where is there to be found a treatment of slug or intermittent flow, which occurs widely in industrial equipment; of the problem of flooding in gas liquid flow, which is central to the design of nuclear reactor core cooling systems; pressure drop and holdup in large diameter pipes, in which the energy industry has so much concern; or drop sizes and interchange processes in annular flow, which determines the design of gas-liquid reactors in the chemical industry. Modern computational methods for calculating gas-liquid flow using large integrated codes, and the special problems this entails, find no mention either.

On the other hand there is plenty of redundancy. As examples, bubble rise velocity is treated in some detail in four chapters, the equations of motion for dispersed two phase flow in three, design and operation of bubble columns in three, along with innumerable development of flow pattern maps. In a volume dedicated to gas-liquid flows it is strange to find two chapters dealing with liquid-liquid flow and one with visualizations methods for single phase flow. It's as if these chapters were added to fill out the preplanned page requirement.

Volume 3 consists of three sections; 1. "Properties of dispersed and atomized flows," 15 chapters., 2. "Flow regimes, hold-up and pressure drop" 16 chapters and 3. "Reactors and Industrial applications" 18 chapters. In each section the quality and relevance of each contribution varies enormously. An excellent, encyclopedic presentation of contacting and hydrodynamics of trickle bed reactors by Dudukovic and Mills in Section three is counterbalanced by a cookbook type chapter on the Hydraulics of Distillation column piping in the same section. Some few chapters deal with a subject broadly but most concern themselves with a very narrow aspect of the field. This book is hardly an encyclopedia and will be of only limited use to the researcher or designer concerned with gas-liquid flow.

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Encyclopedia of Fluid Mechanics *Volume IV: Solids and Gas-Solids Flows,* 1,391 pp.

Though described as an encyclopedia, this volume is actually a collection of papers in the area delineated by the title. These are grouped into four sections, namely: properties of particulates and powders, particle-gas flows, fluidization and industrial applications, and particulate capture and classification. Of the forty-four articles printed, eight are written by the editor himself, and the remainder by authors from a wide variety of backgrounds and geographic locations. A few of these are well known contributors to their fields, with a broad view of the current state of knowledge and the ability to summarize it in a way one would hope to find in an encyclopedia article. Unfortunately, many are not, and some contribute little more than a narrow account of a particular contribution of their own. On the positive side, one might mention an excellent review of bubble dynamics in fluidized beds, written by the editor, and a number of other chapters which, if nothing else, end with useful bibliographies.

In a multi-author work of this type some uneveness of quality is to be expected, but in a book which described itself as an "encyclopedia" one might expect more evidence that the authors had received guidance on the nature of their contributions, and been required to follow it. The production of the volume also seems to have received little attention. The table of contents lists forty-four articles and an index, occupying a total of 1391 pages. However, the review copy actually ends on page 1329, after the forty-second article!

In summary, this is a poor production, not at all to be compared with the great scientific encyclopedias, whose articles have often become classic expositions of their fields. Its price is such that its main market would be expected to be academic and technical libraries, and even for them it does not represent good value.

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Supercritical Fluid Extraction Principles and Practice

By Mark McHugh and Val Krukonis, Butterworth Publishers, Stoneham, MA, 507 pp., 1986, $39.95

Supercritical fluids have attracted considerable attention from the industrial and academic research communities over the past 15 years. Higher-than-ideal gas compressibilities, liquid-like densities, low viscosities (typically an order of magnitude lower than for organic solvents), and kinematic viscosities that are lower than for liquid metals are among the remarkable combination of properties exhibited by fluids in the (approximate) range [$1 < T_r < 1.2$; $1 < P_r < 2$; $T_r \equiv T/T_c$, $P_r \equiv P/P_c$]. As chemical engineering continues its commodity/specialty transition, supercritical fluids will hopefully find their way into more and more novel applications that exploit their still largely untapped potential. The casting away of supercritical extraction's heavy "distillation-substitute" yoke is prominent among the positive developments which this trend toward diversification will undoubtedly bring about.

The authors of this book are active in supercritical research, to which they bring an interesting blend of academic (Mark McHugh) and entrepreneurial (Val Krukonis) perspectives. They have organized their work into 12 chapters, an epilogue, and two appendices. Chapters 1 through 5 provide historical and thermodynamic background information on the subject, through a discussion of: history (Chapter 2), phase diagrams (Chapter 3), experimental methods (Chapter 4), and thermodynamic modelling (Chapter 5). Chapters 6 through 12 discuss past, present and future applications of supercritical technology. The emphasis is heavily descriptive, and the topics covered include basic operating modes for supercritical processing (Chapter 6), pre-1976 applications (Chapter 7), activated carbon regeneration and water-organic separations (Chapter 8), polymer processing (Chapter 9), coffee decaffeination, edible oils extraction, pharmaceuticals processing, isomeric separations and waste stream treatment (Chapter 10), chemical reactions (Chapter 11), and supercritical fluids as nucleation media, porous polymer formation, and polymer swelling (Chapter 12). Appendix A, comprising more than 40% of the book's length, is a critical review of 95 patents; Appendix B contains computer programs for the calculation of phase equilibria via the Peng-Robinson equation of state.

The whole field of supercritical fluids is presented by the authors from an analytical, descriptive perspective, at the expense of synthetic rationalization. Readers interested in exploring potential applications and learning some of the trade's rules of thumb and exciting possibilities will find the book's seven descriptive chapters (6 through 12), 273 litera-