

Book Reviews *

The Chemistry of β -Lactams. Edited by Michael I. Page (University of Huddersfield). Chapman & Hall: New York. 1992. xx + 352 pp. \$179.50. ISBN 0-7514-0061-0.

No single chemical class of compounds has had a greater impact on the control of infectious disease in the last fifty years than β -lactam antibiotics. The generation of semisynthetic penicillins and cephalosporins in the 1970s followed by the discovery of novel β -lactam antibacterials (i.e., monobactams, penems, carbapenems, carbacephems) in the last decade has resulted in an explosion in the β -lactam literature, far too voluminous for newcomers in the field to follow. *The Chemistry of β -Lactams* plays a role in filling this void by exposing the reader, in a single volume, to topics such as β -lactam biosynthesis, mechanism of action, antibacterial activity, structure-activity relationships (SAR), bioisosteres, resistance, chemical reactivity, and total synthesis. Individual chapters are extensively referenced (in many instances the early literature is included) providing the reader with a historical perspective on key scientific developments. *The Chemistry of β -Lactams* understandably does not cover all pertinent areas of β -lactam research; nonetheless, the topics chosen are presented well. The book's title is misleading, particularly since mechanism of action, biosynthesis, and resistance play a significant role in it; the title certainly will attract medicinal and organic chemists but not likely microbiologists or physicians interested in drug mechanism and SAR.

J. E. Baldwin and C. Schofield (Chapter 1) describe the mechanistic investigations and experimental results (much of which emanated from the Oxford group) leading to the fascinating unraveling of the penicillin and cephalosporin biosynthesis mechanism. In addition, clavulanic acid, carbapenem, and monocyclic β -lactam biosyntheses are included. In two ensuing chapters, M. I. Page (Chapters 2 and 4) probes the underlying factors responsible for the chemical reactivity of the β -lactam ring including the effect of structural changes on β -lactam reactivity. The penicillin nucleus serves as the model substrate in his examination of nucleophilic additions to β -lactam antibiotics. These sections will be of interest to medicinal chemists interested in the design of novel β -lactam structures.

Steady progress has been achieved in recent years in increasing our understanding of β -lactam structure-function. H. C. Neu (Chapter 3) provides a concise and comprehensive review of important β -lactam therapeutics and describes the effect of structural change not only on antibacterial activity but also on the pharmacological and toxicological properties of these agents. Medicinal chemists will be interested in this chapter but will need to access chemical structures to fully appreciate its contents, since structures were not included. The target of β -lactam antibiotics is a family of β -lactam recognizing proteins consisting largely of transpeptidases (penicillin binding proteins (PBPs)) and β -lactamases. J.-M. Frère, M. Nguyen-Distèche, J. Coyette, and B. Joris (Chapter 5) describe the current level of understanding of transpeptidases (PBPs) structure-function. β -lactamases, which are responsible for conferring bacterial resistance to the lethal action of β -lactam antibiotics, are described by S. G. Waley (Chapter 6), and a compilation of novel β -lactamase inhibitors and mechanisms by which they prevent bacterial resistance is presented by R. F. Pratt (Chapter 7).

An arsenal of β -lactams has been prepared over the last 40 years to respond to bacterial challenges, and the last three chapters of the book are devoted to chemical synthesis efforts which have played such an important role in the drug discovery of β -lactam antibiotics. Important synthetic work involving some of the key targets of the 1980s (i.e., carbapenems, penems, and monobactams) surprisingly was not reviewed. R. D. G. Cooper (Chapter 8), however, did highlight synthetic pathways used to access one of the more recent classes of β -lactams, the carbacephems. This chapter illustrates how a chemical modification (carbon isostere) of the cephalosporin nucleus confers greater molecular stability to a family of β -lactams, allowing the generation of potent carbacephem antibacterials. L. N. Jungheim and R. J. Ternansky (Chapter 9) then report on a more speculative approach for identifying novel β -lactam-like antibacterials involving the generation of mimics of the presumed pharmacophore of β -lactam antibiotics. Bicyclic pyrazolidinones, a product of rational drug design, and the naturally occurring lactivicin are among those described. Finally, in Chapter 10, E. W. Colvin presents a potpourri of β -lactam total syntheses, including the original syntheses of penicillin V (Sheehan) and cephalosporin C (Woodward) and the conversion of penicillins to cephalosporins (Morin), all of which were originally described over 25 years ago.

