

### Polymers from the Inside Out: An Introduction to Macromolecules

Alan E. Tonelli and Mohan Srinivasarao  
(Wiley-Interscience, New York, 2001)  
249 pages, \$69.95  
ISBN 0-471-38138-1

In contrast to small molecules, polymers have many internal degrees of freedom that allow them to respond from the "inside," by changing their molecular size and shape, to affect their "outside" macroscopic, physical properties. Hence the title of this interesting book. The authors have designed it as a text for a one- or two-semester undergraduate course. As readers will discover, this book also serves as a valuable guide for selected topics in polymer science not normally covered in standard introductory textbooks.

After a brief introduction to polymers, chapters 2–7 cover material found in most polymer courses: step-growth polymerization, chain-growth polymerization, microstructure, conformational characteristics, solution properties, and bulk properties. These chapters are written concisely with a minimum of equations. Each chapter concludes with a series of interesting questions for discussion. Unlike other texts I have seen, in this book the authors describe a useful set of class demonstrations that can be performed by the instructor and that should greatly help in keeping students interested and motivated. The demonstrations are well thought out and are designed to illustrate specific principles covered in each chapter. For these reasons, I believe this book to be a very good undergraduate textbook. Furthermore, I feel that the book would also be a good supplementary resource, particularly the demonstrations, for a graduate-level course.

*Polymers from the Inside Out* discusses topics not normally covered in introductory courses. For example, there is a nice description of the application of nuclear magnetic resonance (NMR) to polymers, based in part on the authors' research. The authors also introduce the rotational isomeric state approach for realistically modeling the conformational properties of polymers under  $\theta$  conditions (i.e., when the energy of the mixture is equal to the energy of the components separately). They then show how the rotational isomeric state model can be used to interpret NMR spectra, with polypropylene used as an example.

What I like best about this book is the treatment of biopolymers given in Chapter 8. This chapter gives a very understandable description of polypeptides, proteins, and poly(nucleic acids). The authors briefly discuss important top-

ics of current interest such as the protein-folding problem, as well as DNA replication, transcription, and the genetic code. It is clear that many problems in biology are interdisciplinary in nature. Chapter 8 provides an excellent introduction of biopolymers to students of polymer science.

*Reviewer: John G. Curro is a senior scientist at Sandia National Laboratories and a research professor at the University of New Mexico. His research interests include statistical mechanics, computational modeling, and simulation of amorphous polymers in the condensed state.*

### The Science of Paintings

W. Stanley Taft and James W. Mayer  
(Springer-Verlag, New York, 2000)  
236 pages, \$59.95  
ISBN 0-387-98722-3

*The Science of Paintings* is an ambitious title for a slim book. It starts by introducing the structure and analysis of paintings. It then expands upon the materials used by painters and considers the optics of paintings and their interaction with various examination techniques. Appendices give a brief background for a number of techniques. It states that no prior knowledge of physics or chemistry is required and that an accompanying instructor's manual with problems and sample examinations is available.

The book contains contributions from other authors, who each provide a chapter or appendix on their own area of expertise. Each chapter or appendix stands on its own; some are more informative than others. This reviewer, for example, while aware of the traditional Italian use of hen's eggs as a paint medium, was not aware of the Native American technique of making paint from chewed salmon roe.

However, each chapter and appendix is pitched at a different level. The book grew out of an undergraduate-level course and reads as a collection of only vaguely related independent modules. Given the intended audience, it is a shame that no overview of the subject is attempted. This is a particular omission, as the choice of subjects and the depth to which each is covered seems idiosyncratic. For example, among methods of identification, autoradiography and organic methods get similar coverage as do, among dating methods, radiocarbon dating and dendrochronology. Each of these methods may have a certain validity in its own right, but they are hardly of equal applicability in the investigation of paintings.

Read in isolation, the book may present a potentially distorted view of the field to the student. This problem is not helped by the fact that the text contains no references

(this reviewer is still ignorant of the exact details concerning chewed salmon roe painting). The bibliography is similarly patchy, some aspects being well covered, others less so, with some surprisingly old references and the omission of some more recent key texts.

