Book Reviews*

The Organic Chemistry of Nucleic Acids. By Yoshihisa Mizuno. Elsevier Science Publishers: Amsterdam and New York. 1986. viii + 342 pp. $90.75. ISBN 0-444-99521-8.

Professor Mizuno stated in his Preface that this monograph deals with various aspects of the chemistry of nucleic acids, excluding their physical chemistry. It concerns the chemistry and biochemistry as well as their applications in nucleosides, nucleotides, and oligonucleotides. Emphasis is given to the contributions made by Japanese scientists in the field. The purpose of this book is to provide basic information for graduate students, teachers, and researchers in organic chemistry.

The book consists of 11 Chapters, including Introduction, Nucleosides, Synthesis of Nucleosides, Reactions of Nucleosides, Organic Phosphates and Phosphorylation, Oligodeoxyribonucleotides, Oligoribonucleotides, Enzymes Associated with Nucleic Acids, Sequencing, Interactions between Drugs and Nucleic Acids—a Case of Drug Designs, and Genetic Engineering. A large number of references is included at the end of each Chapter.

This book is a new entry to an interdisciplinary field which may interest quite a broad audience. It will provide many aspects of basic information about the field to the newcomers. The reviewer finds that the book is a handy desk-side reference, and its reference listings are particularly useful.

The author intended to present the subject in a textbook style and used flow-sheet style presentations of many structural formulae for synthetic schemes and reactions. His intention was to free the reader from the problems involved in reading the complicated nomenclature. However, when he presented the summary of reactions of nucleosides in Chapter 4, many reactions were presented in a flow sheet and each reaction was identified by a number. When these reactions were subsequently discussed in the text, no indexing was made to relate the number in the flow sheet with the contents of the discussion. This omission made a quick search and reading of a particular reaction a bit more time consuming. For example, some 31 reactions are listed in Figure 4.1 on pages 94–95 on the reactions of the basic moiety of adenosine, yet the number does not designate any particular aspect of discussion in the text. The reviewer also finds that, while the author intends to cover a variety of subjects in the book, it is difficult to satisfy the needs of some readers in such an interdisciplinary field. While many different types of enzymes were discussed in Chapter 8, survey for a particular type of enzyme might be overlooked, such as the restriction endonucleases which were treated only briefly in Chapters 8 and 10 (p 264 and 332–333).

Other features of the book provide the readers with quick and well-presented reviews on nucleic acid–drug interactions in Chapter 10, synthesis of nucleic acids in Chapters 6 and 7, and sequencing in Chapter 9 but only a brief introduction to genetic engineering in Chapter 11.

The first printing of the book contains many typographical errors which occur, for example, in the Reference listing (ref 9 on page 16), in text (DNA as DAN on page 21), in formulae **1–5** on page 308, and in Figure 10.4 on page 310. The price tag will prevent most graduate students and some teachers from acquiring this book.

In spite of these minor criticisms, the reviewer finds this book to be a valuable and timely addition to the references of organic chemistry in a field of science of growing importance. It will be a worthwhile addition to many public and private libraries.

Nien-chu C. Yang, *University of Chicago*

Ring-Opening Polymerization. Kinetics, Mechanisms, and Synthesis. Edited by J. E. McGrath (Virginia Polytechnic Institute and State University). ACS Symposium Series No. 286. American Chemical Society: Washington, D.C. 1985. 398 pp. $74.95 U.S. and Canada. Export price $89.95.

This book represents the proceedings of an international symposium sponsored by the Division of Polymer Chemistry at the 187th Meeting of the American Chemical Society, St. Louis, Missouri, April 8–13, 1984.

Although there are numerous excellent review articles (i.e., *Adv. Polym. Sci.* **1980** *37*; **1985**, *68/69*) and books (see, for example, *Ring-Opening Polymerization*, edited by K. J. Ivin and T. Saegusa, Elsevier Applied Science Publishers, 1984, 3 volumes, reviewed in: *J. Am. Chem. Soc.* **1985**, *107*, 6151) on the same topic, I consider that this book represents an excellent and very useful addition to the library on Ring-Opening Polymerization.

