BOOKS

Carbonate Chemistry of Aquatic Systems, by R. E. Loewenthal and G. v. R. Marais, Ann Arbor Science, 433 pp + xi, $22.50.

The Ca-Mg-Carbonic System is important in natural waters, water use and water treatment. The physical-chemistry of the system is well understood but of considerable complexity, which has impeded the application of theory to practical water conditioning. However the implementation of theory via graphical aids provides relatively simple access to solutions to complex problems. This book develops and explains the use of Modified Caldwell-Lawrence Diagrams in a wide variety of water treatment situations.

The first four chapters are concerned with the equilibria between the numerous ionic species involved in the acidity-alkalinity relations, with and without solid phases (especially $CaCO_3$) present. Chapter five develops both the theory and practical (graphical) methods to be used for water conditioning. Chapters six and seven consider the special cases of alkalinity-calcium deficient waters and hot water systems, respectively. The appendices include buffer capacity tables, alkalinity-acidity-pH equilibrium diagrams, Modified Caldwell-Lawrence diagrams for a variety of ionic strengths and temperatures, and the computer programs for generating these tables and graphs.

The text is printed directly from a typescript and many tables and graphs were computer-generated. One might have hoped that this would have reduced the price. No significant errors were found. With the large number of symbols used, a nomenclature table would have been useful.

The book is stated to be of interest to public health and water treatment engineers, chemists, geologists and geochemists. I would concur—and draw it to the attention of chemical engineers working in these fields.

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Chemical and Engineering Thermodynamics, S. I. Sandler, Wiley, New York (1978). 587 pages, $21.00.

This book is intended for use by undergraduate students in chemical engineering. It differs from currently-used textbooks in this field in a number of ways:

a) It contains no material on power and refrigeration cycles in the text. Some of the problems introduce a smattering of this material, but the reader may be surprised at the lack of discussion of cycles, Carnot engines and lost work.

b) It contains no material on the thermodynamics of fluid flow, although the microscopic equations of change in vector form are presented in an appendix.

c) Considerable emphasis is placed on the correlation and prediction of phase equilibria and the estimation of thermodynamic properties.

The subject is approached in a quasi-axiomatic fashion, in which the student is expected to accept a number of "experimental observations". This approach avoids some of the tautologies and allows a faster presentation of material by the instructor. Balance equations for mass, energy and entropy in both differential and difference form are used in the thermodynamic description of processes. The connection with balance equations for chemical reactors is later shown clearly. It is a pleasure to see a number of topics which have rarely been presented in an undergraduate textbook. These include:

a) Stability criteria
b) Electrolyte solutions
c) Osmotic pressure
d) Solubility behavior in liquid-liquid and liquid-solid systems
e) Chemical equilibrium with multiple reactions

A mixture of units (and abbreviations for them) are used in this book, but "Since SI units are not yet in common use", most problems and examples use English engineering units. The tables

of data or figures presenting data are interspersed throughout the text. This arrangement may be convenient when solving the problems of the chapter, but it is difficult to find the data again. An appendix at the end of the book for all data would have been preferable. For a book stressing the correlation and prediction of data, the use of such out-dated material as the van der Waals equation (with the constants evaluated from T_c and P_c) for estimating properties, the reprinting of the constants of the Beattie-Bridgeman equation, the use of the corresponding states correlation utilizing z_c as the third parameter and the reprinting of a pressure-enthalpy diagram for methane from 1945 do not indicate to the student the changes that have occurred in the past ten years in the estimation of properties. No mention is made of the Redlich-Kwong equation in this book, but the reader is referred to Reid, Prausnitz and Sherwood for more current information.

I do not think that this book is the one for use in a first course in thermodynamics. For students who have had a basic course in engineering thermodynamics it could be used for a one-semester course in chemical engineering thermodynamics which emphasized the analysis and prediction of phase equilibria.

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The Practicing Scientist's Handbook: A Guide for Physical and Terrestrial Scientists and Engineers by Alfred J. Moses. Van Nostrand Reinhold, 1292 pages, $52.50, August 1978.

This reference handbook appears to fill a need for a compendium of information about materials. Under one cover, the author has assembled information on a broad spectrum of materials. He commences with data relevant to particle physics, includes the elements, simple organic and inorganic compounds and finally adds chapters that address the properties of alloys, composites and specialized aerospace materials. Presentation of much of this physical, mechanical and chemical data in one volume is quite useful.

The handbook has complete sets of cross-references and bibliographies for each section. These are helpful. Should the reader wish more detailed information, these references are the universally accepted, most complete sources available in a particular subject matter. This follow-up capability gives the handbook value as a day-to-day working source, without leaving it unwieldy.

As in every venture of this type, the handbook has some deficiencies and problems. The great diversity of information included has made cross-indexing and internal cross-referencing extremely difficult. Material has been drawn from many primary sources. Although adequately credited, reproduction is uneven and borders on the illegible, in a few instances. The author's choice of coverage and relative weighting of subject matter is good, but presents great difficulties in arrangement and utility. The publishers have not been as helpful as possible, failing to use their experience in the editorial and format areas, to make the presentation of information smoother.

On balance, this is a new and useful addition to the working reference library. It will be found most convenient on many laboratory bookshelves and individual desks. It is targeted primarily at those who measure properties, employ property data for process design or require information on materials for analytical or structural design purposes. However, the prospective user is warned, that some effort must be made to learn to use the sometimes awkward format and arrangement of this volume.

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