

Book Reviews

Physical Chemistry. By IRA N. LEVINE (Brooklyn College, City University of New York). McGraw-Hill Book Co., New York. 1978. xvi + 847 pp. \$21.00. Also **Student/Instructor's Solution Supplement**, v + 276 pp.

This is a comprehensive textbook of physical chemistry for use at the undergraduate level. It provides a rigorous yet readable treatment that generally follows a macroscopic-to-microscopic development. The first twelve chapters are devoted to classical thermodynamics; a chapter on statistical mechanics is near the end. Each chapter includes a large selection of problems, which are supported by examples in the text itself and by fully worked-out, carefully dimensioned solutions in the "Supplement". Reviews of important mathematical and physical concepts are built in. Common student misconceptions are anticipated. Because students as well as instructors will find this an attractive book, it should be a serious competitor with established texts. However, some instructors may feel that more examples of actual experimental data and more references to the recent literature would help give the student a sense of an experimentally based, growing discipline. Also, despite the author's previous experience in writing an outstanding quantum mechanics text, he has not solved the problem of blending accessibility and rigor in this area in "Physical Chemistry". Too often he has settled for "it turns out" and a reference to his other text.

Norman C. Craig, *Oberlin College*

Recent Advances in the Chemistry of β -Lactam Antibiotics. Edited by J. ELKS (Glaxo Research Ltd.). The Chemical Society, London. 1977. vi + 313 pp. \$29.00.

This book contains the Proceedings of an International Symposium, arranged by the Fine Chemicals and Medicinals Group of the Industrial Division of The Chemical Society, and held in Cambridge, England, 28-30 June, 1976. Thirty-two reports, most of them from industrial research laboratories, are given. They cover a wide range of topics, in the area of the biosynthesis of β -lactam antibiotics; chemical modifications of penicillins and cephalosporins, with extensive reports on structure-activity correlations; total syntheses of β -lactams; reports on new naturally occurring β -lactam antibiotics; and chiroptical studies of penicillin derivatives, and kinetic studies on the hydrolysis of simple β -lactams. The different reports vary a great deal in length and emphasis, but together they embody an impressive amount of information about the potential for chemical modification of the sensitive structures found in β -lactam antibiotics. The volume suffers from the lack of an index, but seems to be well suited for browsing, with large numbers of intriguing structures available to catch one's eye and invite one to dig more deeply into the text. The book should prove valuable to anyone who is interested in an overview of the many areas in which research on the chemistry of β -lactam antibiotics is progressing.

Seyhan N. Ege, *The University of Michigan*

Treatise on Materials Science and Technology. Volume 10. Properties of Solid Polymeric Materials. Part A. Edited by J. M. SCHULTZ (University of Delaware). Academic Press, New York. 1977. xiv + 451 pp. \$44.00.

This contributed text consists of two chapters. The first, by J. H. Magill, presents in 368 pages a general review of polymer science with emphasis on those properties directly related to morphology. The subject matter is presented clearly and concisely. It should meet the editor's objective of providing a general background in polymer science for materials scientists and engineers. The major part of this chapter is concerned with morphology-property relationships, and is much more detailed. Molecular weight, crystallinity, and the amorphous state are discussed in depth. This chapter concludes with a discussion of concepts related to processing. Several, simple schematic diagrams are used to introduce the reader to various processing techniques. This chapter contains an extensive bibliography.

The second chapter, by T. L. Smith, deals with the molecular aspects of rubber elasticity. It is the first of several chapters (others to follow in Part B) dealing with specific properties related to mechanical behavior. This chapter introduces the subject of network polymers.

There then follows a detailed discussion of the molecular theory of rubber elasticity. A mathematical approach is taken in interpreting the properties of elastomers based on the theory of rubber elasticity.

W. Lincoln Hawkins, *Plastics Institute of America*

Contemporary Topics in Polymer Science. Volume 2. Edited by ELI M. PEARCE (Polytechnic Institute of New York) and JOHN R. SCHAEFFGEN (E. I. du Pont de Nemours). Plenum Press, New York. 1977. viii + 316 pp. \$32.50.

