An Introduction to Tissue-Biomaterial Interactions

Kay C. Dee, David A. Puleo, and Rena Bizios
(John Wiley & Sons, Hoboken, NJ, 2002)
xx + 228 pages, $83.95
ISBN 0-471-25394-4

This book is primarily intended for use as a textbook early in a biomedical engineering curriculum, but could also be used in an introductory graduate course for engineers who have had no biomedical exposure. Since the text is almost entirely qualitative, readers without a strong mathematical background will have no problem understanding the presented material.

The book is divided into nine main chapters, plus a tenth chapter containing a discussion of examples of vascular intervention and of joint and tooth replacements. The first two chapters describe biomaterials (e.g., metallic, ceramic and glassy, and polymeric) and proteins (i.e., the various levels of structure and several specific proteins). Chapter three uses this information to discuss protein–surface interactions. The next four chapters are the strength of the book, dealing with the bodily processes that occur when an operation places a foreign object (such as a biomedical device) into the body: blood interactions and coagulation, inflammation and infection, the immune system and inflammation, and wound healing. These chapters are very detailed. For example, in appropriate places, charts show the lineage of the various blood cells, and show the processes in, for instance, humoral- and cell-mediated immunity and ligand binding. The last two chapters are titled "Biomaterial Surfaces and the Physiological Environment" and "Biocompatibility." The former includes methods for characterizing and modifying surfaces, and the latter covers methods for testing biocompatibility.

Each chapter ends with a useful summary; a short bibliographical/suggested reading list consisting of books or chapters in edited books, with no references to journal research articles; quiz questions designed to aid the reader in retaining the information in the body of the chapter; and "study questions/discovery activities." Answers to the quiz questions are provided at the end of the book, along with an excellent glossary of terms.

By itself, this textbook does not contain enough information for a whole semester class. An instructor, though, will have opportunities to greatly amplify the materials in the book due to some intriguing questions. For example, in chapter 3, page 44, within a discussion of protein desorption from a surface, the text states, "For desorption to occur, all contacts between protein and surface must be simultaneously broken." Why simultaneously? Is "peeling" not allowed? And in some places, the text invites expanded discussion (e.g., in chapter 4, section 4.3.1: Deformation and Blood Flow).

This book gathers together in one place a lot of fundamental information. Besides being useful in an early biomedical engineering course, it can also serve as a reference for fundamental information or a refresher for those who are not intimately involved in this area, but who need the contained information from time to time.

Reviewer: *Giles Cokelet, research professor in the Department of Chemical and Biological Engineering at Montana State University, Bozeman, has spent more than 40 years as a researcher—mainly dealing with micro- and macrorheology of blood—and a professor in the field of chemical and biomedical engineering.*

The following 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*.

Books

Advances in Amorphous Semiconductors, Jai Singh and Koichi Shimakawa, Taylor & Francis, London, 2003, 329 pp., $95.00, ISBN 0-415-28770-7.

Biomineralization: Reviews in Mineralogy and Geochemistry, *Vol. 54*, Patricia M. Dove, James J. De Yoreo, and Steve Weiner, eds., Mineralogical Society of America, Washington, D.C., 2003, 381 pp., $36.00, ISBN 093995066-9.

Crystal Growth Technology, Hans J. Scheel and Tsuguo Fukuda, eds., John Wiley & Sons, West Sussex, 2003, 668 pp., $210.00, ISBN 0-471-49059-8.

Handbook of Moiré Measurement, C.A. Walker, ed., Institute of Physics Publishing, Bristol, 2004, 501 pp., $110.00, ISBN 0-7503-0522-3.

High-K Gate Dielectrics, M. Houssa, ed., John Wiley & Sons, Hoboken, NJ, 2003, 601 pp., $120.00, ISBN 0-7503-0906-7.

High-Pressure Surface Science and Engineering, Y. Gogotsi and V. Domnich, eds., Institute of Physics Publishing, Bristol, 2004, 639 pp., $175.00, ISBN 0-7503-0881-8.

Host-Guest Systems Based on Nanoporous Crystals, Franco Laeri, Ferdi Schüth, Ulrich Simon, and Michael Wark, eds., Wiley-VCH, Weinheim, Germany, 2003, 662 pp., $220.00, ISBN 3-527-30501-7.

An Introduction to Materials Engineering and Science for Chemical and Materials Engineers, Brian S. Mitchell, John Wiley & Sons, Hoboken, NJ, 2003, 954 pp., $145.00, ISBN 0-471-43623-2.

Introduction to Phonons and Electrons, Liang-fu Lou, World Scientific, River Edge, NJ, 2003, 222 pp., $28.00, ISBN 981-238-461-8.

Linear Position Sensors: Theory and Application, David S. Nye, John Wiley & Sons, Hoboken, NJ, 2003, 170 pp., $79.95, ISBN 0-471-23326-9.

The Local Chemical Analysis of Materials, J.W. Martin, Elsevier, Oxford, 2003, 215 pp., $120.00, ISBN 0-08-043936-5.

Macromolecules Containing Metal and Metal-Like Elements; *Vol. 2:* **Organoiron Polymers**, Alaa S. Abd-El-Aziz, Charles E. Carraher, Jr., Charles U. Pittman, Jr., John E. Sheats, and Martel Zeldin, eds., John Wiley & Sons, Hoboken, NJ, 2003, 287 pp., $125.00, ISBN 0-471-45078-2.

Metal and Ceramic Matrix Composites, B. Cantor, F.P.E. Dunne, and I.C. Stone, eds., Institute of Physics Publishing, Bristol, 2004, 429 pp., $125.00, ISBN 0-7503-0872-9.

Methods and Materials for Remote Sensing: Infrared Photo-Detectors, Radiometers and Arrays, Yuri Abrahamian, Radik Martirossyan, Ferdinand Gasparyan, and Karen Kocharyan, Kluwer Academic Publishers, Dordrecht, 2004, 160 pp., $135.00, ISBN 1-4020-7706-8.

Millimeter-Wave Waveguides, Dmitri Lioubtchenko, Sergei Tretyakov, and Sergey Dudorov, Kluwer Academic Publishers, Dordrecht, 2003, 191 pp., $115.00, ISBN 1-4020-7531-6.

Nanocomposite Science and Technology, Pulickel M. Ajayan, Linda S. Schadler, and Paul V. Braun, Wiley-VCH, Weinheim, Germany, 2003, 230 pp., $135.00, ISBN 3-527-30359-6.

Physics and Chemistry of Interfaces, Hans-Jürgen Butt, Karlheinz Graf, and Michael Kappl, Wiley-VCH, Weinheim, Germany, 2003, 361 pp., $55.00, ISBN 3-527-40413-9.

Spectroscopy of High-T_c Superconductors: A Theoretical View, N.M. Plakida, ed., Taylor & Francis, London, 2003, 294 pp., $90.00, ISBN 0-415-28808-8.

Statistical Physics of Crystals and Liquids, Duane C. Wallace, World Scientific, River Edge, NJ, 2003, 312 pp., $58.00, ISBN 981-238-112-0.

Underneath the Bragg Peaks: Structural Analysis of Complex Materials, T. Egami and S.J.L. Billinge, Pergamon, Oxford, 2003, 404 pp., $165.00, ISBN 0-08-042698-0. □

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