

Book Reviews

Structure and Bonding in Solid State Chemistry. By M. F. C. Ladd (University of Surrey). John Wiley & Sons: New York. 1986. 324 pp. \$19.95 (paperback).

The subject matter in this book appears to be quite suitable for a specialized one-semester undergraduate course in chemical bonding. There are several physical chemistry text books on the market which are geared toward a two-semester course in thermodynamics (one semester) and elementary quantum mechanics (one semester). There is generally very little emphasis on chemical bonding. This book contains material on chemical bonding which could be of value to non-chemistry (in particular, chemical physics) majors.

After a brief introduction to the structural and other properties of solids (isomorphism, polymorphism, phase transitions, etc.) in Chapter 1, the author has provided detailed analysis of ionic, covalent, van der Waals, and metallic bonding in Chapters 2-5. The evaluation of cohesive energies in ionic solids and their relationships with other parameters are presented in an extremely lucid manner.

On the basis of the fact that one has to invoke quantum ideas to explain covalent bonding, the author has, very appropriately, provided simple yet detailed accounts of the quantum mechanics of the "Particle in a Box", "H-Atom", "H₂-Molecule" and hydrid bonds in complex molecules (Chapter 3). The covalent bonding in several *molecules* is illustrated; however, detailed discussions on important covalent solids are totally lacking.

In Chapter 4, the fundamentals of intermolecular interactions between neutral molecules are elegantly developed. Several organic crystal structures and their characteristics as molecular crystals are presented.

Chapter 5 on metallic bonding gives both classical and wave mechanical theories of free electrons in metals. These ideas are developed to describe the electrical properties of metals, semiconductors, and insulators in terms of their energy band structures. The results on low-temperature specific heat of crystals are discussed briefly and the importance of electronic specific heat to the total specific heat at low temperatures is emphasized.

Several problems at the end of each chapter, some with solutions and hints, provide a challenge, as well as help in learning this important topic. The appendices at the end of each chapter, which possibly could be of more utility as a separate chapter, make this book mathematically self sufficient. With additional suggested reading this book is, perhaps, the only one of its kind dealing with chemical bonding at an elementary level.

Raj K. Khanna, *University of Maryland*

Advances in Clinical Chemistry. Volume 25. Edited by H. E. Spiegel (Hoffman-La Roche, Inc.). Academic Press, Inc., Harcourt Brace Jovanovich Publishers: Orlando, FL. 1986. ix + 303 pp. \$49.50. ISBN 0-12-010325-7

The purpose of *Advances in Clinical Chemistry* is to broaden the scope of clinical chemists. There are five chapters contained in this volume. Each chapter is written by a recognized expert in the field. The areas of focus are Ion-Selective Electrodes, the Somatomedins, Synthetic Peptide Substrate Assays for Hemostasis Testing, Bile Acids, and Folic Acids.

Ion-selective electrodes are membrane-based potentiometric devices that are capable of accurately measuring the activity of ions in solution. In recent years, the range of measurable species has been further extended to include dissolved gases and even biochemicals. Not only does this chapter provide a general overview of the basic principles and practical aspects of ion-selective electrode measurements, it also emphasizes the current state of technology with regard to the incorporation of these devices in modern clinical chemistry analysis.

Somatomedins are plasma factors that stimulate sulfate incorporation into chondroitin sulfate of cartilage, have insulin-like activity in adipose tissue and diaphragm, and cause increased thymidine incorporation into DNA in various tissues. This chapter presents an account of recent advances in the understanding of the origins, functions, and clinical significance of these factors. The sections of this chapter fall into two groups: Those describing where and how somatomedins are produced, how they are transported in the circulation, and how they interact with their target tissues, and those concerned with the measurement of somatomedins and the physiological and clinical significance of their levels in the circulation.

Hemostasis is a complex molecular event by which blood remains fluid in the vascular system of mammals. Over the last decade, a new era in hemostasis testing has occurred with the introduction of synthetic peptide substrate procedures. This new assay can be monitored by a simple

spectrophotometer. This chapter reviews this new test procedure in depth and points out where more work is needed so that these substrates can be accepted in routine laboratory hemostasis testing.