*Reviewer: Spike Bucklow is a senior research scientist at Hamilton Kerr Institute at the University of Cambridge. His research interests include artists' techniques and materials.*

### Physics Meets Mineralogy

H. Aoki, Y. Syono, and R.J. Hemley, Editors  
(Cambridge University Press, New York, 2000)  
xvii + 397 pages, \$100  
ISBN 0-521-64342-2

The present book was originally intended as a *Festschrift* for Yoshito Matsui on the occasion of his retirement from the Institute for Study of the Earth's Interior, Misasa, Japan, in 1997. For some reason, it eventually evolved, the editors tell us, "into a standard book, covering recent investigations, contributed by outstanding researchers from both geosciences and condensed-matter physics, that can be referred to for coming decades." A *Festschrift* is a tribute to an aging scientist by his friends and students, whose main purpose is to please said scientist, and usually has no claim to immortality. In the present case, the editors provide us with the criteria by which to assess the value of the book: Does it cover recent investigations, are most of the contributors outstanding researchers, and will the book be referred to for "coming decades"? Assuming that "decade" means 10 years instead of 10 days and the plural begins at two, we can immediately dispose of the overly optimistic last statement: Given the rate of progress of mineral physics in recent years, the book would have to be truly remarkable to be referred to in 20 years. Strangely enough, the editors mention twice that Matsui worked in the tradition of Goldschmidt and Pauling, who are better known as chemists than physicists. But let it pass!

Matsui's main contributions were in the field of computational mineralogy, where physics does indeed meet mineralogy, and roughly half of the 20 papers that comprise the volume deal with, for example, *ab initio* methods, molecular dynamics, and density functional theory. I personally know about half of the 45 authors, some of whom are indeed outstanding researchers. That leaves a sizeable number of authors, good scientists whom it would probably be an exaggeration to qualify as outstanding. Quite a number of the articles reporting recent investigations are very focused and technical and probably of interest only to

practitioners in the field. In my opinion, the value of the book resides in half a dozen informative and up-to-date review papers all written by "outstanding researchers." Let me quote, for instance: "Density functional theory in mineral physics," "MgO—The simplest oxide," "Computer simulation approach to the thermoelastic, transport, and melting properties of lower mantle phase," or "Polymorphism in crystalline and amorphous silica at high pressures." The book certainly should be in physics and earth sciences libraries, but, considering its stiff price, I doubt that individual researchers would find it a good value.

*Reviewer: Jean-Paul Poirier is a geophysicist in the Department of Geomaterials at the Institut de Physique du Globe de Paris. He is interested in the deep Earth and the physics of minerals at high pressures.*

The following recently published books, relevant to materials science, have come to *MRS Bulletin's* attention. Some of the books listed here may be reviewed in future issues of *MRS Bulletin*.

#### Books

**Advances in Dielectric Materials and Multi-layer Electronic Devices**, K.M. Nair, A.S. Bhalla, S.-I. Hirano, T.K. Gupta, J.H. Jean, B.S. Hiremath, and Ro. Pohonka, eds., American Ceramic Society, Westerville, 2001, 550 pp., \$100.00, ISBN 1-57498-118-8.

**Aerospace Materials**, B. Cantor and H. Assender, Institute of Physics Publishing, Bristol, 2001, 300 pp., \$65.00, ISBN 0-7503-0742-0.

**Alloying: Understanding the Basics**, J.R. Davis, ASM International, Materials Park, 2001, 350 pp., \$138.00, ISBN 0-87170-744-6.

**Analysis of Surfactants, 2nd Ed., Revised and Expanded**, Thomas M. Schmidt, Marcel Dekker, New York, 2001, 646 pp., \$225.00, ISBN 0-8247-0449-5.

**Applications of Silicon-Germanium Heterostructure Devices**, C.K. Maiti and G.A. Armstrong, Institute of Physics Publishing, Bristol, 2001, 416 pp., \$130.00, ISBN 0-7503-0723-4.

**Basics of Spectroscopy**, David W. Ball, SPIE Publications, Birmingham, 2001, 920 pp., \$70.00, ISBN 0-8194-3698-4.

**Biological Micro- and Nanotribology, Nature's Solutions**, M. Scherge, ASM International, Materials Park, 2001, 300 pp., \$74.95, ISBN 3-540-41188-7.

**Chemical Engineering Fluid Mechanics, 2nd Ed., Revised and Expanded**, Ron Darby, Marcel Dekker, New York, 2001, 584 pp., \$75.00, ISBN 0-8247-0444-4.

**Chemical Properties of Material Surfaces**, Marek Kosmulski, Marcel Dekker, New York, 2001, 776 pp., \$225.00, ISBN 0-8247-0560-2.

