some effective initiator systems are required to homopolymerize or copolymerize the highly water soluble VAc monomer.

The thorough understanding of the mechanism and kinetics of polyVAc lattices is important both industrially and scientifically and will enable a polymer chemist to make a VAc latex tailored for a specific end use; however, comparatively little work has been done on this subject outside of industrial circles. In addition, there are differences in the approaches toward this goal between the industry and academia. The application of kinetic results accumulated from dilatometer emulsion polymerization experiments to the industrial semicontinuous stirred tank or to continuous production processes is a very difficult task. Nevertheless, it is unavoidable because the thorough understanding of the industrial processes is impossible without it.

In industry, exact repeatability of emulsion polymerization processes within narrow limits is desirable, which means that the final solids content should be constant within $\pm 1\%$; the particle size, emulsion viscosity, and polymer average molecular mass should vary little from batch to batch; and any residual monomer should be maintained within minimum possible narrow limits. In order to achieve these conditions, the formulation of the emulsion polymerization should not be subject to variations such as minor changes of raw materials or of operative conditions. In addition, the formulation should give a reasonably satisfactory latex product even with substitute raw materials that are not entirely satisfactory, i.e., some lower grades or second-class raw materials can be used.

There are other restrictions of the emulsion polymerization process in industrial practice. The process should be completed in the shortest possible time; an overall time including loading the chemicals, polymerization, cooling, and

unloading should be within 8-12 hours to allow working two or three shifts per day. It is desirable to prepare a latex at the highest concentration possible, usually >50%, to save time in production, unlike most theoretical work in laboratories. The upper limit of the maximum solids content is generally the high viscosity of the latex product which prevents proper stirring and heat transfer. In industry, the shapes of the universal emulsion polymerization reactors are nearly standard; cylindrical vessels with heights about double their diameters are generally used. However, the nature and shape of the stirrer and the rate of stirring vary from plant to plant, and that may affect the polymerization performance to a great extent. The most appropriate stirrer and agitation conditions are usually determined empirically. It is necessary to avoid excessive precipitation on the reactor walls and stirrer because that means loss of raw materials and wasted time due to reactor cleaning.

PolyVAc homopolymer lattices are mostly produced by a delayed addition method in semicontinuous emulsion polymerization processes. In this method, 5-15% of the monomer is added into the reactor containing the water phase at the start, and some of the formulation ingredients and the balance of the monomer gradually. In some cases there is also gradual addition of water phase or water phase components. The delayed addition procedure avoids the coalescence of the monomer-swollen latex particles, thus attaining greater colloidal stability. On the other hand, copolymerization of VAc monomer requires the application of simultaneous monomer feeding methods due to the great differences between the VAc monomer and other comonomers. The monomers are mostly added in different streams so that comonomers are together in the polymerization reactor at any one time, forcing a homogeneous and uniform copolymer structure in the final product (see Sec. 5). Nevertheless, this is a complex method, and sometimes very heterogeneous copolymers are obtained comprising polyVAc homopolymers and copolymers of different structures (having different monomer sequences in the copolymer) at the end of the reaction. Thus, monomer feeding details are considered secrets of the companies in the industry, and that is one of the main causes of the separation between academic and industrial research practices.

Industrial laboratories are generally involved in both short- and long-term projects. Short-term duties include statistical experiments to understand batch-to-batch variations, scaling up problems from laboratory scale to pilot scale and from pilot scale to plant scale, the improvement of the final latex properties by minor variations in the chemical formulations, and monomer feeding procedures for the homopolymer and copolymerization reactions. Long-term duties include understanding the nature of particle formation, average particle size and particle size distribution control, the effects of the types and the concentrations of emulsifiers, initiators and stabilizers on the kinetics of the polymerization, and stabilization properties of the final latex products. The understanding of the mechanism of copolymerization in semicontinuous and continuous processes is also important. If the theory of all aspects of the homopolymerization and copolymerization of VAc had been developed, the industrial laboratories would avoid a large number of unnecessary empirical experiments. However, there is no such unified theory of the subject yet due to the complexity of the process and the different approaches of academic and industrial circles to the problem. Smith-Ewart kinetics is not valid for VAc homopolymerizations because of the appreciable solubility of the VAc monomer in the water medium, but the academic circles have published papers for years explaining the kinetic behavior of VAc emulsion polymerization as a deviation from Smith-Ewart general theory. Smith-Ewart and related theories may be applicable to nearly water-insoluble styrene monomer, and to some extent to acrylic ester monomers, but only the ideas and theories of aqueous initiation with propagation in both water and monomer swollen polymer particle phases is applicable for VAc kinetics. It is also a difficult task to extend these ideas to controlled monomer feed processes, which is the major practice in industry.

In general, industrial laboratories carried out most of the work done on vinyl acetate emulsion polymerization and copolymerization with acrylic monomers and both academic circles and industrial laboratories made comparatively few publications in scientific periodicals.

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------------------------------------|---------------------------------|--------------------------|
| 181 Water Soluble Polymers: Solution Properties and Applications | | <i>Edition:</i> |
| <i>Author:</i> Amjad, Zahid (editor) | <i>Dynix:</i> 78751 | <i>Series:</i> |
| <i>Publish.:</i> Plenum Press | <i>Call No.:</i> 547 Wa | |
| <i>- place:</i> New York, NY | <i>ISBN:</i> 0306459310 | |
| <i>- date:</i> ©1998 | <i>Shelf:</i> Adult Non-Fiction | <i>Year:</i> 1998 |
| <i>Subject:</i> Water-soluble polymers -- Congresses | | <i>Price:</i> \$125.00 |
| <i>Desc:</i> xii, 259 p., illus., 26 cm. | | |

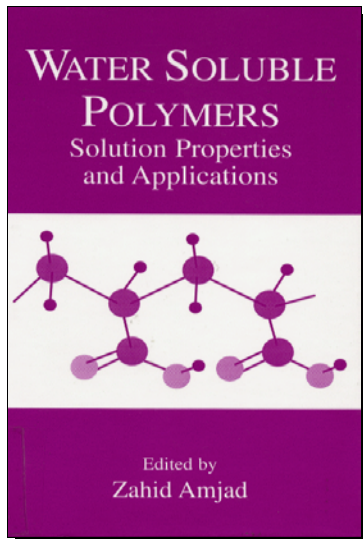


Table of Contents

1. Kinetics of Adsorption for Hydrophobically Modified Poly(Acrylic Acids) at Cyclohexane/Water Interfaces (Christopher Rullson)
2. Effect of Solids Concentration on Polymer Adsorption and Conformation (Tsun-gyuan Chen, Chidambaram Maltesh, and Ponisseril Somasundaran)
3. Water Solubility Characteristics of Poly(Vinyl Alcohol) and Gels Prepared by Freezing/Thawing Processes (Christie M. Hassan, Patrina Trakampan, and Nicholas A. Peppas)
4. Enzymatic Modification of Guar Solutions: Viscosity-Molecular Weight Relationships (Akash Tayal, Vandita Pai, Robert M. Kelly, and Saad A. Khan)
5. The Influence of Additives and Impurities on Crystallization Kinetics: An Interfacial Tension Approach (Wenju Wu and George H. Nancollas)
6. Inhibition of Hydroxyapatite Growth in Vitro by Glycosaminoglycans: The Effect of Size, Sulphation, and Primary Structure (Paschalis Paschalakis, Demitrios H. Vynios, Constantine P. Tsiganos, and Petros G. Koutsoukos)
7. Influence of Humic Compounds on the Crystal Growth of Hydroxyapatite (Zahid Amjad and Michael M. Reddy)
8. Crystal Growth of Hydroxyapatite in Vitro and Dental Calculus and Plaque Formation on Human Teeth in Vivo (Abdul Gaffar, Edgard C. Moreno, John Afflitto, and Yelloji-Rao K. Mirajkar)
9. Adsorption of Hydroxypropylcellulose on Hydroxyapatite via Formation of Surface Complex with Sodium Dodecylsulfate (Saburo Shimabayashi, Sawa Nishine, Tadayuki Uno, and Tomoaki Hino)
10. The Inhibition of Calcium Carbonate Formation by Copolymers Containing Maleic Acid (Pavlos G. Klepetsanis, Petros G. Koutsoukos, Gabriele-Charlotte Chitanu, and Adrian Carpov)
11. Kinetic Inhibition of Calcium Carbonate Crystal Growth in the Presence of Natural and Synthetic Organic Inhibitors (Zahid Amjad, Jeff Pugh, and Michael M. Reddy)
12. Novel Calcium Phosphate Scale Inhibitor (Libardo A. Perez and Stephen M. Kessler)
13. Inhibition of Mineral Scale Precipitation by Polymers (Shiliang He, Amy T. Kan, and Mason B. Tomson)
14. Pilot Test Results Utilizing Polymeric Dispersants for Control of Silica (Charles W. Smith)
15. Inhibition of Gypsum Scale Formation on Heat Exchanger Surfaces by Polymeric Additives (Zahid Amjad)
16. Applications of Structured Cationic Polyelectrolytes in Wastewater Treatments (Haunn-Lin T. Chen)
17. Optimization of Cooling Water Treatment Formulations for Use in Recycled Waters (Paul J. Forbes)
18. Water-Soluble Polymers in Hair Care: Prevention and Repair of Damage during Hair Relaxing (Ali N. Syed, Wagdi W. Habib, and Anna M. Kuhajda)
19. Application of Ultra-High Molecular Weight Amphoteric Acrylamide Copolymers to Detergents (Yoshiyuki Hayashi, Danian Lu, and Nobuo Kobayashi)

Subjects

| | |
|--------------|-----------------------------------------------------------------|
| 340 . | Water-soluble polymers -- Congresses |
| 425 . | Water-soluble polymers -- Industrial applications -- Congresses |

About the Editor
Index

Reviews - Synopsis - Dust Jacket

From Book News, Inc.

The 19 papers report recent developments in understanding the solution properties of water soluble polymers and their applications in aqueous systems. Such polymers are used in a wide range of industries from cosmetics and sugar refining to wastewater treatment, pulp and paper production, petroleum, and agriculture. Among the topics are the kinetics of adsorption for hydrophobically modified poly(acrylic acids) at interfaces between cyclohexanes and water, the influence of human compounds on the crystal growth of hydroxyapatite, inhibiting calcium carbonate formation with copolymers containing maleic acid, pilot test using polymeric dispersants to control silica, optimizing cooling water treatment formulations for use in recycled water, and applying ultra-high molecular weight amphoteric acrylamide copolymers to detergents. Book News, Inc.®, Portland, OR

PREFACE

This volume contains a series of papers originally presented at the symposium on Water Soluble Polymers: Solution Properties and Applications, sponsored by the Division of Colloids and Surface Chemistry of the American Chemical Society.

The symposium took place in Las Vegas City, Nevada on 9 to 11th September, 1997 at the 214th American Chemical Society National Meeting. Recognized experts in their respective fields were invited to speak. There, was a strong attendance from academia, government, and industrial research centers. The purpose of the symposium was to present and discuss recent developments in the solution properties of water soluble polymers and their applications in aqueous systems.

Water soluble polymers find applications in a number of fields of which the following may be worth mentioning: cosmetics, detergent, oral care, industrial water treatment, geothermal, wastewater treatment, water purification and reuse, pulp and paper production, sugar refining, and many more. Moreover, water soluble polymers play vital role in the oil industry, especially in enhanced oil recovery. Water soluble polymers are also used in agriculture and controlled release pharmaceutical applications. Therefore, a fundamental knowledge of solution properties of these polymers is essential for most industrial scientists. An understanding of the basic phenomena involved in the application of these polymers, such as adsorption and interaction with different substrates (i.e., tooth enamel, hair, reverse osmosis membrane, heat exchanger surfaces, etc.) is of vital importance in developing high performance formulations for achieving optimum efficiency of the system.

A serious problem encountered in many industrial processes is the build-up of undesirable deposits on the walls of water handling equipment. These deposits, especially on heat transfer surfaces in cooling, boiler, geothermal, and distillation systems, lead to over- heating, loss of system efficiency, unscheduled shutdown time, and ultimately heat ex- changer failure. These deposits can be categorized into the following four groups: a) mineral scales (i.e., CaCO_3 , $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, CaSO_4 , CaF_2 , $\text{Ca}_3(\text{PO}_4)_2$, etc.), b) suspended solids (i.e., mud or silt), c) corrosion products (i.e., Fe_2O_3 , Fe_3O_4 , ZnO , etc.), and d) microbiological mass. In reverse osmosis systems, deposition of unwanted materials may result in poor water quality and premature membrane failure. The development of deposits on heat exchanger and membrane surfaces continues to be a limiting factor in the efficient operation of the systems. Thus, effective operation of industrial water systems continues to depend on the control of deposits in these systems.

In the past few years, polymers have been successfully used by the water treatment industry for numerous functions including scale inhibition, metal ion stabilization, crystal modification, and dispersancy. Polymers used in water treatment formulations are usually anionic and have molecular weight ranging from 500 to 20,000 daltons. In wastewater treatment, high molecular weight polymer are used as flocculating and coagulating agents. In cosmetics and hair care applications, the industrial chemist depends on the use of water soluble polymers to develop an aesthetically pleasing, functional, and stable product. Polymers also offer unique opportunities in the controlled release of active from the formulated product. In detergents use of polymers as builders is prevalent.

This volume provides an introduction to the use of water soluble polymers in many fields ranging from oral care, cosmetics, detergent, pharmaceutical, to industrial water treatment. A wide range of expertise has been brought together to this book in such a diverse applications. The first four chapters address the solution properties of polymers. The next five chapters examine the growth and inhibition of hydroxyapatite, an important component of teeth, bones, and urinary stones. In the next 8 chapters use of polymers in industrial water and wastewater treatment applications is presented. The final two chapters deal with the use of polymers in hair care and detergent applications.

I hope this book will prove to be a valuable addition to the library of the academic researchers and, even more so, for the technology-focused industrial scientist involved with polymers who are interested in expanding their applications into new fields.

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------|--------------------------------|----------------------------------------------------|
| 182 Water-Based Industrial Finishes: Recent Developments | | <i>Edition:</i> |
| <i>Author:</i> Gillies, M. T. (editor) | <i>Dynix:</i> 64074 | <i>Series:</i> Chemical Technology Review: No. 167 |
| <i>Publish.:</i> Noyes Data Corporation | <i>Call No.:</i> 667.63 Gi | |
| <i>- place:</i> Park Ridge, NJ | <i>ISBN:</i> 0815508123 | |
| <i>- date:</i> ©1980 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1980 |
| <i>Subject:</i> Coating processes -- Patents | | <i>Price:</i> \$48.00 |
| <i>Desc:</i> xii, 435 p., 25 cm. | | |

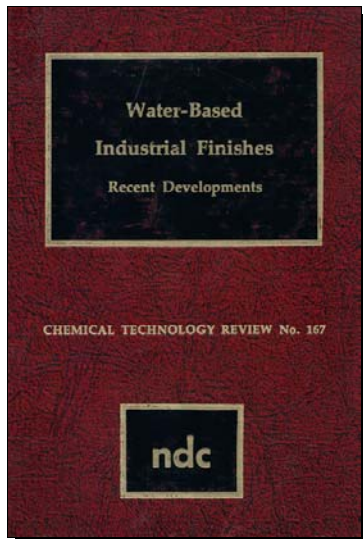


Table of Contents

- Introduction
- Thermally Cured Organic Coatings
- Electrodeposited Coatings
- Organic Corrosion Resistant Coatings
- Nonstick and Can Coatings
- Coatings for Automotive and Electrical Uses
- Autodepositing and Air-Dried Coatings For Special Applications
- Inorganic and Metallic Coatings
- Special Processes
- Company Index
- Inventor Index
- U. S. Patent Number Index

Reviews - Synopsis - Dust Jacket

FOREWORD

The detailed descriptive information in this book is based on U.S. patents issued since January 1978 that deal with recent developments in water-based industrial finishes.

This book is a data-based publication, providing information retrieved and made available from the U.S. patent literature. It thus serves a double purpose in that it supplies detailed technical information and can be used as a guide to the patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced commercially oriented review of recent developments in water-based industrial finishes.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have bypassed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The table of contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

Subjects

| | |
|--------------|------------------------------|
| 236 . | Coating processes -- Patents |
| 369 . | Emulsion paint -- Patents |

INTRODUCTION

Liquid industrial finishes are still preferred in many sectors of the coatings industry. Notably since the beginning of 1978, there has been a renaissance of interest in water-based paints, stimulated by new EPA air pollution guidelines. Water-based means that practically no organic solvents are used in manufacture or formulation; any indispensable solvent present serves as high boiling point modifier. Safety aspects are considerable, particularly for paint workers, as it means freedom from diseases with long latency periods.

Such marked advancements in water based paints as described in this book are only made possible by the introduction of new or radically modified additive systems. Here are discussed the latest trends, detailing the energy and health advantages to be gained and likely areas of further refinement.

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------|--------------------------------|--------------------------|
| 183 Water-Based Paint Formulations | | <i>Edition:</i> |
| <i>Author:</i> Flick, Ernest W. | <i>Dynix:</i> 50461 | <i>Series:</i> |
| <i>Publish.:</i> Noyes Data Corporation | <i>Call No.:</i> 667 FI | |
| <i>- place:</i> Park Ridge, NJ | <i>ISBN:</i> 0815513453 | |
| <i>- date:</i> 1975-<©1994 ©1997 > | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1994 |
| <i>Subject:</i> Paint -- Patents | | <i>Price:</i> \$144.00 |
| <i>Desc:</i> v. <3, 4 > 25 cm. | | |

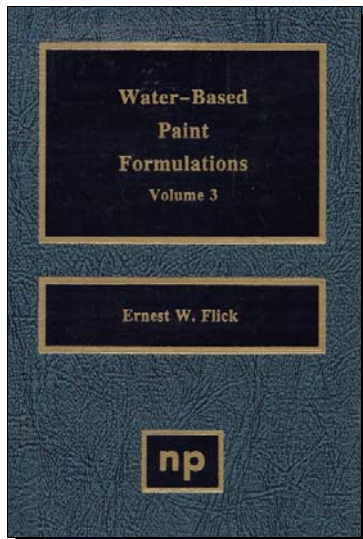


Table of Contents

- SECTION I: Coatings and Topcoats
- SECTION II: Coil Coatings
- SECTION III: Enamels
- SECTION IV: Enamels -- Baking
- SECTION V: Exterior Paints and Related
- SECTION VI: Interior Paints and Related
- SECTION VII: Lacquers
- SECTION VIII: Primers
- SECTION IX: Sealers
- SECTION X: Stains
- SECTION XI: Texture Paints
- SECTION XII: Miscellaneous
- SECTION XIII: Trade Named Raw Materials
- SECTION XIV Suppliers' Addresses:

Reviews - Synopsis - Dust Jacket

PREFACE

This collection of 463 up-to-date water-based trade and industrial formulations will be of value to technical and managerial personnel in paint manufacturing companies and firms which supply raw materials or services to these companies, and to those interested in less hazardous, environmentally safer formulations. The book will be useful to both those with extensive experience as well as those new to the field. This book includes new and different formulations than those included in the previously published Industrial Water-Based Paint Formulations and Water-Based Trade Paint Formulations.

The data consist of selections of manufacturers' suggested formulations made at no cost to, nor influence from, the makers or distributors of these materials. The information given is presented as supplied; the manufacturer should be contacted if there are any questions. Only the most recent data supplied us has been included. Any solvent contained is minimal.

The table of contents is organized in such a way as to serve as a subject index. The formulations described are divided into sections which cover exterior, interior, and exterior and/or interior water-based paints, enamels, and coatings, as indicated below:

- I. Coatings and Topcoats
- II. Coil Coatings
- III. Enamels
- IV. Enamels-Baking
- V. Exterior Paints and Related
- VI. Interior Paints and Related
- VII. Lacquers
- VIII. Primers
- IX. Sealers
- X. Stains
- XI. Texture Paints
- XII. Miscellaneous

Each formula has been placed in the chapter which is most applicable. The reader, if seeking a formula for a specific end use, should check each chapter which could possibly apply.

In addition to the above, there are two other sections which will be helpful to the reader:

Subjects

280 . | Paint -- Patents

XIII. A chemical trade name section where trade-named raw materials are listed with a chemical description and the supplier's name. The specifications which the raw materials meet are included if applicable.

XIV. Main office addresses of the suppliers of trade-named raw materials and/or formulations.

Included in the descriptive information for each formulation, where available, the following properties may be listed: viscosity, solids content, % nonvolatiles, pigment volume concentration, density, pH, spatter, leveling, sag resistance, scrub cycles to failure, contrast ratio, ease of dispersion, fineness of grind, heat stability, freeze-thaw stability, ease of application, gloss foaming, cratering, brightness, opacity, water spotting, adhesion to chalk, brush clean-up, reflectance, and sheen.

| Title | Location | Edition / Series / Misc. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------|
| 669 Water-Based Trade Paint Formulations
Author: Flick, Ernest W.
Publish.: Noyes Publications
- place: Park Ridge, NJ
- date: ©1988
Subject: Emulsion paint
Desc: xxv, 697 p., 25 cm. | Dynix: 07902
Call No.: 667.63 FI
ISBN: 0815511477
Shelf Adult Non-Fiction | Edition:
Series:
Year: 1988
Price: \$25.00 |

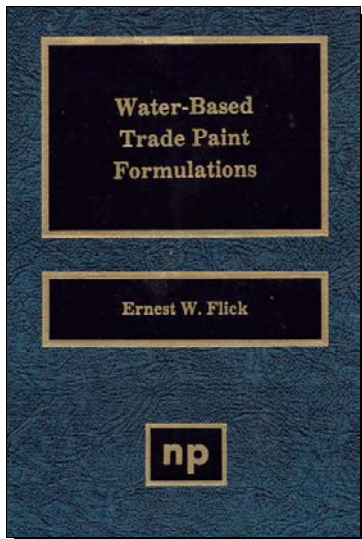


Table of Contents

Introduction

Section I. Exterior Paints, Enamels and Coatings
 Exterior paints
 Exterior tint base paints
 Exterior tinted paints
 Exterior trim tint-base enamels
 Exterior white paints
 Exterior white and light tint paints
 Exterior white semi-gloss paints and enamels
 Roof coatings
 Miscellaneous exterior paints

Section II. Interior Paints, Enamels and Coatings
 Interior flat paints
 Interior flat tint bases
 Interior flat white paints
 Interior flat white and tint bases
 Interior semi-gloss paints and enamels
 Interior tint base semi-gloss paints and enamels
 Interior tinted paints
 Satin/sheen/eggshell paints and enamels
 Stipple and texture paints

Section III. Exterior and/or Interior Paints, Enamels, Primers and Stains
 Colored enamels
 Gloss enamels and paints
 Intumescent fire retardant paints
 Primers and primer/sealers
 Semi-gloss paints and enamels
 Stains
 White enamels
 Miscellaneous paints and enamels

Section IV: Trade-Named Raw Materials

Section V: Suppliers' Addresses

Subjects

256 . Emulsion paint

Reviews - Synopsis - Dust Jacket

PREFACE

This collection of 562 up-to-date water-based trade paint formulations will be of value to technical and managerial personnel in paint manufacturing companies and firms which supply raw materials or services to these companies, and to those interested in less hazardous, environmentally safer formulations. The book will be useful to both those with extensive experience as well as those new to the field.

The data consist of selections of manufacturers' suggested formulations made at no cost to, nor influence from, the makers or distributors of these materials. The information given is presented as supplied; the manufacturer should be contacted if there are any questions. Only the most recent data supplied us has been included. Any solvent contained is minimal.

The table of contents is organized in such a way as to serve as a subject index. The formulations described are divided into three major sections, which cover exterior, interior, and exterior and/or interior water-based paints, enamels, and coatings. Further subdivision into chapters is as indicated below.

- I. Exterior Paints, Enamels and Coatings
 - 1. Exterior paints
 - 2. Exterior tint base paints
 - 3. Exterior tinted paints
 - 4. Exterior trim tint-base enamels
 - 5. Exterior white paints
 - 6. Exterior white and light tint paints
 - 7. Exterior white semi-gloss paints and enamels
 - 8. Roof coatings
 - 9. Miscellaneous exterior paints

- II. Interior Paints, Enamels and Coatings
 - 10. Interior flat paints
 - 11. Interior flat tint bases
 - 12. Interior flat white paints
 - 13. Interior flat white and tint bases
 - 14. Interior semi-gloss paints and enamels
 - 15. Interior tint base semi-gloss paints and enamels
 - 16. Interior tinted paints
 - 17. Satin/sheen/eggshell paints and enamels
 - 18. Stipple and texture paints

- III. Exterior and/or Interior Paints, Enamels, Primers and Stains
 - 19. Colored enamels
 - 20. Gloss enamels and paints
 - 21. Intumescent fire retardant paints
 - 22. Primers and primer/sealers
 - 23. Semi-gloss paints and enamels
 - 24. Stains
 - 25. White enamels
 - 26. Miscellaneous paints and enamels

Each formula has been placed in the chapter which is most applicable. The reader, if seeking a formula for a specific end use, should check each chapter which could possibly apply.

In addition to the above, there are two other sections which will be helpful to the reader:

- IV. A chemical trade name section where trade-named raw materials are listed with a chemical description and the supplier's name. The specifications which the raw materials meet are included if applicable.
- V. Main office addresses of the suppliers of trade-named raw materials and/or formulations.

Included in the descriptive information for each formulation, where available, the following properties may be listed: viscosity, solids content, % nonvolatiles, pigment volume concentration, density, pH, spatter, leveling, sag resistance, scrub cycles to failure, contrast ratio, ease of dispersion, fineness of grind, heat stability, freeze-thaw stability, ease of application, gloss foaming, cratering, brightness, opacity, water spotting, adhesion to chalk, brush clean-up, reflectance, and sheen.

