Biopolymers for Medical and Pharmaceutical Applications, *Vols. 1–2*

Alexander Steinbüchel and Robert H. Marchessault, Editors
(Wiley-VCH, 2005)
1132 pages; $436.25
ISBN 3–527–31154–8

This two-volume set, with a focus on biomedical applications, is a "spin-off" product of the 10-volume set in the biopolymers series (ISBN 3–527–30290–5). The editors' objective is to provide the scientific and industrial community with a comprehensive overview of the current understanding on various biopolymers that are being used or have the potential to be used in medicine and pharmacy.

The book contains 32 chapters collected in two volumes. In Volume 1, three chapters talk about polyphenols and natural rubber, four chapters introduce various polyesters including the polyanhydride polyphosphate, and 14 chapters review the variety of polysaccharides from commonly seen alginate, chitin, and dextran to lesser-known but very interesting schizophyllan, levan, and others. Volume 2 includes eight chapters focusing on polyamides and complex proteinaceous materials, and three chapters dealing with miscellaneous biopolymers. Each chapter is an overview of a specific class of biopolymer, covering its discovery, occurrence, chemical and physical properties, characterization, biosynthesis, biodegradation, molecular genetics, physiological role, fermentative production, isolation, purification, and applications. Not only has each chapter provided a comprehensive review of the literature on the topic of biopolymers, but each also gives a complete list of patents, which may be of particular interest to industrial readers.

The book is written in a very clear way, assuming little prior knowledge, and the index is a good assist to the readers. Necessary background information such as ribosomal protein synthesis and enzymatic and chemical modification of protein and poly(amino acid) is given in full detail as independent chapters to benefit readers from outside fields. Although each chapter was written by different authors, a uniform structure and standard were used throughout the book.

In conclusion, this is an ideal handbook to be found in libraries or mid-sized laboratories that are interested or active in this area.

Reviewer: *X. Tracy Cui is an assistant professor of bioengineering at the University of Pittsburgh. Her research focuses on polymer-based biomaterials and biosensors.*

Natural Fibers, Biopolymers, and Biocomposites

Amar K. Mohanty, Manjusri Misra, and Lawrence T. Drzal, Editors
(CRC Press, Taylor and Francis Group, 2005)
874 pages; $149.95
ISBN 0-8493-1741-X

This book establishes a milestone in the composites literature. It aims to be "a comprehensive source for the latest advances in the area" of bio-based polymers that can substitute for petroleum-based materials. For the most part, it very successfully accomplishes this goal, and will grow in importance over the years as we work toward a more sustainable society. The book is very well written and edited. Most chapters read smoothly, and the overall theme is developed through 27 chapters. It includes background for the novice, as well as depth for the experts. Although some overlap occurs, it is minor, and allows one to read chapters out of sequence.

The two main trends driving the growth of these materials are the need to replace petroleum, and disposal issues such as the increasing lack of landfill space in many areas. Bio-based products can be burned for energy, or composted (with collection of methane), whereas some plastics are less easy to deal with (e.g., PVC). Besides the material cost, fabrication into fibers adds processing costs that could be reduced by using the wealth of natural fibers (e.g., cotton, jute, and bacterial cellulose). Additional benefits include lack of abrasiveness, sequestering CO_2, high specific properties, low toxicity, and use of low-cost agricultural waste. For instance, the 9 million tons of palm oil produced yearly generate 90 million tons of largely fibrous waste which is discarded (Chapter 9). Chapters by industrial contributors (DuPont, Dow, Eastman) discuss some of their commercialized products that are based on renewable materials: DuPont's poly(trimethylene terephthalate) (PTT), marketed under the trade name Sorona; Dow's poly(lactic acid) (PLA); and Eastman's cellulose acetate (CA). This focus on bio-based materials makes sense now, and will certainly grow in importance. The modern bio-era is just beginning. Current high-tech production methods for polymers are based on more than 50 years of development for petrochemical feedstocks, but less than 5–10 years for renewable bio-sources. We will have a lot of concerns to keep university researchers busy exploring options, and this book mainly consists of such university-based studies. A wealth of data is presented on everything from fiber pull-out forces for composites to new nanofibers being produced. Although the editors have done a remarkable job with the text and index, some of the non-glossy pictures are diffi-

