

## Book Reviews\*

**Reaction Rates of Isotopic Molecules.** By Lars Melander (University of Göteborg) and William H. Saunders, Jr. (University of Rochester). John Wiley + Sons: New York. 1980. xiv + 331 pp. \$29.95.

The book "Isotope Effects on Reaction Rates" by Lars Melander, which appeared in 1960, had a major influence in promoting the use of the kinetic isotope effect for the study of reaction mechanisms. It was especially notable for its clear presentation of the transition-state theory of the kinetic isotope effect and the qualitative deductions which could be drawn from it. Although the book has stood the test of time well, as in practically every field of science two decades of work in numerous laboratories has greatly enriched its domain.

It is therefore particularly gratifying to have available the present successor volume, which results from the collaboration of Melander with William H. Saunders, Jr., another respected investigator who has been active in this field almost since its inception. Anyone engaged in the study of chemical reaction mechanisms should have a copy of this book. It is also admirably suited to serve as a reference work or a supplementary text for a graduate course in reaction mechanisms.

Rather than offering exhaustive coverage of this now extensive field, the authors have been selective, following their own interests which are nicely complementary. There is a thorough discussion of the fundamental theory and a good introduction, with examples, to the use of computer modelling methods for the calculation of isotope effects. I found the discussions of primary hydrogen isotope effects, tunnelling, solvent isotope effects, and secondary isotope effects particularly cogent and authoritative. Although there is a final chapter on Isotope Effects in Reactions with Complex Mechanisms which involves a short section on the Kinetics of Enzymatic Reactions, this important and extensive application of kinetic isotope effects is barely broached. Still, enzyme chemists will find the book useful for its clear presentation of basic theory and its concise and unified interpretation of results in simpler systems.

This book gives an excellent general introduction to the field and for this purpose has no serious competitor.

V. J. Shiner, Jr., *Indiana University*

**Steric Exclusion Liquid Chromatography of Polymers.** Edited by Josef Janca (Czechoslovak Academy of Sciences). Marcel Dekker, Inc.: New York. 1984. xv + 329 pp. \$55.00.

This book is Volume 25 in the "Chromatographic Sciences Series". It is a text written for those who are already quite familiar with polymer characterization procedures and chromatographic principles. It is not suitable as an introductory text for the field, and it is not intended to be a "how to" book. The seven chapters include discussions of general principles, system calibration, correction for axial dispersion, effects of experimental conditions, use for polymer analysis, automatic data treatment, and precision and accuracy of results. The discussion of general principles presents a good overview of the general separation process, with specific emphasis on the SEC experiment. The various retention models (geometric, restricted diffusion, hydrodynamic, stochastic, etc.) are covered in adequate detail. Discussions of various molecular weight calibration methods are fairly well organized but inadequate for someone who is problem-solving a system not covered in that chapter. This is a general complaint with the book. The chapters tend to be a list of every published attempt to solve a particular problem. There is little overview or summary that would allow someone to extrapolate the information to other systems. Discussions of instrumental errors and the use of computers are unnecessarily simplistic, given the level of material in the other chapters. On the positive side, each chapter contains an excellent bibliography and its value is more as a reference source. From this standpoint, the book is a useful addition to the library of the investigator who needs a guide to searching the existing literature.

Merlin K. L. Bicking, *State University of New York at Buffalo*

**Dynamics of Molecular Liquids.** By W. G. Rothschild (Ford Motor Company). John Wiley and Sons: New York. 1984. XVI + 415 pp. \$49.95.

The author of this book has done extensive research on the infrared and Raman spectroscopy of the condensed phase since 1964, and the book is a clear and very detailed distillation of his own experience together with closely related work. It is not "a comprehensive collection of the major current theories on rotational and vibrational relaxation phenomena of

molecular liquids" as is implied by the title and book jacket.

In the area of the author's work, the coverage is excellent and includes references as late as 1983. In related areas, literature references later than 1979 are rather sparse.

The book is divided into three chapters: Chapter one (66 pages) gives general background theory pitched at a "level suitable for graduate students". However, a neophyte would benefit from having, in addition to basic quantum mechanics, prior exposure to an elementary treatment of correlation functions such as that given in McQuarrie's "Statistical Mechanics" or the relevant parts of "Dynamic Light Scattering" by Berne and Pecora. The remaining two chapters cover rotational relaxation (150 pages) and vibrational relaxation (131 pages). The chapter on rotational relaxation starts with a very clear discussion, including many examples, of the J and M extended diffusion models and the theory of spectral moments. Vibration-rotational interaction is then discussed followed by a review of recent theories. There is surprisingly little overlap between the material covered in this book and that covered by Cook et al. in their book "Molecular Dynamics" published in 1982, which it supplements nicely. The coverage of theories of rotational relaxation is selective rather than comprehensive since there is little discussion of theories, such as the hydrodynamics theory of Oxotoby, which depend largely on computer modeling. The third chapter is devoted to vibrational relaxation. Mechanisms of dephasing, resonance energy transfer for both two and multilevel systems are described with emphasis on the physical ideas underlying the theoretical models.

