Plastics Process Engineering. James L. Throne. 944 pp. Marcel Dekker, 1979, $65.00.

There are two general approaches to writing a technical book. One is to do a definitive review of a limited area. The other is to teach a subject step by step giving examples and key literature references. This book attempts to be both. Polymer processing is now simply too large a subject to review effectively in one text. Throne does a good job in some areas. The material on rotational molding and thermoforming does not appear to be available in other texts. But injection molding, for example, is covered incompletely; too much time is spent on older and less useful references while important ones are missed. The chapter on reactor design, a subject not covered in other processing texts, is rather theoretical and out of content with the rest of the book. Little is given on mixing and calendering is not discussed.

The author includes homework problems and suggests that the book can be used as an undergraduate or graduate textbook or for self study. In comparison to other texts available in the field the price alone argues against this. The publishing quality (my copy arrived with the binding torn off) is also a deterrent. A more fundamental problem is that the book does not really teach the subject. There are no worked examples. Topics are not developed from a point of view. Literature work is just presented without critique or unification of different approaches.

The book generally takes the traditional approach, looking at each different process, extrusion, blow molding etc. rather than that of fundamental process operations in the recent book by Tadmor and Gogos [see book review *AIChE J.*, **26**, 173 (1980)]. Of the basic principles needed for process modelling only heat transfer is covered to any extent. For momentum transport only some non-Newtonian viscosity relations are given. Mass transfer appears under "Thermodynamics".

Although the book is not recommended as a text, the specialist, particularly in industry, will find a number of useful sections. In addition to those mentioned above there is a chapter on assembly techniques and a fairly extensive one on plastics economics. The subject index (no author index) will also be useful to those seeking specific material.

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Solution Chemistry of Surfactants, Volumes 1 and 2, ed., K. L. Mittal, Plenum Press, New York, 1979, 961 pp., ISBN 0-306-40174-6 (vol. 1) and 0-306-40175-4 (vol. 2), $75.

The two volume set documents the proceedings of the section on Solution Chemistry of Surfactants of the Fifty-second Colloid and Surface Science Symposium held at Knoxville, Tennessee, June 12-14, 1978.

Volume 1 contains eight overview papers, followed by sections on thermodynamics and kinetics of micellization in aqueous media and effect of solvent and micelles in nonaqueous media. Volume 2 covers reactions and interactions in micellar media, microemulsions and reactions in microemulsion media, adsorption at interfaces and general papers. Forty-nine papers by 108 contributors from 19 countries are included.

The overview section establishes a good foundation for a full appreciation of the current research papers that follow. The influence of surfactant chemistry on chemical reaction improvement, analytical chemistry, and electrochemistry is well-covered. Many applications of surfactant chemistry are discussed with special emphasis on the timely topic of enhanced oil recovery.

Experienced researchers and newcomers will benefit by an immediate entrance to the expanding literature on the subject. A reader obtains a good perspective of the current status of fundamental thought and demonstrations of utility of modern techniques to the study of surfactant chemistry.

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Fundamentals of Freeze Drying, J. D. Mellor, Pub 3/79, Academic Press, 1978; $47.50, 386 pages.

Freeze drying is used for preparing biological specimens and for pharmaceutical manufacture. It has taken over about one-third of the instant-coffee market, and is used for various specialty foods, as well as meals for backpacking and military purposes. There have been several previous reviews of the field, but none as detailed as that presented here by Mellor.

Three major subjects are covered—theoretical analysis of drying rates; a survey of processes and equipment, including the cycled-pressure process devised by Mellor; and characteristics of particular substances affecting freeze drying. The treatment is in the vein of chemical engineering and transport. A nomenclature section and about 400 references are included.

Many topics are considered, but the coverage is nevertheless somewhat uneven. The book describes several useful laboratory devices and explores some innovative process approaches, but is light on standard, batch, tray freeze dryers (2 pages); microwave freeze drying (3 pages); condenser design and placement; the specific application to coffee; agitated freeze dryers with continuous solids flow; and some of the newer areas such as production of compressed freeze-dried foods through limited freeze drying or controlled rewetting. Heat and mass transfer within the porous, dry layer are discussed in a thorough and knowledgeable fashion, although I would have liked to see inclusion of the dusty-gas type of model for combining viscous and Knudsen flows and bulk diffusion.