This treatise is a composite of papers presented at the Eighth Biennial Polymer Symposium of the ACS Division of Polymer Chemistry. The volume is introduced by P. J. Flory's Polymer Division Award Address on the molecular theory of rubber elasticity. Individual papers describe important, recent developments in polymer research, both scientific and practical. The subject matter of these papers deals with a variety of problems. There are two papers concerned with liquid crystals, one on solutions from polyhydrazides in aqueous, organic bases, and a second on the preparation and properties of polyester-liquid crystalline melts. Another group of papers is in the field of rigid-chain polymers, in dilute and concentrated solution and on phase equilibria in rigid-chain polymer systems. Compatibility in polymer mixtures is covered in two papers, one in general terms and the second dealing with phase separations. Other papers deal with the solid-state synthesis and properties of photoconducting, metallic, and super-conducting polymer crystals; acetylene-containing aromatic heterocyclic polymers; rates of conformational transitions and of cis-trans isomerizations in flexible polymer chains; and topochemical effects in chemical reactions of crystalline organic compounds. The final two papers describe practical research on biodegradable polymers for slow drug release. Discussion of many of the papers is included.

W. Lincoln Hawkins, *Plastics Institute of America*

Molecular Structure by Diffraction Methods. Volume 5. Senior Reporters: L. E. SUTTON (University of Oxford) and M. R. TRUTER (Rothamsted Experimental Station). The Chemical Society, London. 1977. xiv + 440 pp. £35.00 (\$70.00).

The present volume, part of an annual series of Specialist Periodical Reports, bears the format and most of the virtues and shortcomings of the previous volumes. The period covered is April 1975, through August 1976, but unlike the early volumes, Volume 5 no longer offers comprehensive coverage of the published literature for all areas of structure research.

Part I contains two chapters, one a complete survey of recent gas-phase structure determinations by electron diffraction, and the other a review of all reported electron diffraction studies of molecular conformation, from earliest work through August, 1976. The latter (by R. K. Bohn) is the one bright spot in an otherwise lackluster book. In addition to tabulating an astonishing number of conformational studies in a clear and logical manner, it provides a useful, if brief, discussion of problems in collecting and interpreting the data, together with a modest amount of critical discussion of some of the more interesting or controversial results.

Part II consists of a single short chapter on neutron diffraction studies, which despite the relatively small number of structures published during the period is not complete. It reflects a continued emphasis on studies of hydrogen bonds, but also increasing efforts in investigating inorganic systems, especially those with very heavy atoms. The reporter (J. C. Speakman) chose to discuss a small number of studies in some detail rather than give brief uniform treatment to each reported structure.

In Part III, X-ray structures are reviewed. There are 20 chapters by 10 reporters, a chapter for each group in the periodic table, with additional chapters on organic molecules, natural products, globular proteins and nucleic acids.

An author index, but no subject or formula index, is provided. As evidenced by the introduction, both the Senior Reporters and the authors of individual chapters are sensitive to the need for readability and critical evaluation in the reports. These features are especially desirable in the absence of complete sets of references. Unfortunately

many of the reports fall short in both areas. Introductory remarks also suggest that severe financial constraints, arising in part from poor sales of previous volumes, have forced the reduced coverage in Volume 5. The price of this periodical has doubled since 1974, a fact not likely to increase its appeal either to individuals or institutional libraries. Specialized reviews of this sort are potentially very valuable, and it is hoped that the persons responsible for this one can find an alternative format that offers the desired information in an acceptable form at an acceptable price.

E. J. Jacob, *University of Toledo*

Biological Activity and Chemical Structure. Edited by J. A. KEVERLING BUISMAN (Philips-Duphar). Elsevier Scientific Publishing Co., New York, 1977. x + 314 pp. \$44.60.

This book is Volume 2 in a series entitled "Pharmacochemistry Library" and presents the invited papers and summaries of round-table discussions at the IUPAC-IUPHAR Symposium, Noordwijkerhout, The Netherlands, 1977. Volume 2 in no way compares to the quality of Volume 1, "The Hydrophobic Fragmental Constant. Its Derivation and Application" by R. F. Rekker. While the blurb put out by the publishers for this present Volume 2 states "These proceedings provide an up-to-date review of the state of knowledge and research in the field of QSAR (Quantitative Structure-Activity Relationship)", this is not completely true. The coverage of the disciplines which contribute to QSAR is not complete, and the quality of the presentations varies. The majority of the papers are, however, substantive and informative and give one a feeling for certain of the contributing factors such as lipophilicity, hydrophobic fragmental constants, crude electronic parameters and steric parameters, and certain of the mathematical techniques such as regression analysis, pattern recognition, etc.

The most glaring omission from the book is a contribution on the role of quantum chemistry and especially state-of-the-art quantum chemistry in QSAR written by a well-qualified quantum chemist. Moreover, it is apparent from the round-table discussions that none of the invited participants had real expertise in quantum chemistry.