**Chemical Vapor Deposition**, J. Park, ASM International, Materials Park, 2001, 650 pp., \$140.00, ISBN 0-87170-733-0.

**Computational Methods for Smart Structures and Materials II**, C.A. Brebbia and A. Samartin, WIT Press, Southampton, 2000, 184 pp., \$99.00, ISBN 1-85312-816-3.

**Conjugated Polymer and Molecular Interfaces: Science and Technology for Photonic and Optoelectronic Applications**, William R. Salaneck, Kazuhiko Seki, Antoine Kahn, and Jean-Jaques Pireaux, Marcel Dekker, New York, 2001, 888 pp., \$225.00, ISBN 0-8247-0588-2.

**Contamination-Free Manufacturing for Semiconductors and Other Precise Products**, Robert Donovan, Marcel Dekker, New York, 2001, 464 pp., \$165.00, ISBN 0-8247-0380-4.

**Continuous and Discontinuous Modeling of Cohesive-Frictional Materials**, P.A. Vermeer, ASM International, Materials Park, 2001, 321 pp., \$70.00, ISBN 3-540-41525-4.

**Copper Interconnect Technology**, Christoph Steinbruechel, SPIE Publications, Birmingham, 2001, 130 pp., \$44.00, ISBN 0-9194-9897-9.

**Corrosion-Resistant Linings and Coatings**, Philip A. Schweitzer, Marcel Dekker, New York, 2001, 448 pp., \$175.00, ISBN 0-8247-0554-8.

**CRC Materials Science and Engineering Handbook, 3rd Ed.**, James F. Shackelford and William Alexander, eds., CRC Press, 2001, 1980 pp., \$179.95, ISBN 0-8493-2696-6.

**The Defect Chemistry of Metal Oxides**, D.M. Smyth, Oxford University Press, New York, 2000, 304 pp., \$85.00, ISBN 0-19-51104-5.

**Deformation and Fracture Behavior of Polymers**, W. Grellman, ASM International, Materials Park, 2001, 525 pp., \$99.00, ISBN 3-540-41247-6.

**Design and Properties of Glass-Ceramics**, Wolfram Holand and George H. Beall, The American Ceramic Society, Westerville, 2001, 400 pp., \$100.00, ISBN 1-57498-107-2.

**Electroactive Materials**, Jurgen O. Besenhard, et al., eds., Springer-Verlag, Wein, 2001, 129 pp., \$119.00, ISBN 3-211-83655-1.

**Electroactive Polymer (EAP) Actuators as Artificial Muscles—Reality, Potential, and Challenges**, Yoseph Bar-Cohen, SPIE Publications, Birmingham, 2001, 687 pp., \$88.00, ISBN 0-8194-4054-X.

**Electron Microscopy in Heterogeneous Catalysis**, P.L. Gai-Boyes, Institute of Physics Publishers, Bristol, 2001, 150 pp., \$70.00, ISBN 0-7503-0809-5.

**Electron Microscopy of Quasicrystals**, K. Chattopadhyay and S. Ranganathan, Institute of Physics Publishing, Bristol, 2001, 200 pp., \$60.00, ISBN 0-7503-0807-9.

**Environmental Effects on Engineered Materials**, Russell H. Jones, Marcel Dekker, New York, 2001, 520 pp., \$195.00, ISBN 0-8247-0074-0.

**Environmental Issues and Waste Management Technologies in the Ceramic and Nuclear Industries VI**, Dane Spearing and Vijay Jain, eds., American Ceramic Society, Westerville, 2001, 450 pp., \$98.00, ISBN 1-57498-116-1.

**Fire Retardant Materials**, A.R. Horrocks and D. Price, CRC Press, 2001, 444 pp., \$207.95, ISBN 0-8493-3883-2.

**Forensic Interpretation of Glass Evidence**, James Michael Curran, Tacha Natalie Hicks, and John S. Buckelton, CRC Press, 2000, 200 pp., \$99.95, ISBN 0-8493-0069-X.

**Fracture Mechanics of Piezoelectric Materials**, Quing-Hau Qin, WIT Press, Southampton, 2001, 264 pp., \$153.00, ISBN 1-85312-856-2.

**Fracture Resistance of Aluminum Alloys**, J.G. Kaufman, ASM International, Materials Park, 2001, 220 pp., \$139.00, 0-87170-732-2.

