BOOKS

Electrochemical Systems, John S. Newman, Prentice-Hall, Inc., Englewood Cliffs, New Jersey (1973). 432 pages.

Electrochemical Systems attempts to cover a broad breadth of material in a relatively few pages, and to a large degree the author has been successful. This book covers nearly all facets of electrochemistry and electrochemical engineering including thermodynamics, kinetics, fluid mechanics, thermal transfer, and potential theory. In nearly all of the discussions, Newman carefully and logically takes the reader through a derivation of the controlling mechanisms and laws. Consequently, for the reader who is willing to carefully assimilate the various treatments, the book will greatly enhance an appreciation for and understanding of electrochemical systems and the interrelationships of the many complex phenomena involved therein.

The material is obviously presented for those who are somewhat familiar with electrochemistry or electrochemical systems and have a good grasp of physical chemistry and mathematics (calculus and vector analysis). The book is separated into four sections. The first section, which the reviewer enjoyed the most because of its brief yet comprehensive treatment of a very difficult subject, deals with thermodynamics. This section starts with a logical development of chemical potential, phase equilibria, and electric potentials and ends with a treatment of the more complex types of liquid junctions. The second section deals with all aspects of electrode kinetics, including electrophoresis, streaming potentials, and electrocapillary phenomena. The third section concludes the more fundamental treatment of electrochemical engineering by developing the mechanisms for the various transport processes (including thermal) that can occur within an electrochemical cell. There is some duplication between the third section and earlier sections; however, this duplication increases the readability of the book, making it possible to understand the third section without the prerequisite of the earlier sections. The fourth section which is intended to be a discussion of the applications of the laws developed in the earlier sections is somewhat limited in its treatment of such applications. It does cover a few of the application problems that confront the engineer such as supporting electrolytes, limiting currents, and current distribution.

The author has apparently restricted this last section to the development of those application tools that he felt most meaningful in light of the previous sections.

The four major sections of the book are preceded by an excellent introductory section that can be easily read and understood by engineers, managers, or students lacking the background to fully assimilate the remainder of the book. This introduction very quickly reviews some of the more basic concepts of electrochemical engineering in simple terms and serves as an excellent background on the subject.

Electrochemical Systems should be considered as an authoritative textbook on the subject in that it can only be understood and appreciated by those having the interest and the physical chemical background. For those having this interest and background, this book is highly recommended as a very compact, well-developed, and most comprehensive treatise.

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Physical Properties of Hydrocarbons Volumes I and II, Robert W. Gallant, Gulf Publishing Company, New York (1972). Vol. I, 225 pages. Vol. II, 200 pages. $17.95 each.

Over the years, Robert W. Gallant published a series of papers on hydrocarbon processing which presented, in graphical form, physical and thermodynamic properties of many chemicals commonly used in the chemical processing industry. Now, the entire series has been published as a two-volume set in hard cover. Volume I covers paraffinic hydrocarbons, alcohols, oxides, and glycols. Volume II covers other oxygenated hydrocarbons, nitrogen containing materials, aromatics, naphthenes, and materials having sulfur in the structure.

Almost 170 compounds are included. Graphs are given for most compounds to determine as a function of temperature, the vapor pressure, heat of vaporization, as well as vapor and liquid heat capacity, density thermal conductivity and viscosity. In some cases, the surface tension variation with temperature is also shown.

For each compound, the source of the data (or estimation method) and an error band are given. Cgs units are employed except for vapor pressure where psia-°C scales are used. On most of the graphs, the grid lines are sufficiently fine so that one can obtain a precise number.

The author is to be commended for the final product. The labor involved must have been enormous. I have had many occasions to use these graphs and, in almost all cases, the result was judged as reliable.

Although the books are somewhat expensive, they are invaluable in those cases where property values are needed quickly.

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Ultrasonics, The Low- and High-Intensity Applications, Dale Ensminger, Marcel Dekker, Inc., New York, N. Y. (1973). 570 pages. $24.50.

During the past two decades the growth of industrial ultrasound applications and the concomitant research activity in this area have produced a need for a concise collection of these results suitable for students and engineers involved in ultrasonics. Mr. Ensminger's book will help considerably to fill that need. Following an initial overview of the subject, two chapters cover the fundamental theory of acoustics and ultrasound and the important equations for ultrasonic design and application in about 100 pages. The author includes enough of the foundations of acoustics to refresh one already familiar with the subject, but someone just entering the field may need to consult more basic sources using this reference as a guide. Chapters 4 and 5 deal with design of horns for processing applications and the basic design of ultrasonic transducers. These two chapters should be of special interest to all workers in ultrasonics.