

BOOK REVIEWS

Ullman's Encyclopedia of Industrial Chemistry

Vols. B2, B3: Unit Operations I, II

Edited by Barbara Elvers, Michael Ravenscroft, James Rounsaville, Gail Schulz; Wolfgang Gerhartz, Executive Editor, VCH Publishers, New York, 1988, approx. 650 pp./vol., \$190.00 vol.

This encyclopedia has been a standby of chemical technologists and process engineers for many years, and the two volumes under review are part of a fifth, completely revised English language edition. The volumes appearing currently are classified as "A Series" and "B Series." The former have alphabetically arranged topics with the same general coverage as the Kirk-Othmer and McKetta encyclopedias; some 12 out of a projected 28 volumes in this series have appeared so far. The B volumes cover basic unit operation and unit process information; to date, only the B2 and B3 volumes have been issued. Chemical engineers involved with the classical unit operations will be especially interested in these two volumes.

At first perusal, the books are impressive. Typography and graphics are done in the characteristic style found in German publications. Reference lists appear extensive and up-to-date. Credentials of chapter authors are strong. The articles exhibit careful editing and consistency of style. And, going deeper into the technical content of the works, one is not disappointed in their substance. Indeed, the books hold up well under careful scrutiny and represent a valuable source of information on current practice in a number of the chemical engineering unit operations.

Volume B2 deals primarily with solids processing operations. Chapter authors are primarily from Western Europe, where much of the current research in

solids technology is being conducted. There is a brief, but useful, introduction to solids technology that sets the stage for the book's coverage; following this, the contents are divided into three main sections: particle technology, phase separation and classification, and fluid-solids mixing. Major chapters of the particle technology section cover particle size analysis, crystallization/precipitation, solids drying, size reduction, size enlargement, and solids handling. A chapter on spraying and atomization of liquids seems to appear as an interloper, and is given much less space than it probably deserves; its intermediate location is, of course, due to similarities between the mechanics of solid and liquid particles. The section on separation and classification is divided into subsections of solid-liquid, solid-gas and solid-solid processes. Major coverage is given to filtration, centrifugation, dust removal, screening, and elutriation. It is interesting to note that contributions from the United States have centered on specialty techniques such as flotation and electrostatic precipitation, indicative of the role of these techniques in the minerals industry. The third section, on mixing, embraces stirring (solid-liquid) and blending of solids. A brief chapter is also included on the mixing of highly viscous fluids as might be found in polymer processing. It is noted that coverage of gas mixing is reserved for Volume B4.

Volume B3 covers fluid processing operations and is divided into five sections: diffusional separation processes, separations in biotechnology, energy management and heat generation, low-temperature technology, and vacuum technology. Here the authorship of the chapters is more internationally distributed, with significant contributions from North America. The major techniques for sepa-

rating homogeneous mixtures are covered in this volume, with the exception of membrane permeation, which has been consigned to Volume B1. As for the previous volume, a brief introductory chapter sets the stage.

The lead section, on diffusional separations, occupies about two thirds of the book, and includes a very complete section on distillation. Major coverage is also given to liquid-liquid extraction, gas absorption, and adsorption, in keeping with their prominence in the chemical industry. These chapters provide a useful combination of fundamental considerations and equipment-related discussions. Inserted in this section are impressive chapters on heat exchange and evaporation, the former running well over 100 pages.

A most welcome section deals with separations in biotechnology and comprises chapters on process scale chromatography and on bioseparations in general. The section on energy management and heat generation includes chapters on combustion, energy management, pinch technology, cooling towers, heat transfer media, electrically generated heat, and radiation heating. In this section, treatments tend to be more descriptive than specific. Brief sections on low-temperature technology and vacuum technology round out the book.

For both of these volumes the coverage of topics is thorough, within the space constraints, and timely. As mentioned earlier, reference lists are extensive and include many citations dated in the latter 1980's. As is inevitably the case, the material will become dated before another edition of the encyclopedia appears. Whether supplementary volumes will appear for updating purposes (as is done for the Kirk-Othmer) has not been announced. Meanwhile, the current state of unit operations coverage by this work is

quite good, and most readers will find that the chapters serve as excellent review pieces.