One can contrast the topics covered in the invited lectures at this Symposium with the topics covered in the Gordon Conference on QSAR held a few months earlier. It is a pity that Gordon Conference Proceedings are not published since that conference presented a far better balance of subjects.

The editors of this series would be well advised to strive for future volumes in this series of the quality of Volume 1, and to have conference proceedings as a somewhat separate series.

The book is comprised of photoreduced offsets of typed manuscripts. The type sizes differ widely, and as a result the photoreduction of some small type fonts leads to the printing of certain of the papers being too small to be appropriate for a hard cover volume.

Joyce J. Kaufman, *The Johns Hopkins University and
The Johns Hopkins University School of Medicine*

Dioxin: Toxicological and Chemical Aspects. Edited by F. CATTABENI (University of Milan), A. CAVALLARO (Laboratory of Hygiene & Prophylaxis, Province of Milan), and G. GALLI (University of Milan). SP Medical & Scientific Books, Division of Spectrum Publications, Inc., New York (Distributed by Halsted Press, Division of John Wiley & Sons). 1978. xiii + 22 pp. \$20.00.

The tragic release of 2,3-p-7,8-tetrachlorodibenzo-p-dioxin (TCDD) on July 10, 1978, in Seveso (near Milan), Italy, has prompted world-wide attention. About three months after the dramatic events at Seveso, a workshop was organized by the University of Milano to address the toxicological, analytical, and chemical aspects of this exquisitely toxic compound—and its close relatives. This volume comprises a collection of the papers presented at this meeting.

The book starts off with a review of the events which occurred in Seveso, with Chapter 2 covering an introduction of the chemistry of TCDD together with a listing of past releases to the workplace environment. Interestingly, 229 Monsanto workers were exposed in 1949 at Nitro, W. Va.

Chapters 3-8 cover topics related to the isolation and analytical determination (largely by GC/MS) of TCDD and related materials. The isolation and clean-up procedures are well described, and overall the section is quite close to the present state of the art. However, the GC/MS detection limits are currently at least one order of magnitude lower than described in these chapters.

The toxicology of TCDD and related compounds is broadly covered in Chapters 9-16. Quite a number of subsequent toxicology studies

have only confirmed just how very toxic this material is. Indeed the chronic toxicology of TCDD is just now appearing, with Van Miller, Allen, and others at the University of Wisconsin finding neoplastic tumors in rats at the parts per trillion level (*Chemosphere*, 1977).

The last five chapters (17-21) attempt to shed light on possible decontamination routes by a variety of physical and chemical means.

The book is well worth having and is an absolute "must" for an environmental science, occupational health, or toxicology library.

William C. Kuryla, *Union Carbide Corporation*

Infrared and Raman Spectra of Inorganic and Coordination Compounds. Third Edition. By K. NAKAMOTO (Marquette University). John Wiley & Sons, New York, 1978. xv + 448 pp. \$24.50.

Eight years have elapsed since publication of the Second Edition of this reference text on inorganic vibrational spectroscopy. Although the Third Edition is organized along the same lines as its predecessor, it has been expanded considerably to reflect the large body of data and new experimental techniques which have appeared during the interim period.

Part 1 provides a condensed discussion of the fundamentals of vibrational spectroscopy, including treatments of normal coordinates and vibrations, the GF matrix method, potential fields and force constants, and infrared and Raman selection rules. Much of this material has been lifted verbatim from the previous edition. Notable exceptions are an expanded treatment of Raman spectroscopy (the greater importance accorded this topic is reflected by its inclusion in the title of the Third Edition) and a discussion of matrix isolation vibrational spectroscopy. The brief introduction to group theory is sketchy, and the associated discussion of how to determine the number of normal modes belonging to an irreducible representation seems unduly labored. Readers unfamiliar with these latter topics are best advised to consult more lucid treatments available in several textbooks.

Parts 2-4 survey the results of infrared and Raman studies of inorganic, coordination, and organometallic compounds. While this classification of compounds is somewhat arbitrary, it facilitates the organization of a vast amount of information. The material on inorganic compounds is further categorized according to the number of atoms or their spatial disposition in the molecule (diatomic, triatomic, pyramidal four atom molecules, etc.), while the results on coordination and organometallic compounds are generally arranged according to ligand type (ammines, carbonyls, alkenes, etc.). Parts 2-4 contain extensive compilations of vibrational frequency data, assignments, and (when available) force constants. Actual spectra are reproduced in some cases to aid the discussion.