**The Handbook of Optical Coherence Tomography**, Brett E. Bouma and Guillermo J. Tearney, Marcel Dekker, New York, 2001, 768 pp., \$195.00, ISBN 0-8247-0558-0.

**Impact Behavior of Fibre-Reinforced Composite Materials and Structures**, S.R. Reid and G. Zhou, eds., CRC Press, 2001, 280 pp., \$169.95, ISBN 0-8493-0847-X.

**Industrial Polymers Handbook**, Edward S. Wilks, John Wiley & Sons, New York, 2001, 2500 pp., \$980.00, ISBN 3-527-30260-3.

**Introduction to Physical Polymer Science, 3rd Ed.**, L.H. Sperling, John Wiley & Sons, New York, 2001, 720 pp., \$89.95, ISBN 0-471-32921-5.

**Introduction to Semiconductor Manufacturing Technology**, Hong Xiao, Prentice Hall, 2001, 647 pp., \$106.00, ISBN 0-13-022404-9.

**Ion Exchange and Solvent Extraction, Vol. 15**, Yizhak Marcus and Arup K. Sengupta, Marcel Dekker, New York, 2001, 504 pp., \$225.00, ISBN 0-8247-0601-3.

**LIA Handbook of Laser Materials Processing**, John F. Ready, ed.; Dave F. Farnon, assoc. ed., Laser Institute of America/ Magnolia Publishers, Orlando, 2001, 715 pp., \$240.00, ISBN 0-912035-15-3.

**Materials Characterization by Dynamic and Modulated Thermal Analytical Techniques**, Alan T. Riga and Lawrence Judovits, eds., American Society For Testing and Materials, West Conshohocken, 2001, 223 pp., \$75.00, ISBN 0-8031-2887-8.

**Materials Science of Concrete VI**, Jan Skainy and Signey Mindess, American Ceramic Society, Westerville, 2001, 300 pp., \$90.00, ISBN 1-57498-069-6.

**Materials Science of Concrete**, J. Marchand, J.J. Beaudoin, R.D. Hooton, and M.D.A. Thomas, American Ceramic Society, Westerville, 2001, 500 pp., \$98.00, ISBN 1-57498-113-7.

**MEMS and MOEMS Technology and Applications**, P. Rai-Choudhury, SPIE Publications, Birmingham, 2000, 528 pp., \$88.00, ISBN 0-8194-3716-6.

**Metal Nanoparticles: Synthesis, Characterization, and Applications**, Daniel L. Feldheim and Colby A. Foss, Jr., Marcel Dekker, New York, 2001, 360 pp., \$150.00, ISBN 0-8247-0604-8.

**Microcontinuum Field Theories II, Fluent Media**, A. Cemal Eringen, ASM International, Materials Park, 2001, 320 pp., \$149.00, ISBN 0-387-98969-2.

**Mobile and Rapidly Assembled Structures III**, F. Escrig and C.A. Brebbia, WIT Press, Southampton, 2000, 224 pp., \$125.00, ISBN 1-85132-817-1.

**Modeling for Casting and Solidification Processing**, K.-O. Yu, Marcel Dekker, New York, 2001, 720 pp., \$195.00, ISBN 0-8247-8881-8.

**Molecular Materials and Functional Polymers**, Werner J. Blau, Panatotis Lianos, and Ulrich Schubert, eds., Springer-Verlag, Wien, 2001, 192 pp., \$119.00, ISBN 3-211-83597-0.

**Nanoscale Materials in Chemistry**, Kenneth J. Klabunde, John Wiley & Sons, New York, 2001, 292 pp., \$99.95, ISBN 0-471-38395-3.

**Nano-Surface Chemistry**, Morton Rosoff, Marcel Dekker, New York, 2001, 720 pp., \$195.00, ISBN 0-8247-0254-9.

**Nonlinear Dynamics and Chaos in Semiconductors**, K. Aoki, Institute of Physics Publishing, Williston, 2000, 580 pp., \$179.00, ISBN 0-7503-0514-2.

**Nonlinear Fracture and Damage Mechanics**, M.H. Aliabadi, WIT Press, Southampton, 2001, 264 pp., \$153.00, ISBN 1-85312-508-3.

**Optical Sensors and Switches, V**, Ramamurthy and Kirk S. Schanze, Marcel Dekker, New York, 2001, 544 pp., \$195.00, ISBN 0-8247-0571-8.