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------------|--------------------------------|----------------------------------------------------|
| 184 Water-Soluble Polymers: Recent Developments | | <i>Edition:</i> |
| <i>Author:</i> Meltzer, Yale L. | <i>Dynix:</i> 51469 | <i>Series:</i> Chemical Technology Review: No. 126 |
| <i>Publish.:</i> Noyes Data Corporation | <i>Call No.:</i> 668.4 Me | |
| <i>- place:</i> Park Ridge, NJ | <i>ISBN:</i> 0815507429 | |
| <i>- date:</i> ©1979 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1979 |
| <i>Subject:</i> Water-soluble polymers -- Patents | | <i>Price:</i> \$25.00 |
| <i>Desc:</i> xiv, 496 p., illus., 25 cm. | | |

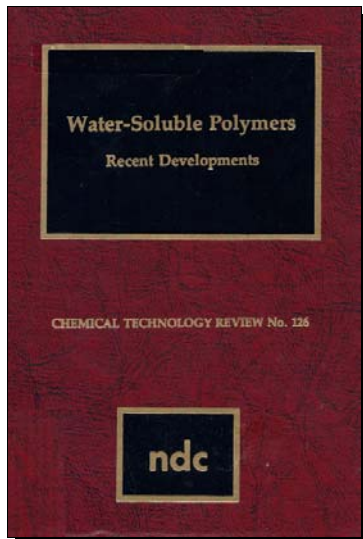


Table of Contents

INTRODUCTION
 - The Market
 - Product Classification of Water-Soluble Polymers

ACRYLAMIDE POLYMERS
 - Processing
 Nonionic Surfactants from Water-Soluble Copolymers of Acrylamide with Hydrophobic Monomers
 Sugar-Decolorizing Quaternary Ammonium Acrylamide Resins
 High Molecular Weight Acrylamide Polymers
 Aqueous Solutions of Polyacrylamides
 Preparation of Water-Soluble Cationic High Polymers
 Water-Soluble Vinyl High Polymers by Reversed-Phase Emulsion Polymerization
 Quaternary Modified Acrylamide Polymers
 Low-Dusting, Free-Flowing Acrylamide Polymer Composition
 - Applications
 Dispersions of Water-Soluble Polymers in Oil
 Films and Absorbent Articles
 Dispersion of High Molecular Weight Polymers in Water
 Hydrophilic N, N-Diethyl Acrylamide Copolymers
 Oil Base Paints
 Emulsifiers Useful for Emulsion Polymerization of Vinyl Monomers
 Glyoxal Modified Poly(Strengthening Resins for Use in Paper
 Pressure-Sensitive Adhesive Compositions
 Concentrated Polymer Emulsion as a Cleaner and Lubricant

ACRYLIC ACID AND METHACRYLIC ACID POLYMERS
 - Processing
 Production of Acrylic Acid
 Chemically Joined, Phase Separated Self-Cured Hydrophilic Thermoplastic Graft Copolymers
 Preparation of Methacrylic Acid from Methacrolein
 Glycol Methacrylate or Glycol Acrylate Polymers and Copolymers
 Aqueous Acrylic Latex and Water-Soluble Modified Polycaprolactone Adduct
 Preparing Methacrylic Acid
 Powdery Copolymer Comprising Methyl Methacrylate and Monomer Having a Basic Nitrogen Atom
 Anionic Hydrogels
 Preparing a Purified Methacrylic Acid Ester
 - Applications
 Controlling Corrosion in Gas-Containing Aqueous Drilling Fluid
 Setting Solution for Dental Glass Ionomer Cements
 Alloy Fibers of Rayon and Copolymers of Acrylic and Methacrylic Acids
 Preparation of Amphoteric Ion-Exchangers by Substitution of Hydrophilic Polymers
 Aqueous Polish Composition
 Coating Material and Method
 Aqueous Coating Composition
 Preparing Solid Water-Soluble Polymers
 Hydrophilic Acrylic Polymers as Marine Filters, Algae Growth Catalysts, and Breeding Stimulus for Fish and Invertebrates
 Acrylate Adhesive Aqueous Dispersions
 Pressure-Sensitive Adhesive
 Premixed Dental Composition for the Preparation of a Dental Silicate Cement
 Powder Coating Compositions with Hydroxy-Containing Acrylic Copolymers and Carboxylic Acid or Anhydride
 Crosslinking Agent

Subjects

341 . Water-soluble polymers -- Patents

ALKYDS

- Processing
Storage Stable Resins
Water-Dispersible Alkyd Paint Composition
Alkyd Resin Manufacture Using Water or Steam to Reverse or Retard Gelation
- Applications
Water-Dispersed Coating Composition of Short Oil Alkyd Resin and Tris(Hydroxymethyl)Nitromethane
Pitch Water-Soluble Resin
Water-Dispersed Coating Composition of Short Oil Alkyd Resin and Alkanolamine

CARBOXYLIC PRODUCTS

- Processing
Preparation of Water-in-Oil Emulsions of Water-Soluble Vinyl Carboxylic Acid Polymers and Copolymers
Preparing Stable Aqueous Dispersions of Rosin-Base Material
Preparing Microspheres Having Liquid Center and Seamless Rigid Walls
Aqueous Copolymer Dispersions
Polymerizable Esters
- Applications
Water-Borne Bondable Base Coat and Size Coat
Process for Producing Stable Emulsion of Polymer
Antidandruff Shampoos Containing Metallic Cation Complex to Reduce In-Use Sulfide Odor
Manufacture of Plastics Dispersions
Aqueous Adhesive
Flexible Water Absorbent Polymer Compositions
Controlling Soil Erosion
Antisettling Agents for Pigmented Aqueous Lacquer
Absorbent Articles Made from Latexes of Carboxylic Synthetic Polyelectrolyte Containing N-Substituted Acrylamide
Crosslinking Agent
Carboxylic Polymeric Thickeners

CELLULOSE ETHERS AND OTHER CELLULOSE PRODUCTS

- Processing
Low-Substituted Cellulose Ethers
Production of Dialdehyde Cellulose from Cellulose
2,3-Di-(2,3-Diiodopropoxy)Propylcellulose and Method of Producing the Same
Cellulose Thiocyanate
Swellable Cellulose Ethers from Regenerated Cellulose Film
Transformation of Comminuted Swellable Cellulose Ether into an Easily Workable Material
Water-Adsorbing Cellulose Ethers—Bis(Acrylamido)Acetic Acid Crosslinking Agent
Production of Water-Adsorbing Cellulose Ethers in a Medium Other than Isopropyl Alcohol
Production of Water-Adsorbing Cellulose Ethers—Crosslinking Agent Polyfunctional Towards Cellulose
Viscosity Reduction of Cellulose Derivatives
Alkali Metal Salt of Carboxymethylcellulose Ether
Cold-Milling Cellulose Derivatives
- Applications
Method of Canning Foods
Cellulose Ether-Polyacrylamide Aqueous Gels
Leather Dressing Composition
Gelled Perfume
Coating Composition Comprising Methylcellulose and Polyvinyl Acetate

EPOXY PRODUCTS

- Processing
Electrodeposition of Aqueous Dispersion of Copolymers of Polyethylenically Unsaturated Epoxy Adducts
Aqueous Coating Composition—Polymer Containing Randomly Distributed Epoxy Groups
Aqueous Coating Composition—Polymer Containing Terminal Epoxy Groups
Water-Based Coating Compositions
New Epoxy Derivative
Heat-Hardenable Aqueous Epoxy Emulsions Containing Aminoplast Resin
Epoxy Modified Acrylic Latexes
- Applications
Aqueous-Based Epoxy Slurry for Forming a Consolidated Gravel Pack
Aqueous Epoxy Resin Paint Composition

Aqueous Coating Composition for Cans

ETHYLENE OXIDE POLYMERS AND RELATED PRODUCTS

- Processing
Ethylene Oxide Polymers as Emulsifiers for Aqueous Latexes
- Applications
Carpet Cleaning Composition
Making Stable Detergent Compositions
Compositions for Denaturing Paints
Organosilane-Containing Prill
Printing Formulations

FORMALDEHYDE PRODUCTS

- Processing
Water-Soluble Phenol/Formaldehyde Condensation Products
Formaldehyde Solutions Stabilized with Interpolymers
Aqueous Urea-Formaldehyde Resin Compositions Having Improved Storage Life
- Applications
Spray-Dried Phenolic Adhesives
Production of Urea-Formaldehyde Adhesives
Hardener for Producing Solid Foams or Compact Structure from Aqueous Solutions

GELATIN AND GELATIN PRODUCTS

- Processing
Hardening Gelatin
Gelatin-Based Compositions and a Method for the Generation of
Stabilized Foams Therefrom
- Applications
Gelatin Coating Composition

POLYMERS WITH INORGANIC COMPONENTS

- Processing
Preparing Organotin Compounds
Catalyst Support Prepared by Alcohol Treatment of Hydrogels
Water-Soluble Defoaming Agents
- Applications
Aqueous Emulsion Copolymers Containing Lower Alkyl Hydrogen Polysiloxane
Organotin Polymers and Antifouling Paints Containing Same
Polymer Modified Hydrophilic Inorganic Fillers for Thermoplastic Polymeric Materials
Color Developing Record Sheet Containing Metal-Modified Novolak Resin Particles
Aqueous Explosive Slurries with Inorganic Peroxide Sensitizer
Gelled Water-Bearing Explosive Composition
Aqueous Antifouling Coating Composition Comprised of Emulsified Water-Insoluble Polymer and Triphenyltin Derivative
Cleaning Agents for Contact Lenses
Cement Composition

NATURAL GUMS

- Processing
Purification of Tamarind Gum
Cellulase-Free Xanthan Gum
Xylitol Chewing Gum with Hydrophilic Colloid Binder
Self-Complexing Galactomannan Gums
Polygalactomannan Allyl Ether Gels
- Applications
Clay-Free, Thixotropic Wellbore Fluid
Fibrous Simulated Food Product with Gel Structure
Dry Beverage Mix Composition
Dry Dessert Mix Composition
Combined Reversible Aqueous Colloidal Dental Impression Material
Conditioning Shampoo Composition Containing a Cationic Derivative of a Natural Gum
Flash Drying of Xanthan Gum and Product Produced Thereby
Instant Acidified Milk Gel
Controlled Release System for Juvenile Hormone in Aqueous Environment
Acid-Base Gellina Products

POLYAMIDES

- Processing
Manufacture of Fibrids from Poly-(Amide-Imide) Resins
Method of Coating with Water-Dispersible, Low Molecular Weight Polyamide Resin Particles of Uniform Sizes
Partially Imidized Polyamide Acid Polymers
Casting Films of Poly(m-Phenylene Isophthalamide) and Its Copolymers
Water-Dispersible, Low Molecular Weight Polyamide Resin Particles of Uniform Sizes
Water-Soluble Polyamine Condensate Polymers Having Greater Linear Characteristics
Manufacture of Polyamides
Method for Extracting Granular Polyamides and for Preparing Polyamid Powder
Thixotropic Aqueous Polyimide Compositions
- Applications
Aqueous Polyimide Electrocoating Mixtures
Aminopolyamide-Acrylamide-Glyoxal Resin
Polyamide Gel Removal

POLYESTERS

- Processing
Aqueous Vinyl Ester Copolymer Dispersion Capable of Being Crosslinked
- Applications
Water-Soluble Heat-Resistant Insulating Varnish
Greater Water Resistance and Shorter Drying Time in Water-Soluble Enamel Paints
Aqueous Coating Compositions Containing a Mercaptan Polyester and an Aminoplast
Polymers of Vinyl Acetate Plasticized with Low Molecular Weight Polyesters
Water-Soluble Wire Enamels
Wire Enamel with Improved Heat Shock Properties
Water-Dispensible Hot Melt Polyester Adhesives
Water-Dispersion Varnish for Electrodeposition
Primer-Surfacers Composition of an Acrylic Polymer, a Polyester Resin and an Organic Dispersant

POLYETHYLENIMINE (PEI) PRODUCTS

- Processing
Producing Linear Polyethylenimine
- Applications
Water-Soluble Polyaminoamides Compatible with Polyethylenimine Products for Use in the Paper Industry

POLYURETHANE PRODUCTS

- Processing
Production of Water-Soluble or Water-Dispersible Blocked Polyisocyanates
Production of Water-Dispersible Polyurethanes Having Ionic Groups and Hydrophilic Side Chains
Preparation of Cationic Resin Aqueous Emulsions
Anionic Aqueous Polyurethane Having Blocked NCO Groups
Aqueous Polyurethane Having Blocked NCO Groups
Aqueous Cationic Polyurethane Having Blocked NCO Groups
- Applications
Polyurethane Thickeners in Latex Compositions
Removal of Selenium Compounds from Urethane Solutions
Hydrophilic and Thermoreactive Urethane Compositions with Improved Properties

POLYVINYL ALCOHOL (PVA) AND RELATED PRODUCTS

- Processing
Preparing Polyvinyl Alcohol Deposits of Reduced Water Sensitivity
Plasticized Polymers of Vinyl Acetate
Manufacture of Open-Pore Shaped Articles of Polyvinyl Alcohol-Acetal Sponge
Process for Separating Polyvinyl Alcohol from Its Solution
Aqueous Dispersions of Vinyl Acetate/Polyacrylate Ester of Pentaerythritol/Hydroxymethyl Diacetone Acrylamide Copolymers
- Applications
Acid Modified Polyvinyl Acetate Textile Sizes
Hollow Membrane Fibers
Rust Resistant Latex Paint Primer for Metal Surfaces
Adhesive Composition
Liquid Adhesive Composition

Treating Wastewater Containing Polyvinyl Alcohol
Aqueous Flowable Concentrates of Particulate Water-Insoluble Pesticides
Premixed Catalyzed Vinyl Acetate Polymer Adhesive Composition

POLYVINYLPIRROLIDONE (PVP) AND RELATED PRODUCTS

- Processing
Adhesives Based on Aqueous Dispersions of Butadiene Copolymers, Polyvinylpyrrolidones and Anionic Macromolecular Compounds
Manufacture of Vinylpyrrolidone Polymers
Enhancing Dispersibility of Water-Soluble Polymers
- Applications
Coated Substrate Having a Low Coefficient of Friction Hydrophilic Coating
Stabilized Nitroglycerin Tablets
Water-Containing Plastic Composition
Compositions for the Detackification of Paint Spray Booth Wastes
Cosmetic Emulsions Containing N-Vinylpyrrolidone-Vinyl Alkylcarboxylate Copolymer
Cosmetic Emulsions Containing N-Vinylpyrrolidone-Alkyl Acrylate Copolymers
Shampoo Composition Containing a Detergent and a Graft Cationic Copolymer

RESOLE RESINS

- Processing
Carbohydrate-Based Condensation Resin
Stable Aqueous Resoles
- Applications
Aqueous Phenolic Resole Dispersion Containing Certain Hydroxyalkylated Gums as Interfacial Agents
Aqueous Resole Resin Solutions Having Dispersed Inert Salts

STARCH, STARCH PRODUCTS AND RELATED PRODUCTS

- Processing
Treating a Dextrose Solution
Preparing Crosslinked Starches
Preparation of Starch Sulfate Esters
Removal of Heavy Metal Ions from Aqueous Solutions with Insoluble Crosslinked-Starch-Xanthates
Producing b-Lactose
Hydrolysis of Lactose
Preparation of D-Fructose
Removing Maltotetraose and Lower Saccharides from Solution
Copolymerized Starch Composition
Water-Absorbing Starch Resins
Making Xylose
Copolymerization of Vinyl Monomers with Cellulose and Starch in Copper Ammonium Solutions
Two-Stage Decomposition of Hemicelluloses to Xylose
Water-Absorbing and Urine-Stable Stepwise-Grafted Starch Polyacrylonitrile Copolymers
Recovering Dextrose and Dextrins from Protein-Containing Starch Products
- Applications
Cocrystallization of Dextrose and Dextrins from Protein-Containing Starch Products
Nondairy Coffee Whitener Containing Acetate Salt
Starch-Based Dessert Composition
Sweet Coatings for Food Products
Rapidly Solubilized AHF Composition
Water Loss Reduction Agents
Modified Starch Containing Liquid Fuel Slurry
Disaccharide Derivatives
Starch-Coated Antiperspirant Having Delayed Activity
Starch-Coated Antiperspirant—Atomizable Gel
Crosslinked Starch-Coated Antiperspirant
Protein-Starch Binary Composition for Molding Shaped Articles
Gum Confections Containing Potato Starch
Beer-Type Beverage
Precompact-Starch Binder-Disintegrant-Filler Material
Starch Air Freshener Gels
Making Paper Containing Cationic Starch and an Anionic Retention Aid
- New Technologies
- Processing

Preparing Polymers from Water-Soluble Vinyl Monomers
Electrophoretic Technique for Varying the Concentration of a Colloidal Solution
Process for Continuously Coagulating an Aqueous Latex
Process for Treatment of Wastewater
Process for Producing Water-Soluble Organic Macromolecules
Tablets Coated with Aqueous Resin Dispersions
Process for Dissolving Water-Soluble Polymers and Gums in Water
Process for Crosslinking Hydrophilic Colloids
- Products
Water-Soluble Polymers Derived from Copolymerization of Diene and Maleic Acid
Impregnation and Primer Coating of Absorptive Substrates with Plastics Dispersions
Hydrophobic Lithographic Printing Masters
Maleinized Polybutadiene
Adhesive Formulation Containing Isobutylene Rubber
Chelate-Forming Aqueous Resin Composition
Water-Soluble Oxidation-Reduction Polymers
Thermoplastic Hydrogels
Crosslinked Water-Swellable Polymer Particles
Dispersion of Water-Soluble Polymers in Oil
Water-Soluble Amine-Linked Polymeric Colorants
Aqueous Wetting and Film-Forming Compositions
Water-Based Magnetic Inks

COMPANY INDEX
INVENTOR INDEX
U.S. PATENT NUMBER INDEX

Reviews - Synopsis - Dust Jacket

FOREWORD:

The detailed, descriptive information in this book is based on U.S. patents, issued since March 1977, that deal with water-soluble polymers.

This book serves a double purpose in that it supplies detailed technical information and can be used as a guide to the U.S. patent literature in this field. By indicating all the information that is significant, and eliminating legal jargon and juristic phraseology, this book presents an advanced, commercially oriented review of water-soluble polymers.

The U.S. patent literature is the largest and most comprehensive collection of technical information in the world. There is more practical, commercial, timely process information assembled here than is available from any other source. The technical information obtained from a patent is extremely reliable and comprehensive; sufficient information must be included to avoid rejection for "insufficient disclosure." These patents include practically all of those issued on the subject in the United States during the period under review; there has been no bias in the selection of patents for inclusion.

The patent literature covers a substantial amount of information not available in the journal literature. The patent literature is a prime source of basic commercially useful information. This information is overlooked by those who rely primarily on the periodical journal literature. It is realized that there is a lag between a patent application on a new process development and the granting of a patent, but it is felt that this may roughly parallel or even anticipate the lag in putting that development into commercial practice.

Many of these patents are being utilized commercially. Whether used or not, they offer opportunities for technological transfer. Also, a major purpose of this book is to describe the number of technical possibilities available, which may open up profitable areas of research and development. The information contained in this book will allow you to establish a sound background before launching into research in this field.

Advanced composition and production methods developed by Noyes Data are employed to bring these durably bound books to you in a minimum of time. Special techniques are used to close the gap between "manuscript" and "completed book." Industrial technology is progressing so rapidly that time-honored, conventional typesetting, binding and shipping methods are no longer suitable. We have by-passed the delays in the conventional book publishing cycle and provide the user with an effective and convenient means of reviewing up-to-date information in depth.

The Table of Contents is organized in such a way as to serve as a subject index. Other indexes by company, inventor and patent number help in providing easy access to the information contained in this book.

INTRODUCTION:

An intense competitive struggle for markets has developed over the past few years among starch products, natural gums, the semisynthetics and the synthetics. The traditional starch products lost ground to the semisynthetics and synthetics because some traditional starch products were found to cause stream pollution in various industrial applications, while some semisynthetics and synthetics, with lower BOD (biological oxygen demand or biochemical oxygen demand), sharply reduced such pollution.

The traditional starch products and traditional natural gums labored under the disadvantage of competing with the semisynthetics and synthetics, which could be tailor-made for end uses. Competition for markets, however, has increased, because modified starches, starch derivatives and natural gum derivatives can now also be tailor-made for end uses.

The modified starches and starch derivatives do hold an advantage over the semi-synthetics, synthetics and natural gums in generally being less expensive. Strongly favoring the semisynthetics and synthetics, however, is the great versatility which they have displayed in their applications. In addition, the market structures for the semisynthetics and synthetics have been developed to a high degree, particularly more than the natural gums, and the producers of semisynthetics and synthetics have provided considerably more servicing and product information than the natural gum producers.

Geographically, production of the semisynthetics and synthetics is located primarily in the industrialized countries of the world, especially in Austria, Canada, France, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom, the United States and West Germany. The Soviet Union and the Eastern European countries are also significant producers of synthetics. In contrast, production of the natural gums is located mainly in the developing countries of the world, especially those of Asia and Africa. In recent years, government officials in the developing countries producing natural gums have shown grave concern about the loss of markets to the synthetics. Concerning the starches, starch is found in many parts of the world. On a worldwide scale, cornstarch holds the largest share and the United States is the largest producer of cornstarch.

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 185 Water-Soluble Resins: An Industrial Guide
Author: Flick, Ernest W.
Publish.: Noyes Publications
- place: Park Ridge, NJ
- date: ©1991
Subject: Gums and resins
Desc: xiv, 436 p., 25 cm. | Dynix: 50462
Call No.: 668 FI
ISBN: 0815512740
Shelf Adult Non-Fiction | Edition: 2nd edition
Series:
Year: 1991
Price: \$64.00 |

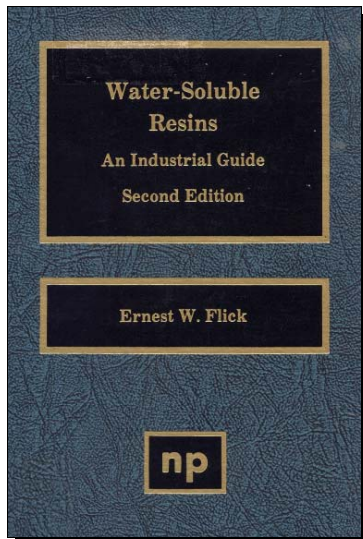


Table of Contents

- PRODUCT INFORMATION
 Abatron, Inc.
 Aceto Corp.
 Air Products and Chemicals, Inc.
 Aqualon
 Bercen, Inc.
 Callaway Chemical Co.
 Cargill, Inc.
 Cook Paint and Varnish Co.
 CPS Chemical Co., Inc.
 Dock Resins Corp.
 Dow Chemical Co.
 DuPont
 Dynagel, Inc.
 Firestone Synthetic Rubber & Latex Co.
 FMC Corp.
 Freeman Chemical Corp.
 Genesee Polymers Corp.
 B.F. Goodrich Co.
 Goodyear Chemicals
 W.R. Grace & Co.
 H & C Industries, Inc.
 Henkel
 Hercules, Inc.
 Hi-Tek Polymers, Inc.
 Hormel
 Huls America, Inc.
 ICI Resins US
 Mobay Corp.
 Monsanto Chemical Co.
 Morton International, Inc.
 NL Chemicals, Inc.
 Norland Products Inc.
 Occidental Chemical Corp.
 C.J. Osborn
 Oxychem
 Polysat Inc.
 Ranbar Technology Inc.
 Reichhold Chemicals, Inc.
 Sartomer Co.
 StanChem Inc.
 Thibaut & Walker
 TIC Gums, Inc.
 Union Carbide Corp.
 Unocal Chemicals Division
 R.T. Vanderbilt Co., Inc.

Subjects

| | |
|--------------|-------------------------------|
| 265 . | Gums and resins |
| 376 . | Gums and resins,
Synthetic |
| 469 . | Water-soluble polymers |

- SUPPLIERS' ADDRESSES
 TRADE NAME INDEX
 RESIN INDEX

Reviews - Synopsis - Dust Jacket

PREFACE

The second edition of this popular industrial guide contains descriptions of more than 1100 currently available water-soluble resins, supplied by 47 manufacturers or distributors of these products. Both natural and synthetic resins are included. The book will be of value to technical and managerial personnel involved in the final products made with these resins, as well as the suppliers of basic raw materials.

Types of water-soluble resins included in the book are cellulose ethers; collagens; gelatins; natural gums; and synthetic resins, their dispersions, emulsions, and solutions.

The data in the book represent selections from manufacturers' descriptions made at no cost to, nor influence from, the makers or distributors of these materials. Only the most recent information has been included. It is believed that all of the products listed are currently available, which will be of utmost interest to readers concerned with product discontinuances.

The book lists the following information, as available, in the manufacturer's own words, for each product:

- (1) Company name and product category;
- (2) Trade names and product numbers;
- (3) Product description—important features, properties and applications.

Products are presented by company, and the companies are listed alphabetically. Also included in the book are a Trade Name Index and a Resin Index, for easy and rapid location of products by the reader. In addition, another section, which will be useful, contains Suppliers' Addresses. It can be found immediately following the Product Information Section.

My fullest appreciation is expressed to the companies and organizations which supplied the data included in the book.