The book is relatively error free, although a few troublesome points do arise. Thus the nature of the symmetry element (traditionally a point, line, or plane) which can be associated with the identity operation (p 20) is unclear, the previously undefined point group C_{3i} (p 92) should be changed to S_6 , the use of two different labels for the same irreducible representation (t_{2g} for orbitals on p 215; F_{2g} for states on p 263) is confusing, and the importance of π -backbonding in N_2 complexes (p 300) is overstated.

The book contains an adequate subject index. Abundant references to primary journals, review articles, and other texts appear at the end of each Part. Few (<3%) of the references cited, however, were published after 1974.

Overall, the author has done a creditable job in assimilating a great deal of information from a variety of sources. This book can be recommended to anyone who employs infrared and Raman spectroscopy to characterize inorganic and organometallic compounds.

Charles Kutal, *University of Georgia*

Carbohydrate Chemistry. Volume 9 (Specialist Periodical Reports). Senior Reporter: J. S. BRIMACOMBE. The Chemical Society, London. American Chemical Society, Washington, D.C. 1977. xiii + 485 pp. \$58.00.

This, the ninth report in the series, is a concise, comprehensive coverage of the literature on carbohydrate chemistry and biochemistry between mid-January 1975 and mid-January 1976. With few exceptions, the report is similar to previous ones. It is divided into two parts prepared by eight contributors and totaling more than 2770 references.

Part I, entitled "Mono-, Di-, and Tri-saccharides and their Derivatives", contains 28 sections and 204 pages. The scope of each section

is quite restricted and clearly defined. Titles of such sections are, for example, "Free Sugars", "Ethers and Anhydro-sugars", "Thio- and Seleno-sugars", "Antibiotics", "Polarimetry", etc. A major section, entitled "nucleosides", contains 29 pages and approximately 150 references. This represents about one-seventh of the total references in Part I. Other prominent sections are: "Glycosides", "Esters", and "NMR Spectroscopy and Conformational Features of Carbohydrates".

Part II, entitled "Macromolecules", contains 8 sections totaling 258 pages. While Part I summarizes some unique chemistry of small saccharides, Part II deals with the biochemistry of large saccharides. Prominent sections are: "Glycoproteins, Glycopeptides, and Animal Polysaccharides", and "Enzymes". Other sections are "General Methods", "Plant and Algal Polysaccharides", "Microbial Polysaccharides", "Glycolipids and Gangliosides", and "Chemical Synthesis and Modification of Oligosaccharides, Polysaccharides, Glycoproteins, Enzymes, and Glycolipids".

The authors are to be commended on the completion of this clear, well-organized summary of such a large volume of material. The conciseness of the report coupled with the large number of references render the text quite useful, particularly to anyone interested in carbohydrate chemistry.

W. B. Lunsford, *Baylor University*

Introduction to Polymer Science and Technology. Edited by H. S. KAUFMAN (Ramapo College of New Jersey) and J. J. FALCETTA (Bausch and Lomb, Inc.). Wiley-Interscience, New York. 1977. x + 613 pp. \$27.50.

The purpose of this book is to provide the fundamentals of the preparation, characterization, and utilization of polymers to as wide an audience as possible, including technical, production, sales, and management personnel and students enrolled in an upper-level undergraduate course.

A total of seventeen authors contributed the eleven chapters in the book. The chapters are generally well written, at about the right level and seem to be authoritative. They can be grouped, loosely, into three major categories: General Concepts ("Introduction to Polymer Science"), Organic Chemistry ("Polymerization" and "Polymer Modifications"), Physical Properties ("The Size and Weight of Polymer Molecules", "Polymer Morphology", "Transitions and Relaxations in Polymers", "Mechanical Properties of High Polymers", and "Rheology"), and Polymer Processing ("Extrusion", "Injection Molding", and "Polymer Fabrication Processes"). Most chapters conclude with lists of General References, Specific References, and Discussion Questions and Problems (without answers).

To a very large extent, the book does meet its stated goal, and it can be highly recommended to anyone wishing to learn about polymeric materials.

J. E. Mark, *University of Cincinnati*

Topics in Current Chemistry, Volume 58. New Theoretical Aspects. Contributors: ANDRÉ JULG (Université de Provence), ROBERT S. BUTLER and PAUL DE MAINE (Pennsylvania State University), and REINHART GEICK (Universität Würzburg). Springer-Verlag, New York. 1975. 186 pp. \$23.80.