One of the strongest features of the book is the amount of space devoted to the mathematical development of the theories presented. However, the usefulness of the book is considerably diminished by the incomplete index which makes it sometimes difficult to relate the fundamental theory with its applications. For example, there is only one index entry to Mori's theory of continual fractional representation (pp 183-185), but on p 183 one is informed that the theory has been previously mentioned. The only way to locate the earlier mention is to reread the text until p 177 is reached. Even there one is referred to an even earlier mentioning and it finally transpires that the first time the work is probably referred to in the text is on p 76. Similarly the topic of Coriolis interaction is given only one entry (pp 367-369), an appendix!). Nevertheless, there is an extensive discussion on this topic starting on p 96, and the subject is mentioned in at least half-a-dozen places in the text. As a final example of the index problem, not all the molecules whose relaxation properties are discussed are listed in the index; thus there is no entry for trimethylchloromethane or for carbon disulfide, and for benzene, the index entries are incomplete.

Despite this deficiency, the monograph is strongly recommended as an intermediate level theoretical introduction to the fundamental principles of relaxation phenomena written from the standpoint of infrared absorption and Raman and Raleigh scattering.

J. E. Bloor, *University of Tennessee*

**Mechanisms of Inorganic and Organometallic Reactions. Volume 2.** Edited by M. V. Twigg. Plenum Press: New York. 1984. xvi + 453 pp. \$59.50.

The intent of this series is to provide a continuing critical review of the primary literature on the mechanisms of inorganic and organometallic reactions in solution. In essence the series represents a continuation of the now defunct Specialist Periodical Reports "Inorganic Reaction Mechanisms" of The Royal Chemical Society. Volume 1 in the series covered the literature for the period July 1979 through December 1980, while the present volume covers the period January 1981 through June 1982. It is divided into three parts—(1) Electron Transfer Reactions (3 chapters, 78 pp), (2) Substitution and Related Reactions (6 chapters, 158 pp), and (3) Organometallic Reactions (5 chapters, 140 pp)—plus references and author and subject indices. Each chapter is prepared by a different author. The reviews of the literature appear to be quite comprehensive for the time period noted. However, the problem with such a format is that the need to cover a large number of papers on any one subject in a limited number of pages prevents much critical analysis by the reviewer. Thus most reviews merely report a few key results and repeat conclusions from the original articles. (Admittedly, there is significant variation from chapter to chapter in this regard.) Such reports are mostly of use only to the investigators reasonably familiar with the subject matter covered. A further disadvantage of the format is that the time delay inherent to publishing a bound, printed volume results in a

\*Unsigned book reviews are by the Book Review Editor.

somewhat dated literature survey. Thus the value of such a volume is less as a single work than as an integral part of a continuing series which provides a comprehensive but efficient chronological summary of the literature on inorganic and organometallic reaction mechanisms. As such the series would be quite useful to individuals such as graduate students writing theses, or more senior researchers preparing review articles, research proposals, etc., who need to survey the relatively recent publications in a particular area of endeavor. The quality of the first two volumes indicates that the value of the series will increase as more volumes are added and the series becomes a standard source for such surveys. In this context, the series should be on the subscription list of every complete chemistry reference library.

Peter C. Ford, *University of California, Santa Barbara*

### Textbooks on Introductory Chemistry

**General Chemistry.** By D. A. MaQuarrie and P. A. Rock. W. H. Freeman: New York. 1984. xviii + 1168 pp. \$31.95.

**Introduction to General, Organic, and Biological Chemistry.** By R. J. Oullette. Macmillan: New York. 1984. xvi + 703 pp. \$28.95.

**Introductory Chemistry for Health Professionals.** By K. J. Lyska and L. T. Pryde. Macmillan: New York. 1984. xviii + 652 pp. \$28.95.

### Books on Applied Chemistry

**Carbon Fibers. International Fiber Science and Technology Series. Volume 3.** By J.-B. Donnet and R. C. Bansal. Marcel Dekker: New York and Basel. 1984. ix + 291 pp. \$75.00.

Contains chapters on preparation, structure, surface properties, mechanical and other physical properties, and applications, augmented by extensive bibliographies and author and subject indexes.

**Handbook of Chemical Specialties: Textile Fiber Processing, Preparation, and Bleaching.** By J. E. Nettles. John Wiley and Sons: New York. xviii + 467 pp. \$60.00.

