Book Reviews

Syntheses of Sulphones, Sulphoxides and Cyclic Sulphides. Edited by Saul Patai and Zvi Rappoport (The Hebrew University, Jerusalem). John Wiley and Sons: Chichester, U.K. 1994. ix + 720 pp. $350.00. ISBN 0-471-93970-6.

This book is the last of a series of updates complementing the very useful series *The Chemistry of Functional Groups*. It is my understanding, from the foreword, that the main series will continue. Judging from the number of references and the size of the book, this update has been a considerable undertaking. This volume contains seven main chapters: Synthesis of Open-Chain Sulfones, Appendix to the Synthesis of Open-Chain Sulfones, Synthesis of Sulphoxides, Appendix to the Synthesis of Sulphoxides, Cyclic Sulfones and Sulfoxides, Appendix to Cyclic Sulfones and Sulfoxides, and Cyclic Sulfides. In each case, the appendixes are considerable works in their own right. Perusal of the reference list for each chapter reveals that literature up to and including the early 1990s has been convered. In some cases, the early 1993 literature has been reviewed. A check of some of the references revealed remarkable accuracy to the original papers.

As would be expected from a work of this size with several contributing authors, there is considerable variation in writing style. However, a high standard of presentation has been maintained throughout the book. Although this is not the kind of book a chemist would pick up for a casual read, the numerous schemes and summary tables make it very easy to scan the major reactions presented in the reviews. In most cases, schemes are presented with sufficient detail as to make the text redundant. Despite the chapter headings, there is some overlap between topics. A case in point is the appearance of numerous syntheses of cyclic sulfones in the first chapter on open-chain sulfones. Personally, I found this useful although readers should be prepared to search the index, which in general is quite useful. As the reader of this review will note, there is liberal interchange of "f" and "ph" in "organosulfur" throughout the book. Overall, this is a very useful book. The number of reactions and references presented is very large such that it will be a useful resource for organosulfur chemists for years to come. The very high price will, however, restrict its appearance to major collections.

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JA945158W

Advances in Chromatography. Edited by Phyllis R. Brown (University of Rhode Island) and Eli Grushka (Hebrew University of Jerusalem). Marcel Dekker: New York. 1994. xvi + 435 pp. $165.00. ISBN 0-8247-9087-1.

The text is the 34th volume in a continuing series on separation methods with applications for readers in a wide variety of scientific disciplines. In this series, leading experts provide up-to-date evaluations of progress and trends in separation science. The separation techniques discussed in the 34th volume include capillary electrophoresis, gas chromatography, high-performance liquid chromatography, supercritical fluid chromatography, and statistical aspects of chromatography. Separations of analytes including plasma proteins, carbohydrates, pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), phenols, and organic anions and cations from complex matrices such as human serum, natural products, and environmentally derived sources are presented. The 34th volume admirably achieves the series goal of presenting "current, critical reviews of the most important developments in chromatographic science."

Advances in Chromatography is a multiauthored text including the contributions of 13 authors from the United States, Germany, and Japan who represent industrial, governmental, and academic affiliations. The book consists of seven chapters, an index, a list of contributors to the current volume, and a listing of contents of other volumes in the series. Chapter 1, High-Performance Capillary Electrophoresis of Human Serum and Plasma Proteins by Oscar W. Reif, Ralf Lausch, and Ruth Freitag, presents basic considerations in protein separation and the use of capillary electrophoresis in serum and plasma protein separation. Chapter 2, Analysis of Natural Products by Gas Chromatography/Matrix Isolation/Infrared Spectrometry by W. M. Coleman, III, and Bert M. Gordon, discusses hardware and spectral interpretation by gas chromatography/matrix isolation/fourier transform infrared spectrometry. Chapter 3, Statistical Theories of Peak Overlap in Chromatography by Joe M. Davis, discusses statistical modeling of overlap in one-dimensional and multidimensional separations. Chapter 4, Capillary Electrophoresis of Carbohydrates by Ziad El Rassi, compares electrophoretic systems and separation methodologies having application to carbohydrates. Chapter 5, Environmental Applications of Supercritical Fluid Chromatography by Leah J. Mulcahey, Christine L. Rankin, and Mary Ellen P. McNally, presents examples of supercritical fluid chromatographic separations of PCBs, pesticides and herbicides, phenols, and PAHs. Chapter 6, HPLC of Homologous Series of Simple Organic Anions and Cations by Norman E. Hoffman, discusses reversed-phase chromatography, ion-exchange chromatography, and ion-exclusion chromatography of organic ions. Chapter 7, Uncertainty Structure, Information Theory, and Optimization of Quantitative Analysis in Separation Science by Yuzuru Hayashi and Rieko Matsuda, describes stochastic properties of signals, uncertainty structure and information theory of quantitative analysis in high-performance liquid chromatography and capillary electrophoresis, fundamentals of model optimization, and factors affecting precision and throughput.

