BOOK REVIEWS

Fluidization, Second Edition

Edited by J.F. Davidson, R. Clift, and D. Harrison, Academic Press, Inc., 1985, 733 pp., $96.50/£75.00

This volume follows the format and approach of the first edition, *Fluidization,* edited by J. Davidson and D. Harrison, 1971 by providing a compilation of expository chapters written by internationally recognized experts, covering various aspects of fluidization. The chapter titles and authors are: 1. Incipient Fluidization and Particulate Systems (J.P. Couderc); 2. Hydrodynamic Stability of Fluid-Particle Systems (R. Jackson); 3. Continuous Bubbling and Slugging (R. Clift, J.R. Grace); 4. Gas Jets in Fluidized Beds (L. Massimilla); 5. Distributor Characteristics and Bed Properties (A.B. Whitehead); 6. Spouted Beds (J. Bridgwater); 7. High-Velocity Fluidization (J. Yerushalmi, A. Avidam); 8. Downflow of Solids Through Pipes and Valves (P.J. Jones, L.S. Leung); 9. Mixing (J.J. Van Deemter); 10. Fluidization of Dissimilar Materials (A.W. Nienow, T. Chiba); 11. Elutriation (D. Geldart); 12. Coarse Particle Systems (T.J. Fitzgerald); 13A. Heat Transfer in Fluidized Beds: Convective Heat Transfer in Fluidized Beds (A.M. Xavier, J.F. Davidson); 13B. Heat Transfer in Fluidized Beds: Radiative Heat Transfer in Fluidized Beds (A.P. Baskakov); 14. Immersed Tubes and Other Internals (O. Sitnai, A.B. Whitehead); 15. The Physical Behaviour of Three-Phase Fluidized Beds (R.C. Darton); 16. Drying (D. Reay, C.G.J. Baker); 17. Particle Growth and Coating in Gas-Fluidized Beds (A.W. Nienow, P.N. Rowe); 18. Chemical Reactors (W.P.M. Van Swaiij); 19. Fundamentals of Coal Combustion (R.D. LaNauze); 20. Multiple-Spouted Gas-Fluidized Beds and Cyclic Fluidization Operation and Stability (V.B. Kvasha).

Although the present volume is labeled a second edition the editors have changed the content and focus somewhat from the original; Chapters 4, 7, 8, 12, 17 and 19 represent either entirely new topics or topics that have been given substantially increased coverage. Some articles in the original volume are classics that have stood the test of time, and as the editors state in the preface, "... the new volume should not replace the old one completely." The older articles on Particulate Systems (J. Richardson), Bubbles (P. Rowe), and Slug Flow (Hovmand & Davidson), among others, can still be consulted and used to great advantage. In other cases, understanding has improved or new phenomena have come to the attention of researchers to the point where good solid updated reviews are necessary. In this category, I include jetting behavior (Chapter 4), fast-fluidized beds (Chapter 7), and large particle systems (Chapter 12). An interesting feature of the two volumes is that, although they have many subjects and authors in common, none of the repeat authors (with one exception), have written twice on the same topic. Thus, among the many repeated topics, including mixing, reaction engineering, heat transfer, drying, effects of internals, spouted beds and three-phase systems, one can benefit not only from an updated review but also from another point of view.

The authors and editors have achieved remarkable uniformity of notation for such a diverse subject, and the chapters on the whole are well-written and up-to-date. The production quality of both figures and text is excellent. The only slightly negative comment is that the volume is lacking a good chapter on fundamental multiphase fluid mechanics. This volume is a must for any library with a reasonable collection in fluidization. Despite its high cost, it would, like the first edition, be a good purchase for active researchers in the field, as many of the chapters are of truly lasting value.

G.M. Homsy
Department of Chemical Engineering
Stanford University
Stanford, CA 94305

Handbook of Aqueous Electrolyte Solutions: Physical Properties, Estimation and Correlation Methods

A. L. Horvath, Ellis Horwood Limited, 1985, 631 p. $154.95.

This book is a compendium of estimation and correlation methods for physical properties of aqueous electrolyte solutions. The first part of the book gives a very brief discussion (14 pages) on the theory of the properties of aqueous electrolyte solutions, primarily concerning the structure of water. The second part of the book surveys in eighteen chapters the correlations found in the published literature for physical and selected thermodynamic properties of aqueous electrolyte solutions. The goal of the book as stated by the author is to present a systematic and complete collection of the more important methods reported in the literature and to make recommendations on the use of this selection of predictive methods. The intended readership is graduate students, workers and researchers in electrochemical science and engineering and related areas.

The title of the book is misleading since this book is not a handbook, but more of a resource guide to prediction and correlation methods for aqueous electrolyte solutions. Although there are tables and figures of physical property data for various aqueous electrolyte solutions, this book is not a comprehensive source for data for any electrolyte. In fact, this book is not indexed sufficiently to enable one to find data or even correlations for a particular aqueous electrolyte solution. For example, suppose you wish to know the viscosity of an aqueous solution of sulfuric acid as a function of temperature or composition. The subject index does not list sulfuric acid or any specific electrolyte. You will not find the subject "viscosity" itself but will find "viscosity diagram of aqueous solution" listed. From the subject index you are referred to Appendix 9 titled "Miscellaneous Figures." In this Appendix there are forty-eight diagrams of physical properties; five are viscosity diagrams, one is for the H_2SO_4-H_2O system. None of the diagrams in Appendix 9 are referenced and for many it is unclear if data or a correlation are represented. If you wish to find a correlation for the viscosity of sulfuric acid, the Table of Contents lists a chapter named "Viscosity." Numerous expressions are given to predict viscosity for aqueous electrolyte solutions in general. However, it is unclear what is the most appropriate correlation to use for a sulfuric acid solution.

