tists and technologists working in the field of oxide chemistry and catalysis.

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Interfacial Phenomena. Equilibrium and Dynamic Effects

By Clarence A. Miller and P. Neogi, Marcel Dekker, 1985, 354 pp., $69.50.

This book is Volume 17 in the "Surfactant Science Series," familiar to any researcher in interfacial phenomena. Unlike most of its predecessors in this series, this volume is written as a textbook.

Interfacial Phenomena. Equilibrium and Dynamic Effects is the first book in the field written by chemical engineers specifically for chemical engineering applications of colloid and surface chemistry. As a result, it contains a significant amount of material previously unavailable in a single volume, treated in a unified manner. Furthermore, much of the basic material is presented more rigorously than in traditional references and texts in interfacial phenomena.

The first four chapters are an introduction to the principles of interfacial phenomena. Chapter 1 covers the fundamentals of interfacial tension. The concept of interfacial tension is derived scrupulously using both thermodynamics and mechanical approaches. This concept is extended to applications including shapes of interfaces, measurement of interfacial tension and adsorption. A particularly unique feature of this chapter is the inclusion of a discussion of the Cahn and Hilliard approach to calculating interfacial density and concentration profiles. Chapter 2 continues along the same lines, covering wetting and contact angle phenomena. Both molecular and empirical approaches are included. Once again, material unique to this text is included covering contact angle hysteresis and density profiles in liquid films.

Chapters 3 and 4 are a basic introduction to colloids and surfactants, respectively. The chapter on colloids only covers particle interactions in detail, immediately moving to discussions of colloid stability and coagulation. The section on polymer stabilization of colloidal dispersions is somewhat unique to texts in this area. Conspicuously absent is significant treatment of electrokinetic phenomena. The chapter on surfactants briefly covers some chemistry of surfactants and one model of micellization thermodynamics. The majority of the chapter is devoted to other patterns of association such as microemulsions, liquid crystals and surface films, some of which represents material not treated in other texts.

Chapters 5–7 cover interfacial transport phenomena, and really set this book apart from all others in this field. Interfacial conservation equations are derived, and their application to problems in interfacial stability is emphasized. In particular, an entire chapter is devoted to interfacial stability and wave motion, using linear stability analysis. This chapter is very readable since the discussion is limited to the prototypical instabilities that give physical insight without excessive mathematical complexity. A second chapter covers instabilities caused by heat and mass transfer, including the familiar Marangoni instability. Brief discussions of nonequilibrium interfacial tension, and the effects of chemical reaction and spontaneous emulsification are also included. The third chapter briefly covers a variety of other problems in interfacial transport including surface rheology and dynamic contact lines.

In reviewing a book such as this, the goals of the authors as well as the utility of the book to the interdisciplinary audience to which it must appeal should be considered. The authors have written this book to give a brief introduction to interfacial phenomena with significant emphasis on the nonequilibrium aspects. In this sense, they have been successful. Any chemical engineer with knowledge of transport phenomena could learn the principles of interfacial phenomena from this book. Anyone with previous knowledge of colloid and surface chemistry could do the same, although some knowledge of transport phenomena might be a useful prerequisite. The phsyical explanations that encompass the analysis are uniformly excellent. The reader desiring to learn the material in detail, particularly that on interfacial dynamics, will want to keep a paper and pencil handy to insert missing steps in the derivations, not always a trivial exercise in this book. The reader doing this will find very few errors in the equations, all of which are obvious. The same applies to the descriptive material. Readers seeking more depth on particular topics will find ample references to other texts and the research literature. In summary, the practicing engineer or scientist in colloids and surfaces should consider this book essential as a reference.

Finally, the utility of this book as an instructional text should be considered. Students may find the presentation somewhat terse compared to other textbooks, and many of the problems are quite challenging both intellectually and analytically. For a one-semester course emphasizing interfaces and interfacial transport, there is no better text available. For a course on colloids, this book is unsuitable. For a one-semester survey course covering both interfaces and colloids, such as that taught by this reviewer, the book can still be used as long as it is supplemented with material on colloid science and colloid transport. While the price may seem high for a textbook, the publisher does offer almost a 40% discount on orders of at least five copies for classroom use.

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Handbook of Energy Systems Engineering

Edited by Leslie C. Wilbur, Wiley Series in Mechanical Engineering Practice, 1985, 1,775 pp., $74.95.

According to the publisher, this volume "is a rich sourcebook of reference data and formulas, performance criteria, codes and standards, and techniques used in the development and production of energy." Material was "chosen for its optimum usefulness and applicability to the field of energy engineering."

The Publisher's advertisement is a fair summary of this comprehensive handbook that will be of special use to practicing engineers with prior familiarity with any of the many subjects for which this reference volume serves as a source of quantitative data. The book is not meant to be and is not suitable as a textbook on energy engineering.