Bile acids are not routinely analyzed in clinical chemistry laboratories. The chapter on bile acids reviews our present knowledge of the biosynthesis of bile acids, its circulation within the body, and the methods for their determination. In addition, the application of bile acid measurement to clinical medicine is described, along with the use of certain bile acids as pharmacological agents for the treatment of gallstone disease.

Folate deficiency is one of the most common vitamin deficiency states seen in clinical practice and is particularly prevalent among people in the lower socioeconomic groups. This chapter reviews the biochemistry, methods of measurement, and nutrition requirements of folate, the conditions associated with folate deficiency, inborn errors of metabolism, and other causes of disordered folate metabolism.

Stephen K. Hall, *Medical College of Ohio*

Separation and Spectrophotometric Determination of Elements. By Zygmunt Marczenko (Warsaw Technical University). John Wiley and Sons: New York, NY. 1986. 678 pp. \$159.00. ISBN 0-470-20334-X

This book is voluminously referenced but almost totally devoid of any critical analysis of the methods cited. Nearly every element is examined. To Marczenko, separation means isolation. The author does not acknowledge that modern analytical chemistry developed largely to avoid using spectrophotometric methods, which are time consuming and susceptible to many interferences. The reader is left with a wealth of options, and little information to choose between them, for a technique that is seldom used for most of the elements discussed.

The book provides much information on the aqueous chemistry and isolation of the elements and could prove to be a useful resource for sample preparation. The sections on metal isolation methods are particularly interesting. The depth of citation is impressive. If one were interested in, for example, rhenium, a good idea of its reactivity and solution behavior can be gleaned from the seven pages devoted to it. Unfortunately three of the seven pages are devoted to two time-consuming spectrophotometric methods in detail.

Spectrophotometric enthusiasts will enjoy the book. Individuals concerned with the chromatographic separation of elements (a subject totally neglected in the volume) will find an interesting compilation of chemistry that could be useful to them. Atomic spectroscopists may find it useful in deriving preconcentration methods. Chemical analysts will find the book of marginal utility. Anyone using the book will have to supply their own analysis of the quality of most procedures, the details of which require consulting the cited references.

Raymond J. Lovett, *West Virginia University*

Atmospheric Chemistry. Fundamentals and Experimental Techniques. By Barbara J. Finlayson-Pitts (California State University, Fullerton) and James N. Pitts, Jr. (University of California, Riverside). John Wiley & Sons: New York. 1986. xxvii + 1098 pp. \$59.95. ISBN 0-471-88227-5

The author's objective was to write a text/reference book useful to established researchers and to students interested in the chemistry of the lower atmosphere and the experimental techniques used to study it. The book contains discussions of the fundamentals of kinetics, spectroscopy, and photochemistry that should prove helpful to students; descriptions of many experimental techniques used to study the atmosphere; and a great many rate constants, reaction mechanisms, and other relevant data for organic and inorganic species found in the atmosphere. The authors state in the preface that their efforts do not constitute a comprehensive survey of the literature; still, the volume contains extensive literature references ranging from the earliest in a specific area to mid-1985. All in all, the authors have achieved their objective very well.

The book begins with a brief history of air pollution followed by eight more parts covering tropospheric photochemistry; experimental kinetic, mechanistic, and spectroscopic techniques, kinetics and mechanisms of gas-phase reactions in the atmosphere and in the laboratory; photochemical pollution; acid deposition; particulate matter; chemistry of the natural troposphere; and a brief discussion of the impact of tropospheric chemistry on the stratosphere. The index is thorough and the detailed table of contents (it occupies 18 pages) greatly helps with locating material in this large volume.

The length of this book may discourage its use as a text for survey courses. However, it can be recommended for purchase by serious stu-

dents and researchers. It is well-organized and clearly written, it contains a great deal of valuable information in a single source, and it provides ample literature references for those who seek more.

Ray L. McDonald, *University of Hawaii*

Materials Degradation Caused by Acid Rain. Edited by R. Baboian (Texas Instruments, Inc.). ACS Symposium Series, No. 318, American Chemical Society: Arlington, VA. 1986. xiv + 447 pp. \$79.95. ISBN 0-8412-0988-X

This book is the result of a symposium sponsored by the Division of Industrial and Engineering Chemistry, Inc. at the 20th State-of-the-Art Symposium of the American Chemical Society, Arlington, Virginia, June 17-19, 1985. The papers represent the state of our knowledge about materials problems resulting from acid deposition as we understand it through the Federal assessment efforts. The book is a must for those interested in the progress of the ongoing National Acid Precipitation Assessment Program.