Waterborne & Solvent Based Acrylics and Their End User Applications

LASCT Holdings - maximum detail by Title **W**

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------|
| 186 Waterborne & Solvent Based Acrylics and Their End User Applications | | <i>Edition:</i> |
| <i>Author:</i> Oldring, Peter and Peter Lam (editors) | <i>Dynix:</i> 70138 | <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology |
| <i>Publish.:</i> SITA (Selective Industrial Training Associates) Technology, Ltd. | <i>Call No.:</i> 667.9 Wa v.1 | |
| <i>- place:</i> London, UK | <i>ISBN:</i> 0947798447 | <i>Year:</i> 1996 |
| <i>- date:</i> ©1996 | <i>Shelf</i> Reference | <i>Price:</i> \$130.00 |
| <i>Subject:</i> Acrylic resins | | |
| <i>Desc:</i> 1 v. (xiii, 490 p.) illus., 26 cm. | | |



Table of Contents

Reviews - Synopsis - Dust Jacket

Subjects

| | |
|-------|----------------------|
| 214 . | Acrylic Resins |
| 420 . | Thermoplastic resins |
| 462 . | Thermosetting resins |
| 492 . | Waterborne acrylics |

Volumes

| |
|----------------------------------------------------------------|
| Vol 1: Waterborne & Solvent Based Acrylics and.. |
| Vol 2: Waterborne & Solvent Based Epoxies and.. |
| Vol 3: Waterborne & Solvent Based Surface Coating Resins and.. |
| Vol 4: Waterborne & Solvent Based Saturated Polyesters and.. |

Waterborne & Solvent Based Epoxies and Their End User Applications

LASCT Holdings -
maximum detail by Title

W

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------|
| 187 Waterborne & Solvent Based Epoxies and Their End User Applications | | <i>Edition:</i> |
| <i>Author:</i> Oldring, Peter (editor) | <i>Dynix:</i> 70139 | <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology |
| <i>Publish.:</i> SITA (Selective Industrial Training Associates) Technology, Ltd. | <i>Call No.:</i> 667.9 Wa v.2 | |
| <i>- place:</i> London, UK | <i>ISBN:</i> 0947798498 | <i>Year:</i> 1996 |
| <i>- date:</i> ©1996 | <i>Shelf:</i> Reference | <i>Price:</i> \$130.00 |
| <i>Subject:</i> Epoxy resins | | |
| <i>Desc:</i> xii, 516 p., illus., 24 cm. | | |

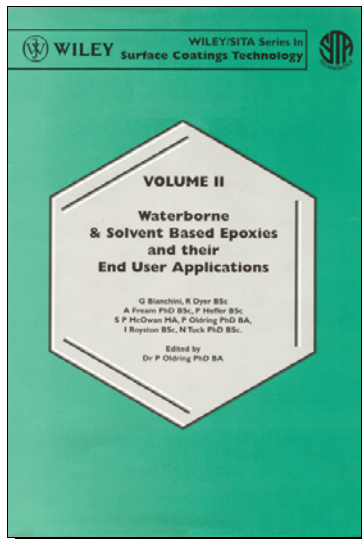


Table of Contents

| |
|------------------------------------------------------------------------------------------------------------|
| Chapter I: INTRODUCTION |
| I INTRODUCTION |
| II TOXICITY AND POTENTIAL OESTROGENIC EFFECTS OF EPOXY RESINS BASED UPON BISPHENOL 'A' AND EPOCHLOROHYDRIN |
| III REFERENCES |
| Chapter II: THE CHEMISTRY OF EPOXY RESINS |
| I EPOXY RESINS BASED ON BISPHENOL 'A' |
| 1. Phenoxy Resins |
| 2. Physical Properties of Bisphenol 'A' Based Epoxy Resins |
| 3. Physical Properties of Phenoxy Resins |
| II EPOXY RESINS NOT BASED ON BISPHENOL 'A' |
| 1. Bisphenol 'F' Based Epoxy Resins |
| 2. Halogenated Epoxy Resins |
| 3. Epoxy Novolac Resins |
| 4. Hydrogenated Bisphenol 'A' Epoxy Resins |
| III REACTIVE DILUENTS |
| IV EPOXIDISED VEGETABLE OILS |
| V EPOXY RESINS FOR CATIONICALLY CURED COATINGS |
| VI EPOXY CURING AGENTS FOR POWDER COATING RESINS |
| VII WATERBASED EPOXY RESINS |
| VIII UNSATURATED EPOXY CONTAINING MATERIALS |
| IX REFERENCES |
| Chapter III: CHEMISTRY OF MODIFIED EPOXY RESINS |
| I EPOXY ESTERS |
| 1. Catalysts For Epoxy Ester Formation |
| 2. Fatty Acid Based Epoxy Esters |
| (i) Catalysts |
| (ii) Preparation of Epoxy Esters Based Upon Fatty Acids |
| (iii) Classification of Fatty Acid Based Epoxy Esters |
| 3. Dibasic Acid Epoxy Esters |
| 4. Epoxy Modified Polyesters |
| 5. The Use of Monofunctional Epoxy Resins as Modifiers |
| II EPOXY ACRYLATES - UV & EB RADIATION CURABLE OLIGOMERS |
| III EPOXY POLYESTER POWDER COATING RESINS |

Subjects

| | |
|-------|---------------------|
| 260 . | Epoxy resins |
| 324 . | Protective coatings |

Volumes

| |
|----------------------------------------------------------------|
| Vol 1: Waterborne & Solvent Based Acrylics and.. |
| Vol 2: Waterborne & Solvent Based Epoxies and.. |
| Vol 3: Waterborne & Solvent Based Surface Coating Resins and.. |
| Vol 4: Waterborne & Solvent Based Saturated Polyesters and.. |

IV THE CHEMISTRY OF WATER BASED EPOXY COATINGS

1. Emulsions
 - (i) Emulsifying Resins
 - (ii) Emulsion Polymerization
2. Neutralization of Acid or Base Rich Resins
 - (i) Neutralization of Acid Rich Resins
 - (ii) Neutralization of Base Rich Resins
3. Review of Current Modified Waterbased Epoxy Technology Literature
 - (i) Epoxy Acrylics or Modified Epoxy Acrylics and Variants
 - (ii) Epoxy Phosphates
 - (iii) Epoxy Acid Esters with No Acrylic Functionality
 - (iv) Waterbased Epoxy Esters of Fatty Acids
 - (v) Mannich bases
 - (vi) Emulsions
 - (vii) Cationic Systems
 - (viii) Other

V REACTIONS OF HYDROXYL GROUPS WITH EPOXY RESINS EPOXY

VI EPOXY AMINE ADDUCTS

VII REFERENCES

Chapter IV: THE CHEMISTRY OF EPOXY CURING

I EPOXY AMINE CURING OF PRIMARY AND SECONDARY ALIPHATIC POLYAMINE CURING AGENTS

1. General
2. Mechanisms of Primary and Secondary Amine Epoxy Reactions
3. Some Properties of Epoxy-Amine Crosslinked Films
4. Primary and Secondary Amine Curing Agents

II POLYAMIDE, AMIDO POLYAMINE, IMIDAZOLE AND IMIDAZOLINE CURING AGENTS

1. Polyamides
 - (i) Corrosion and Inhibition of Corrosion
 - (ii) Effects of Polyamide Systems on Pot Life
 - (iii) The Influence of Structure, Conditions of Use and Cure and Mixing Ratios of the Polyamide Resin on Film Properties
 - (iv) Accelerators and Solvent selection for Epoxy Polyamide systems
2. Imidazoles and Imidazolines
3. Amino Amides or Amidopolyamines

III TERTIARY AMINES AND INORGANIC BASES - ANIONIC INITIATED HOMOPOLYMERISATION OF EPOXY RESINS

1. Tertiary Amines
2. Inorganic Bases

IV OTHER AMINE AND AMINE DERIVED EPOXY CURING AGENTS

1. Aromatic Polyamines
2. Ethoxylated Amine Adducts
3. Epoxy Amine Adducts
4. Mannich Base Curing Agents
5. Dicyandiamide and Modified Dicyandiamides

V AMINOPLASTS AND PHENOLPLASTS

1. Aminoplasts
 - (i) Cure Mechanisms of Aminoplasts
 - (ii) Selection of an Aminoplast
2. Phenolic Resins

VI ACID CURING AGENTS

1. Anhydride Curing agents
2. Other Organic Acid Functional Curing Agents
3. Inorganic Acids

4. Lewis Acids and Cationic Homopolymerization of an Epoxy Resin and Tertiary Amine Catalyzed Anionic Homopolymerization

VII CURE MECHANISMS FOR MODIFIED EPOXY RESINS

1. Isocyanate Curing of Epoxy Resins and Epoxy Esters
2. Air Drying Epoxy Esters

VIII OTHER EPOXY CURING MECHANISMS

1. Polymercaptans
2. Metal Salts
3. Epoxy Transesterification

IX UV CURABLE SYSTEMS UTILISING EPOXY OR MODIFIED EPOXY RESINS

1. UV Free Radical Curing of Acrylated Epoxies
2. UV Cationic Curing of Epoxy Resins

X REFERENCES

Chapter V: EPOXY RESINS IN HEAVY DUTY COATINGS

I EPOXY RESINS IN HEAVY DUTY COATINGS

1. Marine
2. Off-shore
3. Protective
4. Architectural
5. An Outline of the Use of Epoxy Resins in These Markets

II TRADITIONAL SOLVENT BASED SYSTEMS

1. Amine Cured Epoxy Finishes
2. Amine Adduct Cured Paints
3. Polyamide Cured Epoxy Finishes
4. Comparison of Curing Agent Types
5. Epoxy Blast (Shop) Primers
6. Coal Tar Epoxies
7. Zinc Rich Epoxy Primers

III HIGHER SOLIDS SYSTEMS

IV SOLVENT—FREE EPOXIES

1. Flooring Systems
2. Linings
3. Laminates for Steel Tank Repair

V OTHER CURING AGENTS

1. Polyamide Adducts
2. Mercaptans
3. Carboxylic Acids and Anhydrides

VI EPOXY ESTERS

VII FORMULATING HEAVY DUTY COATINGS WITH EPOXY RESINS

VIII SUPPLIERS

IX REFERENCES

Chapter VI: EPOXY RESINS IN INDUSTRIAL PAINTS

I INTRODUCTION

1. Information Technology
 - (i) Procedure
 - (ii) Application
 - (iii) Discussion
 - (iv) Film Performance Characteristics

2. Machine Tool Business
 - (i) Procedure
 - (ii) Application
 - (iii) Discussion
3. The Domestic Appliance Business
 - (i) Procedure
 - (ii) Application
 - (iii) Discussion
4. The Food Processing Business
 - (i) Procedure
 - (ii) Application
 - (iii) Discussion
5. Agricultural and Construction Equipment Industry
 - (i) Procedure
 - (ii) Application
 - (iii) Discussion
6. Epoxy Ester Primers
 - (i) Procedure
 - (ii) Application
 - (iii) Discussion

Chapter VII: EPOXY RESINS IN COIL COATINGS

I INTRODUCTION

1. Historical Perspective
2. Primers & Backcoats

II COIL COATING EPOXY PRIMERS

1. Original Epoxy Primers
2. Modern Epoxy Primers
3. Chromate-free Coil Coating Epoxy Primers

III COIL COATING EPOXY BACKING LACQUERS

IV LACQUERS FOR FOOD AND BEVERAGE PACKAGING

V MINOR USES OF EPOXY RESINS IN COIL COATINGS

1. Epoxy—Phenolic Combinations
 - (i) Non-stick Bakeware
2. '1-type' Epoxy Resins
 - (i) Acrylamide Acrylics
3. Phenoxy Resins
 - (i) Decorative Lacquers
 - (ii) Zinc-rich Weldable Primers
4. Low Molecular Weight Liquid Epoxy Resins
 - (i) Flexible Polyester
5. Epoxy Esters
 - (i) Stock Primers
6. Epoxidized Soya Bean Oils
 - (i) PVC Plastics and Organosols
7. Epoxy Terminated Polysulphides

VI WATER BASED COIL COATINGS

Chapter VIII: EPOXY RESINS FOR THE AUTOMOTIVE MARKET

I INTRODUCTION

II ELECTROPHORETIC (ELECTRODEPOSITED) PRIMERS

1. Cationic Binders
 - (i) Binders for Cationic Primers
2. Grinding vehicles
3. Formulation of Cationic Primers
4. Specifications of Cationic Primers

- (i) Throwing-power Test
- (ii) Adhesion Test
- (iii) Flexibility Test
- (iv) Salt Spray Test
- (v) Filiform Corrosion Test
- (vi) Water Resistance Test
- (vii) Weatherability Tests

III PRIMER SURFACERS

- 1. Solvent Borne Primer Surfacer
 - (i) Pure Polyester-Melamine Binders
 - (ii) Epoxy-Polyester-Melamine Binders
 - (iii) Epoxy-Polyester-Melamine-Blocked Isocyanate Binders
- 2. Waterborne Primers

Chapter IX: METAL DECORATING APPLICATIONS FOR EPOXY AND MODIFIED EPOXY RESINS

I INTRODUCTION

II TYPES OF EPOXY RESIN SYSTEMS WHICH CAN BE USED FOR METAL DECORATING

- 1. Epoxy Resins
- 2. Epoxy Phenolic Systems
 - (i) Precondensed Epoxy Phenolic Resins
- 3. Epoxy Amino Systems
- 4. Epoxy Esters
- 5. Epoxy Acrylic Internal Systems
- 6. Other Epoxy Systems

III THE USE OF WATERBORNE SYSTEMS IN METAL DECORATING

IV THE DIFFERENT TYPES OF METAL PACKAGING

- 1. DWI Cans
- 2. Three Piece Cans — Mainly Food
- 3. Drawn Cans and Drawn Re-Drawn Cans (DRD)
- 4. Closures
- 5. Aerosols
- 6. General Line
- 7. Tubes

V REQUIREMENTS OF FOOD CONTACT LACQUERS

VI EXAMPLES OF APPLICATIONS OF DIFFERENT EPOXY SYSTEMS IN METAL DECORATING - AS SIGNIFICANT FILM FORMING RESIN

- 1. Epoxy Phenolic Systems
 - (i) Food Can and General Line Lacquers
 - (ii) Side Stripe Lacquer
 - (iii) Internal for Aluminium Closures
 - (iv) Monobloc Aerosol Internal
 - (v) Size for Tinplate Closures
 - (vi) Coil Coating Epoxy Phenolic
 - (vii) Food EOE Lacquers
 - (viii) General Line
- 2. Epoxy Amino Systems
 - (i) Side Stripe Lacquer
 - (ii) Closure Varnish
 - (iii) Ashtray Varnish
- 3. Epoxy Ester Systems
 - (i) Sterilizable Varnish
 - (ii) Crown Varnish
- 4. Modified Epoxy Resins
- 5. Epoxy Acrylics
 - (i) DWI Internal Lacquer - Waterbased

VII EXAMPLES OF APPLICATIONS OF DIFFERENT EPOXY SYSTEMS IN METAL DECORATING

— AS PERFORMAMNCE ENHANCERS

VIII REFERENCES

Chapter X: WATERBORNE EPOXY RESINS IN PROTECTIVE COATINGS FOR STEEL AND CONCRETE

I INTRODUCTION

II DEVELOPMENT OF WATERBORNE EPOXIES

1. 'Self-Emulsifying' Systems
2. Epoxy Emulsions

III FORMULATION OF WATERBORNE EPOXY COATINGS – GENERAL PRINCIPLES

1. Epoxy Resins
2. Curing Agents
3. Epoxy/Hardener Ratio
4. Anti—Corrosive Pigments
5. Pigment Volume Concentration
6. Prime Pigments
7. Extender Pigments
8. Cosolvents
9. Additives
 - (i) Anti-foaming/Defoaming Agents
 - (ii) Biocides
 - (iii) Dispersing Agents
 - (iv) Substrate Wetting Agents
 - (v) Flash Rusting Agents
 - (vi) Rheology Modifiers

IV POT LIFE AND FILM FORMATION

V FORMULATIONS FOR SPECIFIC APPLICATIONS

1. Anticorrosive Primers
2. Topcoats
3. Blockfiller

VI FEATURES AND BENEFITS OF WATERBORNE EPOXIES

VII APPLICATIONS OF WATERBORNE EPOXIES

VIII SUMMARY

IX REFERENCES

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

Epoxy resins have been commercially available for more than forty years and arguably are used in one of the most diverse range of applications in the modern world. The use of epoxy resins is not restricted to the surface coatings industry. They are used in both thermal and ambient cure applications in industries such as aerospace, civil engineering, automotive, chemical, electrical, marine, leisure and many others. Table 1, reproduced from an excellent Shell publication gives details of the applications.

TABLE 1: LIST OF SOME APPLICATIONS FOR EPOXY RESINS

Aircraft and Aerospace

- Structural parts of aircraft, spacecraft and satellites
- Adhesives
- Aircraft paints and coatings

Automotive

- Automotive primers and primer surfacers
- Sealers
- Adhesives
- Structural components

Racing car bodies
Tooling compounds
Ignition coil impregnators
Encapsulants for control modules

Construction
Industrial flooring
Grouts for roads and bridges
Anti-skid road surfaces
Tooling compounds
Repair compounds
Adhesives
Sealants
Pipes
Do-it-yourself compounds
Maintenance paints
Coil coated steel (such as roofing)

Chemical
Linings for storage tanks
Chemical plant including coatings
Pipes and pipe linings
Filters

Electrical
Switchgear construction and insulation
Transformer construction and insulation
Turbine alternator insulation
Electric motor insulation
Cable jointing
Coatings for domestic electrical appliances

Electronic
Printed circuit boards
Packaging of active and passive components
Encapsulation of electronic modules
Adhesives

Food & Beverage
Can & drum coatings
Coatings for flexible tubes

Leisure
Fishing rods
Tennis racquets
Golf club shafts
Bicycle frames
Skis
Musical instruments

Light Engineering
Adhesives
Protective and decorative coatings for:
beds
office and hospital furniture garden chairs
supermarket trolleys
fire extinguishers
bicycles

Marine
Primers and protective coatings for ships and marine structures (such as oil rigs)

Textile
Equipment parts

Glass and carbon fiber sizing agents

Composite structures for artificial limbs

As can be seen from Table 1, epoxy resins are extremely versatile, finding applications in virtually every major industry. It is readily apparent that there are in essence two main uses of epoxy resins, namely surface coatings and engineering (structural). The consumption of epoxy resins between these two areas is approximately equal.

In this series of books only the applications which can be classified as surface coatings are considered, with a few exceptions.

Epoxy resins are synthetic and are not the lowest cost resins potentially available for most applications. Thus they must confer a property or properties to the final product which justifies their additional cost. In almost all cases they impart outstanding chemical/corrosion resistance to the cured film. If this is not required then the formulator can consider other lower cost resins. Protective coatings are an area in which it is difficult to match the performance of epoxy resins at similar cost.

One other property which films containing epoxy resin impart is good electrical insulation, hence epoxies find themselves in many electrical applications, such as circuit board fabrication and direct contact with electronic components, such as encapsulation.

The first attempts at commercializing epoxy resins were made in 1927 in the U.S.A. but the two people credited with developing epoxy resins from bisphenol 'A' and epichlorohydrin, which is by far the largest class of epoxy resins in commercial usage today, are Dr P. Castan of Switzerland and Dr S. Greenlee of the U.S.A. In 1936 Dr Castan produced an amber colored thermoset resin and his developments were licensed by Ciba. In 1939 Dr Greenlee investigated the synthesis of epoxy resins for surface coatings. Lee & Neville give a potted history of the development of epoxy resins for any interested readers.

Epoxy resins can be considered to have been commercially available since 1948 with the world-wide consumption of epoxy resins being 550,000 tons in 1990.

The types of surface coatings utilizing epoxy resins can be divided into:

- Paints which cure at ambient temperatures either as a 1-pack or 2-pack system
- Paints which cure at elevated temperatures
- Can coatings
- Automotive paints
- Powder coatings
- Radiation curable inks and coatings

In this book, all of these applications will be considered and they will be further subdivided for easy reading, although the last two will only be briefly mentioned.

The methods of application of epoxy containing surface coatings can vary widely even in the same classification. They range from high technology techniques including electrodeposition and electrostatic powder spraying through to conventional liquid spraying as well as low technology brush or roller application.

The article to be coated often dictates the method of application and the type of cure mechanism.

The following few examples illustrate this. Beverage cans are coated at a rate up to 2,000 per minute. Thus a fast application and method of cure is needed. For waterbased internal lacquers, typically spraying with thermal curing is used. Oil rigs or ships are mostly hand painted with 2-pack ambient (or low temperature) curing paints. Car bodies first undergo electrodeposition of the primer followed by thermal curing. Automotive top coats (which do not contain epoxy resins) would normally be sprayed.

Epoxy resins are commercially available either as solids or liquids. Generally the higher the molecular weight the higher the melting point. Grades of liquid epoxy resins vary in viscosity. It is possible to obtain epoxy resins dissolved in organic solvents or containing reactive diluents to reduce the viscosity. Waterbased emulsions of some epoxy resins are also commercially available.

Unlike many of the other types of resin considered in this series of books, resin manufacturers for the surface coatings industry do not manufacture epoxy resins. However a number of them buy epoxy resin and further modify it. Despite there being a large number of resin companies the suppliers of epoxy resins are limited to a few large, often multinational, companies. The situation can be likened to the difference between a supplier of chemicals and resin

suppliers. Most of the companies manufacturing epoxy resins also manufacture a wide range of other chemicals including fine chemicals.

Epoxy resin molecules contain at least one and normally two (or more) epoxy (glycidyl) groups. Normally the higher molecular weight epoxy resins contain the same basic repeat unit. The bulk of the epoxy resins in commercial use today are based upon the di-epoxide of bisphenol 'A' (diphenylolpropane, often abbreviated as DPP). They are produced by the condensation of epichlorohydrin with bisphenol 'A'. In addition to excellent corrosion and chemical resistance, epoxy resins impart good adhesion with good mechanical properties in cured films.

Epoxy resins are not only used simply as epoxy resin with a curing agent. They are frequently modified by further chemical reaction prior to incorporation in a coating formulation. There are many reasons for this. Examples include;

- (a) Overcoming, in some cases, the potential brittleness of a '100%' epoxy film.
- (b) Reduction in cost of a '100%' epoxy resin based formulation.
- (c) Incorporation of some of the benefits of the chemical and corrosion resistance of epoxy resins in other resin systems.
- (d) Further improvements to the chemical or corrosion resistance of a final cured film.
- (e) Improving the infamous weathering (particularly chalking) characteristics of epoxy resins.
- (f) Inducing water solubility.
- (g) Inducing radiation curing.

There are many excellent text books available giving detailed information about the preparation, chemistry and uses of epoxy resins. It is not the intention of this book to try and cover ground which these books have done so well. The main objective is to consider the relevance of epoxy resins to the coatings industry, supported with in-depth discussion about how and why formulators use epoxy resins. These books are intended to be sequels to the original series of 'Resins for Surface Coatings' This is with an in-depth treatment of both the chemistry of the resins and the way they are used by formulators. Only minimal details of production processes will be given to enable the reader to understand some of the limitations of the manufacture of the resins. With this category of resins it is the modified epoxy resins which are of most interest. The preparation, chemistry of reaction with cure mechanisms and methods of incorporating them into formulations for a wide range of substrates and applications will be discussed. In addition, any discussion about epoxy resins would not be complete without consideration of the types, chemistry and cure mechanisms of curing agents used with epoxy resins.

TOXICITY AND POTENTIAL OESTROGENIC EFFECTS OF EPOXY RESINS BASED UPON BISPHENOL 'A' AND EPICHLOROHYDRIN

Epoxy resins have been subjected to a lot of detailed scrutiny over many years. In essence more is known about epoxy resins and their constituents than most other industrial chemicals. An extensive summary and evaluation of the toxicology of epoxy resins has been published by Gardiner et al.

An area of concern which arose mid-1995 is the potential of bisphenol 'A', a starting material for the manufacture of bisphenol 'A' epichlorohydrin based epoxy resins, the major class of epoxy resins used in surface coatings today, to act as an estrogen mimic. This is particularly relevant for direct food contact applications, such as internal food can lacquers and water tank linings. There is evidence that minute quantities of bisphenol 'A' can migrate from the cured coating into the foodstuff, although for beer and beverage DWI internal coatings none has yet been detected, with a detection limit of 5 ppb. At the time of writing a global investigation, including a pharmacokinetic study into the real significance of the reported effects is underway, in the context of the suggestion by some academic workers that estrogen mimics can reduce sperm count and possibly affect the genitalia of males exposed in utero. At this point in time the whole of the surface coating industry, raw material suppliers and canmakers have no reason to believe that there is any problem with bisphenol 'A'. However it will take some time and many experiments before this statement can have unequivocal scientific support. Meanwhile local industry groups working together on a global basis will supply industry statements on the latest situation. Due to the speed with which information is being disseminated and the rapidly changing circumstances, it is not appropriate to make definitive statements in this book. One important point however, is that once reacted with epichlorohydrin to form the epoxy resin, the regeneration of bisphenol 'A' from the product is not possible.

It is important that this subject be kept in context. There are many naturally occurring estrogen mimics, which are far more active than bisphenol 'A'. In addition, as analytical techniques become more sophisticated and more and more industrially derived chemicals are tested, many more chemicals which act as potential estrogen mimics will be claimed. Until the relevance to mankind of in vitro screening tests is unambiguously clarified, it is important that over-reaction on a

purely emotional basis should be avoided. In the case of food contact there are few if any suitable alternatives to epoxy systems, and none which have been so extensively physiologically investigated. At this point in time and for the foreseeable future there is no satisfactory replacement for epoxy resins in direct food contact applications, and no sound scientific basis for seeking such replacements for health reasons.

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------|
| 827 Waterborne & Solvent Based Saturated Polyesters and Their End User Applications [Vol. 4: Polyester] | | <i>Edition:</i> |
| <i>Author:</i> Sanders, Don (editor) | <i>Dynix:</i> 99427 | <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 4: Polyesters] |
| <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited | <i>Call No.:</i> 667.9 Wa v.4 | |
| <i>- place:</i> Chichester, [West Sussex], UK | <i>ISBN:</i> 0471978884 | |
| <i>- date:</i> ©1999 | <i>Shelf:</i> Adult Non-Fiction | <i>Year:</i> 1999 |
| <i>Subject:</i> Coating processes | | <i>Price:</i> \$123.50 |
| <i>Desc:</i> xiii, 577 p., illus., 24 cm. | | |

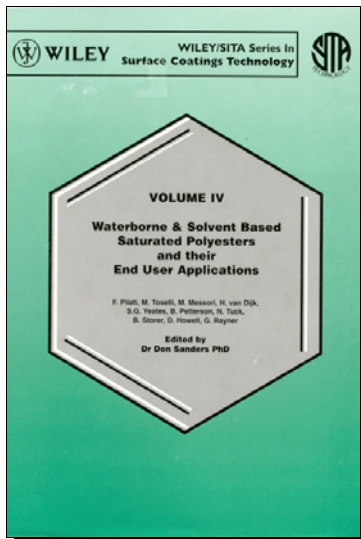


Table of Contents

CHAPTER I - PRINCIPLES OF STEP POLYMERISATION

1. Introduction
2. Monomers and molecular structure
 - (i) Monomer functionality
 - (ii) Polymer chain build-up and molecular architecture
 - (iii) Monomer reactivity
 - (iv) Monomers for polyesters
3. Reaction pathways
 - (i) Polyesters by direct esterification
 - (ii) Polyesters by alcoholysis
 - (iii) Polyesters from acyl chloride
 - (iv) Polyesters by acidolysis
 - (v) Polyesters by ether exchange
 - (vi) Other reaction for the preparation of polyesters
4. Side Reactions
 - (i) Thermal chain scission
 - (ii) Ether-moiety formation
 - (iii) Cyclisation reactions
 - (iv) Decarboxylation reactions
 - (v) Other side-reactions
5. Molecular weight and molecular weight distribution
 - (i) Linear polymers
 - (a) Effect of stoichiometry and conversion on molecular weight
 - (ii) polymerisation of A-A & B-B bifunctional monomers
 - (iii) polymerisation of A-A & B-B monomers in the presence of monofunctional monomer (B-)
 - a. stoichiometric balance, $r = 1$
 - b. stoichiometric imbalance, $r < 1$ and $No_a = Nob_1$
 - (iv) polymerisation of A-B monomers in the presence of monofunctional monomer (B-)
 - (b) Molecular weight distribution
 - (c) Alternative approaches for molecular weight and MWD
6. The role of chemical equilibrium in step polymerisation
 - (i) Non-driven, closed systems
 - (ii) Driven systems
7. Kinetics of step polymerisation
 - (i) Kinetics of polyesterification to produce linear polymers
 - (ii) Direct esterification
 - (a) Auto-catalysed direct esterification
 - (b) Externally catalysed direct esterification
 - (iii) Alcoholysis polymerisation
 - (a) Alcoholysis polymerisation with no other reactions occurring
 - (b) Alcoholysis polymerisation with simultaneous thermal chain scission
 - (c) Alcoholysis polymerisation: kinetics of non-driven systems
 - (iv) Kinetics of non-stoichiometric step polymerisations
 - (v) Kinetics of non-equivalent reactivity of functional groups
 - (vi) Polymerisations of A-A with B-B'
8. Step polymerisation methods
 - (i) Bulk polymerisation
 - (ii) Solution polymerisation
 - (iii) Polymerisation in heterophase systems

Subjects

235 . Coating processes

Volumes

Vol 1: Waterborne & Solvent Based Acrylics and..

Vol 2: Waterborne & Solvent Based Epoxies and..

Vol 3: Waterborne & Solvent Based Surface Coating Resins and..

Vol 4: Waterborne & Solvent Based Saturated Polyesters and..