This book does offer a starting point for an understanding of how physical properties have been correlated with over 2000 references listed to allow a search to continue for information that may be specifically needed. Each of the physical property chapters concludes with a brief recommendation of how to proceed with the correlations and estimates just reviewed. These recommendations are the most useful sections of the book. If the entire book was written in this critical manner, the book may have been more useful. As it is, a reader may be unsure about the relevance or importance of a correlation as presented without reading other literature on the subject.

Another disadvantage of this book is that the chapters are not categorized in a way to use the contents effectively. It would have been helpful to classify correlations as being applicable for dilute solutions or concentrated solutions, by electrolyte, and as being a theoretical or empirical expression. Each physical property chapter has to be read thoroughly to understand the relevance of the information presented. The book is poorly cross-referenced. For example, there is a chapter concerning activity coefficients; however, there are also discussions of activity coefficient correlations in the chapters on vapor pressure, diffusion coefficients, and osmotic coefficients. Although each chapter is self-contained, much information is repeated throughout the book. For many of the correlations the values of the empirical or property constants needed to utilize them are not given; therefore, the general relationships that are given would be difficult to apply to a specific solution.

A handbook of physical properties and correlations for aqueous electrolyte solutions would be extremely useful for scientists and engineers dealing with electrochemical systems. However, this book would be a disappointment for someone who reads the title and thinks a long-needed handbook of aqueous electrolyte solutions now exists. Workers who wish to quickly and easily find a correlation for a particular physical property would find it difficult to use. For the researcher or graduate student who needs a resource guide, this book may be a good reference to initiate a search in the literature for physical property correlations for an aqueous electrolyte solution.

Jan B. Talbot
Department of Applied Mechanics and Engineering Sciences
Mail Code B-010
University of California, San Diego
La Jolla, California 92093

Thermodynamic Data for Pure Compounds. Part A: Hydrocarbons and Ketones. Part B: Halogenated Hydrocarbons and Alcohols (Physical Sciences Data 25)

By Buford D. Smith and Rakesh Srivastava, Elsevier, New York, 1986, Part A:883 pp., Part B:999 pp., $294.50.

These data compilations are intended primarily to facilitate calculations of vapor-liquid equilibria in mixtures, i.e. to calculate pure-component vapor-phase fugacity coefficients and pure-component liquid-phase fugacities. Tabulated data are given for vapor pressures, saturated vapor volumes, saturated liquid volumes, enthalpies of vaporization and second virial coefficients. No data are given for heat capacities or for enthalpies and entropies of formation. No data are given for solids, superheated gases or supercritical fluids.

To facilitate estimates when data are not available, the following constants are given for many (but not all) listed compounds: critical properties, acentric factor, radius of gyration, melting temperature, normal boiling temperature and dipole moment; these constants can then be used as input data for well-known correlations. Finally, constants are reported for several well-known equations that give vapor pressure or liquid density as a function of temperature. Perhaps most useful, the authors give literature sources for every property tabulated.

The authors deserve thanks from the community of phase-equilibrium thermodynamicists for their painstaking work. These tabulated pure-component data will be useful for reduction (and subsequent correlation) of experimental vapor-liquid equilibrium data for mixtures.

J.M. Prausnitz
Chemical Engineering Department
University of California
Berkeley, CA 94720

Instrumentation and Control for the Process Industries

By John Borer, Elsevier, New York, 1985, 293 pp., $64.50.

Process Instruments and Controls Handbook, Third Edition

Edited by Douglas M. Considine, McGraw-Hill, New York, 1985, 1766 pp., $89.50.

These two texts cover the same subject area, namely measurement and control of process variables. The Borer text gives roughly equal coverage to measurement and control, while the Considine text devotes about 70% to measurement and 30% to control. If one could purchase only one of these texts, there is no doubt that the Considine text is the more desirable choice. The Considine text is significantly better in terms of its technical content and coverage.

In the measurement section of the Borer text, the basic variables, temperature, pressure, flow and level are discussed. The treatment is somewhat superficial and dated. A real problem with the text is the lack of any references at the end of chapters. If one would like to learn more about a particular technique, there is no place to go.

Two examples can be cited concerning the dated nature of the material. In discussing the selection of pressure measurement devices, Borer spends most of his time on Bourdon devices. One sentence is devoted to strain gauges. By way of contrast, Considine's text points out that strain gauges are the most common pressure transducer, considering all process related uses. Further, it is pointed out that strain gauges have made serious inroads on pneumatic technology in many applications. In the control section of Borer's text there is a chapter titled "Control Mechanisms." This chapter is devoted to a discussion of various bellows and mechanical linkages to achieve PID type control. Although they still exist in the field, the type of hardware discussed is being replaced by digital computer control systems. There is a discussion of pneumatic controllers in the Considine text as well. However, the emphasis in the Considine text is clearly toward digital control and instrumentation.

There is one serious error in the Borer text. In discussing the use of the relative gain for control loop pairing, the process gain and not the relative gain is used. This error appears both in the text and the accompanying illustrative example.

The Considine text gives very thorough coverage of the subject area. Detailed treatment of the basic measurements, temperature, flow, pressure, etc. are given as well as new approaches, fiber optics, on-line analytical instruments, thin film methods, etc. There are even discussions of machine vision and voice recognition. This handbook was written by over 140 specialists in the field and it