Although authored by many contributors, each chapter is presented in a uniform format with the divisions and subdivisions conveniently outlined on the first page of each chapter for ready access to the information presented. Major chapter divisions are noted by Roman numerals and subdivisions are alphabetized.

Each chapter stands alone; however, as several chapters address various aspects of the same separation technique, the organization of the text could be improved by grouping the chapters by subject area, rather than in random order. The addition of an introductory note from the editors would enhance the text's presentation and should be considered in future volumes in the series. The topical coverage and level of coverage are appropriate for a mixed audience of professionals and students of separation science. The series on *Advances in Chromatography* fulfills its objectives and provides important information to a broad-based, interdisciplinary, scientific community.

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JA945143Y

Transition Metal Chemistry. The Valence Shell in d-Block Chemistry. By Malcolm Gerloch (University of Cambridge) and Edwin C. Constable (Institut für Anorganische Chemie). VCH: Weinheim, Germany. 1994. xi + 216 pp. $35.00. ISBN 3-527-29219-5.

This book provides a concise yet thorough introduction to transition metal structure, bonding, and spectroscopy. The authors adopt a valence shell approach as an attempt to unify and demystify the factors that govern transition metal chemistry. They attempt to distinguish between the effects *on* the d electrons from the effects *of* the d electrons. Written for the "early-to-mid U.K. degree level" this text would certainly complement a lecture-driven, first-year graduate class or an upper-division undergraduate class. Because of its brevity it offers examples sparingly and provides suggestions for further reading at the end of each chapter. Additional information and details are presented in "Boxes" throughout the text. The illustrations are uncomplicated and easy to follow. There are no exercises as found in classical textbooks.

The text opens with a brief introduction to transition metals then segues into crystal field theory and its application to spectroscopy. The authors very clearly and effectively discuss term symbols and crystal field splittings. This moves the reader into Chapter 4, which explores the nature and intensities of d−d transitions. A discussion of magnetism precedes Chapter 6, Ligand Fields, Bonding and the Valence Shell. Here the authors develop bonding models for octahedral compounds and quickly point out the various successes and failings of crystal field, ligand field, and MO theory. They do not shy away from using any of these models where appropriate and take careful means to discriminate between them. Chapter 7 applies the open valence shell model to transition metal geometries. Here the authors examine the steric effects of the open d shell on the metal−ligand bonds. The preference for

square planar, tetrahedral, or trigonal bipyramidal coordination environments and the Jahn−Teller effects are all ascribed to the open d shell. The last few chapters seek to tie up the loose ends and explain the reactivity of transition metal complexes. A breif discussion of complex stability and energetics is offered in Chapter 8, while Chapter 9 examines the consequences of the open d shell on the chemistry of metal complexes. The first half of Chapter 9 focuses on the thermodynamic consequences of the d-electron configuration, while the second half concentrates on the "kinetic manifestations of partially filled d orbitals." Kinetics and mechanisms of ligand substitution and electron transfer reactions are discussed. Finally, a brief look into the valence shell of the f-block elements is offered in the last chapter.

This text provides exactly what Gerloch and Constable contend, an outline of theoretical structure for transition metal chemistry that is nonmathematical and consistent with the open d shell approach.

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JA945061+

Laser Spectroscopy: Techniques and Applications. By E. Roland Menzel (Texas Tech University). Marcel Dekker: New York. 1995. xv + 298 pp. $135.00. ISBN 0-8247-9265-3.

The goal of this book is to present a collection of interesting applications for laser spectroscopy with a particular concentration on unusual applications. There are nearly 100 examples described in the 220 pages on applications. In order to accomplish this goal, the author has sharply limited the scope of the coverage for each application. The typical application is discussed with reference to a block diagram that shows the relationship between the instrumental components necessary to accomplish the application. The important underlying principles are discussed, but experimental details and examples of using the application are outside the scope of the book. Any examples of experimental data are typically simplified sketches of idealized spectra. The characterization of a technique or application is generalized, and few specifics are provided. The authors intends the book to build an awareness of what has been accomplished and what is possible. It seeks to provide a flavor of a field rather than an understanding. In a sense, the book is a review of reviews. The author intends the book to be readable by a novice entering laser spectroscopy. The explanations are short, simple, and qualitative with a minimal use of mathematics. It is not a book that a novice should use to build an understanding of an area, but it will display the range of applications from which a novice can quickly survey example applications.