The volume contains 29 separately authored papers in 5 sections: Measurement and Monitoring of Atmospheric Deposition (5 papers), Metallic Corrosion (9 papers), Masonry Deterioration (7 papers), Degradation of Organics (3 papers), and Economic Effects (5 papers). The papers are assembled in such a way as to introduce the reader to the scope and nature of the atmospheric deposition (acid rain) problem. For those interested in how man and his technology are affecting our environment, this collection of papers establishes what information is available to better understand how materials degrade differently in an ambient environment enriched in anthropogenic NO_3^- and SO_4^{2-} , their precursors, and associated forms and ions. The papers weave a tale about a complex international and global problem of acidification that has potential to affect exposed building materials.

The volume might have been enhanced if the Measurement and Monitoring section had been more explicitly aimed at providing a tie to the materials degradation issue. However, for those interested in the nature of Atmospheric Deposition and its measurement, these papers do establish the magnitude of the issue.

Section two establishes our understanding of metals corrosion in acid environments and introduces current efforts to better understand and predict effects. This chapter details the efforts of the National Acid Precipitation Assessment Program to bound the metals corrosion problem and includes some interesting related industry research. One is impressed by the infancy of the science and the enormity of the yet to be defined and understood processes involved.

Masonry, including marble, limestone, and portland cement concrete, can be expected to degrade differentially and more rapidly in acidified environments. Numerous measurement and other difficulties arise in making these determinations. These papers reflect an accurate description of our present understanding and of the ongoing attempts to better assess deterioration of calcareous materials under ambient conditions, especially as related to our national cultural heritage.

Organic degradation owing to "acid rain" is a little-studied and lit-

tle-understood area of inquiry. The three papers in this group call attention to concerns about acid effects on woody plants, painted wood surfaces, and reduced service lives of wood products and outdoor nylon fabrics.

Economic impacts of materials degradation owing to "acid rain" are hard to assess. The utility of a number of disparate techniques of analysis are discussed. The authors suggest the importance of economic losses. Their analyses remain controversial but point to the need to obtain new knowledge and to understand the ramifications of continued damage. Is it millions or is it billions?

As is true for any symposium volume, the individual papers varied in their impact and impression on the reviewer. The book is a mixture of what we know and what we need to know. In the aggregate, this work accomplishes the stated purpose "to provide information on the wide range of materials affected by acid deposition".

Raymond Herrmann, *National Park Service*

Introduction to Organic Photochemistry. By John D. Doyle (The Open University). John Wiley and Sons: New York. 1986. viii + 176 pp. \$31.95. ISBN 0471-90974-2

Professor Coyle deserves to be congratulated on producing a highly readable and very well organized survey of the most important photochemical reactions of organic molecules for a beginner familiar only with the fundamentals of organic chemistry.

The first chapter provides a qualitative outline of the fundamental photophysical and photochemical principles. It is very complete in that it mentions briefly virtually all processes that are likely to be of importance to a synthetic photochemist. It is strictly descriptive in that it states what happens but does not ask how or why it happens. For such an elementary introduction it is remarkably free of gross oversimplification and outright error. I have admired the lucid pedagogy of the exposition and the excellent organization.

In Chapters 2, 3, and 4, the photochemistry of three most important structural classes of organic substrates is described and documented on well-selected examples. The chapters deal with alkenes, aromatics, and carbonyl compounds, respectively. The well-balanced treatment offers a brief but instructive survey of the main types of photochemical transformations in these compounds. Photochemical reactions of organic nitrogen-, oxygen-, sulfur-, and halogen-containing compounds are discussed very briefly in Chapter 5. There are no references in the text, but a good selection of recommended reading is provided at the end of each chapter. Emphasis is on synthetic aspects throughout. Perusal of the five-page index revealed no obvious shortcomings.

I have found only a few misprints and minor errors (on the top line on p 30, "lower" should be replaced by "higher"; on p 153 organic azides are stated to be yellow; when pure, these are colorless). I recommended the book wholeheartedly to anyone interested in preparative organic chemistry and looking for a quick survey of photochemical processes.

Josef Michl, *The University of Texas at Austin*