The book is prefaced by the editor who surveys the state of the art and summarizes the content of the following 25 papers. Most of the remaining 25 chapters represent quite comprehensive reviews made by experts in the field. They are as follows: anionic polymerization of cyclosiloxanes with cryptates as counterions (Boileau), anionic polymerization of ethylene oxide with lithium initiators (Quirk), free radical ring-opening polymerization (Bailey), mechanisms of *N*-carboxy anhydride polymerization (Harwood), synthesis of block copolymers (Richards), metal–alcoholate initiators (P. Teyssie et al.), anionic polymerization of α,α-disubstituted β-propiolactones (Lenz et al.), structure–reactivity relationships in ring-opening polymerization (Penczek et al.), metalloporphyrin catalysts (Inoue), anionic polymerization of octamethylcyclotetrasiloxane in the presence of 1,3-bis(aminopropyl)-1,1,3,3-tetramethyldisiloxane (McGrath et al.), block copolymers containing poly(ϵ-caprolactone) (Hsieh et al.), organolithium polymerization of ϵ-caprolactone (Morton et al.), polymerization of heterocyclics (Franta et al.), thermal and photochemical initiators (Crivello), polymerization of substituted oxiranes (Jedlinski et al.), polymers from *N*-alkylaziridines (Goethals et al.), block copolymers containing poly(ethylene oxide) and poly(*N*-isovalerylethyleneimine) (Litt et al.), polysiloxane macromers (Yamashita et al.), polyepoxides (Robins et al.), mechanisms of metathesis polymerization (Ivin et al.), ring-opening polymerization of phosphorus(III) containing monomers (Kobayashi), polymerization of atom-bridged bicyclic acetals and ortho esters (Hall, Jr. et al.), radiation polymerization (Williams et al.), polymerization of epichlorohydrin in the presence of ethylene glycol (Okamoto), and polymerization of lactones (Sharkey).

The entire book is unexpectedly well presented given the fact that it represents a collection of manuscripts which were printed by photocopy. Although the price is high, this book should be present on the desk of everybody active or interested in ring-opening polymerization.

Virgil Percec, *Case Western Reserve University*

Heterocyclic Compounds. Volume 44. Thiophene and Its Derivatives. Parts 2 and 3. Edited by S. Gronowitz (University of Lund). John Wiley & Sons: New York. 1986. Part 2: xiii + 906 pp. $195.00. ISBN 0471-83832-2. Part 3: x + 1272 pp. $260.00. ISBN 0471-83833-0.

Thiophene chemistry played a small but nevertheless important role in organic chemistry since the discovery of the parent compound by Victor Meyer, but the subject received an enormous impulse in the 1940s from the introduction of commercial availability. The result is that the one volume, by one author, Howard Hartough, published in 1952 was enough to cover the subject comprehensively, but in the mid-1980s, four volumes and a substantial group of authors are required. The first of the four was published in 1985; the second and third are now in hand; and the fourth is in preparation. Each volume ("Part") is paginated, indexed, and priced separately.

Part 2 consists of five chapters on the following subjects: electrophilic substitution (R. Taylor); alkylthiophenes (P. Cagniant, D. Cagniant, D. Paquer, and G. Hirsch); halothiophenes (M. G. Reinecke and P. Pedaja); nitrothiophenes (R. K. Norris); and aminothiophenes (R. K. Norris). Part 3 contains two chapters by S. Gronowitz and A.-B. Hörnfeldt on compounds containing thiophene–oxygen or thiophene–sulfur bonds, a chapter on acyl derivatives by R. M. Scrowston, one on thiophenecarboxylic acids by J. M. Barker and P. R. Huddleston, and one on side-chain reactivity of thiophenes by G. Musumarra. The chapters follow the style of previous volumes and have an abundance of clearly drawn structures and extensive tabulations of such useful information as physical properties and synthetic yields. Each volume has a complete author index and a gratifyingly thorough subject index. The editor assumed a great task in agreeing to oversee (and contribute to) these volumes and is to be commended on the excellence of the result.