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cult to see clearly. Given the length of the book and the relatively modest cost, this is fully understandable. I recommend this book highly to anyone concerned with the future of the plastics and composites industry. My perspective is that of a faculty member in both a materials science and engineering department and a biomedical engineering department who worked for seven years for a chemical industry giant in the past and continues to consult for various other companies.

Reviewer: *Chris Batich is a professor at the University of Florida. His research focus is on polymers, surface science, biomaterials, biomedical applications of polymers, and guided tissue regeneration.*

Powder Metallurgy and Particulate Materials Processing

Randall M. German
(Metal Powder Industries Federation, 2005)
536 pages; $95.00
ISBN 0–9762057–1-8

The book is an excellent text and reference resource on powder metallurgy (PM) principles, fabrication, properties, and applications. In addition to classical PM materials (e.g., ferrous and nonferrous metals and alloys, cermets, refractory or carbides), there is treatment of composites. This broadens the applications of PM processing technologies. The unique feature of this book is that it is very useful as a textbook for undergraduate and graduate curricula in PM as well as being valuable to the practicing engineer in the real world.

Generous use of clear figures, graphs, and tables makes the book enjoyable and conveys the concepts very clearly. The initial description of metal powders and their characteristics, followed by powder manufacturing processes and the importance of microstructural control, naturally lead to tailoring of powders for creating dense bodies. Various techniques for powder characterization are described very well with simple, usable mathematical treatment and practical examples. Methods of powder fabrication are explained in a lucid manner that also includes material-specific production techniques. Chapter 4 should have included a section dedicated to the morphology of metal powders, which would have differentiated the external features from the microstructure. Powder shaping technologies (e.g., injection molding) are illustrated well with computer simulations and practical examples. Subsequent chapters on powder compaction science and engineering, including sintering phenomena and the creation of fully dense products, are explained very lucidly in both theoretical and practical terms. Much attention has been paid to commercial alloys and the importance of binders for effective PM processing. Production-related processes for sintering and manufacture of fully dense products as well as final finishing operations are very extensively covered. Describing the densification mechanism in simple language makes it easy to understand, while extensive process conditions for achieving full densification of various materials provide a wealth of reference information. A separate chapter is dedicated to the important aspect of materials properties, and these are extensively covered. The problem sets at the end of each chapter encourage readers to put on their thinking caps.

The final chapters deal with the economics of PM processing and address the different markets and applications of PM products. The viability of PM alloys on a commercial scale is very much for niche applications where the cost versus performance tradeoff becomes critical.

Throughout the book, clear figures, tables, and the generous use of data make the text easy to follow and place all the information into a proper perspective that engineers can utilize. The appendices on materials properties are gathered nicely, although it is not explicit if some of the properties are for wrought or PM-processed material. The inclusion of common commercial alloys (e.g., Inconel) would be very useful.

To conclude, the book provides considerable fundamental treatment of PM processing that is written in a very concise, informative manner. The topics covered are wonderfully illustrated with graphs, photomicrographs, and tables. This is an excellent and handy book for students and engineers studying or working in powder metallurgy.