To some extent the theoretical development may hamper physical understanding. A reader new to the field would probably not obtain a feeling for what factors are rate-limiting to drying under various conditions, for which effects in theoretical models are only second-order corrections, or for the directional effects of factors such as freezing rate, particle size and sublimation temperature on the loss of volatile flavor substances.

With regard to the cycled-pressure process, I still come away with the feeling that the gains in overall drying rate which may be attained do not offset its complexity. Ordinary freeze drying is usually rate-limited by heat transfer. Cycling the pressure upwards takes advantage of the increase in thermal conductivity of the dry layer with increasing pressure. However the rate advantage will be minimized or eliminated by comparison with a noncycled case where the pressure is also higher than usual. For that comparison case it may be desirable to create some gas circulation to keep mass transfer between the piece surfaces and the condenser from becoming a rate limit. A modified design using a vacuum fan of the sort used in the Zarchin process for vapor-recompression evaporation should do this in much simpler fashion that pressure cycling.

Despite these specific misgivings, I do feel that this is an important and useful book, which should be on the shelf of anyone seriously concerned with freeze drying.

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Transport Processes and Unit Operations, Christie J. Geankoplis, Allyn and Bacon, Inc., Boston, Massachusetts, 1978; 650 pages, $25.95.

This comprehensive volume serves the purpose well as an introductory text on transport processes and unit operations for undergraduate students of chemical engineering. The entire book can be covered in a one-year course of study. The text will also be useful for students graduating in bioengineering, ceramic engineering, environmental engineering, food technology, mechanical engineering and metallurgical engineering.

The book is divided into two parts. Part I deals with the fundamentals of transport processes dealing with the transfer of mass, momentum and heat. Part II covers the applied aspects and many unit operations have been discussed. The list of unit operations, though considered sufficient, yet many operations like adsorption, dialysis and ion-exchange are not covered. Both

parts of the book are logically divided into several chapters and each contains an impressive number of solved examples as useful illustrations. The subject matter is dealt with considerable clarity and originality. Each chapter terminates with a selected list of unsolved problems which should prove very useful for the adoption of this book as a text. An added attraction of the book consists in the adoption of SI (Système International d' Unités) system of units. The author is to be congratulated for the job done so well.

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"Wastewater Treatment," Donald W. Sundstrom and Herbert E. Klei, Prentice-Hall, Inc., Englewood Cliffs, NJ, May 1979, 444 pp, $23.

The authors have emphasized basic principles of biological, physical, and chemical unit processes in current use or with future potential. Unlike most introductory texts on wastewater treatment, the coverage reflects a strong chemical engineering approach which is particularly evident in the sections dealing with aeration and mass transfer, biological mechanisms and kinetics, adsorption, and membrane processes. The discussions of unit processes and operations are not tied to specific applications but these are amply available in the literature and the book does not suffer in their absence. The introductory chapter on wastewater characteristics is abbreviated and somewhat lacking perspective of toxic "priority" pollutants, hazardous substances, and appropriate regulatory jargon. The chapter on sludge disposal is too brief considering its relative importance. Gas stripping and solvent extraction could also have received more attention although aeration is well covered. Some mention of relative energy consumptions would have augmented the cost chapter.

The text, equations, and figures and problems are generally well composed and readable. The notation is well explained within the text and summarized *in toto* in a separate appendix. Page or subject references for the lesser known constants and dimensions for other symbols would have been helpful.

Overall the authors have demonstrated their familiarity with both the chemical and environmental engineering literatures. The book can be recommended as a good introductory text on the subject for a senior/first-year graduate course.

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Handbook of Separation Techniques for Chemical Engineers, Philip A. Schweitzer, Editor in Chief; 1,093 pages; $42.50, McGraw-Hill, New York (1979).