The Chemistry of β -Lactams reviews aspects of an area which

deservedly has received a considerable amount of scientific attention over the last 50 years and will continue to generate interest in the future. The book is certainly not (nor was it intended to be) a provocative source for ideas on new avenues of β -lactam antibacterial discovery, nor is it particularly timely (a majority of the references are over 5-10 years old). Nonetheless, if the reader is interested in an up-to-date summary on aspects of microbiology and β -lactam antibacterial research, *The Chemistry of β -Lactams* is certainly worth reading and would be a worthwhile addition to university and industrial research libraries.

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Photochemistry of Lignocellulosic Materials. ACS Symposium Series 531. Edited by Cyril Heitner (Pulp and Paper Research Institute of Canada) and J. C. Scaiano (University of Ottawa). American Chemical Society: Washington, DC. 1993. viii + 224 pp. \$64.95. ISBN 0-8412-2692-x.

This book was developed from the symposium sponsored by the Division of Cellulose, Paper, and Textile at the 203rd National Meeting of the American Chemical Society held in San Francisco, CA, on April 5-10, 1992. After a preface by the editors, there are 16 chapters organized under the following headings: Mechanism of Light-Induced Yellowing; and Color Stability. There are author, affiliation, and subject indexes.

β -Glucosidases. Biochemistry and Molecular Biochemistry. ACS Symposium Series 533. Edited by Asim Esen (Virginia Polytechnic Institute and State University). American Chemical Society: Washington, DC. 1993. x + 260 pp. \$74.95. ISBN 0-8412-2697-0.

This book was developed from a symposium sponsored by the Division of Agricultural and Food Chemistry at the 204th National Meeting of the American Chemical Society held in Washington, DC, on August 23-28, 1992. After a preface there are 16 chapters covering β -glucosidases of mammals, plants, fungus, and bacterium. There are author, affiliation, and subject indexes.

Annual Reports in Organic Synthesis. 1993. Edited by Philip M. Weintraub (Merrell Dow Research Institute), Kenneth Turnbull (Wright State University), Daniel M. Ketch (Wright State University), Raymond Gross (Merrell Dow Institute), and Tony Yantao Zhang (Reilly Industries, Inc.). Academic Press: San Diego, CA. 1993. xviii + 546 pp. \$65.00. ISBN 0-12-040823-6.

This book is a collection of abstracts of synthesis of organic compounds which have appeared in common journals from February 1, 1991 to 1992. After a preface by the editors, a list of journals abstracted, and a glossary of abbreviations, there are seven chapters organized under the following headings: Carbon-Carbon Bond Forming Reactions; Oxidations; Reductions; Synthesis of Heterocycles; Protecting Groups; Useful Synthetic Preparations; and Reviews. There is also an author index.

Molybdenum Enzymes, Cofactors, and Model Systems. ACS Symposium Series 535. Edited by Edward I. Stiefel (Exxon Research and Engineering Company), Dimitri Coucouvanis (University of Michigan), and William E. Newton (Virginia Polytechnic Institute and State University). American Chemical Society: Washington, DC. 1993. xii + 388 pp. \$94.95. ISBN 0-8412-2708-x.

This book is developed from the symposium sponsored by the Division of Inorganic Chemistry at the 204th National Meeting of the American Chemical Society held in Washington, DC, on August 23-28, 1992. After a preface by the editors, there are 23 chapters organized under the following headings: Molybdenum Cofactor Enzymes; Molybdenum Cofactor Models; Nitrogenase; and Nitrogenase Models. There are author, affiliation, and subject indexes.

Near Infrared Spectroscopy. Bridging the Gap Between Data Analysis and NIR Applications. Ellis Horwood: West Sussex, UK. 1992. xvi + 474 pp. \$85.00. ISBN 0-13-617416-7.

This book was developed from the 5th International Conference on Near Infrared Spectroscopy in Haugesund, Norway, on June 16-20, 1992. After a preface by the editors, there are 73 chapters, in typescript, listed under the following headings: Introduction to NIR Spectroscopy; Spectral Interpretations; Progress in Calibration Methods; Developments

*Unsigned book reviews are by the Book Review Editor.

in NIR Software; Developments in Instrumentation; Applications—Agricultural Sciences; Applications—Food Sciences; Applications—Chemical Industry; and Practical Implementations. There is also a subject index.