The book begins with introductory chapters on spectroscopic properties of materials and spectroscopic instrumentation. It is followed by chapters describing laser spectroscopy applications for absorption, photoluminescence, time domain spectroscopy, and Raman spectroscopy. Numerous applications are given in each chapter to illustrate typical uses of the methods. The book concludes with a series of chapters on selected techniques and applications of lasers, spectroscopy, and laser spectroscopy. In addition to familiar laser applications, these chapters include sections on optical memories, photodynamic therapy and other medical applications, isotope separation, control of semiconductor wafer etching, and X-ray lasers. The emphasis is on the instrumentation and physical basis of the spectroscopic measurement. The applications do not include examples of molecular spectroscopy, where lasers are used to understand structure or dynamics.

The writing has a very personal tone. It is conversational, informal, and chatty. The author is particularly concerned with explaining why he chose to include specific topics and why he chose to limit the scope of his discussion in many areas. The choice of applications strongly reflects the author's interests rather than reflecting all the important or current applications in a field. The author realizes that the latter applications already are well reviewed and concentrates on the more unorthodox and specialized examples that are less known. The most extensive discussions include examples from the author's own laboratories, such as examples of using fluorescence spectroscopy for measuring the aging of power transmission cable insulation or for detecting latent fingerprints. The references also reflect the author's own reading of the literature. Only about one-half of the references refer to work in the primary research literature. Most of the remaining references are to proceedings of conferences, particularly the Proceedings of the S.P.I.E. The author makes extensive use of proceedings because they reflect the commercial applications that he emphasizes. It is intended that the reader will use the references in the proceedings articles to access the original literature. The bulk of the references are within the most recent 10 years.

This book is not intended to serve as a reference book nor as an entry point for novices into the field. It will widen the background of a person whose primary field is not laser spectroscopy, and it may point a reader to interesting problems. The book is of most interest to chemists, but there is much in it that applies to physicists and engineers as well.

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JA945145I

Chemical Oscillations and Instabilities: Non-Linear Chemical Kinetics. By Peter Gray (Gonville and Caius College, Cambridge University) and Stephen K. Scott (University of Leeds). Oxford University Press: New York. 1994. xvi + 453 pp. ISBN 0-19-855864-3.

Nonlinear dynamics evolved in the past three decades into an important and intellectually beautiful field to which chemists have provided some of the most striking visual examples of the nonlinear far-from-equilibrium phenomena which pervade the physical and biological world: periodic and aperiodic (chaotic) oscillations, multistability, excitability, and the formation of chemical waves and spatial patterns.

In the main pair of their book (The Techniques), the authors guide the reader through detailed demonstrations of important techniques of nonlinear analysis, making extensive use of their autocatalytic models known as "Gray−Scott" and of the thermokinetic Salnikov model. Using these models, they illustrate further the dynamics of the CSTR and the plug flow reactor, as well as the formation of traveling waves and Turing patterns. One chapter deals with deterministic chaos. The second part of the book (Experiments) reviews specific chemical systems: solution reactions, in particular the Belousov−Zhabotinsky system, and gas-phase combustion processes, e.g. the $H_2 + O_2$ reaction and cool flames. The literature covers the developments up to 1989.

This is a timely and authoritative introduction to the specifically chemical aspects of dynamical instabilities. It complements several recent books that focus on mathematical and physical principles.

Michael Menzinger, *University of Toronto*

JA9451473

Reviews in Computational Chemistry. By Kenny B. Lipkowitz (Indiana University-Purdue University at Indianapolis) and Donald B. Boyd (Eli Lilly and Co.). VCH: New York. 1993. xx + 280 pp. $79.00. ISBN 1-56081-620-1.

This text is the fourth volume in the series *Reviews in Computational Chemistry*. This volume presents a substantial selection of well-established techniques in computational chemistry, including progress in modern research in the field as well as educational modeling software.

The first chapter reviews *ab initio* methods applicable to large molecules. In this chapter Cioslowski gives a brief review of self-consistent field and perturbation theory methods, as well as a description of the most widely used software. The second chapter by McKee and Page is devoted to the calculation of reaction pathways and includes methods for locating minima and saddle points on a potential energy surface and for constructing the reaction path Hamiltonian. In the third chapter Whitnell and Wilson give an overview of molecular dynamics methods for simulating chemical reactions in solution. Periodic boundary conditions, intermolecular forces, initial conditions, and numerical integrators are discussed and illustrated with several applications on reaction dynamics from the recent literature. The last chapter by DeKock, Madura, Rioux, and Casanova shifts the emphasis to the use of computational chemistry for educational purposes. These authors survey the chemical education literature as well as available software for classroom and "hands-on" demonstrations. Finally, the Appendix, written by Boyd, provides a useful tabulation of molecular modeling software, including quantum chemistry, molecular dynamics, and molecular graphics.

This volume is a useful addition to the computational chemistry literature. It is well-written and should be readily accessible to nonexperts with a chemistry background. In particular, this book