Industrial Application of Radioisotopes. Edited by G. Földiák (Institute of Isotopes of the Hungarian Academy of Sciences). Elsevier Science Publishers: Amsterdam and New York. 1986. 564 pp. $120.50. ISBN 0-444-99530-7

The use of radioisotopes in industrial applications is well advanced and very varied. This book attempts to provide a comprehensive, up-to-date treatment of this subject. The scope of topics covered is broad and impressive. Most aspects of radioanalytical methods, the use of tracers, sealed sources, and nuclear instruments are covered. Bringing all these areas together fills a gap in the literature.

The core of the book is really contained in Chapters 3 and 4 on

*Unsigned book reviews are by the Book Review Editor

radiotracer techniques and radioanalytical methods. The many separate subunits dealing with particular applications are well written and contain useful schematic diagrams, and worked-out examples, primarily from the oil, steel, and chemical industries. In most cases each application can be read and understood independently of the rest. The style and level of presentation is somewhere between a textbook and a professional monograph. The approach is generally descriptional rather than derivational with formulas and facts simply stated. An exception to this is the section on activation analysis which does start with a concise derivation of the theoretical basis of the technique before moving to applications. Although there are generally a plethora of practical hints included, there are relatively few references to advanced texts or to original journal literature for those who want more detailed information in order to actually set up a particular measurement. Another quibble is that the first chapter on "Basic Data and Definitions" is misplaced. It probably should simply be an appendix since it is really a compendium of facts that are not introduced in any natural order.

Two applications of radioisotopes receive more attention than others, as a chapter each is devoted to them. One chapter involves nuclear methods of well logging for oil, coal, ore, and water exploration using both γ-rays and neutrons. The other chapter concerns radiography for nondestructive testing of defects and investigation of internal structure of materials. The many medical applications which utilize similar methods are not covered. Another chapter represents a mix of assorted radioisotope applications, including radiation effects on organic substances, polymers, lubricants, etc., and irradiation of produce. These have little relation to one another. Although each is treated rather superficially, there is a lot of useful, current data presented.

In summary, this book is not for students but rather the practicing industrial chemist or physicist with a measurement problem. Its comprehensive coverage, useful diagrams, and data compilations would enable technical staff to make a knowledgeable choice of method.

Leonard F. Mausner, *Brookhaven National Laboratory*

The Chemical Physics of Solvation. Part B: Spectroscopy of Solvation (Studies in Physical and Theoretical Chemistry. Volume 38). Edited by R. R. Dogonadze (Georgian Academy of Sciences), E. Kálmán (Hungarian Academy of Sciences), A. A. Kornyschev (Academy of Sciences of the USSR), and J. Ulstrup (Technical University of Denmark). Elsevier Science Publishers: Amsterdam and New York. 1986. XXV + 559 pp. $124.00. ISBN 0-444-42674-4

This, the second part of a three-volume treatise on solvation, is devoted to the spectroscopy of the solute–solvent interaction. Part A dealt with theories of solvation, and Part C will focus on specific physical, chemical, and biological systems.

The spectroscopy of solvation deals with the effect of a solvent on a solute's energy exchange with electromagnetic radiations and, occasionally, on the solute's effect on the solvent's exchange. It covers many aspects of structural and dynamical interactions between solvent and solute. They appear in absorption, emission, or scattering, and involve shifts in frequencies, intensities, or line shapes (often through lifting of degeneracies or breaking of symmetries).

