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.

RANE L. CURL
Dept. of Chemical Engineering
University of Michigan, Ann Arbor MI

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