Handbook of Hazardous Materials. Edited by Morton Corn (The Johns Hopkins University). Academic Press: San Diego, CA. 1993. xvi + 772 pp. \$150.00. ISBN 0-12-189410-x.

This book is a collection of summaries on a range of topics of recent past or current emphasis in the field of hazardous materials. After a list of contributors and a preface by the editor, there are 63 chapters and an extensive index.

Thermodynamics in Geochemistry: The Equilibrium Model. By Greg M. Anderson and David A. Crerar. Oxford: New York. 1993. xx + 588 pp. \$75.00. ISBN 0-19-506464-x.

This book is designed to be a first introduction to geochemistry but continues into more advanced topics. After a preface by the editors, there are 19 chapters with the following chapter headings: Thermodynamics—A Model Subject; Mathematical Background; Thermodynamic Terms; The First Law of Thermodynamics; The Second Law of Thermodynamics; Statistical Interpretation of Entropy; Thermodynamic Properties of Simple Systems; Applications to Simple Systems; Partial and Apparent Molar Properties; Ideal Solutions; Fugacity and Activity; Standard States; The Equilibrium Constant; Heterogeneous and Open Systems; Solid Solutions; Gaseous Solutions; Aqueous Electrolyte Solutions; Redox Systems; and Speciation Calculations. There are appendixes with the following headings: Constant and Numerical Values; Expressions for ΔG , ΔS , ΔH , and $\ln K$ as a Function of Temperature for Various Versions of the Heat Capacity Function; Standard Thermodynamic Properties of Selected Minerals and Other Compounds; Electrochemical Cell Conventions; EQBRM—A Fortran Speciation Program; and the Answers to Problems. There is a bibliography and a subject index.

Kirk-Othmar Encyclopedia of Chemical Technology. Fourth Edition. Volume 8. Edited by Jacqueline I. Kroschwitz and Mary Howe-Grant. Wiley Interscience: New York. 1993. xxviii + 1094 pp. \$275.00. ISBN 0-471-52676-2.

This is the eighth volume of a 25-volume encyclopedia set, with four volumes being published each year. The Fourth Edition is similar in format to the earlier editions with updates to the entries as necessary and the addition of several new subjects. This volume contains 27 entries ranging from *Deuterium and Tritium* to *Elastomers, Polyethers*. This volume does not contain an index; however, supplement and index volumes are scheduled for publication in 1998.

Organic Synthesis. Volume 71. Edited by Larry Overman. J. Wiley and Sons: New York. 1993. xxiv + 286 pp. \$39.95. ISBN 0-471-30531-6.

This is volume 71 of a series which contains experimental procedures that illustrate important new synthetic methods or describe the preparation of particularly useful chemicals. This book contains 30 procedures, a list of unchecked procedures, an author index, and a subject index.

The Chemistry of the Copper and Zinc Triads. Edited by Alan J. Welch and Stephen K. Chapman (University of Edinburgh). Royal Society of Chemistry: Cambridge, U.K. 1993. x + 260 pp. £47.50. ISBN 0-85-186715-4.

This book is the Proceedings of the First International Conference on the Chemistry of the Copper and Zinc Triads held at the University of Edinburgh on July 13–16, 1992. After a preface by the editors, there are 41 papers which cover environmental chemistry, organometallic/coordination chemistry, and biological/medicinal chemistry. There is a short subject index.

Handbook of Photochemistry. Second Edition. Revised and Expanded. By Steven L. Murov (Modesto Junior College), Ian Carmichael (University of Notre Dame), and Gordon L. Hug (University of Notre Dame). Marcel Dekker, Inc.: New York. 1993. viii + 125 pp. \$125.00. ISBN 0-8247-7911-8.