**Oxide Surfaces**, James A. Wingrave, Marcel Dekker, New York, 2001, 544 pp., \$185.00, ISBN 0-8247-0000-7.

**Phase Equilibria Diagrams. Vol. 13: Oxides**, Robert S. Roth, ed., American Ceramic Society, Westerville, 2001, 477 pp., \$150.00, ISBN 1-57498-126-9.

**Phase Transitions and Self-Organization in Electronic and Molecular Networks**, J.C. Phillips and M. F. Thorpe, Kluwer Academic Publishers, New York, 2001, 454 pp., \$150.00, ISBN 0-306-46568.

**Physics and Applications of Semiconductor Quantum Structures**, Takafumi Yao and John-Chun Woo, eds., Institute of Physics Publishing, Bristol and Philadelphia, 2001, 276 pp., \$155.00, ISBN 0-7503-0637-8.

**Plastics Additives, 5th Ed.**, Hans Zweifel, ed., Hanser/Gardner, Cincinnati, 2001, 1160 pp., \$128.00, ISBN 1-56990-295-X.

**Polymeric Materials Structures**, G.W. Ehrenstein and R.P. Theriault, Society of Plastic Engineers, Brookfield, 2000, 250 pp., \$41.00.

**Polymeric Materials: Structure-Properties-Applications**, G.W. Ehrenstein, Hanser/Gardner, Cincinnati, 2001, 278 pp., \$39.95, ISBN 1-56990-310-7.

**Practical Guide to Image Analysis**, ASM International, Materials Park, 2000, 290 pp., \$159.00, ISBN 0-87170-688-1.

**Principles of Lithography**, Harry J. Levinson, SPIE Publications, Birmingham, 2001, 410 pp., \$72.00, ISBN 0-8194-4045-0.

**Properties, Growth and Applications of Diamond**, M.H. Nazare and A.J. Neves, eds., IEE Publishing, Edison, 2001, 550 pp., \$195.00, ISBN 0-85296-7853.

**Properties of Lithium Niobate**, K.K. Wong, INSPEC, Edison, 2001, ISBN 0-85296-7993.

**Properties, Processing and Applications of YBCO and Related Materials**, Wai Lo and A.M. Campbell, eds., IEE Publishing, Edison, 2001, ISBN 0-85296-9317.

**Rare Earth Doped Fiber Lasers and Amplifiers, 2nd Ed.**, Michel J.F. Digonnet, Marcel Dekker, New York, 2001, 792 pp., \$225.00, ISBN 0-8247-0458-4.

**Reactions and Synthesis in Surfactant Systems**, John Texter, Marcel Dekker, Rochester, 2001, 888 pp., \$250.00, ISBN 0-8247-0255-7.

**Regenerated Cellulose Fibres**, Calvin Woodings, CRC Press, 2001, 352 pp., \$142.50, ISBN 0-8493-1147-0.

**Shape Optimization by the Homogenization Method**, Gregoire Allaire, ASM International, Materials Park, 2001, 460 pp., \$79.95, ISBN 0-387-95298-5.

**Silicon-Based Materials and Devices**, Hari Singh Nalwa, ed., Academic Press, San Diego, 2001, 634, \$475.00, ISBN 0-12-513909-8.

**Solid Lubrication Fundamentals and Applications**, Kazuhisa Miyoshi, Marcel Dekker, New York, 2001, 416 pp., \$99.75, ISBN 0-8247-8905-9.

**Tape Casting: Theory and Practice**, Richard E. Mistler and Eric R. Twiname, American Ceramic Society, Westerville, 2000, 292 pp., \$90.00, ISBN 1-57498-029-7.

**Technology of Fluoropolymers**, J. George Drobny, CRC Press, 2001, 184 pp., \$99.95, ISBN 0-8493-0246-3.

**Tellurite Glasses Handbook: Physical Properties and Data**, Raouf El-Mallawany, CRC Press, 2001, 392 pp., \$179.95, ISBN 0-8493-0368-0.

**Thermodynamic Basis of Crystal Growth**, J. Greenberg, ASM International, Materials Park, 2001, 282 pp., \$74.95, ISBN 3-540-41246-8.

**Thin Film Magneto-resistive Sensors**, S. Tumanski, Institute of Physics Publishing, Williston, 2001, 576 pp., \$120.00, ISBN 0-7503-0702.

**Transmission Electron Microscopy and Diffractometry of Materials**, B. Fultz and J. M. Howe, Springer-Verlag, New York, 2001, 748 pp., \$89.95, ISBN 3-540-67841-7.



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