This is a multiauthored monograph, with the advantage that all areas are presented in depth by experts. Perhaps this means that some intercomparisons are missed, at the detailed level of a given system, and some techniques of limited applicability (in solvation) receive no coverage (such as ESR, EXAFS, Mössbauer, and muon spin relaxation), but the overall feeling is that the chapters complement each other very well. There are two chapters each on IR and UV–vis and one each on Raman, NMR, dielectric microwave, ultrasound and diffraction (X, e^-, and n). The contents are the following: Chapter 1, Spectroscopic Approaches to the Study of Ionic Solvation (E. Kálmán and G. Kabisch); Chapter 2, Interactions in and Structures of Ionic Solutions and Polyelectrolytes—Infrared Results (G. Zundel and J. Fritsch); Chapter 3, Infrared Spectroscopic Results on Solvate Structures in Crystals (G. Zundel and J. Fritsch); Chapter 4, Raman Spectroscopic Measurements of Ion Hydration (M. H. Brooker); Chapter 5, Quantum Theory of Electronic and Vibrational Spectra of Impurity Molecules in Polar Media (R. R. Dogonadze and T. A. Marsagishvili); Chaper 6, Ultraviolet and Visible Light Absorption of Solute Molecules in Condensed Media (E. M. Itskovitch, J. Ulstrup, and M. A. Vorotyntsev); Chapter 7, Nuclear Magnetic Resonance Spectroscopy in Ionic Solvation Studies (H. G. Hertz); Chapter 8, Dielectric Microwave Spectrometry (H. Farber and S. Petrucci); Chapter 9, Ultrasonic Absorption Spectrometry (H. Farber and S. Petrucci); and Chapter 10, X-Ray, Electron, and Neutron Diffraction Studies of Ionic Solvation (E. Kálmán and G. Palinkas).

An admitted bias is toward the physics of the solvation process, and there are relatively few experimental details. The reference lists look very good, but the index could be viewed as somewhat weak in that it makes no distinction, for a given entry, between a whole section devoted to that topic and a mere mention in passing.

For chemists involved with solvation this should become an invaluable background reference to what has been done and what can be learned spectroscopically. All good research libraries should own a copy.

David C. Walker, *University of British Columbia*

Techniques of Chemistry. Volume 6. Investigation of Rates and Mechanisms of Reactions: Part II, Investigation of Elementary Reaction Steps in Solution and Fast Reaction Techniques. Series Editor A. Weissberger. Edited by C. F. Bernasconi (University of California, Santa Cruz). John Wiley and Sons: New York. 1986. xii + 673 pp. $175.00. ISBN 0471-83096-8

In the introduction to this volume, the editor defines a "fast reaction" as any reaction with a half-life shorter than $\sim$10 s. Since some of the techniques described in this book extend into the subpicosecond range, the overall time scale that is covered is 13–15 decades. While the emphasis is on techniques applicable to reactions in solution, at least some of them (e.g., flash and laser photolysis) are widely used to study gas-phase reactions, as well. References in individual chapters appear to extend through 1983, a not unreasonable time lag for a multiauthored production such as this. Individual authors have treated their subjects very differently, ranging from detailed and extensive theoretical background material to wiring diagrams with specifications of components.

Chapter I: Rapid Flow Methods, by B. H. Robinson, represents the relatively slow end of the time domain covered in this book. This is followed by a long chapter by G. Schwarz, which establishes the theoretical basis for the several relaxation methods described in subsequent chapters. This chapter provides an excellent background, but it seems out of place to devote 40 pages or so to such basics as linear algebra, thermodynamics, and transition-state theory. More detailed discussions of specific relaxation methods are provided by Chapter III, Temperature-Jump Methods (D. H. Turner); Chapter IV, Pressure-Jump Methods (W. Knoche); Chapter V, Electric Field Methods (E. M. Eyring and P. Hemmes); and Chapter VI, Ultrasonic Methods (J. E. Stuehr). Chapter VII, Electrochemical Reactions (C. P. Andrieux and J. M. Savéant), differs in emphasis from other chapters; as the authors state, the emphasis is on the role of chemical reactions in electrochemical mechanisms, rather than on electrochemistry as a technique for the study of reaction kinetics in solution. Chapter VII, Flash and Laser Photolysis (M. A. West), and Chapter IX, Pulse Radiolysis (L. M. Dorfman and M. C. Sauer, Jr.), both deal with the production of reactive species by pulses of light or high-energy electrons, respectively. Finally, Chapter X, Nuclear Magnetic Resonance Line-Shape Analysis of Reorganizing Systems (G. Fraenkel), and Chapter XI, Electron Paramagnetic Resonance (N. Hirota and H. Okaya-Nishiguchi), are concerned with rate measurements by line broadening methods, although the last chapter also discusses kinetic applications of conventional EPR spectroscopy.

The general level throughout this book is very high, and individual chapters will provide a thorough and up-to-date background for anyone starting to use the experimental methods discussed therein.

Ralph E. Weston, Jr., *Brookhaven National Laboratory*