- (iv) Interfacial polymerisation
 - (v) Dispersion polymerisation
 - (vi) Solid-state polymerisation
- References

CHAPTER II- POLYESTER DESIGN CONSIDERATIONS

1. Introduction
 2. Design for properties
 3. Design for thermal transition
 - (i) Glass transition temperature
 - (ii) Melting crystallisation
 - (iii) Liquid crystalline behaviour
 - (a) Thermotropic main-chain liquid crystalline polyesters
 - (b) Thermotropic side-chain liquid crystalline polyesters
 - (c) Lyotropic main-chain liquid crystalline polyesters
 4. Stability and degradation
 - (i) Thermal stability
 - (ii) Hydrolytic stability
 - (iii) Photostability
 - (iv) Chemical resistance
 - (v) Biodegradation
 5. Solubility
 6. Modification of properties by blending
 7. Control of ecological behaviour in the molten state
 8. Design of other physical properties
 - (i) Mechanical properties
 - (ii) Crystallisation rate
 - (iii) Permeability
 9. The design of chemical structure - homopolyesters
 - (i) Polyesters with chemical structure (-O-R-O-CO-R'-CO-)
 - (a) R and R' aliphatic
 - (b) R aliphatic and R' aromatic
 - (i) Poly(ethylene terephthalate) - PET
 - (ii) Poly(1,4-butylene terephthalate) — PBT
 - (iii) Poly(trimethylene terephthalate) —PTT
 - (iv) Poly(alkylene naphthenate)s
 - (c) R and R' both aromatic
 - (d) R aromatic and R' aliphatic
 - (ii) Polyesters with structure (-O-R-CO-)
 - (a) R aliphatic
 - (b) R aromatic or aromatic-aliphatic
 - (iii) Microbial formation of polyesters
 10. The design of chemical structure - copolyesters
 - (i) Random polyesters
 - (ii) Block copolymers
 - (iii) Alternative copolymers
 - (iv) Graft copolymers
- References

CHAPTER III - THE CHEMISTRY & TECHNOLOGY OF THE CROSSLINKING OF AMINOPLASTS

- Introduction
2. Film forming process of aminoplast containing coating formulations
 - (i) Introduction
 - (ii) Crosslinking reactions
 3. Backbone resins functionality and molecular weight relationships for aminoplasts containing coating formulations
 - (i) Introduction
 - (ii) The effect of aminoplast clustering on the crosslinking density of the cured coating film
 - (iii) The effect of polymer functionality on the crosslinking density of the cured coating film
 - (iv) The effect of acrylic polymer functionality on the crosslinking density of the cured film
 - (v) Effect of molecular backbone polymers on the crosslinking of the cured film
 4. The four main types of aminoplasts used in industrial coating formulation
 - (i) Introduction
 - (ii) Urea formaldehyde crosslinking agents
 - (iii) Melamine formaldehyde crosslinking agents

- (iv) Benzoguanamine formaldehyde crosslinking agents
 - (v) Glycoluril formaldehyde crosslinking agents
 - (vi) Degree of alkylation
 - (a) Highly alkylated amino crosslinking agents
 - (b) Partially alkylated amino crosslinking agents
 - (c) High amino crosslinking agents
 - (vii) Alkylation alcohol
 - 5. Possible reactions during the formation of industrial coatings crosslinked with aminoplasts
 - (i) Introduction
 - (ii) Types of reaction
 - (iii) Specific acid catalysis mechanisms
 - (a) Ether exchange reactions
 - (b) Self condensation reactions
 - (c) The formation of the carbonium ion
 - (iv) General acid catalysis mechanism
 - (a) The formation of Schiffs base
 - (b) The demethylation reaction
 - (c) Side reactions
 - (v) Different reaction mechanisms-specific versus acid catalysis
 - (a) Hydrogen ion concentration
 - (b) Effective functionality of aminoplast
 - (c) Protonation of melamine aminoplast
 - (vi) Reversible and irreversible reactions during curing
 - (a) Crosslinking mechanism
 - (h) Reversible reactions
 - (c) Irreversible reactions
 - (vii) Hydrolysis reactions
 - (a) Hydrolysis of disubstituted alkoxyethyl amino groups
 - (h) Hydrolysis of monosubstituted alkoxyethyl groups
 - (viii) Self condensation reactions
 - (a) Methylene bridges
 - (h) Cyclic trimerisation
 - 6. The required level and type of aminoplast in Industrial coatings formulations
 - (i) Introduction
 - (ii) Calculation stoichiometric ratios of aminoplasts and backbone polymers
 - (iii) Levels of highly alkylated aminoplasts with polyfunctional backbone polyester polymer systems
 - (iv) Levels of highly alkylated aminoplast with low functionality backbone polymer systems
 - (v) Levels of partially alkylated aminoplast with polyfunctional polymer systems
 - (vi) Levels of partially alkylated aminoplasts with low functionality backbone polymer systems
 - 7. Summary
 - (1) Aminoplast overview
 - (ii) Highly alkylated aminoplast crosslinking reactions
 - (iii) Partially alkylated aminoplast reactions
 - (iv) Reversible bond breaking reactions
 - (v) Irreversible bond breaking reactions
 - (a) Hydrolysis reactions
 - (b) Demethylation reactions
 - (c) Self condensation reactions
 - (vi) Aminoplast selection
 - 8. Aminoplast crosslinkers: concerns and future requirements
 - (i) Environmental and threshold limit values
 - (ii) Long term degradation chemical damage
- References

CHAPTER IV - WATERBORNE SATURATED POLYESTERS

- Introduction
- 2. Hydrolysis and hydrolytic stability
 - (i) Steric effects
 - (ii) Anchimeric effect
 - (iii) Effect of pH
 - (iv) Electronic effects
 - (v) Effect of polyester hydrophobicity
 - (vi) End-group effects
 - (vii) Additive stabilisation

- (viii) Summary
- 3. Stabilisation and solubilisation of waterborne polyesters
 - (i) Ionic stabilisation
 - (ii) Nonionic stabilisation
 - (iii) Use of external surfactants
- 4. Classification and characterisation of aqueous polyester solutions and dispersions
 - (i) Aqueous dispersions and emulsions of saturated polyesters
 - (ii) Polyester colloidal dispersions
- 5. Factors affecting the physical nature of waterborne polyesters
 - (i) Inverse emulsification
 - (ii) Effect of agitation
 - (iii) Effect of neutralisation
 - (iv) Effect of cosolvent
- 6. The chemistry of waterbased polyester coatings
 - (i) Carboxyl functional polyesters
 - (a) Polyfunctional alcohol modified polyesters
 - (b) Dimethylolpropionic acid polyesters
 - (c) Polyesters modified with high functionality organic acids
 - (d) Processing of TMA-functional polyesters
 - (e) Acrylic modified polyesters
 - (f) Recycled polyesters
 - (g) Applications of carboxyl functional waterborne saturated polyesters
 - (ii) Nonionic functional polyesters
 - (iii) Sulphonate functional polyesters
 - (a) The chemistry of sulphonate functionality
 - (b) Applications of sulphonate functional polyesters
 - (iv) Iminosulphonyl functional polyesters
- 7. Aqueous polyester-acrylic hybrids
- References

CHAPTER V - PRINCIPLES, DERIVATISATION AND APPLICATION DENDRITIC POLYESTERS

- 1. Introduction
- 2. Dendritic growth
 - (i) Divergent growth
 - (ii) Convergent growth
- 3. Synthesis of dendritic polyesters
 - (i) Monodisperse versus polydisperse structures
- 4. Properties of dendritic polyesters
 - (i) Influence of a core
 - (a) Influence on molecular weight
 - (b) Influence on rheological properties
 - (ii) Influence of core type
 - (a) Core functionality
 - (b) Inherent core flexibility
 - (iii) Influence of chain extender nature
 - (iv) Influence of end group type
 - (a) Influence on glass transition temperature
 - (b) Influence on melt viscosity
 - (c) Influence on solubility
 - (d) Influence on crystallinity
 - (e) Influence on rheological behaviour
 - (F) Influence on reactivity
- 5. Derivatisation of dendritic polyesters
 - (i) Application of dendritic polyesters
 - (a) High solid alkyds from dendritic polyesters
 - (b) Dendritic polyesters in radcure applications
 - (i) influence acrylate functionality + nature of nonreactive groups
 - (ii) self-emulsifying dendritic waterborne acrylate
 - (c) Epoxidised dendritic polyester as modifiers in epoxy applications
 - (i) dendritic epoxies as modifiers in bisphenol A and epoxy amine hardeners
 - (ii) effects of dendritic epoxy in glass fibre reinforced epoxy laminates
 - (d) Epoxidised dendritic polyester as modifiers in structural adhesives
 - (i) dendritic polyesters as additives in the rmoplastics
 - (ii) dendritic polyesters as interfiice promoters in polypropylene polyamide lain mates

- (iii) dendritic polyester as processing aid for linear low density polyethylene (LLDPE)
- References

CHAPTER VI- POLYESTERS IN INDUSTRIAL PAINTS

1. Introduction
2. Polyesters as industrial stoving paints
 - (i) White goods
 - (ii) Application of high solids polyester melamines by high speed electrostatic discs
 - (iii) Application of high solids polyester melamines by high speed electrostatic bells
 - (iv) High performance finishes
 - (v) Polyesters with isocyanates as 2-component polyurethanes
 - (vi) Polyester isocyanate coating of industrial force drying
 - (vii) Polyester isocyanate coating for ambient cure

CHAPTER VII- THE APPLICATION OF SATURATED POLYESTER IN OE AND REFINISH (VR) COATINGS

1. Introduction
2. Historical development
3. Saturated polyesters in single pack OE top coats
4. SAG control modifications to polyesters
5. Polyester/amino top coat
6. Application of polyester/amino top coats
7. Clear base coat systems
 - (i) Saturated polyesters in base coats
8. Base coats for OE and VR
 - (i) Principles of base coat formulation
 - (a) Raw Material choice in base coat formulation
 - (b) Modifying resins for polyester base coats
 - (c) Typical formulation for polyester base coats
 - (d) Some aspects of COB systems
 - (e) Colour matching for VR base coats
 - (f) Metamerism
 - (g) Mixing and use of COB refinish products
 - (h) Two-pack polyester systems
 - (i) 2k polyester for plastic finishing
 - (j) OE primer surfacers
 - (k) Primers for refinishing
9. Water dilutable polyesters

CHAPTER VIII- SATURATED POLYESTER RESINS & POWDER COATINGS

- Introduction
- (i) Historical background
 - (ii) Establishment of polyester powders
 - (iii) Recent developments
2. Powder Coating Market
 - (i) Growth
 - (ii) Resin usage
 3. Powder Manufacturing Process
 - (i) Manufacture by the extrusion method
 - (a) Extrusion
 - (b) Grinding and classification
 - (ii) The VAMP process
 4. Polyester Powder Coating Resin
 - (i) Basic resin chemistry
 - (ii) Resin design
 - (iii) Chain of reactants
 5. Polyester Resin Curing Agents and Curing Reactions
 - (i) Carboxylic polyester resins
 - (a) Epoxy resins
 - (b) Triglycidyl isocyanurate
 - (c) Araldite PT 920
 - (d) Beta-hydroxyalkylamide
 - (e) Aliphatic oxirane system
 - (f) Acrylic resins
 - (ii) Hydroxyl polyester resins

- (a) Blocked isocyanates and uretdiones
- (b) Tetramethoxymethyl glycoluril
- (c) Acid anhydrides
- (d) Melamines
- 6. Polyester Powder Coatings for Interior Use
 - (i) General formulating principles
 - (ii) Polyester epoxy
 - (a) Starting point formulation
 - (b) Lower gloss coatings
 - (a) Dry blending
 - (b) Fillers
 - (c) Incompatible components
 - (d) Accelerators
 - (e) Dual curing agents and competing reactions
 - (c) Typical coating powders
- 7. Polyester Powder Coatings for Exterior Use
 - (i) TGIC cured polyester
 - (ii) Isocyanate cured polyester
 - (iii) Formulation of lower gloss exterior grade finishes
 - (a) Fillers, waxes and accelerators
 - (b) Dry blending
 - (c) Extruded blends of resins
 - (d) Competing curing reactions
 - (iv) TGIC free polyester systems
 - (a) Araldite PT 910
 - (b) Beta-hydroxyalkylamide (HAA)
 - (a) Pinholing
 - (b) Yellowing
 - (c) Aliphatic-oxirane system
 - (d) Tetra-methoxymethyl glycoluril (TMMGU)
 - (v) The durability of polyester powder coatings
 - (a) Superdurable coatings
- 8. Formulation for Specific Applications
 - (i) Speciality finishes
 - (a) Textures
 - (b) Structures
 - (c) Wrinkles
 - (d) Hammers
 - (e) Metallics
 - (f) Antiques
 - (ii) Special applications
 - (a) Powders for tribo applications
 - (b) Thin film powders
 - (i) Particle size
 - (ii) Binder system
 - (iii) Pigmentation
 - (c) High temperature applications
- 9. Raw Materials
 - (i) Resins and curing agents
 - (ii) Pigments
 - (a) Pigment evaluation and selection criteria
 - (b) Heat and chemical resistance
 - (c) Stability to extrusion
 - (d) Dispersion
 - (e) Blooming and plate—out
 - (f) Levelling
 - (g) Light and weather fastness
 - (h) Organic pigments
 - (i) Titanium dioxide
 - (j) Organic pigments
 - (k) Metallic and pearlescent pigments
- 10. Characteristics of the Curing Process
 - (i) Thermoviscoelastic analysis
 - (a) Following the curing process

- (ii) Differential Scanning Calorimetry (DSC)
 - (a) The exothermic path
 - (b) Reaction kinetics
 - (c) Determination of cure of a coating
10. Conclusion

CHAPTER IX - SATURATED POLYESTER SYSTEMS IN WOODFINISHING

- 1. Saturated polyester systems in woodfinishing
 - (i) Unsaturated polyester resins
 - (ii) Alkyd resins
 - (iii) Polyester polymers
 - (iv) Isocyanate crosslinked coatings
 - (v) Isocyanates
- 2. Nitrocellulose based coatings
- 3. Non convertible nitrocellulose based coatings
- 4. Precatalysed systems
- 5. Acid catalysed systems

INDEX

Reviews - Synopsis - Dust Jacket

This volume provides an in-depth commentary on polyester-based surface coatings and their applications — a presentation of fundamental polyester chemistry is followed by descriptions of various end-uses, such as automotive coatings, industrial paints, powder coatings, and wood finishing.

Target Audience: Paint chemists, formulators of paints, resins, and additives, technologists, industrial researchers, and academics interested in polyester resins and their applications.

Note: Waterborne & Solvent Based Acrylics and Their End User Applications, Waterborne & Solvent-Based Epoxies and Their End-User Applications, Waterborne & Solvent-Based Polyurethanes and Their End-User Applications, and The Chemistry and Application of Phenolic Resins & Amino Crosslinking Agents are companion volumes to this title.

INTRODUCTION

Step polymerisation is a process which, starting from monomers with two or more functional groups, leads to polymers through the formation of oligomers, whose molecular weight increases progressively with reaction time. At each moment during polymerisation most of the molecules have two or more reactive functional groups (a fraction of cyclic molecules is typically present at each stage of polymerisation, and in some particular cases, molecules with just one functional group can be present). Often, but not necessarily, the reactions for step polymerisation are condensation reactions which lead to the formation of low molecular weight by-products in company with an increase in molecular weight. On a stoichiometric basis, these are termed polycondensation reactions and the products obtained are polycondensates.

Even though stringent requirements are necessary both for monomers and for the reaction conditions if high molecular weights are to be achieved, a wide variety of polymers are in practice now prepared by step polymerisation, many of them on the commercial scale. These include polyesters, polyamides, polycarbonates, polyurethanes, etc.; these are discussed in detail in a number of specialised monographs, including the range of textbooks and encyclopaedias published by SITA Technology. Although some general comments can be made which apply to all the polymers prepared by step polymerisation, regardless of the chemical nature of their functional groups, many aspects of the polymerisation pathways are specific to individual classes of polycondensates. In the present chapter we will deal with the general principles of step polymerisation, concentrating particularly on their application to saturated polyesters.

The primary goal of polymerisation is of course to obtain polymers with specified characteristics such as average molecular weight, molecular weight distribution, types of terminal groups, etc. Polymers can often be prepared by alternative routes starting from different monomers. The main reaction pathways for polyesters are briefly discussed here and also in Chapter II, including the role of catalysts, which are usually necessary to obtain high molecular weight products. Side-reactions, which can occur in conjunction with the main polymerisation reaction and which affect both the overall rate of polymerisation and the molecular structure of the final polymer, have to be limited or controlled in order to achieve the desired properties.

The reactions used in step polymerisation are often characterised by low equilibrium constants, and the removal of low molecular weight condensation products is necessary to drive the reaction towards high molecular weight products. The effect of the equilibrium constant on the process conditions will be discussed later.

Kinetics is a very important aspect of polymerisation processes for both scientific and industrial purposes. It will be

discussed later with regard to some straightforward cases. Finally, the primary features of the methods available for the preparation of polymers by step polymerisation will be outlined and considered.

2. Monomers and molecular structure

(i) Monomer functionality

The functionality of a monomer is defined as the number of linkages which a given monomer is able to form with other monomers. For a specific molecule it is an integer which can depend on the type of reaction in which it is involved and on the reaction conditions. For a given set of monomer molecules it can be a fractional number.

Bifunctional monomers typically contain two functional groups per molecule. It is useful to distinguish between those polymerisations where a single type of monomer contains different types of functional groups (A-B monomers), and those involving two or more different monomers, each containing a single type of functional group (e.g. A-A and B-B monomers). In both cases polymerisation leads to linear polymers, but while for A-B type monomers the A to B molar ratio of the functional groups is always unity, for A-A and B-B step polymerisations it may not be. This could be in order to achieve a desired specification or product and might be influenced by process conditions.

Monomers containing a single reactive group such as lactones or cyclic mono-anhydrides behave like bifunctional monomers and can be used for the preparation of linear polymers. Monomers with more than two functional groups per molecule (multifunctional or polyfunctional monomers) can be used alone or together with bifunctional monomers to obtain branched or crosslinked chemical structures.

Monofunctional monomers are sometimes used in conjunction with monomers of higher functionality to control the final average molecular weight or to modify the properties of the final polymer.

When step polymerisation is carried out by reaction between a mixture of monomers with different functionalities, the final chemical structure and its properties can be designed

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------|
| 828 Waterborne & Solvent Based Surface Coating Resins and Their Applications [Vol. 3: Polyurethanes] | | <i>Edition:</i> |
| <i>Author:</i> Thomas, Paul (editor) | <i>Dynix:</i> 99425 | <i>Series:</i> Wiley/SITA Series in Surface Coatings Technology [Volume 3: Polyurethanes] |
| <i>Publish.:</i> John Wiley & Sons - SITA Technology Limited | <i>Call No.:</i> 667.9 Wa v.3 | |
| <i>- place:</i> Chichester, [West Sussex], UK | <i>ISBN:</i> 0471978868 | |
| <i>- date:</i> ©1998 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1998 |
| <i>Subject:</i> Polyurethanes | | <i>Price:</i> \$133.50 |
| <i>Desc:</i> xv, 443 p., illus., 24 cm. | | |

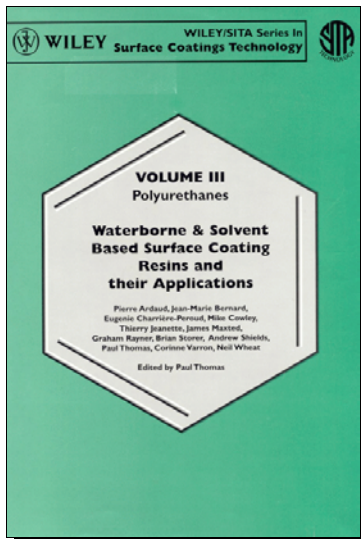


Table of Contents

CHAPTER I: INTRODUCTION TO POLYURETHANES
 HISTORY AND APPLICATIONS
 BASIC POLYURETHANE CHEMISTRY
 CLASSIFICATION OF POLYURETHANES
 1. Two-component polyurethanes
 2. Polyurethanes for oven curing
 3. Moisture cured polyurethanes
 4. Non-reacting polyurethanes
 POLYOLS: MAIN TYPES USED IN PU COATINGS
 1. Polyethers
 2. Polyesters
 3. Acrylics
 POLYISOCYANATES: TYPES AND APPLICATIONS
 1. Aromatic isocyanates
 2. Aliphatic isocyanates
 FUTURE DEVELOPMENTS
 1. High solids
 2. Waterborne coatings
 3. Powder coatings
 REFERENCES

Subjects

318 . Polyurethanes

Volumes

Vol 1: Waterborne & Solvent Based Acrylics and..

Vol 2: Waterborne & Solvent Based Epoxies and..

Vol 3: Waterborne & Solvent Based Surface Coating Resins and..

Vol 4: Waterborne & Solvent Based Saturated Polyesters and..

CHAPTER II: HYDROXYLATED POLYOLS

INTRODUCTION
 POLYESTERS
 1. Monomer selection
 (i) Polyacid selection
 (ii) Polyalcohol selection
 2. Production of polyesters
 (i) Process overview
 (ii) Example of polyester synthesis
 3. Side reactions
 (i) Etherification
 (ii) Acidolysis
 4. Applications
 (i) Aerospace coatings
 (ii) Domestic appliances
 (iii) Can coatings

ACRYLICS
 1. Monomer selection
 (i) Backbone monomers
 (ii) Hydroxy monomers
 2. Production of acrylics
 (i) Process overview
 (ii) Example of acrylic synthesis
 3. High solids acrylics
 (i) Molecular weight
 (ii) Functionality
 (iii) Solubility
 (iv) Glass transition temperature
 4. Applications
 (i) Automotive OEM

- (ii) Car refinish
- (iii) ACE market
- (iv) Wood coatings
- (v) Coatings for plastics
- (vi) Industrial protective coatings

POLYETHERS

- 1. Initiation
- 2. Propagation
- 3. Termination

ALKYDS AND OTHER POLYOLS

POLYOL SPECIFICATIONS

- 1. Hydroxyl number
- 2. Acid value
- 3. Solids content
- 4. Viscosity
- 5. Colour
- 6. Water content

POLYOL SUPPLIERS

REFERENCES

CHAPTER III: ISOCYANATE CHEMISTRY

TYPES OF ISOCYANATE USED IN POLYURETHANE COATINGS

1. Aromatic isocyanates

- (i) TDI
- (ii) MDI
- (iii) Other aromatic isocyanates

2. Aliphatic isocyanates

- (i) HDI
- (ii) IPDI
- (iii) HI2 MDI

(iv) Other aliphatic isocyanates

MANUFACTURE OF ISOCYANATE MONOMERS USED IN POLYURETHANE COATINGS

1. Wurtz synthesis

2. The phosgene route

- (i) The chloroformamide step
- (ii) Thermal cracking of the chloroformamide intermediate
- (iii) Phosgene route conditions
- (iv) Side reactions

(v) The phosgene process

(vi) Conclusions on the phosgene route

3. The carbamate route

(i) Conclusions on the carbamate cracking process

4. Other routes for isocyanate production

5. Industrially produced isocyanate monomers

GENERAL REACTIONS OF ISOCYANATES

1. Reactivity of the isocyanate group

2. Nucleophilic addition

3. Reactions with nitrogen compounds

- (i) Reactions with amines
- (ii) Reactions with hydrazine derivatives
- (iii) Reactions with masked amines

4. Reactions with hydroxy compounds

- (i) Reactions with alcohols
- (ii) Reactions with carboxylic compounds
- (iii) Reactions with water

MANUFACTURE OF POLYISOCYANATES

1. Manufacture of biuret containing polyisocyanates

2. Manufacture of isocyanurate containing polyisocyanates

- (i) Cyclotrimerisation catalysed by quaternary ammonium salts
- (ii) Cyclotrimerisation catalysed by silylated derivatives
- (iii) Other cyclotrimerisation catalysts

3. Manufacture of uretdione containing polyisocyanates

4. Manufacture of allophanate containing polyisocyanates

PROPERTIES OF ISOCYANATES

1. Specifications and characteristics
 2. Analytical determination
 - (i) Residual HDI monomer
 - (ii) Isocyanate functions
 3. Physical properties of polyisocyanates
 - (i) Viscosity
 - (ii) Functionality
 4. Storage of polyisocyanates
 - (i) Effect of storage temperature
 - (ii) Reaction with water
 5. Safety precautions when using polyisocyanates
- REFERENCES

CHAPTER IV: POLYURETHANE CHEMISTRY

THE OH-NCO REACTION

1. Formulation of polyurethane coatings
 - (i) Hydroxylated polyols
 - (ii) Polyisocyanate hardener
 - (iii) Stoichiometric calculations for polyurethane coatings
2. Effect of polyol composition on polyurethane properties
3. Influence of hydroxyl nature
4. Monitoring of PU crosslinking
5. Monitoring of PU crosslinking with Infra Red spectroscopy
6. Influence of solvent selection
7. Catalysts used in polyurethane coatings

BLOCKED POLYISOCYANATES

1. Influence of blocking agent structure on blocked isocyanate dissociation temperature
 - (i) Oximes as blocking agents
 - (ii) Lactams as blocking agents
 - (iii) Dialkyl malonates as blocking agents
 - (iv) Hydroxamic acid esters as blocking agents
 - (v) Pyrazole derivatives as blocking agents
 - (vi) Triazole derivatives as blocking agents
 - (vii) Imidazole derivatives as masking agents
 - (viii) Uretdione derivatives as blocking agents
2. Influence of isocyanate structure on blocked isocyanate dissociation temperature
3. Influence of nucleophilic compounds on blocked isocyanate dissociation temperature
4. Influence of catalysts on blocked isocyanate dissociation temperature
5. Waterborne blocked polyisocyanates
6. Compromise between unblocking temperature and storage

NON-REACTING POLYURETHANE COATINGS

1. Polyurethane dispersions
 - (i) Auto-oxidation
 - (ii) Azomethine crosslinking
 2. Urethane oils and alkyds
 - (i) Structure of oils
 - (ii) Properties of urethane alkyds
- REFERENCES

CHAPTER V: LOW VOC POLYURETHANE COATINGS

HIGH SOLIDS POLYURETHANES

1. Low viscosity polyols
 - (i) Low molecular weight polyols with low polydispersity
 - (ii) Influence of monomer composition
2. Low viscosity polyisocyanates
3. Reactive diluents
 - (i) Low molecular weight diols or polyols
 - (ii) Oxazolidines
 - (iii) Hindered amines (e.g. aspartic acid esters)
 - (iv) Blocked amines (aldimines and ketimines)
4. Problems associated with high solids formulations
 - (i) Formulation concerns
 - (ii) Application concerns
 - (iii) Properties

- 5. Conclusion
- WATERBORNE POLYURETHANES
 - 1. Waterborne polyols
 - (i) Acrylic polyols
 - (ii) Polyester polyols
 - (iii) Polyurethane dispersions
 - (iv) Hybrid polymers
 - 2. Waterborne polyisocyanates
 - (i) Polyisocyanates for two-pack waterborne polyurethane coatings
 - (ii) Polyisocyanates for one-pack waterborne polyurethane coatings
 - 3. The chemistry of two-pack waterborne polyurethane coatings
 - 4. Properties of two-component waterborne polyurethane coatings
 - 5. Formulation of two-component polyurethane coatings
 - (i) NCO/OH ratio
 - (ii) Rheology
 - (iii) Co-solvents
 - (iv) Catalysts
 - 6. Safety issues
 - 7. Conclusions
- POWDER COATINGS
 - 1. Polyols used for powder coatings
 - 2. Hardeners used in powder coatings
 - (i) Blocked polyisocyanates
 - (ii) Internally masked polyisocyanate crosslinkers
 - (iii) Other crosslinking agents
 - 3. Matt powder coatings
 - 4. Conclusions
- REFERENCES