Reviewer: *Sudhi Sant is president and founder of Twin Technologies Inc. in Garden Grove, Calif. He has over 16 years of materials science and metallurgical engineering experience, covering a range of thin films, coatings, and powder metallurgy processes, materials, and applications serving a broad spectrum of industries.*

The History of Science and Technology: A Browser's Guide to the Great Discoveries, Inventions, and the People Who Made Them from the Dawn of Time to Today

Bryan Bunch, with Alexander Hellemans
(Houghton Mifflin, 2004)
776 pages; $40.00
ISBN 0618221239

This is a fascinating book that is a delight to browse. It is organized chronologically, divided into 10 chapters by historical period in which the earliest covers thousands of years, the latest only 30 years (1973–2003). Each chapter begins with an incisive historic overview, putting the main achievements of that period into perspective. Within the body of each chapter, significant events are presented chronologically and categorized for a given year by field (anthropology, archaeology, astronomy, biology, chemistry, communications, computers, construction, earth sciences, ecology and environment, energy, food and agriculture, materials, mathematics, medicine and health, physics, tools, and transport). Obviously, for certain fields, there may be no entry for a particular year. In addition, there are about 175 short essays on selected topics. To cite only topics of particular interest to the materials community, essays address the first ceramics, Chinese cast iron, alchemy, guns and gunpowder, temperature, the search for fiber, the periodic table, creating elements, the chip, and high-temperature superconductors. Also included are 200 brief biographies of notable scientists and inventors. Other features are an index of ~50 pages, about 300 illustrations, and adequate cross-referencing.

In the course of browsing, I discovered some facts of interest: iron chains were used in suspension bridges as early as AD 415; toilet paper was introduced by the Chinese in AD 589, but did not become common in the United States until after 1857; the first scientific laboratory in the New World was set up in 1586 on Roanoke Island, Virginia, by Harriott and Gass to test Au and Ag ores; independent patent applications for the first commercial plastic now known as Bakelite were filed by two men—L. Baekeland in the United States and J. Swinburne in England—just one day apart in 1909; and the first shape-memory alloy, an Au-Cd intermetallic, was discovered in 1932.

A final feature to be remarked is a section titled "Further Reading" that lists 2–8 books for each of the 18 fields covered in the book as well as some general reference works for the history of science and technology broadly. Sadly, this is perhaps the poorest part of the book. Although all references cited are current (most with publication dates of 2001–2003), none of the more substantive, well-recognized though older works in the history of science (e.g., Bernal, Sarton, Forbes and Dijksterhuis, Taton, Bronowski, or Boorstin) and in the history of technology (e.g., Daumas, de Camp, Mumford, Kranzberg and Pursell, Pacey, McNeil, or Gille) are even mentioned. It is still worse in the materials area, where only two references, covering

relatively trivial topics (dust and color), are cited, while several comprehensive and substantial histories of materials science and technology, such as those authored by C.S. Smith, R. Cotterill, J. Delmonte, R. Maddin, L. Aitchison, R.W. Cahn, and R. Raymond, are ignored.

Reviewer: *Jack H. Westbrook is owner of and principal consultant with Brookline Technologies, a consulting firm in Ballston Spa, N.Y., where he consults on materials and technical information systems. He is chair of the* MRS Bulletin *Book Review Board and serves on the* MRS Bulletin *Editorial Board.*

The following new journals and recently published books, relevant to materials research, have come to *MRS Bulletin's* attention. Some of the books listed here may be reviewed in future issues of *MRS Bulletin*. To review a book from this list or to offer recommendations of additional books, contact K. Wilson, Editorial Assistant, *MRS Bulletin*, 506 Keystone Drive, Warrendale, PA 15086-7573, USA; e-mail bulletin@mrs.org.

Journals

ChemMedChem. 12 issues; first issue: January 16, 2006. Subscription rates: €98.00 (individual, Europe), SF 148.00 (individual, Switzerland and Lichtenstein), $124.00 (individual, rest of world), and free online access throughout 2006 (institutions). John Wiley & Sons; www.ChemMedChem.org.

Energy Materials: Materials Science & Engineering for Energy Systems. Launch: 2006; 4 issues. Subscription rates: £76.00/$141.00 (individuals) and £235.00/$435.00 (institutions). Maney Publishing; www.maney.co.uk.

Journal of Instrumentation (JINST). Launch: 2006. Subscription rate: free in 2006 (open access). Institute of Physics Publishing; www.iop.org/journals/jinst.