The stated purpose of this series is to present critical reviews of the present position and future trends in modern chemical research. It is addressed to research and industrial chemists interested in keeping abreast of advances in their subject. The present volume deals with three topics: "The Description of Molecules Using Point Charges and Electric Moments" by A. Julg; "CRAMS—An Automatic Chemical Reaction Analysis and Modeling System" by R. S. Butler and P. de Maine; and "I. R. Fourier Transform Spectroscopy" by R. Geick. The first topic involves a general discussion of the validity of the chemist's concept of point charges. Various procedures for estimating their magnitudes (both phenomenological and theoretical) are presented and compared. The second topic covered involves a computer program (CRAMS) which models chemical reactions. The program was written to help chemists design experiments for testing proposed reaction mechanisms. It can be used to study any fragment or combination of fragments of a proposed reaction system. The final topic dealt with is IR Fourier transform spectroscopy. In this technique, light is not separated into spectral elements. Instead, the light is passed through a two-beam interferometer. The interference of the two beams as a function of path length is Fourier transformed into the spectrum with the aid of a computer. The technique has advantages over conventional spectroscopy primarily in the far-infrared. Detailed math-

ematics of this approach are developed and principal advantages and disadvantages are discussed. A survey of available commercial instruments is presented. This book should prove useful to anyone interested in the three topics covered.

R. L. Matcha, *University of Houston*

Batteries, Volume 1. Manganese Dioxide. Edited by KARL V. KORDSCH (Union Carbide Corp.). Marcel Dekker Inc., New York. 1974. xi + 566 pp. \$47.50.

This volume contains four chapters. The first chapter by Richard Huber is on Leclanché batteries. The author has made major contributions to the field during his long career at Varta Battery Co. The scope and great detail of this chapter reflect an in-depth understanding of the system. This long chapter (239 pp) covers everything from the electrochemistry of the system to the processing of paper for wrapping cells. It is an excellent exposition of the typical combination of science and art that goes into the fabrication of most batteries. It is worth reading if only for this reason.

The second chapter by Karl V. Kordesch on alkaline manganese dioxide batteries contains an enormous wealth of detail on alkaline manganese dioxide cells and their components. The chapter contains an appendix which is a very good compendium on the properties of KOH and NaOH electrolytes. As in the case of the first chapter, the extensive personal experience of the author in the area is evident.

The third chapter by Akiya Kozawa discusses the electrochemistry of manganese dioxide and the production and properties of manganese dioxide. This chapter reviews the extensive work by the author and his co-workers at Union Carbide. The chapter also contains a review of the extensive Japanese work in this area including work published in journals that are not readily available in the U.S.

The last chapter by Donald B. Wood reviews magnesium-manganese dioxide batteries. This chapter is the shortest (29 pp) and gives an overview of cell structures and performance. There is a brief discussion on the use of *m*-dinitrobenzene as a depolarizer instead of manganese dioxide.

On the whole this book gives an excellent overview of the manganese dioxide electrode as related to batteries. It provides an enormous amount of information that is useful to the electrochemist and battery technologist.

James McBreen, *Brookhaven National Laboratory*

Principles of Field Ionization and Field Desorption Mass Spectrometry. By HANS-DIETER BECKEY (Universität Bonn, Federal Republic of Germany). Pergamon Press, New York. 1978. xv + 335 pp. \$35.00.

This book is a major revision of Professor Beckey's previous book "Field Ionization Mass Spectrometry" issued in 1971, and it represents an authoritative treatment of the principles of field ionization and field desorption. In general this book is better organized and has improved style and fewer typographical errors than the first book. The activity in this field since the preparation of the first book required the author to be more selective in his approach. Only subjects considered to be of growing importance are covered. The first chapter is concerned with the theory of field ionization and field desorption. The author does not become involved in the present controversy concerning the mechanism of field desorption of large organic molecules, but simply states that a quantitative theory does not yet exist. The second chapter covers techniques and source design with emphasis on the various kinds of emitters employed in FIMS. Chapter Three discusses selected topics in high-field surface chemistry, including field dissociation of ions, reactions in adsorbed layers, ion clusters, and multiply charged ions. Chapter Four is an excellent chapter on the kinetics and mechanisms of decomposition of field ions in the gas phase. The FI technique provides a time-resolved view of reactions in the 10^{-12} – 10^{-5} s time window. The final chapter concerns qualitative and mixture analysis using FI and FDMS and will be of considerable value to anyone interested in the analytical utility of the technique. For those interested only in this aspect of FDMS there are more extensive reviews available.

The book cannot in 335 pages give a complete coverage of the five major areas selected, but the author has provided numerous references (379) to aid further study. A thorough table of contents and an adequate index are provided.

This book is highly recommended for anyone seriously interested in the study of field ionization or field desorption mass spectrometry.

Charles N. McEwen, *E. I. du Pont de Nemours & Company*