CHAPTER VI: FORMULATION OF POLYURETHANES

POLYOL SELECTION

- 1. Type of polyol
- 2. Structure of the polyol
- 3. Hydroxy content
- 4. Solids content
- 5. Viscosity
- 6. Solvent
- 7. Cost

ISOCYANATE SELECTION

- 1. 1K, 2K or moisture cure systems
 - (i) Two-pack systems
 - (ii) One-pack systems
 - (iii) Moisture cure systems
- 2. Aromatic or aliphatic polyurethanes HDI or IPDI derivatives
 - (i) Aromatic polyisocyanates
 - (ii) Aliphatic polyisocyanates

SOLVENT SELECTION

- 1. Safety characteristics
- 2. Solvent power/cost
- 3. Evaporation rate
- 4. Solvent retention

CATALYSTS

- 1. Influence of catalyst on 2K polyurethane reaction
- 2. Influence of catalyst on 1K polyurethane reaction

ADDITIVES FOR POLYURETHANE PAINTS

- 1. Foam control agents
- 2. Anti-floating/flooding agents
- 3. Mar resistance additives
- 4. Light stabilisers
- 5. Moisture scavengers

GENERAL CONCLUSIONS

REFERENCES

CHAPTER VII: POLYURETHANE BASED SYSTEMS FOR OEM AND VR

1. Introduction
2. Clear Over Base Coat OEM Systems
 - (i) Pigmented Base Coat
 - (ii) Clearcoat
 - (a) Improved Appearance
 - (b) Improved Durability
3. Polyurethane Systems in OEM Applications
 - Formulation 7.1 OEM 2K Clear Coat
 - Formulation 7.2 Polyisocyanate Hardener
 - Formulation 7.3 Thinner Formulation
4. Formulating Principles and the Choice of Raw Materials
 - (i) Hydroxy Functional Acrylic Resin
 - (ii) Choice of Polyisocyanate Curing Agent
 - (iii) Some Polyisocyanates used in Coatings Formulation
 - (iv) Other Components used in 2K Urethane Formulations
 - (a) Solvents
 - (b) Reactive Dilutents
 - (c) Modifying Resins
 - (d) Accelerators
 - (e) UV Absorbers
 - (f) Other Additives
5. Solvent Based 2K Urethane Clear Coats in OEM
 - (i) Pigmented 2K Urethanes in OEM
 - Formulation 7.4 White 2K Acrylic Urethane Automotive Top Coat
6. Polyurethane Primers in OEM Applications
7. Polyurethane Coatings in Vehicle Refinishing
 - (i) The Growth of Polyurethane Refinish Systems
 - (ii) Major Problems in the Development of Polyurethane Refinishing Products
 - (iii) 2K Acrylic Urethanes
 - (a) Solids Content
 - (b) Application Properties
 - (c) Drying
 - (d) Dry Film Thickness
 - (e) Exterior Durability
 - (f) Petroleum Resistance
 - (g) Stoving
 - (h) Health and Safety
 - (iv) 2K Urethanes in VR Applications - Principles of Formulation
 - (a) Primer Surfacer
 - Formulation 7.5 2K Urethane Primer
 - Formulation 7.6 Hardener
 - (v) 2K Urethane top coats and clearcoats for COB systems
 - Formulation 7.7 2K Urethane VR Top Coat
 - Formulation 7.8 Hardener
 - Formulation 7.9 VR Clearcoat
 - (a) Colour Matching for 2K Urethane Vehicle Refinish Top Coats
 - (b) Metamerism
 - (c) Mixing and Use of 2K Urethane Refinish Products
8. Other Solvent-Borne Polyurethane Coatings Used in OEM & VR Applications
 - (i) Primer Surfaces
 - (ii) One Component OEM Urethane Top Coats
9. Waterborne Urethane Coatings in OEM and VR Applications
 - (i) Waterborne OEM Primer Surfaces
10. Other Waterborne Polyurethane Developments in OEM
11. Polyurethane Coatings for Plastics in OEM and YR
 - (i) Thermosetting
 - (ii) Thermoplastic
 - Formulation 7.10 Rapid Dry Pigmented Top Coat for Plastic
12. 2K Acrylic Urethane Clearcoats - Abrasion & Chemical Resistance
13. Underbody Protection Coatings for OEM

REFERENCES

CHAPTER VIII: POLYURETHANE BASED & MODIFIED PROTECTIVE COATING SYSTEMS & THEIR APPLICATIONS

INTRODUCTION
ONE PACK SOLVENT BASED SYSTEMS
1. Introduction
2. Formulation
3. Properties
4. Applications
(i) Offshore & Marine Topside Facilities - Maintenance
(ii) Motorway Bridges - Maintenance
(iii) Railway Bridges - Maintenance
(iv) Dock Walls/Splash Zones - New Construction & Maintenance
5. Formulations
Formulation 8.1 One pack zinc rich Primer for steelwork
Formulation 8.2 One pack Red Oxide Primer
Formulation 8.3 One pack MIO Undercoat
Formulation 8.4 One pack White Gloss finish for steel or concrete
Formulation 8.5 One pack Clear Sealer
Formulation 8.6 One pack moisture cured pitch-polyurethane
6. Latent Hardeners and Reactive Diluents
POLYURETHANE MODIFIED ALKYDS
1. Introduction
2. Formulation
3. Applications
4. Formulations
Formulation 8.7 Urethane Alkyd Zinc Phosphate Primer
Red Oxide
Formulation 8.8 Urethane Alkyd MIO Undercoat Dark Grey
Formulation 8.9 White Urethane Alkyd Semi-Gloss Finish
TWO PACK POLYURETHANES
1. Primers
2. Undercoats
3. Coal Tar Pitch Coatings
4. Topcoats
5. Formulation
6. Properties
7. Applications
(i) Offshore topside facilities oil & gas platforms - new construction
(ii) Marine Environments, splash zone areas, jetty legs - new construction and maintenance
(iii) Civil Construction - Steelwork new construction
(iv) Railway Bridges - Steelwork Maintenance
8. Two Pack Polyurethanes for Concrete and Other Mineral Substrates
9. Formulations
Formulation 8.10 Isocyanate cured two pack epoxy primer
Formulation 8.11 Two pack isocyanate cured coal tar - epoxy
Formulation 8.12 White urethane-acrylic gloss finish
Formulation 8.13 High Solids white polyurethane finish
SOLVENT-FREE POLYURETHANES
Formulation 8.14 Two pack solvent-free polyurethane floor coating
Formulation 8.15 Solvent free one pack polyurethane roller coating, matt
WATER BASED POLYURETHANE COATINGS
ONE PACK ACRYLIC-URETHANE DISPERSIONS
Formulation 8.16 One pack water based white topcoat for spray application
TWO PACK WATER BASED POLYURETHANES
1. Introduction
2. Formulation
3. Properties and applications
Formulation 8.17 Water based two pack polyurethane topcoat
ISOCYANATE FREE TWO PACK POLYURETHANE COATINGS
1. Properties and Applications
SUMMARY
REFERENCES

CHAPTER IX: POLYURETHANES IN LIQUID INKS
1. Background
2. Liquid Ink PU Grades

- 3. End User Specifications and Applications for Liquid Inks incorporating Polyurethanes
- 4. Starting-Point Formulations for Liquid Inks containing Polyurethanes
- Formulation 9.1 Flexo surface-printed single-ply VFFS potato crisp bags
- Formulation 9.2 Lamination inks for flexo or gravure printing Coex/Coex or Coex/PE structures
- Formulation 9.3 Universal lamination inks for flexo and gravure printing a wide range of film substrates including Coex. PP, nylon (treated OPA), treated PET, PVdC-coated films and acrylic-coated films
- Formulation 9.4 Water resistant PVB-based flexo and gravure inks for laminating Coex. Films to themselves and to PE

CHAPTER X: SOLVENT BASED WOOD FINISHING

1. Two Pack Polyurethane Coatings

- (i) Isocyanates
- (ii) Resin Systems
- (iii) Solvents
- (iv) Additives
- (a) CAB
- (b) Nitro Cellulose
- (c) Silicones
- (d) Matting Agents
- (e) Waxes
- (f) Accelerators

Formulation 10.1 White PU Primer

Formulation 10.2 Satin White Two Pack PU

Formulation 10.3 Satin Clear PU

Formulation 10.4 Gloss Clear Spraying Polyurethane

Formulation 10.5 Matt Clear Spraying Polyurethane

Formulation 10.6 Gloss Brushing Polyurethane Lacquer

2. Waterbased Polyurethane Systems

CHAPTER XI: STOVING POLYURETHANES FOR COIL COATING APPLICATIONS

1. Introduction

2. The Coil Coating Process and Formulation Demands

- (a) Shear Stable Rheology
 - (b) Fast Cure Response
 - (c) Flexibility/Hardness Balance
 - (d) End Use Performance
- 3. Polyurethanes in Coil Coatings**
- 4. Polyurethanes - Their Future in Coil Coatings**
- 5. Health & Safety Issues relating to Coil Coating Polyurethanes**

- (a) Safety of the wet paint
 - (b) Safety in the stoving process
 - (c) Safety issues relating to the dried film
- 6. Formulating Polyurethanes for Coil Coatings**
- (i) Type of Polyisocyanate
 - (ii) Blocking Agents for Polyisocyanates/Stoving Polyurethanes
 - (iii) Reaction partners for Polyisocyanates
 - (iv) Polyol: Polyisocyanate balances
 - (v) Use of catalysts in Polyurethane Stoving Finishes
 - (vi) Use of Polyamides in Polyurethanes
 - (vii) The use of stabilisers and other additives for Stoving Polyurethanes

7. Specific Formulations for Coil Coating Stoving Polyurethanes

- (i) Polyurethanes for Appliance finishes
- (ii) Polyurethanes for Automotive and Transportation sectors
- (iii) Polyurethanes for Universal Primers

REFERENCES

CHAPTER XII: POLYURETHANE POWDER COATINGS

1. Introduction

2. Electrostatic application

3. Coating powders

4. The coating powder market

5. Manufacture of coating powders

6. Polyurethane coating powder

- (i) Externally blocked curing agents
- (ii) Internally blocked curing agents

- 7. Polyester urethane coating powder
- 8. Acrylic urethane coating powders
- 9. Typical polyurethane coating powder formulations
Formulation 12.1 Hydroxyl polyester urethane cure
- 10. Polyurethane Coating Powder Properties
- 11. The Future

Reviews - Synopsis - Dust Jacket

This volume provides an in-depth commentary on polyurethane-based surface coatings and their applications — various end-uses, such as coil coatings, liquid inks, OEM and vehicle refinishing, and wood finishing, are addressed.

From the Introduction: "Polyurethanes are macromolecules or polymers formed by the reaction between a polyisocyanate and another polymer (commonly known as a polyol) that contains active hydrogens (OH, COOH...). The choice of raw materials, both polyols and polyisocyanates is very large enabling many combinations with a wide variety of properties..."

Target Audience: Paint chemists, formulators of paints, resins, and additives, technologists, industrial researchers, and academics interested in polyurethane resins and their applications.

Note: Waterborne & Solvent Based Acrylics and Their End User Applications, Waterborne & Solvent-Based Epoxies and Their End-User Applications, Waterborne & Solvent-Based Saturated Polyesters and Their End-User Applications, and The Chemistry and Application of Phenolic Resins & Amino Crosslinking Agents are companion volumes to this title.

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------------------------|---------------------------------|--------------------------|
| 157 Waterborne Coatings [Vol. 3 -- Surface Coatings] | | <i>Edition:</i> |
| <i>Author:</i> Wilson, Alan D., John W. Nicholson and Havard J. Prosser (editors) | <i>Dynix:</i> 23559 | <i>Series:</i> |
| <i>Publish.:</i> Elsevier Applied Science | <i>Call No.:</i> 667.9 Su v.3 | |
| <i>- place:</i> London, UK / New York, NY | <i>ISBN:</i> 1851665188 | |
| <i>- date:</i> ©1990 | <i>Shelf:</i> Adult Non-Fiction | <i>Year:</i> 1990 |
| <i>Subject:</i> Coatings | | <i>Price:</i> \$25.00 |
| <i>Desc:</i> x, 304 p., illus., 25 cm. | | |

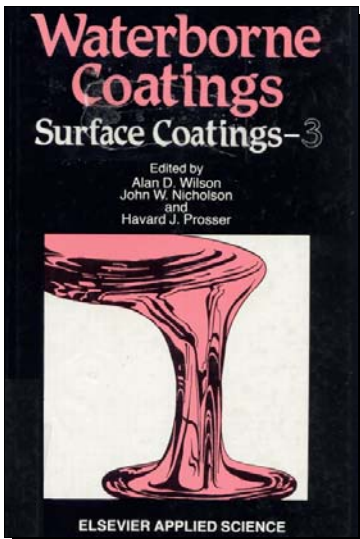


Table of Contents

- Preface
- List of Contributors
- 1. Aqueous Solutions; Small Molecules - Michael J. Blandamer
- 2. Film Spreading and Film Formation by Waterborne Coatings - John W. Nicholson and Eleanor A. Wasson
- 3. Bunte Salt Polymers for Aqueous Coatings - Shelby F. Thames
- 4. Silicone Emulsion Paints: A New Development in Paint Technology - W. Sittenthaler
- 5. Water-based Urethane Dispersions - R. Arnoldus
- 6. The Loop Reactor Process - K. R. Geddes
- 7. Novel Curing Agents for Waterborne Epoxy Resin Systems - F. B. Richardson
- 8. Waterborne Ionomer Lacquers Based on Acrylic Polymers - John W. Nicholson and A. D. Wilson
- 9. Problems with Waterborne Coatings - George R. Hayward
- Index

Reviews - Synopsis - Dust Jacket

PREFACE

Following the favourable reception of Surface Coatings—1 and —2, the present volume has been prepared as the third in the series. The subject of surface coatings continues to undergo development, thanks to the ingenuity of researchers and technologists alike, and we offer this volume as an anthology of timely reviews of the subject.

In preparing this volume we have made a change in editorial policy. Instead of following the pattern of Volumes 1 and 2, and providing a wide coverage of a range of new technologies within the field, we have chosen to spread our net less widely. Accordingly, Surface Coatings—3 is concerned exclusively with waterborne coatings. These materials are of growing importance in a world that is becoming ever more concerned about pollution. The adverse effects that arise from the indiscriminate use of technology are a subject of great importance in the technologically advanced nations of the world, and waterborne coatings have a role to play in reducing one important source of atmospheric pollution.

The present volume begins with a comprehensive outline of the chemical nature of water in a chapter by M. J. Blandamer; next, other fundamental physico-chemical aspects of the use of waterborne coatings are covered in the chapter by J. W. Nicholson and E. A. Wasson. These opening two chapters set the scene for a series of reviews of individual waterborne coatings technologies. Thus, Bunte salt polymers are covered by S. F. Thames, urethane dispersions by R. Arnoldus, loop emulsion polymerisation by K. R. Geddes, silicone emulsion paints by W. Sittenthaler, acrylic ionomers by J. W. Nicholson and A. D. Wilson, and novel dispersing/curing agents for waterborne epoxies by F. B. Richardson. Lastly, striking a contrasting note, G. R. Hayward has prepared a chapter which outlines some of the problems associated with the use of waterborne coatings. This last chapter reminds us that there is still much to do and that scope remains for innovation in the field of environmentally friendly surface coatings. If this book stimulates effort in that direction, as we believe it will, then we have achieved our aim.

Finally, we wish to place on record our thanks to all our contributors for their co-operation and support in the preparation of this volume.

Subjects

| | |
|--------------|---------------------|
| 239 . | Coatings |
| 324 . | Protective coatings |

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------------------------------------------------------------|--------------------------------|--------------------------|
| 941 Waterborne Coatings: A Compilation of Papers from the Journal of Coatings Technology | | <i>Edition:</i> |
| <i>Author:</i> FSCT Publications Committee (editors) | <i>Dynix:</i> 107321 | <i>Series:</i> |
| <i>Publish.:</i> Federation of Societies for Coatings Technology | <i>Call No.:</i> 667.9 Wa | |
| <i>- place:</i> Philadelphia, PA | <i>ISBN:</i> 0934010528 | |
| <i>- date:</i> ©2001 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 2001 |
| <i>Subject:</i> Protective coatings | | <i>Price:</i> \$255.00 |
| <i>Desc:</i> xv, 796 p., illus., 28 cm. | | |

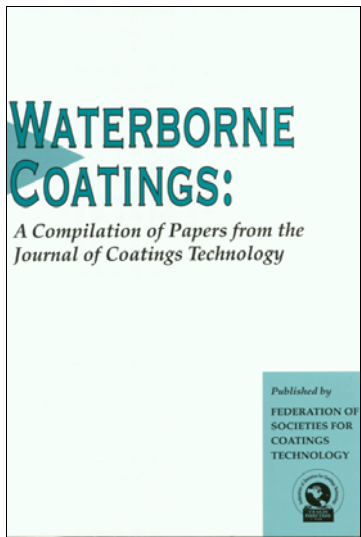


Table of Contents

Mechanism of Film Formation from Polymer Latexes
 Interactions of Associative Thickeners with Paint Components as Studied by the Use of a Fluorescently Labeled Model Thickener
 Influence of Coalescing Aids in Associative Thickener Dispersions
 Coupling Solvent Effects on Water-Reducible Alkyd Resins
 Pigment Stabilization Through Mixed Associative Thickener Interactions
 Water-Reducible, Unsaturated Polyesters as Binders and Clear Coatings for UV Curable Furniture Coatings
 Latex Film Formation at the Molecular Level: The Effect of Coalescing Aids on Polymer Diffusion
 Low-VOC Waterborne Coatings for Wood Based on Nitrocellulose-Acrylic Latex
 Distribution of Driers between the Alkyd and Aqueous Phase in Alkyd Emulsions and Its Relation to Drying Properties
 Development of High Performance, Water-Based Emulsion Coatings for Can Coatings Application
 Interactions of HEUR Associative Thickeners with Waterborne Polyurethanes
 Two-Component Waterborne Polyurethane Coatings
 Measurement of Foaminess of Water-Reducible Coating Polymer Solutions
 Novel Waterborne Epoxy Resin Emulsion
 Novel Composite Latex Particles for Use in Coatings
 Influence of Defoamers on the Efficiency of Waterborne Coating Systems
 Novel Epoxy Resins for Container Waterborne Coatings with Improved Flexibility
 Aqueous Polyurethanes — Polymer Colloids with Unusual Colloidal, Morphological, and Application Characteristics
 Foam Stability and Foam Fractionation of Water-Reducible Acrylic Polymer Systems
 Mechanical Stability of Alkyd Emulsions — Part I: Influence of Emulsion Droplet Size and the Emulsifier
 Mixed Adsorption of Anionic and Nonionic Surfactants on Latex Particles
 Adsorption in Latex Paints in Relation to Some of the Properties of the Mill Base and the Final Coating
 A Waterborne and Environmentally Benign, Marine Timber Coating
 Mechanical Stability of Alkyd Emulsions — Part II: Influence of Alkyd Properties
 Polymers for Water-Based Coatings — A Systematic Overview
 An Additives Approach to Defect Elimination in Thermoplastic Waterborne Industrial Maintenance Coatings
 Statistical Study of Hydrolytic Stability in Amine-Neutralized Waterborne Polyester Resins as a Function of Monomer Composition
 Characterization of Particle Coalescence in Waterborne Coatings Using Atomic Force Microscopy
 Stabilization of Aluminum Pigments in Aqueous Alkaline Media by Styrene Copolymers
 Fourier Transform Raman Spectroscopy for the Analysis of Pigmented Acrylic Latex Films
 Crosslinking of Waterborne Polyurethane Dispersions
 Surface Structure of Latex Films, Varnishes, and Paint Films Studied with an Atomic Force Microscope
 Anionic Blocked Isocyanate-Containing Urethane Prepolymer Dispersions for Coating Applications
 Computer Simulation of Particle Packing in Acrylic Latex Paints
 Latex Blends: An Approach to Zero VOC Coatings
 Film Formation Mechanism of Two-Component Waterborne Polyurethane Coatings
 Coalescence and Film Formation from Latexes
 Colloidal Aspects of Waterborne Epoxy Paints
 Emulsification of Alkyds for Industrial Coatings
 Synthesis, Characterization, and Application of Lesquerella Oil and Its Derivative in Water-Reducible Coatings
 Aqueous Acrylic-Polyurethane Hybrid Dispersions and Their Use in Industrial Coatings
 Film Formation of Vinyl Acrylic Latexes: Effects of Surfactant Type, Water and Latex Particle Size
 Dielectric and Thermal Analysis of the Film Formation of a Polymer Latex
 A Challenge: Aluminum Pigments in Aqueous Coatings
 Characterization of Two-Stage Latexes Using Dynamic Mechanical Thermal Analysis
 Aqueous Dispersions for Ultraviolet Light Curable Coatings
 Factors Affecting Dirt Pickup in Latex Coatings

Subjects

| | |
|-------|---------------------|
| 239 . | Coatings |
| 276 . | Paint |
| 324 . | Protective coatings |

Preparation of UV Curable Emulsions Using PEG-Modified Urethane Acrylates and Their Coating Properties
Mechanistic Considerations of Particle Size Effects on Film Properties of Hard/Soft Latex Blends
Rheology of Waterborne Coatings
Using "High Performance Two-Component Waterborne Polyurethane" Wood Coatings
Rheological Changes During the Drying of a Waterborne Latex Coating
Unifying Model for Understanding HEUR Associative Thickener Influences on Waterborne Coatings: I. HEUR Interactions with a Small Particle Latex
Direct VOC Analysis of Water-Based Coatings by Gas Chromatography and Solid-Phase Microextraction
Silanes in High-Solids and Waterborne Coatings
Exposure Studies of Exterior House Paints Containing Kaolin Clay Pigments
Epoxy Silanes in Reactive Polymer Emulsions
Adhesion of Waterborne Paints to Wood
Microautoradiographic Studies of the Penetration of Alkyd, Alkyd Emulsion and Linseed Oil Coatings into Wood
VOC Testing Comparison: EPA Method 24 versus the Cal Poly Pomona Method
Photodegradation of Water-Based Acrylic Coatings Containing Silica
Novel Ambient Temperature Curable Two-Component Waterborne Silicone-Acrylic Coatings
Formation and Crosslinking of Latex Films through the Reaction of Acetoacetoxy Groups with Diamines under Ambient Conditions
Design of Polymeric Dispersants for Waterborne Coatings
Defoamer Selection in Waterborne Coatings
Driers for Waterborne Coatings
Interfacial Studies of Crosslinked Urethanes: Part III. Structure-Property Relationships in Polyester Waterborne Polyurethanes
Parameters Influencing the Spray Behavior of Waterborne Coatings
Quantitative Method for Determination of Thickener Equilibration in Coatings
High Performance Waterborne Coatings Based on Dispersions of a Solid Epoxy Resin and an Amine-Functional Curing Agent
Crosslinking vs. Interdiffusion Rates in Melamine-Formaldehyde Cured Latex Coatings: A Model for Waterborne Automotive Basecoat
In-Situ Phosphatizing Coatings III: A Water-Reducible Alkyd Baking Enamel
Thermodynamics of Deformation of Latex Blend Coatings and Its Implications for Tailoring Their Properties
Interfacial Studies of Crosslinked Urethanes: Part IV. Substrate Effect on Film Formation in Polyester Waterborne Polyurethanes
Role of Particle Size on Latex Deformation During Film Formation
Effects of Additives on the Performance of Two-Component Waterborne Polyurethane Coatings
New High Performance Two-Component Wood Coatings Comprised of a Hydroxy Functional Acrylic Emulsion and a Water-Dispersible Polyisocyanate
Effect of Particle Size Distribution on the Performance of Two-Component Water-Reducible Acrylic Polyurethane Coatings Using Tertiary Polyisocyanate Crosslinkers
Bake Oven Induced Variation of Surface Chemistry on Electrocoat Paint: Effect on Primer-Electrocoat Intercoat Adhesion
Novel Synthesis of Carboxy-Functional Soybean Acrylic-Alkyd Resins for Water-Reducible Coatings
Formulating Water-Based Systems with Propylene-Oxide-Based Glycol Ethers
Drying of Alkyd Emulsion Paints
Hydrophobic Coatings from Emulsion Polymers
A Perspective on the History of and current Research in Surfactant-Modified, Water-Soluble Polymers
Formulation and Testing of a Waterborne Primer Containing Chestnut Tannin
Free Volume Distribution During Consolidation and Coalescence of Latex Films

Reviews - Synopsis - Dust Jacket

FOREWORD:

This Compilation demonstrates the sophistication of the current state of waterborne paint technology and contains 86 relevant papers published in the "Journal of Coatings Technology" since 1990. The objective of the present Foreword is to provide a background to these papers. Salient features of the polymers in waterborne coatings are described without an attempt to be encyclopedic or to go into excessive detail. For specific information the reader may wish to consult the four texts shown in the references.

The binder polymers useful for waterborne coatings are supplied as colloidal dispersions of particles, commonly having diameters in the range of about 100 to 500 nm, with some water reducible epoxies having diameters up to 1500 nm. The solids content of such dispersions usually ranges from 35 to 60%.

Most aqueous paints can be divided into three classes: those based on latexes, on polyurethane dispersions (PUDs), and on water reducible polymers. Latexes and PUDs have molecular weights above 50,000 and can form films without crosslinkers. Water reducible polymers generally have number average molecular weights in the range of 2,000 to

10,000 and can form coherent films only if there is a chemical reaction, i.e., crosslinking, during film formation.

Most waterborne paints contain organic solvents. The synthesis of latexes is carried out in solvent-free aqueous media but coalescing solvents are added to latex paints to aid film formation and wetting of substrates. Most paints based on water reducible polymers inherently contain solvents because such polymers are commonly synthesized in solvents and these solvents aid emulsification into water. However, some water reducible epoxies are solvent-free.

For similar performance requirements the solvent content of waterborne paints tends to be lower than that of solvent-borne high solids paints. Low solvent content is beneficial for compliance with VOC regulations, and this is one of the reasons why the use of waterborne coatings is increasing. The other reason is that in many applications waterborne paints can provide performance superior to solvent-borne high solids paints.

The waterborne coatings are discussed below in context of the three principal classes of binder polymers. For sake of brevity this Foreword does not comment on polymers used for thickeners though eight papers of the Compilation deal with this subject.

Latexes

Acrylic and vinyl-acrylic latex based architectural paints command the single largest volume in the utilization of waterborne coatings. These products became popular in the 1950s (before the advent of VOC regulations) because they were more durable, had less objectionable odor, and allowed easier clean up of brushes and rollers than the alkyd paints they replaced.

Regulations on VOCs were promulgated in the 1970s and provided motivation for the introduction of latex paints into industrial market. The use of latex paints is now widespread, and includes automotive base coats, metal primers, coatings for plastics and wood, business machine coatings, industrial maintenance coatings, traffic paints, and roof coatings.