Journal of Undergraduate Materials Research (JUMR). Launch: 2005; annually. Virginia Tech; www.jumr.mse.vt.edu.

Nature Physics. 12 issues; first issue: October 2005. Subscription rates: £43.00/€67.00 (individual, U.K. and rest of world), $79.00 (individual, USA, Central and South America), $85.00 (individual, Canada), £833.00/€1291.00 (institution, U.K. and rest of world), $1500.00 (institution, USA, Central and South America), $1605.00 (institution, Canada). Nature Publishing Group; www.nature.com/naturephysics.

Books

Applications of Materials

Adhesion: Current Research and Applications, Wulff Possart, John Wiley & Sons, 2005, 608 pp., $210.00, ISBN 3-527-31263-3.

Fracture and Damage of Composites, M. Guagliano and M.H. Aliabadi, Editors, WIT Press, 2005, 304 pp., $175.00, ISBN 1-85312-669-1.

Fuel Cells Compendium, Nigel Brandon and David Thompsett, Editors, Elsevier, 2005, 632 pp., $125.00, ISBN 0-08-044696-5.

Biomaterials

Biofunctionalization of Nanomaterials, Challa S.S.R. Kumar, Editor, Wiley, 2006, 386 pp., $195.00, ISBN 3-527-31381-8.

Biological and Synthetic Polymer Networks and Gels, Ferenc Horkay and Eric J. Amis, Editors, Wiley, 2005, 392 pp., $240.00, ISBN 3-527-31330-3.

Soft Condensed Matter Physics in Molecular and Cell Biology, W.C.K. Poon and David Andelman, Taylor & Francis/CRC Press, 2006, 344 pp., $79.95, ISBN 0-7503-1023-5.

Inorganic Chemistry, Electrochemistry, Other Chemistry, and Ceramics

Mullite, Harmut Schneider and Sridhar Komarneni, Editors, Wiley, 2006, 510 pp., $220.00, ISBN 3-527-30974-8.

Materials Processing

Handbook of Manufacturing Engineering, 2nd Edition (4 Volume Set), Richard Crowson, Taylor & Francis/CRC Press, 2006, 2830 pp., $139.95, ISBN 0-8247-2341-4.

Physics & Electronics

Concise Encyclopedia of Magnetic and Superconducting Materials, 2nd Edition, Jurgen Buschow, Editor, Elsevier, 2006, 1360 pp., $325.00, ISBN 0-08-044586-1.

Polymer Chemistry

Introduction to Physical Polymer Science, 4th Edition, L.H. Sperling, Wiley, 2005, 875 pp., $99.95, ISBN 0-471-70606-X.

Macromolecules: Vol. 1: Chemical Structures and Syntheses, Hans-Georg Elias, Wiley, 2005, 698 pp., $260.00, ISBN 3-527-31172-6.

Polymer Chemistry, Reactions and Processes, Alain Deffieux, Christian Pichot, and F. Candau, Editors, Wiley, 2006, 312 pp., $199.95, ISBN 3-527-31329-X.

Polymers in Cementitious Materials, M. Miller, Rapra Technology, 2005, 192 pp., $165.30, ISBN 1-85957-491-2.

Structure of Materials

Nanocrystals Forming Mesoscopic Structures, Marie-Paule Pileni, Editor, Wiley, 2006, 346 pp., $175.00, ISBN 3-527-31170-X.

Nanomaterials Handbook, Yury Gogotsi, Taylor & Francis/CRC Press, 2006, 800 pp., $149.95, ISBN 0-8493-2308-8.

Nanoscale Calibration Standards and Methods: Dimensional and Related Measurements in the Micro and Nanometer Range, Günter Wilkening and Ludger Koenders, Wiley, 2005, 541 pp., $198.00, ISBN 3-527-40502-X.

Nanotechnology: Basic Calculations for Engineers and Scientists, Louis Theodore, Wiley, 2005, 459 pp., $82.50, ISBN 0-471-73951-0. □

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