This book is a compilation of photochemical data from The Radiation Chemistry Data Center of unimolecular and bimolecular photochemical data for commonly used organic molecules. The tables are organized according to the type of experiment performed. However, with the advances in equipment available since the first edition (in 1972), the tables have been reorganized, such as extinction coefficients of the

commonly used sensitizer and quencher being omitted while the absorption spectra of selected sensitizers have been expanded. After a preface by the editors the book has 18 chapters with the following headings: Photochemistry of Organic Molecules in Solution; Triplet-State Energies; Ordered; Flash Photolysis: Designing Experiments; Low Temperature Photochemistry of Organic Molecules; Ground-State Absorption Spectra; ESR and ODMR Parameters of the Triplet State; Diffusion-Controlled Rate Constants; Rate Constants of Singlet-State Quenching; Rate Constants of Triplet-State Quenching; Ionization Energies, Electron Affinities, and Redox Potentials of Organic Compounds; Bond Dissociation Energies; Solvent Properties; Chemical Actinometry; Transmission Characteristics of Light Filters and Glasses; Spectral Distribution of Photochemical Sources; Spin-Orbit Coupling; Fundamental Constants and Conversion Factors; and Hammett σ Constants. There are also a list of references, a compound name index, and a molecular formula index.

Theilheimer's Synthetic Methods of Organic Chemistry. Volume 47. Edited by Alan F. Finch. Karger: Basel, Switzerland. 1993. xxiv + 530 pp. \$696.00. ISBN 3-8055-5641-1.

This book is the second in the Tenth Series of Theilheimer's and contains a collection of abstracts of supplementary data from organic chemistry articles published in 1991 and the early part of 1992. After a preface, advice to the user, a survey of the trends in synthetic organic chemistry in 1993, a systematic survey, and a list of abbreviations and symbols, the contents are divided by reactions and reviews. There are a subject index, a formula index of complex functional groups, and supplementary references.

Dissociative Recombination: Theory, Experiment, and Applications. NATO ASI Series. Series B: Physics Volume 313. Edited by Bertrand R. Rowe (Université de Rennes I), J. Brian A. Mitchell (University of Western Ontario), and André Canosa (Université de Rennes I). Plenum: New York. 1993. x + 282 pp. \$95.00. ISBN 9-306-44568-9.

This book is developed from the Second International Conference on Dissociative Recombination: Theory, Experiment, and Applications held at l'Abbaye de Saint Jacut de la Mer, Brittany, France, on 3–8 May 1992. After a preface by the editors, there are 26 papers and six posters covering the areas of molecular ion recombination research, atomic and molecular theory and experiment, plasmas physics, astrochemistry, and aeronomy. There are a list of participants and a short subject index.

Intrinsically Conducting Polymers: An Emerging Technology. NATO ASI Series. Series E: Applied Sciences Volume 246. Edited by M. Aldissi (Champlain Cable Corporation). Kluwer Academic Publishers: Dordrecht, The Netherlands. 1993. xiv + 224 pp. \$109.00. ISBN 0-7923-2456-0.

This book contains papers presented at the NATO Advanced Research Workshop held in Burlington, VT, on 12–15 October 1992. After a preface by the editor, there are 19 papers in typescript covering the topic of basic materials science of conducting polymers. There is also a subject index.

Handbook of Industrial Surfactants. Edited by Michael Ash and Irene Ash. Bower: Brookfield, Vermont. 1993. xiv + 906 pp. \$195.00. ISBN 0-566-07457-5.

This is a reference book which contains the tradenames of surface-active agents with a focus on products used in industry, such as emulsifiers, wetting agents, foaming agents, detergents, dispersants, and solubilizers as well as detergent raw materials, defoamers, and antifoaming agents. After a preface by the editors, the book is divided into the following four sections: Tradename Reference; Tradename Application Cross Reference; Chemical Component Reference; and Manufacturers Directory. There are CAS Number-to-Tradename Cross Reference, CAS Number-to-Chemical Compound Cross Reference, EINECS-to-CAS Number Cross Reference, Ionic Classification, and HLB Classification indexes.

Encyclopedic Dictionary of Chemical Technology. By Dorit Noether and Herman Noether. VCH Publishers: New York. 1993. 298 pp. \$59.50. ISBN 0-89573-329-3.

This book is designed to be a bridge between general and specialized dictionaries by presenting short descriptions of technical terms, chemical processes, and products. There are also a list of abbreviations for compounds/groups, tables of acronyms of chemicals, methods, and organizations, and World Health Organization chemical emergency numbers.