Latexes are prepared by aqueous free radical polymerization. Research in the 1950s and 60s established the mechanism. The kinetics of emulsion polymerization was elegantly tied to particle formation and particle growth, and the effects of surfactants were established. This research led to robust synthesis methods providing reproducible particle size control.

Modern semibatch synthesis starts with batch polymerization of a small fraction of the total monomers to provide a fully converted seed latex at 3 to 10% solids content. Anionic surfactants are very powerful in reducing particle size of the seed latex. Increased initiator level also causes reduction in particle size. The remainder of the monomers is gradually added to the seed and polymerized in such manner that formation of new particles is suppressed. At this stage of the synthesis nonionic surfactants are preferably used for ensuring colloidal stability. A final solids content is most often adjusted to 40 to 45%. The role of surfactants in latexes is the subject of nine papers in the present Compilation.

Semibatch processing allows changing the monomer composition during its gradual addition, and thus the ability to create heterogeneity within the particles. This concept is exploited in the creation of core-shell morphology. First one monomer composition is layered onto the seed latex to become the core of the final particle. The second monomer composition is subsequently layered onto the core to become the shell. Such morphology is investigated in two papers of this Compilation.

Solvent-borne polymers suffer from the limitation that differing polymeric compositions are often thermodynamically incompatible and cannot be conveniently blended. The core-shell morphology is an illustration how various polymers can be blended within the particles of aqueous polymers. Polymer blends can also easily be created by physically mixing various latexes, PUDs, and water reducible polymers. Films of such blends contain heterogeneous domains of a few hundred nanometers in size. Such heterogeneity allows the design of polymer blends with properties unique to aqueous coatings. Blends of aqueous polymers are the subject of three papers of this Compilation.

The science of latexes led to a profound understanding of structure-property relationships of polymers. The glass transition temperature (T_g) of many homopolymers was carefully determined. An accurate mathematical theory allows the calculation of the T_g values of copolymers from the values for homopolymers. It is now common knowledge that harder paints are made from polymers having higher T_g values. This relationship was first established for latex paints. A typical soft monomer is n-butyl acrylate with a T_g of -55°C , and methyl methacrylate is a typical hard monomer with a T_g of $+105^\circ\text{C}$.

The main principles of film formation from latexes are well understood. In the last stages of drying the latex particles come into close contact and must deform to provide gap free films. Deformation can take place only if the latex polymer is soft enough to have a T_g value lower than the temperature for film formation.

Three methods to resolve the dilemma of obtaining strong films from hard latexes should be mentioned. First, solvents

can be added to latexes to act as temporary plasticizers during film formation. The ultimate hardness of the films is established after these solvents evaporate. Second, latexes can be designed to have core-shell morphology with hard cores and soft shells. In such latexes film formation is governed by the soft shell, while the hardness of the film depends mostly on the hard core. Third, hard and soft latexes can be physically blended to get a good balance between film formation and hardness. While this latter approach also serves the purpose, it seems to be less efficient than core-shell morphology.

Modern instrumental techniques provide new insights on the molecular details of film formation from latexes. Indeed, 13 papers of this Compilation deal with this subject.

Architectural latex paints are applied without crosslinkers. In many other applications the solvent resistance and durability of latexes is often improved by crosslinking. For air-dry paints crosslinking through carboxyl groups is quite common. Suitable crosslinking agents are polyaziridine, polycarbodiimide, glycidyl compounds and epoxysilanes. Evolving ambient cure technologies include beta-dicarbonyl functional latexes combined with dicarbohydrazide crosslinkers. Acryloyl functional latexes can be cured with UV light. Hydroxyl functional latexes are crosslinked with isocyanates in ambient cure applications or with amino resins in high temperature cure.

Polyurethane Dispersions

Similarly to latexes, PUDs form strong films by physical drying and without crosslinking. However, in industrial practice the properties of PUD films are often improved by crosslinking through carboxyl groups attached to the PUD polymers. Suitable crosslinking agents are the same as the ones useful for carboxyl-functional latexes.

In the past 20 years large volume end-uses for PUDs were developed, including coatings for plastics, floor coatings, leather and textile finishes, and adhesives. Compared to latexes, PUDs are more costly, provide tougher films, have better resistance to solvents (except to alcohols), and generally better adhesion to a variety of substrates. Latexes are often blended with PUDs to improve film toughness, solvent resistance and adhesion.

A synthesis procedure is described here for sake of illustration. This procedure is typical for many commercial PUDs, and is not intended to cover all PUDs. First a prepolymer is synthesized from a linear oligomeric diol (a hydroxyl terminated polyester, polyether or polycarbonate of 2,000 to 3,000 molecular weight), dimethylolpropionic acid and a diisocyanate. The ratio of these reactants is so adjusted that each prepolymer molecule typically contains about one pendant carboxyl group, four urethane groups in the main chain, and two terminal isocyanate groups. The prepolymer is neutralized with a tertiary amine and emulsified into water. The synthesis is completed by chain extension through the isocyanate groups with a diprimary amine, resulting in the formation of a multiplicity of urea links. The final product is a carboxyl-stabilized colloidal dispersion of a high molecular weight poly(urethane/urea) polymer. The numerous possible variations of PUD synthesis are beyond the scope of this Foreword.

Available evidence indicates that increasing the carboxyl content in the prepolymer causes reduction in final particle size of the PUD. There is also indication that the PUD particles do not have homogeneous composition. The surface of the particles seems to be rich in polyurea, the center is rich in polyurethane.

It should be stated that the present scientific understanding of the PUD technology is at its infancy, particularly when compared to the available profound fundamental information on latexes. Four papers of this Compilation deal with PUDs.

In the past few years hybrid latex-PUD products have become commercial. These contain a PUD and an acrylic polymer within each particle probably in the form of an interpenetrating polymer network. Such hybrids reputedly offer better properties than physical blends of PUDs and latexes. A hybrid can be made by adding acrylic monomers to the PUD prepolymer and polymerizing these monomers during or after the chain extension of the PUD with a diamine. One paper in this Compilation deals with such hybrids.

Water Reducible Polymers

Polymers belonging to this class satisfy four criteria: (1) they are synthesized in non-aqueous media; (2) they are mechanically emulsified into water, aided by attached hydrophilic (carboxyl, sulfonate, tertiary amine or polyethylene oxide) groups and/or by external surfactants; (3) they have number average molecular weights in the range of about 2,000 to 10,000, and must be crosslinked during film formation for providing coherent films; and (4) at a high solids content and formulated to have a low or zero solvent content, their unpigmented aqueous dispersions are milky in appearance and comprise particles having colloidal dimensions.

The last item requires elaboration. Many water reducible polymers (WRPs) become soluble and lose their colloidal structure when greatly diluted with solvent-water blends and at a high pH. For a given polymer composition, too high hydrophile content and too low molecular weight enhance water solubility, while too low hydrophile content and too high molecular weight make it difficult to disperse a polymer into water. The structure and formula of each WRP must be carefully balanced to provide a colloidal dispersion at a solids content suitable for a paint binder. Optimally designed colloidal dispersions have crucial advantages over fully dissolved polymers. They are less hydrophilic, less viscous, and

have higher molecular weight.

There is no generally accepted name for WRPs. They are also called secondary emulsions, aqueous dispersions, hydrocolloids, colloidal solutions and water-solubles.

The first applications of WRPs were for electrocoatings and can liners; i.e., for coatings baked at elevated temperatures.

Electrocoatings date back to the 1960s, and were the first and still are the largest volume application for WRPs. Anodic electrocoat primers are carboxyl stabilized epoxies crosslinked with melamine. Cathodic electrocoats are tertiary amine stabilized, and are crosslinked with blocked isocyanates. Electrocoating is the subject of one paper of this Compilation.

Spray-applied WRP liners for cans were developed in the 1970s. These are based on epoxies or acrylated epoxies and are anionically stabilized. Their films are crosslinked with melamine. Two papers of this Compilation deal with such can liners.

An unresolved puzzle is the failure of extensive industrial research efforts to adapt latex technology to electrocoatings and to interior can coatings. It is now speculated that WRPs have an advantage over latexes in the mechanism of film formation and this is crucial for these two applications. On drying, WRP particles flow together and form films in a fashion characteristic to solution polymers, in contrast to the gradual coalescence of latex particles.

The focus of recent developments is on WRP coatings that are cured at low temperatures, ambient to below 80°C. Commercially important low temperature cured WRP coatings are based on alkyds, two-component urethanes and two-component epoxies. This Compilation contains seven papers on water reducible alkyds, five on aqueous two-component urethanes, and four on epoxy emulsions for low temperature cure with polyamines.

Similarly to their solvent-borne counterparts, aqueous alkyds are cured by heavy metal catalyzed air oxidation. Aqueous alkyds are useful in high gloss architectural coatings and as additives to architectural latex coatings for improving chalk adhesion. The main shortcoming of aqueous alkyds was a lack of long-term hydrolytic stability but there are now improved products on the market.

Solvent-borne two-component urethanes and two-component epoxies are the highest quality coatings for low temperature cure. Breakthrough developments of recent years have allowed adaptation of these chemical approaches to aqueous systems, in several instances without sacrifice in performance.

Aqueous two-component urethanes are based on water reducible acrylic or polyester polyols. The key to success was the realization that isocyanates can react significantly faster with aliphatic hydroxyl groups than with water when the appropriate catalysts are chosen. Equally important were new processes for emulsifying the isocyanate crosslinkers into water. This technology is useful in coatings for plastics, automotive coatings and industrial maintenance coatings.

Special water dispersible amine curatives combined with epoxy emulsions are components of metal primers, cement floor coatings and paints for other evolving applications.

Conclusions

Architectural latex paints and electrocoatings became commercially successful prior to environmental legislation and based solely on technical merit. These products laid the foundation for the entry of waterborne paints into a multitude of markets now requiring VOC reduction. Novel approaches to latex synthesis, and development of polyurethane dispersions and of water reducible polymers opened new vistas in the past three decades. As a result of these technical advances many waterborne paints now provide one or several or all of the following advantages: use of high molecular weight polymers, use of blends of thermodynamically incompatible polymers, low VOC, low odor, ease of application, and convenience in the cleaning of application equipment. Ongoing research is aimed at further improvements in aqueous paints so that they should equal or surpass their solvent-borne kin in as yet unexplored specialized areas of application.

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------------------------------|--------------------------------|--------------------------|
| 189 Waterborne Coatings: Emulsion and Water-Soluble Paints | | <i>Edition:</i> |
| <i>Author:</i> Martens, Charles R. | <i>Dynix:</i> 03813 | <i>Series:</i> |
| <i>Publish.:</i> Van Nostrand Reinhold Company | <i>Call No.:</i> 667.63 Ma | |
| <i>- place:</i> New York, NY | <i>ISBN:</i> 0442251378 | |
| <i>- date:</i> ©1981 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1981 |
| <i>Subject:</i> Emulsions | | <i>Price:</i> \$25.00 |
| <i>Desc:</i> x, 316 p., illus., 24 cm. | | |

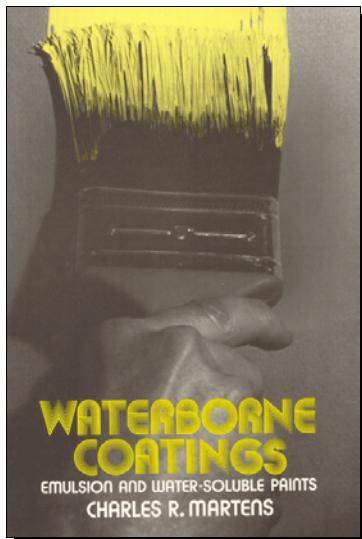


Table of Contents

Preface

1. Introduction
Terminology
History
Function of Paint
Types of Paint
Air Pollution
Coatings to Reduce Volatile Organic Compound Emissions
Paint Industry Statistics
References
2. Properties of Water
Surface Tension
Evaporation Rate
Solvent Action
pH
Noncombustibility of Waterborne Coatings
References
3. General Properties of Coatings
Package Properties of Paints
Application Properties of Paints
Dry Paint Properties
Film Resistance Properties
Pigment-Volume Concentration
Permeability
Penetration and Holdout
References
4. Types of Waterborne Coatings
Colloids
Emulsions O/W or W/O
Milk
Coagulation and Gelation
Application
Water Soluble Coatings
Water Dispersibles
Water-Soluble Formula
Water-Dispersible Formulas
5. Organic Binders
Synthetic Resins
Polymer Structure and Properties
Functionality and Polymerization Mechanisms
Types of Polymerization
Methods of Polymerization
Molecular Weight Effects
Classes of Resins
6. Surfactants

Subjects

| | |
|--------------|-----------|
| 259 . | Emulsions |
| 276 . | Paint |

Wetting Agents
Emulsifying Agents
Detergents
Dispersing Agents
Structure of Surfactants
Types of Surfactants
Solubility and Balance
Application
Selection of Surfactant
References

7. Protective Colloids and Thickeners
Summary

8. Pigments and Extender Pigments
Opacity
Particle Shape
Oil and Water Absorption
Incorporation into Paint
White Pigments
Slurries
Color Pigments
Tinting Strength and Dispersion Properties
Inorganic Pigments
Organic Color
Pigments
Pigment Dispersion

9. Biocides—Preservatives and Fungicides
Package Preservatives
Enzyme Resistance
Fungicides
References

10. Miscellaneous Ingredients
Freeze-Thaw Stabilizers
Buffers
Coalescing Agents
Antirust Agents
Defoamers
Consolvents
Amine Neutralizers
Driers
References

11. Emulsion Formation
Emulsion Polymerization
Postemulsification
Stability of Emulsions
Phase Volume
References

12. Manufacture and Handling
Equipment for Postemulsification
Emulsion Polymerization
Storage of Latex
Latex Paint Manufacture
Dispersing Equipment or Mills
Pigment Slurries
References

13. Trade Sales Paints
Casein Paints
Primers—Sealers

Latex Wall Paints
Interior Semigloss and Gloss Latex Paints
Exterior House Paint
Floor Paints
Stains for Exterior Woods
Problems with Latex Paints

14. Maintenance Paints
Types of Protection
Failure Mechanism
Coating Thickness and Number of Coats
Preventive Maintenance
Surface Preparation
Primers
Immediate Coats and Topcoats
Waterborne Maintenance Paints
Flash Rusting
Chemical and Solvent Resistance
Waterborne Systems

15. Industrial Coatings
Converting to Waterborne Coatings
Production Line Changes
Industrial Finish Products
Painting Plastics
Automobiles and Trucks
Coil Coating
Board Products
Container Coatings
Appliance Finishes
Electrocoating
Autodeposition

16. Cement and Silicate Coatings
Cement Paints
Silicate Paints

17. Miscellaneous Products
Aluminum Paints
Fire-Retardant Coatings
Multicolored Lacquers
Asphalt Coatings
Portland Cement Composition with Latex
Strippable Coatings
Driveway Sealers
Acrylic Latex Caulks

18. Color in Paint
Visible Spectrum
Three Dimensions of Color
Gloss and Its Effect on Color
Light Sources for Color Matching
Color Formulation

19. Testing of Raw Materials and Finished Goods
Raw Materials
Paint Products
Commercial Testing Laboratories
References

20. Surface Preparation and Application
Surface Preparation
Application

21. Regulations Affecting the Manufacture and Use of Coatings

Government Agencies
Food Packaging
Flammability
Air Pollution
Effluent Regulations
Metals

22. Coating Calculations

Definitions
Typical Raw Material Physical Constants
Composition
Paint Application: Cost Analysis
Determination of Volatile Organic Content in Coatings
Weight of Volatile Organic Compounds per 1000 Square Feet of Finished Product
Conversion Factors

Glossary

Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST COVER:

Environmental considerations and the growing energy shortage have given rise to a vast increase in the use of waterborne paints. Here, at last, is a comprehensive, one-volume reference that deals with virtually every type of waterborne coating—aqueous, water-thinned, water-reducible, emulsion, latex, casein, cement, and silicate.

The book's in-depth coverage extends from the raw materials, formulation, manufacture, testing, and application of waterborne paints to regulations pertaining to their use. Trade sales paints, maintenance paints, and industrial coatings are thoroughly discussed. Special attention is given to how the unusual properties of water affect the formulation and application of coatings. You'll find clear explanations of the differences between water-dispersible and water-soluble coatings, along with data on the uses of organic binders, surfactants, protective colloids and thickeners, pigments and extender pigments, biocides, and preservatives and fungicides.

The author utilizes a pragmatic, easy-to-follow approach to evaluate the advantages and disadvantages of waterborne coatings. He shows how they reduce fire hazards and save energy, as well as sets forth clear guide lines for necessary changes in production lines. Essential information is presented on the importance of the pH factor . . . the conversion of anionic deposition paint tanks to cationic types. . . standard testing procedures. . . the benefits of silicate coatings . . . calculations needed for formulation and application . . the function and measuring of color . . . expansion of waterborne coatings into the automotive industry . . and much more.

Exhaustive and practical, this volume will be welcomed by both producers and users of waterborne paints, as well as by coating chemists, production engineers, and professionals in plastics, adhesives, and related industries.

PREFACE:

Waterborne Coatings: Emulsion and Water-Soluble Paints covers the history, development, formulation, and uses of waterborne paints. Since my first book on this subject, Emulsion and Water-Soluble Paints and Coatings, was published in 1964, much progress has been made and many new developments have occurred.

I wish to express my appreciation to the many companies, particularly raw material suppliers, that provided data, information, and photographs.

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------|--------------------------------|--------------------------|
| 673 Waterproofing and Water-Repellency | | <i>Edition:</i> |
| <i>Author:</i> Moilliet, John Lewis (editor) | <i>Dynix:</i> 14927 | <i>Series:</i> |
| <i>Publish.:</i> Elsevier Publishing Company | <i>Call No.:</i> 677.682 Mo | |
| <i>- place:</i> New York, NY | <i>ISBN:</i> | |
| <i>- date:</i> ©1963 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1963 |
| <i>Subject:</i> Waterproofing | | <i>Price:</i> \$25.00 |
| <i>Desc:</i> x, 502 p., illus., 24 cm. | | |

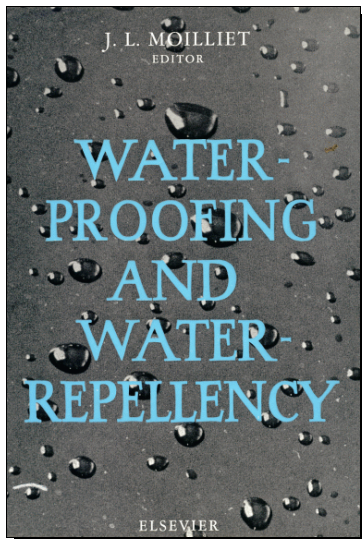


Table of Contents

Preface
List of Contributors
Chapter 1. Principles of Water-Repellency
Chapter 2. The Effect of Structure on Waterproofing
Chapter 3. Waterproofing Emulsions
Chapter 4. Durable Water-Repellents for Textiles
Chapter 5. Silicones
Chapter 6. Water-Repellent Treatment of Cellulosic Fibres
Chapter 7. Waterproofing of Wool Fabrics
Chapter 8. Production of Water-Repellent Finishes on Fabrics made from Synthetic Fibres
Chapter 9. The Testing of Water-Repellent Finishes on Textiles
Chapter 10. Waterproof Coated Fabrics
Chapter 11. The Waterproofing of Paper
Chapter 12. The Waterproofing of Soils and Building Materials
Chapter 13. The Dropwise Condensation of Steam
Chapter 14. Waterproofing Mechanisms in Animals and Plants
Author Index
Subject Index

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

This joint work by a number of experts considers the physical organic and inorganic chemistry of waterproofing processes. Durable organic waterproofing agents, waterproofing emulsions and silicone compounds are described as well as special preparations. Their application to textiles and other substrates is considered, with due attention to the effect of the substrate structure — this in relation to the introductory chapters on the general physical chemistry of water-repellency. Methods of evaluating waterproofed materials and the important techniques of coating textiles with impervious layers receive detailed treatment. Finally, some of the more novel applications of waterproofing techniques to building materials and soils, the dropwise condensation of steam, and the very efficient water proofing mechanisms found in plants and animals are discussed at length.

Subjects

| | |
|-------|--------------------------|
| 587 . | Waterproofing |
| 588 . | Waterproofing of fabrics |

PREFACE:

The waterproofing of textiles has developed from a traditional art to a highly specialised branch of technology during the past thirty years. This has been achieved by research directed to improving the traditional methods, leading to the present-day waterproofing emulsions, by research directed in its initial stages to obtaining chemical combination of the water-repellent with the fibre, leading to the modern durable water repellents, and by the development of radically new substances such as the silicones which have greatly increased the range of possible effects. These researches have been supported by work on the techniques of application, not only to the conventional fibres, but also to the newer synthetic fibres, which have posed their own particular problems. These developments constitute the main theme of the present book, which is elaborated in Chapters 3—9, inclusive.

The developments just referred to are, nearly all examples of the waterproofing of textiles by making them water-repellent: i.e., by rendering them more difficult to wet by water. Where this is achieved, it is possible to preserve the open structure of textile fabrics more or less completely, so that a waterproofed garment often has much the same porosity, texture, and appearance as the untreated one. The scientific principles behind these effects are based on classical surface chemistry and physics. They have become much better understood in the past twenty years, especially as the effect of fabric structure has been investigated, along with the combined effects of fabric structure and intrinsic water-repellency. This scientific background is summarised in Chapters 1 and 2.

An alternative method of waterproofing fabrics is of course to coat them with continuous, water-impermeable films and for many purposes this sort of treatment is essential. Like the methods which are based on rendering textiles water-

repellent, the coating techniques have evolved from a traditional art into a highly sophisticated technology. This development of modern coated fabrics, which has been made possible by the discovery of synthetic film-forming and fibre-forming "polymers" (in the widest sense of the word) is described in Chapter 10.

Waterproofing treatments, of both the general types referred to above, are of course not limited to textiles. A well-known and extremely valuable example of their use is in the flotation of ores. This subject is fairly self-contained, and it has in any case been so fully treated elsewhere, that we have only touched on it very lightly. Other special waterproofing techniques, however, do not appear to have been described so fully, and since several of these are relatively recent developments, the present book contains accounts of the waterproofing of paper, soils, and building materials, and of the dropwise condensation of steam, in Chapters 11—13. A final chapter deals with waterproofing mechanisms in plants and animals, which owe their remarkable effectiveness largely to the ingenious structures which are found in nature.

Since all the chapters are concerned with one or both of two main themes, and since many of them deal with the same materials, a certain amount of overlapping has been inevitable. The editor has not attempted to eliminate all duplication, partly because it seemed essential to leave the authors as much freedom as possible, but chiefly because the independent approaches to similar subject matter were felt to be highly instructive. A number of cross-references have, however, been inserted to draw attention to related passages in the different chapters.

Weathering of Plastics: Testing to Mirror Real Life Performance

LASCT Holdings - maximum detail by Title

W

| Title | Location | Edition / Series / Misc. |
|----------------------------------------------------------------------------|--------------------------------|--------------------------|
| 190 Weathering of Plastics: Testing to Mirror Real Life Performance | | <i>Edition:</i> |
| <i>Author:</i> Wypych, George (editor) | <i>Dynix:</i> 89764 | <i>Series:</i> |
| <i>Publish.:</i> Plastics Design Library | <i>Call No.:</i> 668.4 We | |
| <i>- place:</i> Norwich, NY | <i>ISBN:</i> 1884207758 | |
| <i>- date:</i> ©1999 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1999 |
| <i>Subject:</i> Plastics -- Testing | | <i>Price:</i> \$118.50 |
| <i>Desc:</i> x, 320 p., illus., 23 cm. | | |

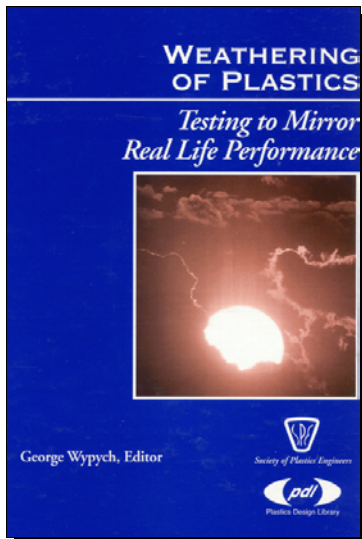


Table of Contents

Preface - George Wypych
 Basic Parameters in Weathering Studies - Geoge Wypych and Tom Faulkner
 Choices in the Design of Outdoor Weathering Tests - Larry W. Masters and Laurence F. Bond
 A Comparison of New and Established Accelerated Weathering Devices in Aging Studies of Polymeric Materials at Elevated Irradiance and Temperature - Jörg Boxhammer and Kurt P. Scott
 Current Status of Light and Weather Fastness Standards. New Equipment Technologies, Operating Procedures and Application of Standard Reference Materials - Jörg Boxhammer
 Weatherability of Vinyl and Other Plastics - James W. Summers and Elvira B. Rabinovitch
 Aging Conditions' Effect on UV Durability - Robert L. Gray, Robert E. Lee, and Brent M. Sanders
 Molecular Weight Loss and Chemical Changes in Copolyester Sheeting with Outdoor Exposure - D. R. Fagerburg and M. E. Donelson
 Fourier Transform Infrared Micro Spectroscopy. Mapping Studies of Weathered PVC Capstock Type
 Formulations. II: Outdoor Weathering in Pennsylvania - Dana Garcia and Janine Black
 Effects of Water Spray and Irradiance Level on Changes in Copolyester Sheeting with Xenon Arc Exposure - D. R. Fagerburg and M. E. Donelson
 Hot Water Resistance of Glass Fiber Reinforced Thermoplastics - Takafumi Kawaguchi, Hiroyuki Nishwiura, Fumiaki Miwa, Kazunori Ito, Takashi Kuryama, and Ikuo Narisawa
 Surface Temperatures and Temperature Measurement Techniques on the Level of Exposed Samples During Irradiation/Weathering in Equipment - Jörg Boxhammer
 Infrared Welding of Thermoplastics: Characterization of Transmission Behavior of Eleven Thermoplastics - Hong Jun Yeh and Robert A Grimm
 Infrared Welding of Thermoplastics. Colored Pigments and Carbon Black Levels on Transmission of Infrared Radiation - Robert A. Grimm and Hong Yeh
 Predicting Maximum Field Service Temperatures From Solar Reflectance Measurements of Vinyl - Henry K. Hardcastle III
 Residual Stress Distribution Modification Caused by Weathering - Li Tong and J. R. White
 Residual Stress Development in Marine Coatings Under Simulated Service Conditions - Gu Yan and J. R. White
 Balancing the Color and Physical Property Retention of Polyolefins Through the Use of High Performance Stabilizer Systems - M. J. Paterna, A. H. Wagner and S. B. Samuels
 Activation Energies of Polymer Degradation - Samuel Y. Ding, Michael T. K. Ling, Atul Khare and Lecon Woo

Subjects

| | |
|--------------|--------------------------------------|
| 310 . | Plastics -- Testing |
| 426 . | Weathering |
| 449 . | Plastics -- Deterioration -- Testing |

Failure Progression and Mechanisms of Irradiated Polypropylenes and Other Medical Polymers - L. Woo, Samuel Y. Ding, Atul Khare and Michael T. K. Ling

Chemical Assessment of Automotive Clearcoat Weathering Atul Khare R. O. Cartyer III, John L. Gerlock and Cindy A. Smith

Effect of Aging on Mineral-Filled Nanocomposites - A. Ya. Goldman, J. A. Montes, A. Barajas, G. Beall and D. D. Eisenhour

The Influence of Degraded, Recycled PP on Incompatible Blends - Claudia M. C. Bonelli, Agnes F. Martins, Eloisa B. Mano and Charles L. Beatty

Interactions of Hindered Amine Stabilizers in Acidic and Alkaline Environments - K. Keck-Antoine, D. Scharf and H. Koch

Interactions of Pesticides and Stabilizers in PE Films for Agricultural Use - Edina Epacher and Bela Pukánszky

The Influence of Co-Additive Interactions on Stabilizer Performance - Robert L. Gray and Robert E. Lee

New High Performance Light Stabilizer Systems for Molded-in Color TPOs: An Update - Peter Solera and Gerald Capocci

Stabilization of Polyolefins by Photoreactive Light Stabilizers - Gilbert Ligner and Jan Malik

Effect of Stabilizer on Photo-Degradation Depth Profile - T. J. Turton and J. R. White

New Light Stabilizer For Coextruded Polycarbonate Sheet - James H. Botkin and Andre Schmitter

Ultraviolet Light Resistance of Vinyl Miniblinds. Part 2. Reaction Products Formed by Lead in Air - Richard F. Grossman

Case Studies of Inadvertent Interactions Between Polymers and Devices in Field Applications - Joseph H. Groeger; Jeffrey D. Nicoll, Joyce M. Riley', and Peter T. Wronski

Automotive Clearcoats - George Wypych and Fred Lee

Index

Reviews - Synopsis - Dust Jacket

In spite of extensive efforts, material weathering testing still requires improvement. This book presents findings and opinions of experts in material degradation testing. The aim is to improve testing methods and procedures. Materials are presented to show that photochemical degradation rate depends on a combination of environmental factors such as UV radiation, temperature, humidity, rain, stress, and concentration of reactive pollutants.