This handbook treats the major industrially significant separation techniques. With the exception of ion exchange, the editor has excluded those techniques involving chemical reactions. Thus, the scope of the handbook can be said to include methods for separation of mixtures of gaseous, liquid, and solid components from themselves or from the suspending medium, using thermal or mechanical driving forces.

The theoretical developments of each of the techniques described is limited purposely while the practical application of the techniques is emphasized. The latter is facilitated through the use of appropriate illustrative examples.

Most sections of the book are adequately referenced, and some extensively, for those having need to pursue the techniques in more detail. In many cases the references include appropriate industrial catalogues and publications. Some sections include useful lists of manufacturers of separation equipment.

One is disturbed by the lack of uniformity in the organization of the material. In some sections for example, a tabulation of nomenclature or notation is included at the beginning of the section. This is a useful practice but it is not followed uniformly throughout the book. Some sections include means for judging the economics of the technique, but economic analysis information is sparse and not uniformly presented. There is a lack of uniformity or even-handedness in the treatment of some of the techniques, some sections overdetailed and others significantly abbreviated.

The author does not dwell unduly on theory, and the book can be used and easily understood by any practicing chemical engineer. It will have most value to process and plant engineers, but can also serve as a useful reference for the student and the academic person. For the latter group, it can serve as a useful introduction to the practical state of the art and an introduction to the current literature.

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Fluid Catalytic Cracking with Zeolite Catalysts, Paul B. Venuto and E. Thomas Habib, Jr., Marcel Dekker, Inc., New York, 1979, 156 pages, $19.50.

Research on zeolites opened a new frontier in catalysis. These crystalline aluminosilicates provide high surface areas in uniform molecular-scale pores, allowing shape-selective catalysis (molecular sieving), high activities for hydrocarbon conversions, and new selectivities associated with "solvation" of reactants by the narrow pores. Zeolites revolutionized the technology of gasoline manufacture, saving U.S. refiners some $\$2.5 \times 10^8$/year by the late 1960's; they are now used for cracking of 5×10^6 bbl of oil/day.

This book is a review of the catalytic cracking process, drawing on literature prior to 1978. It was produced directly from a typewritten manuscript and has already appeared in *Catal. Rev.-Sci. Eng.*, **18**, 1 (1978). It is understandable at the elementary undergraduate reaction engineering level, providing an easy-to-read summary and a good introduction for the beginner, who may, however, be slowed a bit by the jargon ("olefinicity," "solid fluid catalyst particles") and acronyms.

The chemistry of the process is stated concisely and conventionally, the reaction engineering qualitatively and naively—apparently for chemists. There is an ample selection of processing data and a thorough qualitative statement of the complex interplay of variables in the process.

The strength of the review is the authenticity and breadth of the process description. Equally reflecting the authors' industrial association, the review catalogs the literature without extending or critically evaluating it. What are the key unresolved issues, research needs, and directions of evolution of the cracking process? What are the catalysts that accelerate CO combustion in the regenerator; how can effects of metals poisoning be minimized; how can one judge what "lumps" are appropriate for process modeling? It is the reader who must locate the cutting edges.

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ERRATA

In the table of contents [*AIChE J.*, **26**, No. 1 (1980)] the authors of "The Influence of Mixing on the Antisolvent Induced Agglomeration and Sedimentation of Mineral Matter in Coal Derived Liquids" should read: K. R. Vaidyanathan, F. H. Verhoff and J. D. Henry, Jr.

In "Sweetening of Sour Natural Gases by Mixed Solvent Absorption: Solubilities of Ethane, Carbon Dioxide, and Hydrogen Sulfide in Mixtures of Physical and Chemical Solvents" by O. R. Rivas and J. M. Prausnitz [*AIChE J.*, **25**, 975 (1979)] the term diglycolamine was improperly used. Diglycolamine® agent of 2 (2-aminoethoxy) ethanol has for many years been, and continues to be, a registered trademark owned and used by Jefferson Chemical Co., Inc.