These volumes will represent important sources of information for chemical engineers in research, process development, and process design. Coupled with

the parent series that provides alphabetically arranged information, they represent an important resource that belongs in every technical library related in any way to the needs of chemical technologists and scientists. A subscription to the alphabetical series is not necessary in or-

der to purchase these unit operations volumes. This reviewer recommends them highly!

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Laboratory Studies of Heterogeneous Catalytic Processes

E. G. Christoffel (ed., Z. Paál), Elsevier Studies in Surface Science and Catalysis, Vol. 42. New York, 1989, 263 pp., \$144.00.

This book is faithful to its name in presenting several aspects of the experimental study and analysis of heterogeneous catalytic reactions. The material is divided into four chapters: Introduction, Basic Phenomena and Concepts in Catalysis, Investigation of Heterogeneous Catalytic Reaction Systems, and Laboratory Reactors. The material is presented in

very concise form and encompasses a wide range of technical levels. It thus serves primarily as a valuable, condensed reference work rather than a textbook in this reviewer's opinion.

The material of Chapter 3 on investigations of catalytic reactions is undoubtedly the strong point of the book. Contents start with means for investigation of reaction mechanisms, proceed to development of kinetic models with an excellent discussion of parameter estimation methods, and conclude with discussions of mass transport and deactivation effects. A number of examples are included with

the text material that serve as a valuable introduction to the original literature. The coverage of Chapter 4 on laboratory reactors is complimentary to that preceding, and applications of various typical reactors (flow, micropulse, etc.) are described in some detail. The contents of these two chapters can be highly recommended as supplementary to the contents of most current texts on catalysis or reaction engineering.

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Handling of Bulk Solids, Theory and Practice

By P. A. Shamlou, Butterworths, Stoneham, MA, 1988, 193 pp., \$49.95.

This book attempts to address the field of bulk solids handling on a more global basis than has been addressed previously. It is written in a style appropriate for advanced undergraduate or graduate courses on the topic, but also seems to have up to date references in most chapters so that the materials will be valuable to practitioner and researcher as well.

This book is broken down into eight chapters consisting of:

1. Bulk Solids Flow and Handling Properties
2. Pressure Profiles in Bulk Solids Storage Vessels
3. Design of Storage Vessels or Particulate Solids
4. Gravity Flow of Particulate Solids
5. Pneumatic Conveying of Bulk Solids

6. Hydraulic Transport of Particulate Solids

7. Mechanical Conveyors

8. Safety in Bulk Solids Handling

The first half of the book covers solids behavior in bins or vessels, with the interaction of the solids to the vessel and the vessel to the solids. This is a rather comprehensive treatment and should provide both the student and the designer with adequate information to handle this topic rather thoroughly. The references employed in the text are extensive and current, indicating the author's comprehension of the topic, and the historical references are not ignored.

The second half of the book addresses the pneumatic, hydraulic and mechanical transport, along with safety considerations. It is refreshing to see a chapter dedicated to safety to forward community awareness of safety issues for design considerations in the bulk handling of solids. The treatment of the transport sections is adequate, providing the reader with basic information on the topic and giving suffi-

cient information to begin the design process. The detail present in the bin and vessel sections is somewhat lacking for the transport section, a lack which could stem from the author's interest and experience. Some current literature and small points are missing but these do not detract from the overall objective of the book, i.e., to provide information in one place about everything from storage to delivery of bulk solids.

The writing style is straightforward and clear in its approach. I believe that this book is a definite contribution to the field of bulk solids and handling. It is essential for the industrial and academic community to recognize the importance of this topic and that the behavior of solids is not like those of gases and liquids. This book goes a long way to meeting this challenge and should be considered for courses which cover bulk solids.

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Gas-Liquid-Solid Fluidization Engineering

By L. S. Fan, Butterworths series in Chemical Engineering, Stoneham, MA, 1989, 763 pp., \$85.00.

This monograph presents a very detailed review of an important and timely subject. The author should be complimented for a rather complete presentation of the available literature on the

hydrodynamics, mixing and transport characteristics of a variety of three-phase fluidized bed columns. The monograph should be useful to both industrial practitioners and students involved in re-