The potential effect of each parameter of degradation on data gathered is discussed based on known results from a long experience in testing. This book contains data obtained in laboratories of the largest manufacturers of UV stabilizers and chemical companies which manufacture durable materials. The book gives details of testing procedures and choice of parameters of exposure which are crucial for obtaining laboratory results correlating with environmental performance of materials.

In addition to exposure conditions, the book contains many suggestions on sample preparation and post-exposure testing. The effective use of these methods shortens testing time of materials and determines acceleration rate of testing. The book also gives examples of complete, well-designed weathering experiments which may be used as patterns for selection of parameters and techniques for new studies. The areas of research which still require more attention in future studies are clearly indicated.

From Book News, Inc.

This collection of papers reports new developments in material degradation testing methods and procedures. Materials are presented to show that photochemical degradation rates depend on a combination of environmental factors--UV radiation, temperature, humidity, rain, stress, and concentration of reactive pollutants. The potential effect of each parameter of degradation data gathered is discussed based on results from long-term testing. Topics include the effects of water spray and irradiance level on changes in copolyester sheeting with xenon arc exposure, hot water resistance of glass fiber reinforced thermoplastics, residual stress development in marine coatings under simulated service conditions, chemical assessment of automotive clearcoat weathering, and interactions of pesticides and stabilizers in PE films for

agricultural use. The contributors work for manufacturers of UV stabilizers and durable materials. Book News, Inc.®, Portland, OR

PREFACE:

Before synthetic materials found a place in our lives, men and women relied on natural materials to build their houses, churches, buildings, to make their clothing and all other articles which societies required. These "traditional" materials were used with little or no chemical conversion. Natural forces determined which materials were durable and which were perishable. Our forebears learned by observing natural effects which materials should be used for long-term use and which were disposable. At the end of their useful life, disposal of the articles caused little environmental impact as these natural products once again became part of nature.

Today we have become engulfed with products and materials made from materials extensively modified from their original, natural state. These modifications are often done in chemically irreversible ways. We want the products to be durable over their useful life but we also want them to be returned to nature when we no longer need them. We hope that their disposal will not cause pollution. We need our water to be pure, our air to be safe to breathe, and our soil to be uncontaminated.

Conflicts abound. If we are to resolve them and continue to use synthetic materials responsibly, we must plan carefully and gain a complete understanding of how materials will perform and degrade. In particular we must be able to understand how materials weather, what the by-products of weathering are and how materials can be transformed into non-polluting entities either through recycling or natural disposal. Terms such as "life cycle assessment", "recyclable", "biodegradable" and "lifetime warranty" slip easily off our tongues. We need to bring weathering testing to the point at which reliable testing and investigative studies can enable us to use these and related terms with complete confidence.

In spite of the efforts of research groups, standardization organizations and industry, there is much to be done to bring weathering testing to the level that will allow the results to predict the life of materials. There must be a willingness among the involved parties to cooperate and a comprehensive body of information to support their efforts. This book is a contribution to the information base to assist the scientific efforts aimed at improving the knowledge of weathering. ChemTec Publishing and William Andrew will continue to supply information to this field. In the year 2000 we will publish:

- The 3rd Edition of the Handbook of Material Weathering which will focus on information to support weathering testing
- The Atlas of Material Damage, a CD-ROM and on-line database of visual images characterizing various modes of degradation, their morphological features and reasons for the effects
- The Manual of Testing - a collection of methods of testing used in various industries and research laboratories written by experts in their fields
- Weather Data on CD-ROM - a collection of information on weather designed to assist experimenters in selecting the appropriate conditions for laboratory studies.

One aim of this book is to provide a critical overview of methods and findings based on experimental work. Another is to create an awareness of the effect of the combined action of all the weather variables on materials under study.

The introductory chapter outlines experimental design techniques and equipment selection and emphasizes the importance of selecting the basic parameters of weathering including:

- UV radiation
- temperature of the specimens
- rainfall and condensed moisture
- humidity
- pollutants
- stress

The book is structured to illustrate the importance of these parameters on weathering studies. Throughout the book, the authors attempt to show that weathering is not only dependent on UV radiation but that the overall effect depends on the interplay of all parameters which create a unique sequence of events that will change if the parameters are changed. The lack of correlation between laboratory and outdoor exposure is frequently caused by combinations of factors among which the improper selection of laboratory conditions is prime.

After the introduction we discuss the choices available for outdoor weather testing. This relates laboratory tests to tests outdoors so that there may be correlation with natural conditions. The importance of precise control of both UV spectral intensity, temperature and heat flow is demonstrated in Boxhammer's careful use of available equipment and by studies done on automotive components.

The recent availability of the CIRA filters and the continued use of borosilicate filters now permits accurate duplication of solar radiation. The chapter by Summers and Rabinovitch shows how radiation wavelength impacts the performance of several polymers. The manufacturers of weathering equipment can perfectly simulate the solar spectrum. Researchers now must take advantage of these developments. We show that failure to duplicate the solar spectrum invalidates the experiment. The failure is caused by energy input, temperature, moisture, and radiative effects. These parameters should not differ in the experiment from that of natural exposure.

We compare the two most common artificial light sources - xenon arc and fluorescent lamps. The automotive, textile, polymer and stabilizer industries use xenon arc which gives the full spectrum of solar radiation (UV, visible, and near infrared). The use of fluorescent lamps, which lack the spectral range of the xenon arc, should be discouraged except in special cases where the known mechanisms for degradation are triggered only by radiation between 295 nm to 350 nm. Several industries report problems stemming from studies done with fluorescent lamps which fail to correlate with actual outdoor exposure.

Water spray during weathering studies has often been neglected. The reported work on co-polyester sheeting shows how complex material changes can be in the presence of water. More work is urgently needed to determine how humidity and condensation influence material degradation. Two contributions from the Edison Welding Institute have been included to demonstrate the effect of infrared energy and how different materials absorb this energy differently. In particular, the inclusion of pigments complicates infrared absorption. The chapter by Hardcastle shows how an evaluation of performance requirements helps to define a method of predicting the maximum allowable service temperature of vinyls based on measurements of their solar reflectance.

Products in service operate under mechanical stress due both to residual stresses developed during the forming process and to external stress in use. It has long been recognized that stress affects weathering but little has been done to evaluate the effect. Two chapters by White et al propose methods of evaluating the effects of stress in weathering studies. These effects are complex since the initial stress distribution changes during exposure and this requires a knowledge of the kinetics of these changes. A similar situation exists with respect to the effects of pollutants. We know they influence weathering but there are few studies that assess their influence. Paterna et al examine gas fading of automotive components in the presence of nitrous oxides. More elaborate techniques must be developed to evaluate the combined effects of UV radiation, moisture, temperature and pollutants on products to simulate outdoor applications. It is unrealistic to study these influencing factors independently.

Two studies on the effects of high energy radiation have been included to demonstrate well defined projects which evaluated material failures and determined the activation energies of the degradation process for many materials, explained why degradation occurred in industrial sterilization, and determined how such degradation might be prevented.

Assessment of automotive clearcoats and nanocomposites show that current test methods are sufficiently accurate, sensitive and suitable to detect degradation at an early stage of exposure. This is another area where more investigative work is needed. The benefit of this approach lies in gaining information early in the product development process using the equivalent of natural conditions without depending on the use of high energy radiation, often employed in accelerated testing, which causes degradation mechanisms which would not normally occur.

Several contributors emphasize other complexities which must be dealt with in weathering studies. The materials themselves are complex. Many contain additives which interact with the host, the substrates and one another in a weathering situation. Conclusions may err if they are based on an inaccurate knowledge of the real composition of the material under study. Even the manufacturer may be unaware of the true composition as composite additives may have proprietary compositions which are not disclosed. Many fundamental studies are needed to investigate the interactions of multi-component systems and to unravel the effects of processing aids which may be added without knowledge of their effects or interactions. Such practices may lead to unexpected and possibly, catastrophic, failures which would remain undetected in routine research and quality control operations.

The stabilizer manufacturers have, as an industry, made a significant contribution to weathering testing methods. There are several chapters from these sources. They show that their reports to their customers are meticulous in relating the results of evaluations to the conditions of the test. Their approach is conservative in selecting both equipment and test conditions. The tests are expensive. They must relate to the real conditions of use and results should be comparable to those of prior tests.

The book concludes with an example of the type of ground work and planning that is required before routine analysis begins. Using work on automotive clearcoats, we demonstrate how information must be analyzed and categorized to provide a rationale for testing, defining performance requirements, exposure conditions, mechanisms of degradation and how best to observe and measure the changes in specimens. Information gleaned from field performance is used to determine the appropriate laboratory simulations. If this preparatory work is not done the subsequent testing efforts are unlikely to yield useful data and be of little use in predicting future product performance.

One final comment. Manufacturers must operate to meet economic goals. Industry as a whole is becoming increasingly competitive and is continually seeking ways to rationalize production methods to improve economics. Materials from different industries compete for the same markets. Durability has become one of the most important characteristics. The product is either made from an inherently durable material or it receives an external coating which gives the required durability. The first approach is more consistent with recycling processes which generally have difficulty in dealing with multi—component mixtures. As the understanding of weathering increases we may learn how to more frequently select a durable substrate which will not require the complication and cost (initial and recycling) of a surface coating. The economic answer would seem to lie in making the investment in weathering research to avoid the costs of material replacement and material failures.

I sincerely hope that this introductory volume will generate an increased interest in advancing these important studies and provide an inspiration to researchers to pursue weathering studies as both economically and environmentally important activities.

| Title | Location | Edition / Series / Misc. |
|----------------------------------------------------------|----------------------------|--------------------------|
| 191 Western Coatings Symposium, 1985 (sound recording) | | Edition: |
| Author: Cassette Productions Unlimited, Inc. | Dynix: 56827 | Series: |
| Publish.: Pasadena, CA | Call No.: 667.9 We Parts 1 | |
| - place: Pasadena, CA | ISBN: | |
| - date: 1985 | Shelf Adult Non-Fiction | Year: 1985 |
| Subject: Coating technology | | Price: \$80.00 |
| Desc: 22 sound cassettes [Tapes #4 and #9 not available] | | |

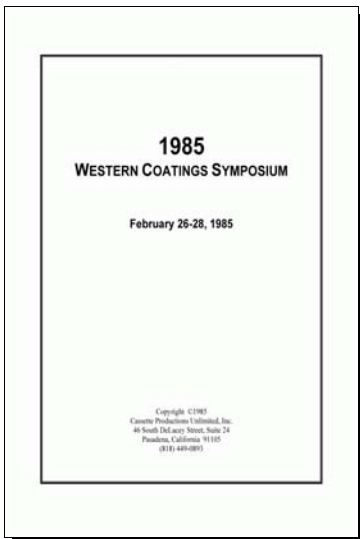


Table of Contents

TUESDAY, FEBRUARY 26, 1985
 Tape #1 - French Process Zinc Oxide in Primers for Hand Cleaned Structural Steel
 Tape #2 - Formulation of Solvent Based Paints Pigmented with Titanium Dioxide
 Tape #3 - High Performance From Lead and Chrome Free Anticorrosive Paints
 (Not Available) Tape #4 - Formulation of Waterborne Alkyds and Saturated Polyesters for Improved Hydrolytic Stability
 Tape #5 - Application for Thick Walled Ceramic Microspheres in Coatings; Today's Frontier in Extender Technology

WEDNESDAY, FEBRUARY 27, 1985
 Tape #6 - Polyurethanes - State of the Art
 Tape #7 - Eastman Chlorinated Polyolefins: New Developments in Coatings Plastics
 Tape #8 - Polyols for High Solids Novel Vinyl Coatings
 (Not Available) Tape #9 - The Validity of Techniques for Determining Color Strength
 Tape #10 - Polyester & Polyurethane Wood Finishes: High Solids Alternatives
 Tape #11 - New Generation Acrylics for Elastomeric Roof Mastic
 Tape #12 - New Coating Systems for Wood and Metal Based on Modification of Urethane Finishes and Urethane Grade Nitrocellulose
 Tape #13 - Formulating Acrylic Water Borne Coatings for Plastics
 Tape #14 - Mixed Ether Melamine Resins in High Solids Coatings
 Tape #15 - Fundamental and Practical Aspects of Adhesion in Waterborne Coatings

THURSDAY, FEBRUARY 28, 1985
 Tape #16 - GENERAL SESSION: Hazardous Material Handling
 Tape #17 - The Role of Paint Additives in the 80's
 Tape #18 - Latex Testing for Coating Applications
 Tape #19 - Corrosion Resistant Waterborne Coatings Through Resin Selection, Formulation; and Use of Additives
 Tape #20 - A New Approach for Low VOC Epoxy Coatings
 Tape #21 - Biocide Resistant Bacteria Ferment and Causing Gassing Paint
 Tape #22 - A Unique Extender Pigment for Low Industrial Coatings

Subjects

| | |
|-------|--------------------|
| 238 . | Coating Technology |
| 283 . | Paint materials |

Reviews - Synopsis - Dust Jacket

FROM THE DUST JACKET:

CASSETTE PRODUCTIONS UNLIMITED is proud to provide audio recording and duplication services at the 1985 WESTERN COATING SYMPOSIUM. Cassette copies of all sessions listed below will be available at the CASSETTE BOOTH throughout the conference or via mail order following it. If you wish to take your cassettes home with you PLEASE PLACE YOUR ORDER NO LATER THAN WEDNESDAY AFTERNOON. For your convenience we accept Visa, Mastercard, American Express and checks. Thank you for your tape order.

Western Coatings Symposium, Technical Excellence and Innovations for 1987

LASCT Holdings -
maximum detail by Title

W

| Title | Location | Edition / Series / Misc. |
|-------------------------------------------------------------------------------|----------------------------|--------------------------|
| 192 Western Coatings Symposium, Technical Excellence and Innovations for 1987 | | Edition: 1987 |
| Author: | Dynix: 53696 | Series: |
| Publish.: Technical Program, Steinbeck Forum | Call No.: 667.9 We Parts 1 | |
| - place: Pasadena, CA | ISBN: | |
| - date: 23 Feb. 1987 | Shelf Adult Non-Fiction | Year: 1987 |
| Subject: Coating technology | | Price: \$20.00 |
| Desc: 2 videorecordings, VHS format | | |



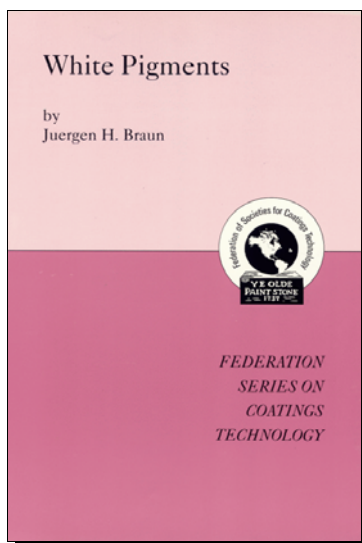
Table of Contents

Reviews - Synopsis - Dust Jacket

Subjects

238 . Coating Technology

| Title | Location | Edition / Series / Misc. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 767 White Pigments
Author: Braun, Juergen H.
Publish.: Federation of Societies for Coatings Technology
- place: Philadelphia, PA
- date: ©1995
Subject: Pigments -- Periodicals
Desc: 43 p., illus., 28 cm. | Dynix: 55947-23
Call No.: 667.9 Fe
ISBN: 0934010447
Shelf Reference | Edition:
Series: Federation Series on Coatings
Technology: No. FS23
Year: 1995
Price: \$50.00 |



Subjects

293 . Pigments

Table of Contents

- I. INTRODUCTION
- II. WHITE PIGMENTS
 - A. Aesthetic Function
 - 1. Optical Concepts
 - a. Light Scattering
 - b. Geometric Optics
 - c. Wave Optics
 - d. Crowding
 - e. Shape and Orientation
 - f. Undertone
 - g. Thin Films
 - 2. Practical Benefits
 - a. Hiding
 - b. Tinting Strength
 - c. Brightness
 - 3. Economics
 - B. Requirements
 - 1. Toxicity
 - 2. Refractive Index
 - 3. Density
 - 4. Color
 - 5. Stability
 - C. Problems
 - 1. Durability
 - 2. Dispersibility
 - 3. Gloss
- III. TITANIUM DIOXIDES
 - A. Commerce
 - B. Manufacture
 - 1. Chloride Process
 - 2. Sulfate Process
 - 3. Surface Treatments
 - 4. Grinding and Finishing
 - C. Characteristics
 - 1. Crystal Phase
 - 2. Particle Size
 - 3. Composition
 - a. Uncoated Pigments
 - b. Coated Pigments
 - c. Slurries
 - 4. Surface
 - 5. Packaging Characteristics and Oil Absorption
 - 6. Contaminants and Color
 - 7. Safety
 - D. Performance
 - 1. Weathering
 - 2. Pigment Interactions
 - E. Commercial Grades

IV. CLASSIC WHITE PIGMENTS

- A. White Leads
- B. Zinc Whites
 - 1. Zinc Oxide
 - 2. Zinc Sulfide
 - 3. Lithopone

V. AIR HIDING

- A. Porosity
 - 1. Extenders
 - 2. Film Qualities
- B. Voids
 - 1. Ropaque®
 - 2. Pittment®
 - 3. Spindrift®

VI. SPECIALTY PRODUCTS

- A. Hiding by Light Absorption
- B. Flake Pigments
- C. Subpigmentary Titanium Dioxide
 - 1. UV Absorbers
 - 2. Flip-Flop Colors

VII. OUTLOOK

VIII. ACKNOWLEDGMENTS

IX. REFERENCES

X. BIBLIOGRAPHY

Reviews - Synopsis - Dust Jacket

INTRODUCTION:

In the distant past, white was the color of clouds, of snow, and of a few creatures and some flowers. Only a few manmade objects could be white because it requires white pigments, and white pigments can only be made from very, very few substances.

Pigment is a term that defines a function:(*) "a substance that imparts black or white or a color to other materials." White pigments make materials whiter, brighter and more opaque, less transparent, than they would be otherwise. Their contribution to the quality of human life is a lighter and brighter world in which to live.

Poverty and deprivation are gray and drab — the colors of dust, deterioration, and age. A bleak environment blights human spirit and well-being. Where and when people can afford it, they brighten their world. Cities, homes, and interiors are painted brightly and colorfully. Whatever is manmade, except for textiles and some papers, owes its whiteness and lightness to white pigment in its surface: houses (inside and out), industrial articles, plastics, glazes, rubber, printed surfaces, some papers, even some foods. Only fiber products, textiles, and papers can be white without pigment.

We will attempt to explain white pigment technology. Its origins are humble. White lead was made in clay pots filled with scrolled lead sheets and vinegar and buried in rooting manure to generate carbon dioxide. Because the industry's roots predate chemical science, there continues to prevail an unreconciled mix of art tinged by witchcraft and science touched by the cerebral. We will focus on the science and will try to do justice to the art.

This monograph addresses managers and technologists of the coatings industry. The objective is to familiarize you with the one ingredient that may take the lion share of your costs. The function of white pigment and the substances that serve this function are discussed. For background, commerce and manufacture are outlined. The monograph is structured in a business style — chapters and sections proceed from the essential to detail. You may wish to limit your casual reading to introductory statements, penetrating deeper only where special interests prompt you. We ask your indulgence for the repetitions that come with a business structure of presentation.

The general matters of white pigments — their optical theory, practical benefits, material requirements, etc. — are discussed in Section II. We then proceed to issues specific to titanium dioxide in Section III. Section IV deals with classic pigments. Section V addresses air hiding, including related matters: extenders and film qualities. Section VI is a catch-all, Section VII a brief and reluctant attempt to decipher the handwritings on walls where they might foretell the future.

(*) - By definition, clays, calcium carbonates, and barytes are extenders in coatings but white pigments in papers.

World-Wide Limits for Toxic and Hazardous Chemicals in Air, Water and Soil

LASCT Holdings - maximum detail by Title

W

| Title | Location | Edition / Series / Misc. |
|---------------------------------------------------------------------------------------|--------------------------------|--------------------------|
| 193 World-Wide Limits for Toxic and Hazardous Chemicals in Air, Water and Soil | | <i>Edition:</i> |
| <i>Author:</i> Sittig, Marshall | <i>Dynix:</i> 50478 | <i>Series:</i> |
| <i>Publish.:</i> Noyes Publications | <i>Call No.:</i> 615.9 Si | |
| <i>- place:</i> Park Ridge, NJ | <i>ISBN:</i> 0815513445 | |
| <i>- date:</i> ©1994 | <i>Shelf</i> Adult Non-Fiction | <i>Year:</i> 1994 |
| <i>Subject:</i> Threshold limit values (Industrial toxicology) | | <i>Price:</i> \$98.00 |
| <i>Desc:</i> xxxiv, 792 p., 26 cm. | | |

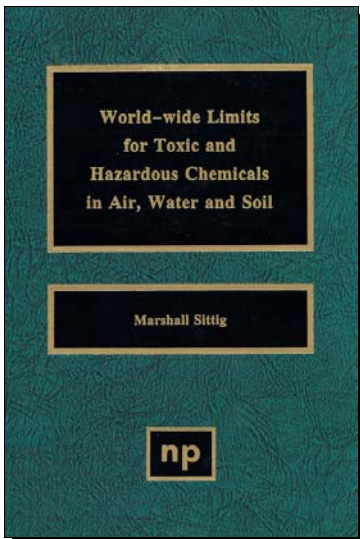


Table of Contents

- Preface
- Introduction
- Table 1: Country Codes
- Table 2: U.S. State Codes
- Table 3: Agency Codes
- Table 4: Codes for Notes
- References
- List of Chemicals

Reviews - Synopsis - Dust Jacket

PREFACE

This book summarizes allowable limits for over 1,100 chemicals (domestic and international) in workplace air, in ambient air, in water of various types, and in soils. It includes data from all pertinent states and 25 foreign countries and organizations.

It is unique in that, for the first time in any publication, a variety of data on a specific chemical is assembled in one place. Thus, one does not have to go to a variety of reference sources for such data, but can get a panoramic view of the possible hazards associated with exposure to a single chemical, under various conditions, in one place.

The data in this book are new. They have not been presented in this manner before. They represent the latest in numerical values (and cancer assessments), most of them more recent than the third and latest edition of the writer's "Handbook of Toxic and Hazardous Chemicals and Carcinogens".

The data in many cases are unique, hard to obtain, not previously published, and have been assembled in a single reference source for easy use by the reader. They include recent international data, checked by a visit to the United Nations information centers in Geneva, Switzerland in the months immediately before publication. They include very recent data from a variety of State agencies in the U.S.A., standards which have been established to safeguard the public health by many different agencies within the various states.

It is hoped that this book will be of wide utility to:

1. Lawmakers engaged in standards setting who can compare precedents, and then research those precedents to aid in their own work.
2. Manufacturers, distributors and users of chemical products who can now see at a single glance what restrictions do, or may, apply to the products they handle.
3. Enforcement agencies concerned with standards setting, who can see quickly what their own government, or neighboring governments have done in the past and then analyze data gaps and unusual differences in standards between governing bodies.
4. Attorneys defending accused violators of regulatory standards, who can analyze precedents differing from those which their client is accused of violating.
5. Public interest groups concerned with both standard setting and enforcement, who can observe both gaps in existing data and widely differing values for various chemicals to help to set their own agendas.
6. Labor unions and their environmental safety specialists who are concerned with worker protection and who can now compare standards in their own and neighboring governmental divisions for coverage and possible inequity.
7. Health agencies at various levels of government who can now see what precedents exist and what needs to be done to fill data gaps and insure the proper protection of all citizens.
8. Testing laboratories and those governmental bodies concerned with analytical standard setting, who can identify chemicals of concern and the need for further work.
9. Educational institutions with environmental research and teaching programs who can now, in this single volume, observe the panorama of what has been done and what should receive attention in the future.
10. Emergency personnel such as first aid and fire fighting groups, who can quickly get a profile of possible hazards associated with various chemicals to enable them to prepare emergency response methods.

Subjects

| | |
|-------|------------------------------------------------|
| 335 . | Threshold limit values (Industrial toxicology) |
| 382 . | Industrial toxicology |
| 451 . | Pollution |
| 480 . | Hazardous Substances -- standards |
| 497 . | Pollutants, Chemical |

11. Contracting firms and equipment manufacturers involved in toxic chemical cleanup operations.
12. Lending institutions concerned with the acceptability of properties for financing based on the present status of soils, for example, and the possible costs of remedial steps to prevent future litigation regarding the consequences of past uses.
13. Consulting firms having clients with present or possible future environmental problems.