The book contains the following information: demographics (energy demands, consumption, prices, and sources); energy use for conservation, heat utilization, storage, transportation, and cogeneration; energy utilization laws and principles (thermodynamics, heat transfer, thermophysical properties, and fluid mechanics); energy systems technology (pumps, fans, valves, piping, lubrication, instrumentation and controls, compressors, cooling systems, water treatment, shell and tube heat exchangers, compact heat exchangers); prime movers (steam turbines and engines, gas turbines, internal combustion engines, jet and rocket engines); coal technology; nuclear technology; petroleum technology; gas technology; solar-derived power; geothermal energy; environmental control; electricity generation, distribution and use; advanced energy systems; guide to codes, standards, and reference material; engineering mathematics; conversion factors; physical and critical constants; transport properties; steam tables, etc.

As might be expected of a handbook prepared by nearly 100 authors, individual contributions and chapters exhibit widely varying quality and topical coverage. Many chapters are marred by inadequate lists of references, which appear thorough elsewhere (e.g., in the chapter on nuclear technology and the section on biomass conversion under solar-derived power). This problem requires correction in a future edition. The index appearing at the end of the book, however, is complete and useful.

There are important developing energy technologies that are covered either too briefly or not at all, *viz.*, tars and heavy oils, synthetic fuels, fusion energy, and geothermal energy from hot, dry rocks. The chapter called "Advanced Energy Systems" is an unusual collection of topics, namely, the hydrogen economy (rather complete), fusion power (disposed of in 7 pp), and laser diagnostics (dealing only with holography, speckle interferometry, and computer-aided interpretation of laser images). Chapter 17 on "Engineering Mathematics" is a substantially augmented handbook compilation of mathematical formulas.

This book has some, but not many typographical errors. Essentially all of the topics are covered by experts, who possess firsthand information about the systems and techniques they describe. The utility of the book derives from this hands-on experience of the authors, as will become apparent to readers of the chapters dealing with energy systems, coal, nuclear, petroleum, solar, and geothermal technologies. This handbook should prove to be useful to energy engineers working in many fields.

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Fluid Mixing Technology

By James Y. Oldshue, McGraw-Hill, New York, 1983, 574 pp., $41.00.

Mixing in the Process Industries

By N. Harnby, M. F. Edwards, and A. W. Nienow, Butterworths, London, 1985, 374 pp., $87.95.

Liquid-liquid, liquid-gas, and liquid-solids mixing in batch vessels is the primary topic of both these books. It has been nearly twenty years since the last comprehensive treatment (Uhl and Gray, *Mixing: Theory and Practice,* Academic Press, 1966), and the present books provide a welcome update and overview. *Mixing in the Process Industries* will be of more use to researchers, while *Fluid Mixing Technology* is recommended for the practicing engineer who has no interest in becoming a specialist but wants some general background in the field.

The Oldshue book defines the terminology of batch mixing and explains some general design considerations. A helpful feature in the book is the keywords section and miniindex provided at the end of each chapter, which allows the reader to review the main points. The book rarely provides enough information to make a specific design choice. Many graphs display "typical results" without specifying the experimental system. This is acceptable in a field that relies heavily on past experience and on the conservative scaleup of specific, pilot plant results. *Fluid Mixing Technology* realistically portrays modern, commercial practice in the design and analysis of batch mixers. There has been comparatively little impact from the transport phenomena approach that had revolutionized some aspects of chemical engineering design. Those interested in research on mixing must accept this both as a frustration and as a challenge.

Mixing in the Process Industries was cohesively written by the editors, who were also the major contributors. All three are academics, and they set a rather different tone for the book than that by Oldshue.Their coverage tends to be more detailed, and they provide comprehensive references and an indication of current research directions. Although their book is still primarily intended for the nonspecialist, Harnby, Edwards and Nienow hint at how the field may ultimately evolve from engineering empiricism to engineering science. A special feature in the book is an extensive discussion of solids-solids mixing. A notable omission is a chapter devoted to turbulence theory and modeling.

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What Every Engineer Should Know About Computer Modeling and Simulation

By D. M. Ingels, Marcel Dekker, Inc., 1985, 176 pp., $27.50

The title gives the impression that this book could be a guide for students and practicing engineers interested in computer modeling and simulation. Unfortunately, the text falls short in many areas and turns out to be little more than a philosophical overview of the process of computer modeling and simulation. Although the intended audience are newcomers to the field, the book provides little more than an organization of the step-by-step approach used in the production of large software packages.

The text opens with a brief introduction into computer modeling and simulation. The next three chapters deal with methodology, defining and analyzing the problem, and generating mathematical models, respectively. These chapters do not contain significant amounts of useful information and lack the illustrations required to emphasize major points. The material presented in these chapters is better stated with greater applicability to chemical engineering in the text by R. Aris, *Mathematical Modelling Techniques,* Pittman, 1978.

Chapter 5 describes solution techniques for mathematical models. The techniques illustrated are very old and many are no longer used in modern mathematical software. The latest reference in this chapter is 1977 with many in the 1950's and 1960's. Since numerical analysis is a rapidly changing area, this chapter is out of date.

Chapters 6 and 7 deal with the development of the computer model and the overall simulation, respectively. Chapter 6 is well written and is the saving point of the text. A good discussion of computer languages suitable for simulations and characteristics of good software, e.g., transportability are presented. Finally, Chapter 7 reviews many of the previous discussions and provides an outline of steps to follow from the beginning to the end of a computer simulation.