This is a practical, how-to-do-it approach making use of published material, patents, and informally handed down information. It starts with a review of the chemistry of the principal natural and synthetic fibers and then successively takes up fiber finishing, warp sizing, and the many aspects of preparation, such as sizing and bleaching. Chemical equations and structures are given throughout, and most reliable, although some aromatic compounds are represented incorrectly as cyclohexane derivatives. A lot of useful infrared spectra are reproduced. A list of 162 reference citations and four pages of bibliography for further reading contribute to the reference value of the book.

**Costs of Remedial Actions at Uncontrolled Hazardous Waste Sites.** By H. L. Rishel, T. M. Boston, and C. J. Schmidt. Noyes Publications: Park Ridge, NJ. 1984. \$32.00.

Consists largely of tables and charts, most of which relates to a set of 35 types of unit operations, such as ponding, revegetation, etc., prepared as an account of work sponsored by the U.S. EPA.

**Wood Adhesives: Chemistry and Technology.** Edited by A. Pizzi. Marcel Dekker: New York and Basel. 1983. ix + 364 pp. \$65.00.

Collects material on "the more technically and economically important adhesives for wood bonding and their preparation and formulation, as well as techniques and hints on their application", in a single volume.

**Glass Reinforced Polymer Systems. Materials Technology Series. Volume 14.** Edited by C. J. Hilado. Technomic Publishing: Lancaster, Pa. 1984. v + 182 pp.

A collection of articles originally published in the *Journal of Com-*

*posite Materials*, 1980-1982, and the *Journal of Reinforced Plastics*, 1982-1983.

**Fundamentals of Air Pollution. 2nd Edition.** By A. C. Stern, R. W. Bouble, D. B. Turner, and D. L. Fox. Academic Press: New York and London. 1984. xviii + 530 pp. \$39.00.

Written by a chemist, a meteorologist, and two mechanical engineers, this book treats the subject comprehensively but pedagogically and includes questions as well as references. Fifteen new chapters have been added to the revised version of the first edition.

**Aerosols: An Industrial and Environmental Science.** By G. M. Hidy. Academic Press: New York and London. 1984. xx + 774 pp. \$89.00.

A comprehensive introduction, with a balance among fundamental colloid science, atmospheric science, engineering aspects, and environmental science. Suitable for instructional use, but sufficiently referenced and indexed to serve as a work of reference.

### Books on Mathematical and Physical Subjects

**Topics in Applied Physics. Volume 55. The Physics of Hydrogenated Amorphous Silicon. I. Structure, Preparation, and Devices.** Edited by J. D. Joannopoulos and B. Lucovsky. Springer-Verlag: Berlin and New York. 1984. xii + 287 pp. Ca. \$45.00.

This is a collection of seven contributed reviews: Introduction; Structural and Chemical Characterization; Fundamental and Applied Work on Glow Discharge Material; CVD Material; Solar Energy Conversion; and Devices Using Fluorinated Material.

**The Visual Display of Quantitative Information.** By Edward Tufte. Graphics Press: Box 430, Cheshire, CT. Available only by ordering directly. 1983. 197 pp. \$34.00 postpaid.

This book is a comprehensive treatment of presenting data effectively in graphic form. It deals with history, design and esthetics, theory, and the practical side, with a rich and varied display of examples. It should be of great benefit to all chemists who write papers, reports, books, and proposals.

**Toward a Structural Theory of Action: Network Models of Social Structure, Perception, and Action.** By Ronald S. Burt. Academic Press: New York and London. 1983. xv + 381 pp. \$74.50.

The author develops mathematical models for the relation of status, perception, and action and applies them to the sociology of scientific journals, American manufacturing industries, etc.

**Probability Theory and Mathematical Statistics for Engineers.** By V. S. Pugachev, translated from the Russian by I. V. Sinitsyna. Edited by E. Eykhoff. Pergamon Press: Oxford and New York. 1984. xvii + 450 pp. \$90.00.

This is a translation of a book first published in Russian, apparently in 1980, and based on lecture courses for students at the Moscow Aviation Institute concerned with applied mathematics.

**Clustering of Large Data Sets.** By Jure Zupan. Research Studies Press, John Wiley and Sons: New York. 1982. xviii + 122 pp. \$31.95.

This book treats the problems of classification in science, especially in chemistry, from the standpoint of digital computers, with special attention given to infrared spectral data.

**Computing in Applied Science.** By W. J. Thompson. John Wiley and Sons: New York. 1984. xxiv + 325 pp. \$26.95.

A major aim of this book is to help the applied scientist to develop skill in using computers and formulating problems for them. The dedication is remarkable: "To my personal computer, for many a fruitful evening together." (Sounds cozy!)