While many of the values for allowable limits in air and water are better known, the values for soil are relatively new and unique. It is the author's hope that they will be useful and, indeed, may assist in standard setting for toxics in soil in other jurisdictions where such standards have not been heretofore been considered.

| Title | Location | Edition / Series / Misc. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 829 Writing and Designing Manuals
Author: Robinson, Patricia A. and Ryn Etter
Publish.: CRC (Chemical Rubber Company) Press
- place: Boca Raton, FL
- date: ©2000
Subject: Technical writing
Desc: 202 p., illus., 24 cm. | Dynix: 99426
Call No.: 808.066 Ro
ISBN: 1566703786
Shelf Adult Non-Fiction | Edition: 3rd edition
Series:
Year: 2000
Price: \$55.00 |

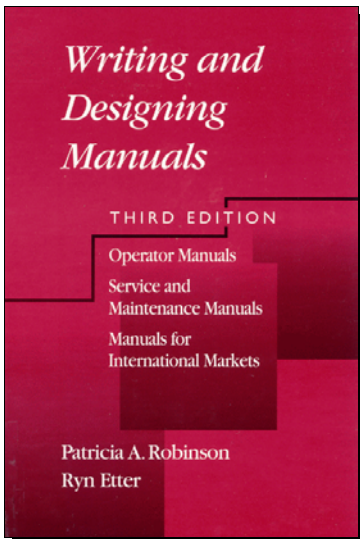


Table of Contents

FULL TITLE: Writing and Designing Manuals: Operator Manuals, Service and Maintenance Manuals, Manuals for International Markets

Chapter 1: Understanding the Context
 Overview
 Value of Manuals to a Company
 Role of the Technical Writer
 Place of the Technical Writer: Location, Location, Location
 A Technical Writer's Survival Skills
 The Writing Process
 So How Many Writers Does It Take to Make a Manual?
 What the Writer Needs (Besides More Money)
 Summary
 References

Chapter 2: Analyzing the Manual Users
 Overview
 Do People Really Use Manuals? Yes, But
 What Do Users Really Want? Why Can't They Get It? And Should We Care?
 Who Are Your Users? How Do You Know? How Do You Find Out?
 Spectrum of Users
 Users' Questions as Manual Organizers
 Users as Cocreators: Feedback Sources
 Checklist: User Questions as Organizers of the Manual
 Summary
 Checklist: User Characteristics
 References

Chapter 3: Structuring the Manual
 Overview
 Manuals Are Not Novels
 What Do Manuals Offer the User?
 How Can You Organize and Write Manuals?
 A Manual Is Not a Library
 Strategies That Work
 Review of Effective Writing Strategies
 Summary
 Checklist
 Reference

Chapter 4: Designing the Manual
 Overview
 Writers as Designers
 Design Choices: Why Cookbooks Work Better Than Novels
 Summary
 Checklist
 Further Reading

Chapter 5: Choosing and Designing Graphics
 Overview
 Why Use Graphics?

Subjects

544 . Technical writing

How to Design Effective Graphics
New Uses of Visual Media
Summary
Checklist
Further Reading

Chapter 6: Safety Warnings
Overview
Product Liability Background
The Duty to Warn
Developing Good Warnings for Your Product
Special Problems
Summary
Checklist
References

Chapter 7: Service and Maintenance Manuals
Overview
Effective Design for Service and Maintenance Manuals
Summary
Checklist

Chapter 8: Manuals for International Markets
Overview
New Standards for International Manuals
International Manuals: The User Spectrum Expands
Producing Translated Manuals
Summary
References

Chapter 9: Managing and Supervising Manual Production
Overview
Who Writes the Manual?
Scheduling and Monitoring Document Preparation
Organizational Settings That Affect Writers
Summary

Bibliography
Index

Reviews - Synopsis - Dust Jacket

The completely revised and updated third edition of *Writing and Designing Manuals* addresses all aspects of manual development, from choosing a format to writing effective warnings. It offers extensive information on the current state of the art in desktop publishing; alternative media such as videos, CD-ROMs, and online help; the impact of new technologies such as CD-ROMs and digital cameras on manual design and production; and the impact of the internet on manual design.

Target Audience: Technical writers, editors, and graphic artists involved in manual preparation.

FROM THE DUST JACKET:

How can you make sure your manuals comply with European Union requirements?
What types of photos and drawings work best in technical publications?
How can you write safety warnings that will help prevent product liability claims?

Gone are the days when a manual might be a few pages of typewritten text. Thanks to the advances in computer technology, even small companies can produce slick, professional publications. *Writing and Designing Manuals, Third Edition* guides you through the messy complex, frustrating, and fascinating business of producing manuals.

A survival guide for writers in the real world, *Writing and Designing Manuals, Third Edition* has become the standard reference for technical writers and editors. The completely revised and updated Third Edition includes:

- Current materials on desktop publishing
- Alternative media such as videos, CD-ROMs, and on-line help
- The impact of new technology such as CD-ROMs and digital cameras on manual design and production

- New regulations for products sold overseas
- Impact of the Internet on manual design

Readable and practical, this book addresses all aspects of manual development from choosing a format to writing effective warnings. Not limited to text elements, the manual also provides guidance for designing illustrations to complement the text and underscore the safety warnings.

FEATURES

- Explains what works with real-world examples
- Includes 50 figures that illustrate the major points
- Covers a wide variety of products — from Consumer goods to industrial machines
- Provides current information on requirements for safety warnings
- Contains hard-to-find information on European requirements

PREFACE TO THE THIRD EDITION:

Like its predecessors, this edition of *Writing and Designing Manuals* is written for the technical writers, editors, and graphic artists who labor in the trenches doing the best they can with too few resources and too-tight deadlines. Over the 15 years since the first edition appeared, much in the profession has changed, but the central problem remains: how to get needed information to users in a form they will actually use. As in previous editions, we have relied on the experience of hundreds of technical writers, editors, and graphic artists from a broad spectrum of industries. Some came to seminars, some we met consulting, but all of them gave us the benefit of their perspectives. The suggestions in this book are based on what works in the real world, not some idealized academic construct. We asked the people doing the job what works for them, and this book represents their collective answer.

As in previous editions, we have organized the book to reflect the major steps in manual production: planning and understanding the context, analyzing the user, choosing organizational and writing strategies, designing a format, and developing graphics. Also included are chapters addressing special topics: safety warnings, service and maintenance manuals, manuals for international markets, and managing the technical publications function.

Reflecting the changes in the world since the last edition, we address the impact of new production technology, the rapid growth of the Internet as a way to do business, changes in product liability law, and the emergence of the European Community, with its implications for manual writers. We have included many new examples taken from manuals that reflect the increasing quality to be found in the profession. When we first started in this business, it was not uncommon for the product manual to be a couple of pages of typewritten text. Now, thanks to computer technology and the growth of trade journals such as *Technical Communication*, even tiny companies can produce slick, professional publications. We have grown along with the profession, and hope that this new edition of our book will continue to be a source of information and connection for technical communicators engaged in the messy, complex, frustrating, and fascinating business of producing manuals.

| Title | Location | Edition / Series / Misc. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| <p>194 Year Book: F.S.C.T. Membership Directory</p> <p>Author: Federation of Societies for Coatings Technology</p> <p>Publish.: Federation of Societies for Coatings Technology</p> <p>- place: Philadelphia, PA</p> <p>- date: ©2002</p> <p>Subject: Coatings -- Directories</p> <p>Desc: 400 p., illus., 21 cm.</p> | <p>Dynix: 10231</p> <p>Call No.: 667.5 Fe 2002</p> <p>ISBN:</p> <p>Shelf Reference</p> | <p>Edition:</p> <p>Series:</p> <p>Year: 2002</p> <p>Price: \$150.00</p> |

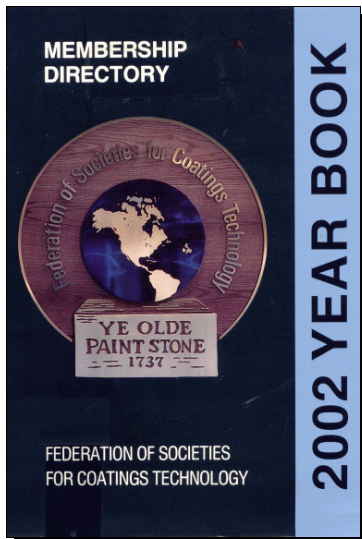


Table of Contents

- 2002-2003 Executive Committee
- 2002-2003 Board of Directors
- Past-Presidents
- Honorary Members
- Roll of Honor
- 50-Year Members
- Staff
- Sites of Annual Meetings and Shows
- FSCT Committee Chairs
- Delegates to Other Organizations
- Coatings Societies International (CSI) Members
- Coatings Industry Education Foundation (CIEF)
- Joseph J. Mattiello Memorial Lectures
- ALPHABETICAL LIST OF MEMBERS
- Society Rosters
- Affiliate Members

Reviews - Synopsis - Dust Jacket

Welcome to the FSCT Membership Directory. This listing, offered as a benefit to members only, is your online guide to the addresses, phone and fax numbers, and Societies for all of the members of the FSCT

Subjects

242 . Coatings -- Directories

The FSCT Articles of Incorporation, Bylaws, Standing Rules, Duties of Committees and Annual Meeting Awards are now published on the FSCT website (www.coatingstech.org).

| Title | Location | Edition / Series / Misc. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------|
| 195 Yearbook and Directory: 2002-2003
Author: Los Angeles Society For Coatings Technology
Publish.: Group Administrative Services
- place: Los Alamitos, CA
- date: ©2002
Subject: Coatings -- Directories
Desc: 146 p., illus., 21 cm. | Dynix: 57894
Call No.: 667.9 Lo 2002-200
ISBN:
Shelf Reference | Edition:
Series:
Year: 2002
Price: \$12.00 |

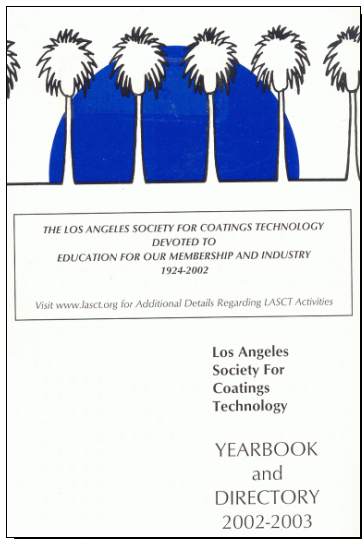


Table of Contents

- 2002-2003 Officers
- 2002-2003 Committee Chairpersons
- Yearbook Committee
- Past Presidents
- Outstanding Service Awards
- 50-Year Members
- 25-Year Members
- 2002-2003 Program Schedule
- Federation Code of Ethics
- Scholarship Program
- Constitution and Bylaws
- Standing Rules
- A Brief History
- Active Members
- Honorary Members
- Roll of Honor
- Educator & Student Members
- Associate Members
- Retired Members
- Complete Roster
- Conversion Tables
- Government Agencies
- Notes
- Calendar
- Advertiser's Index

Subjects

242 . Coatings -- Directories

Reviews - Synopsis - Dust Jacket

A BRIEF HISTORY OF LASCT:

Seventy-eight years have passed since that Monday night when 16 men from 11 companies gathered together for the first meeting of the Los Angeles Paint and Varnish Production Club. The date was May 4, 1924. The place was the City Club, 833 South Spring Street. Early membership records are obscure, but it is recorded that 15 companies were represented by 1929, and total membership had grown to 54 by 1936. Originally, membership was restricted to representatives of paint and varnish producers. In 1937, raw material salesmen were invited to attend meetings and in the early forties were offered Inactive (Associate) Membership.

The first roster was printed in 1946 and listed 142 members. Ten years later membership had grown to 317, was 513 by 1966 and reached 590 in 1978-79. A new record of 653 members was set in 1997-98.

The Los Angeles Club joined the National Association of Paint and Varnish Production Clubs (Federation) in 1927 and in 1936 adopted a Constitution and By-Laws as recommended by the Federation. The name was changed to the Los Angeles Society for Coatings Technology in 1960, and in 1965 the Society was incorporated under California law.

There was some difficulty in obtaining speakers in the early years, and many meetings were scheduled (often two in the same month) to coincide with their availability.

Records mention speakers making use of "lantern slides" in the twenties and talking moving pictures in the thirties. At the first joint meeting of the Executive Committees of the Golden Gate and Los Angeles Clubs in 1954, it was agreed to coordinate programs between the two groups. This was later extended to include the Rocky Mountain and Pacific Northwest Societies and is still in effect.

During these seventy-eight years, meeting places have covered a wide spectrum, but each era seems to have had its

favorites. In the thirties it was the Hotel Rosslyn and later the Royal Palms Hotel. By the mid-forties, Scully's Restaurant became the regular meeting place; in 1958 the Club moved to Michael's Restaurant. The year 1960 was the beginning of a five year stay at the Montebello Country Club, from which location they moved to the Chalon Mart. The present meeting place is at the Buena Park Holiday Inn.

The first West Coast Symposium and Show in Los Angeles was held at the Biltmore Hotel in April of 1952. Established on a biennial basis and alternating between San Francisco and Los Angeles, symposia and shows were held in 1956 and 1960 at the Statler, in 1964 at the Biltmore, in 1968 at the Century Plaza, and most recently at the Airport Marriott and Disneyland Hotel. Additional revenue from these functions resulted in the establishment in 1960 of an irrevocable trust fund for educational purposes. Its 1993 West Coast Symposium and Show held at the Disneyland Hotel set a record for raw material company booth participation, general attendance, and profit made for its scholarship program.

In 1947, a course in Paint Technology was sponsored at Los Angeles City College and continued for 27 years before being transferred to Los Angeles Trade-Technical College in 1974. It was then moved to California State University, Los Angeles, in 1982. This comprises fifty-five years of service to the paint industry.

In 1966, a Coatings Library as established at the City of Commerce Library and now contains the most complete collection of coatings literature in the West. Also in 1966, a Scholarship Program was instituted to assist students in the direction towards the coatings industry.

Social functions were always an important part of Club activities. Occasional ladies nights and fishing trips were held in the thirties. In April 1943, the first Spring Frolic was held at the Mayfair Hotel and became a yearly tradition until 1997 when the Christmas Party became the annual social event.

In 1944, the December meeting was officially designated as "Ladies Night" and was held at the Rosslyn Hotel. This function became the annual Christmas Party which was held in lieu of the December meeting until 1960. "Ladies Night" was changed to February and came to be called "Spouses' Night." The annual Summer Party originated in the late forties and was held for several years at the Pasadena Athletic Club and then moved to the Huntington Hotel. Later it was held at the Pomona Country Club, the Queen Mary, The Castaway, the Sportsmen's Lodge and the Long Beach Elks Club.

The Los Angeles Society For Coatings Technology celebrated its 50th Anniversary in 1974-75. In 1976 the Society voted to extend to the associate members the privilege of being elected to office and the board of directors. A major effort has been made during the last few years to identify and honor all eligible 25 and 50 year members. In 1988, the Society welcomed its first woman President. In 1990, the Society was instrumental in establishing a much needed program at Cal Poly San Luis Obispo which concentrates on coatings technology with a B.S. degree in Chemistry. In 1996, Cal Poly Pomona was added as a supported educational institution and a membership educational grant program was established. LASCT celebrated its 75th jubilee in May of 2000. LASCT & CPCA helped to form the Arthur C. Edwards endowed chair, 'KASM' endowed equipment fund and Bill Moore endowed fellowship program at Cal Poly San Luis Obispo's Polymers and Coatings Institute.

Help Report for Holdings

14-Dec-03

| Help Topic | Created | Holdings | Help |
|------------|---------|----------|------|
|------------|---------|----------|------|

Excerpts

Library Holdings Form

10/29/2001 If a publication includes an excerpt in the database, its cover picture will have a yellow shadow. Double-click the cover picture to read the excerpt.

To print an excerpt, press the button on the Library Holdings Form with a picture of a printer. This will print a complete report of the publication currently being displayed on the form. You can also cut and past selected text from the Excerpt reader to your Word Processor.

Filter by field (right-click menu)

Filter records by entering criteria in place in a form

3/25/2000 1 Open a form.

2 Do one of the following:

- To specify the exact field value you want the filtered records to contain, right-click in the field, and then in the Filter For box on the shortcut menu, type the value. For example, to find all the records that have London in the City field, right-click in the City field, and then type London in the Filter For box.

- To specify more complex criteria, type the complete expression using the appropriate combination of identifiers, operators, wildcard characters, and values to produce the result you want. For example, to find all the records where the Company field includes the word "Networking" anywhere in the field, right-click in the Company field, and then type *Networking* in the Filter For box. To display only the records for incidents that were opened in the last 21 days, type [FirstDT]>=now()-21 (In this last example, it doesn't matter which field in the datasheet you right-click in to enter the expression.)

3 Do one of the following:

- To apply the filter and close the shortcut menu, press ENTER.

- To apply the filter and keep the shortcut menu displayed (so that you can specify additional criteria for the field), press TAB. Enter new criteria, and then press TAB again. Repeat until you have just the records you want.

Notes:

- When you save a table or form, Microsoft Access saves the filter. You can reapply the filter when you need it, the next time you open the table or form.
- When you save a query, Microsoft Access saves the filter, but it does not add the filter criteria to the query design grid.
You can reapply the filter after you run the query, the next time you open it.

Using the Like Operator

3/28/2000 Used to compare two strings.

Syntax

result = string Like pattern

The Like operator syntax has these parts:

| Part | Description |
|---------|------------------------------------------------------------------------------------------------------|
| result | Required; any numeric variable. |
| String | Required; any string expression. |
| Pattern | Required; any string expression conforming to the pattern-matching conventions described in Remarks. |

Remarks

If string matches pattern, result is True; if there is no match, result is False. If either string or pattern is Null, result is Null.
The behavior of the Like operator depends on the Option Compare statement. The default string-comparison method for each module is Option Compare Binary.

Option Compare Binary results in string comparisons based on a sort order derived from the internal binary representations of the characters. In Microsoft Windows, sort order is determined by the code page. In the following example, a typical binary sort order is shown:

A < B < E < Z < a < b < e < z < À < Ê < Ø < à < ê < ø

Option Compare Text results in string comparisons based on a case-insensitive, textual sort order determined by your system's locale. When you sort The same characters using Option Compare Text, the following text sort order is produced:

(A=a) < (À=à) < (B=b) < (E=e) < (Ê=ê) < (Z=z) < (Ø=ø)

Built-in pattern matching provides a versatile tool for string comparisons. The pattern-matching features allow you to use wildcard characters, character lists, or character ranges, in any combination, to match strings. The following table shows the characters

allowed in pattern and what they match:

| Characters in pattern | Matches in string |
|-----------------------|---------------------------------------|
| ----- | ----- |
| ? | Any single character. |
| * | Zero or more characters. |
| # | Any single digit (0–9). |
| [charlist] | Any single character in charlist. |
| [!charlist] | Any single character not in charlist. |

A group of one or more characters (charlist) enclosed in brackets ([]) can be used to match any single character in string and can include almost any character code, including digits.

Note To match the special characters left bracket ([), question mark (?), number sign (#), and asterisk (*), enclose them in brackets. The right bracket (]) can't be used within a group to match itself, but it can be used outside a group as an individual character.

By using a hyphen (–) to separate the upper and lower bounds of the range, charlist can specify a range of characters. For example, [A–Z] results in a match if the corresponding character position in string contains any uppercase letters in the range A–Z. Multiple ranges are included within the brackets without delimiters.

The meaning of a specified range depends on the character ordering valid at run time (as determined by Option Compare and the locale setting of the system the code is running on). Using the Option Compare Binary example, the range [A–E] matches A, B and E. With Option Compare Text, [A–E] matches A, a, À, à, B, b, E, e. The range does not match Ê or ê because accented characters fall after unaccented characters in the sort order.

Other important rules for pattern matching include the following:

- An exclamation point (!) at the beginning of charlist means that a match is made if any character except the characters in charlist is found in string
- When used outside brackets, the exclamation point matches itself.
- A hyphen (–) can appear either at the beginning (after an exclamation point if one is used) or at the end of charlist to match itself. In any other location, the hyphen is used to identify a range of characters.
- When a range of characters is specified, they must appear in ascending sort order (from lowest to highest). [A–Z] is a valid pattern, but [Z–A] is not.
- The character sequence [] is considered a zero-length string ("").

In some languages, there are special characters in the alphabet that represent two separate characters. For example, several languages use the character "æ" to represent the characters "a" and "e" when they appear together. The Like operator recognizes that the single special character and the two individual characters are equivalent.

When a language that uses a special character is specified in the system locale settings, an occurrence of the single special character in either pattern or string matches the equivalent 2-character sequence in the other string. Similarly, a single special character in pattern enclosed in brackets (by itself, in a list, or in a range) matches the equivalent 2-character sequence in string.

Ways to select values for a filter to affect what records are returned

3/25/2000 You can select all or part of a value in a field. How you select the value determines what records the filter returns.

(Select what you are filtering by and then right-click in the field and select "Filter by Selection" from the menu.)

| Selecting | Finds records in which | Example |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The entire contents of a field (or placing the insertion point in a field without selecting anything) | The entire contents of that field matches the selection. | You select the value "Tokyo" in the City field. The filter returns all records with Tokyo as the city. |
| Part of a value starting with the first character in a field | The value in that field starts with the same characters you selected. | In the Company name field containing the value Voice Technology, Inc. you select only "Voic" The filter returns all records that have a company name starting with "Voic", such as "Voice Mail Ltd" and "Voice Technology, Inc." |
| Part of a value starting after the first character in a field | All or any part of the value in that field contains the same characters you selected. | In the Company name field containing the value "Admiral Voice and Data Ltd." you select the letters "Voic." The filter returns all records that have "voic" anywhere in the Company name field, such as "APEX Voice Communications Europe GmbH", and "Interactive Voice Technologies". |

(BCM)

Filters

Holdings Form

- 7/7/1998
- 1.) Filters are used to select a group of records for viewing and/or editing.
 - 2.) The filter combo box on the Library Holdings form applies saved filters.
 - 3.) The filter button on the Library Holdings form allows you to create and save your own filters.

Overview

- 7/7/1998
- About using criteria in filters to retrieve certain records

A set of criteria applied to records in order to show a subset of the records or to sort the records. Microsoft Access has four kinds of filters: Filter By Selection, Filter By Form, Advanced Filter/Sort, and Filter For Input.

Criteria are restrictions you place on a filter to identify the specific records you want to work with. For example, instead of viewing all the suppliers that your company uses, you can view just suppliers from Japan. To do this, you specify criteria that limits the results to records whose Country field is "Japan".

Find a Record

Find blank fields or zero-length strings using the Find dialog box

- 3/25/2000
- You must use the Find dialog box to find blanks or nulls.

- 1 In Form view, click in the field (you want to search, and then click Find on the toolbar or press <ctl-f>.
- 2 Do one of the following:
 - To find unformatted blank fields, in the Find What box, type Null or Is Null, and make sure that the Search Fields As Formatted check box is not selected. If blank fields are formatted (such as "Unknown"), type the formatted string, and make sure that the Search Fields As Formatted check box is selected.
 - To find zero-length strings, in the Find What box, type double quotation marks (""), with no spaces in between, and make sure that the Search Fields As Formatted check box is not selected.
- 3 In the Search box, select Up or Down.
- 4 In the Match box, make sure that Whole Field is selected.
- 5 Make sure that Search Only Current Field is selected.
- 6 To find the first occurrence of a blank in a field, click Find First. To find the next and

| Help Topic | Created | Holdings | Help |
|------------|---------|----------|------|
|------------|---------|----------|------|

all subsequent occurrences of a blank, continue clicking Find Next.

(BCM)

Find One Or More Publications

Find Publications Form

10/29/2001 Press the button with a picture of a book to open an easy to use search form.

The Find Publications Form has the following features:

- 1.) By filling out one or more of the search fields and pressing the Show Holdings button, you will build a scrolling table of all the matching publications.
- 2.) Double-click the ID field of any publication to jump to it in the Library Holdings form.
- 3.) You can use wildcards and like expressions in the search fields. See the "Wildcards" help topic for help on wildcards.
- 4.) When a row is selected in the scrolling search results, many of its fields are displayed below the result table.
- 5.) The result table scrolls right and left so you can see many more data fields.

Examples:

| | |
|--------------------------------------------------------|----------------------------------------|
| Enter "poly" in the Title field | Enter "*poly" in the Title field |
| Enter "society" in the Author field | Enter "Flick" in the Author field |
| Enter "?" in the Table of Contents field | Enter "*poly" in the Table of Contents |
| Enter "Chemical Technology Review" in the Series field | |
| Enter "Chemical" in the Series field | |

References to Type Libraries

libraries needed to run this database

4/17/2002 EnumerateReferences
===== Enumerate References Collection (in order of precedence of access) =====

Reference Name: VBA
Path: C:\PROGRAM FILES\COMMON FILES\MICROSOFT SHARED\VBA\VBA332.DLL
Required: True
Broken: False
Kind: Type Library
Version: 3.0

| | |
|--------------------------------------------------------------------------------------------------|----------------|
| Navigate between sections of a record | Press |
| ----- | |
| To cycle forward through sections | F6 |
| To cycle back through sections | SHIFT+F6 |
| | |
| Navigate in forms with more than one page | Press |
| ----- | |
| To go down one page; at the end of the record, moves to the equivalent page on the next record | PAGE DOWN |
| To go up one page; at the end of the record, moves to the equivalent page on the previous record | PAGE UP |
| | |
| Navigate between the main form and subform | Press |
| ----- | |
| To enter the subform from the preceding field in the main form | TAB |
| To enter the subform from the following field in the main form | SHIFT+TAB |
| To exit the subform and move to the next field in the master form or next record | CTRL+TAB |
| To exit the subform and move to the previous field in the main form or previous record | CTRL+SHIFT+TAB |

Wildcards
Search, find or filter using wildcards instead of exact matches

3/28/2000 About using wildcard characters to search for partial or matching values

You use wildcard characters as placeholders for other characters when you are specifying a value you want to find and you:

- Know only part of the value.
- Want to find values that start with a specific letter or match a certain pattern.

You can use the following characters in the Find, Filter and Replace dialog boxes to find such things as field values or records.

| Character | Usage | Example |
|-----------|-----------------------------------------------------------------------|--------------------------------|
| ----- | | |
| * | Matches any number of characters. It can be used as the first or last | wh* finds what, white, and why |

| | | |
|-----|---------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| | character in the character string. | |
| ? | Matches any single alphabetic character. | B?ll finds ball, bell, and bill |
| [] | Matches any single character within the brackets. | B[ae]ll finds ball and bell but not bill |
| ! | Matches any character not in the brackets. | b[!ae]ll finds bill and bull but not bell |
| - | Matches any one of a range of characters. You must specify the range in ascending order (A to Z, not Z to A). | b[a-c]d finds bad, bbd, and bcd |
| # | Matches any single numeric character. | 1#3 finds 103, 113, 123 |

Notes

- Wildcard characters are meant to be used with text data types, although you can sometimes use them successfully with other data types, such as dates, if you don't change the Regional Settings properties for these data types.

- When using wildcard characters to search for an asterisk (*), question mark (?), number sign (#), opening bracket ([), or hyphen (-), you must enclose the item you're searching for in brackets. For example, to search for a question mark, type [?] in the Find dialog box. If you're searching for a hyphen and other characters simultaneously, place the hyphen before or after all the other characters inside the brackets. (However, if you have an exclamation point (!) after the opening bracket, place the hyphen after the exclamation point.) If you're searching for an exclamation point (!) or closing bracket (]), you don't need to enclose it in brackets.

- You can't search for the opening and closing brackets ([]) together because Microsoft Access interprets this combination as a zero-length string.