BOOKS

Polymer Materials Science, Jerold M. Schultz, Prentice-Hall, Inc., Englewood Cliffs, N.J. (1974). 524 pages. $20.00.

Heretofore, textbooks of polymer science have been written from the chemist's or chemical engineer's viewpoint, with a heavy emphasis on polymer synthesis. However, polymers have become so ubiquitous that their further development and utilization require the disciplines of the mechanical and the materials engineer. It was the author's intention to provide a text or self-study guide which assumes the reader has a basic knowledge of physics, crystallography, solid mechanics, and mathematics, with a lesser familiarity with organic chemistry. This approach is commendable because new advances in polymeric materials will be primarily based on process improvements and control of morphology rather than on the chemical design of new molecules.

Although Professor Schultz's approach is promising, to this reviewer the product was disappointing. The treatment often varies from great detail to offhand comments: several pages are devoted to details of transmission electron microscopy but only two sentences to scanning electron microscopy; the molecular weight distribution for addition polymerization with termination by recombination is treated in detail, whereas termination by disproportionation or transfer is ignored. Some theories are presented by rather unconventional approaches, with little indication why these may have any more merit than the classical derivations. It is disturbing to find derivations that are based on oversimplified models which are later generalized. More rigorous derivations would appear preferable. The book has many flaws, the most serious of which is the excessive number of typographical errors; Figure 2.55 exists in four parts but has no caption or coordinate details; Figures 2.56 and 2.57 also lack coordinate details; some micrographs lack specific scaling factors; Figures 5.8 and 7.3 are wrong; Figure 7.9 contains data on natural and GR-S rubbers but is cited in the text as containing data on poly(diethyl siloxane); a few electron micrographs are too cluttered and obscure to be easily understood; equations contain misprints and omissions, and are sometimes incorrectly cited. There are also some erroneous statements; namely, the reader is first introduced to rubbers ". . . as coiled chains, held together by interchain crosslinks," an incorrect definition as this class of materials also includes uncrosslinked but vulcanizable elastomers. Further on in the same chapter, in the discussion of the effect of crosslink density on properties, appears another erroneous statement: "rubber-like materials are characterized as highly crosslinked polymers;" the term *highly crosslinked* is usually reserved for inelastic resins and thermosets. Fillers in rubbery materials are treated as reinforcing particles only. The important aspects of nonreinforcing particles are ignored.

The concepts and examples are not well presented, and an unwary reader could be easily misled into making unwarranted generalizations.

L. H. Peebles, Jr.
Office of Naval Research
495 Summer Street
Boston, Mass. 02210

An Introduction to Process Dynamics and Control, Thomas W. Weber, John Wiley, New York (1974). 434 pages. $19.95.

There have been so many texts published in this subject area that it seems we should run out of possible titles, but Professor Weber's book is both originally and appropriately titled. A serious attempt has been made to establish some physical insight in the reader rather than to illustrate design techniques for feedback systems. Considerable space is devoted to the elementary techniques for developing the correct differential equations. Operational techniques are not used in the first fourth of the book, and the concept of frequency response is not even mentioned until the final chapter. Examples of transient response of many simple processes are presented, and these results are used to illustrate the characteristics of control systems.

The nature of the dimensions of the controller gain, which tends to confuse students, is treated here by introduction of a dimensioned transmitter gain K_T as part of a controller with a nondimensional gain. An alternate approach would be to make the variables dimensionless with respect to the controller spans, which is consistent with the convention for industrial controllers and which yields a dimensionless gain. The temptation presented to an eager student to convert a gain from psi/GPM to $lb._F$-min./$ft.^5$ is then avoided.

The explanations in the text are clear and detailed, and many problems are included which should be both illuminating and challenging. The detailed discussions and relatively slow pace of this book should appeal to students but may not interest many professors who have unbounded confidence in their classes when selecting texts. Except for the chapter on distributed systems, the material presented in the text could be used at the sophomore or junior level. This book might be most appropriate for a first course in a curriculum which had space for a later course on more advanced topics.

A. D. Baer
Dept. of Chemical Engineering
University of Utah
Salt Lake City, Utah

Transport Phenomena and Living Systems: Biomedical Applications of Momentum and Mass Transfer, E. N. Lightfoot, John Wiley, New York (1974). 495 pages. $22.50.

Student and practitioners of transport phenomena with interests in solving biomedical problems will welcome this fine text. The book clearly shows its lineage and includes numerous cross-references to its parent. It is, however, a distinct and unique being in its own right. While the temptation must have been great simply to exercise the methodology of transport phenomena in a biological context, Professor Lightfoot has chosen to approach real biological problems from a transport perspective. This is an important distinction. Deduction from fundamentals is pursued to practical limits in a number of areas, and the pursuit is both stimulating and challenging to follow. But practical physiologic, pharmacologic, and engineering problems are not avoided merely because useful results cannot yet be obtained a priori. There is a clear statement of the heuristic process which demands judgment in equipment design and model development. The book thus integrates the art and science of chemical engineering in an unusually creative way and illustrates how necessary practical simplifications may be tested in magnitude against theory.

The text is devoted exclusively to momentum and mass transfer with somewhat greater emphasis on the latter. Much of it is comprised of examples which illustrate and enlarge upon basic material, and many thoughtfully