J|A|C|S
BOOK REVIEWS

Elemental Sulfur and Sulfur-Rich Compounds II. Topics in Current Chemistry, 231. Edited by Ralf Steudel (Technische Universität Berlin). Springer-Verlag: Berlin, Heidelberg, New York. 2003. x + 248 pp. $229.00. ISBN 3-540-40378-7.

This volume, edited by Ralf Steudel who is a recognized authority in the field of sulfur chemistry, contains six chapters, four of which were written or co-written by Steudel himself. Its main focus is on the energy, geometry, molecular spectra, and chemistry of inorganic species containing S−S bonds.

Chapter 1 by Wong is a review of the quantum chemical calculations of sulfur-rich compounds, including disulfane, polysulfanes, and sulfur clusters. The literature is covered from 1980. Much attention is paid to the proper choice of basic sets and to the comparison of the results of calculations at different levels of theory. The style of presentation limits the audience to specialists in the area. Generalists looking for a good introduction to the field would be better served to consider alternative sources.

In Chapter 2, Eckert and Steudel cover the spectra of sulfur molecules and solid sulfur allotropes. In my opinion, this chapter is the strength of the volume. The text is clearly written and contains much valuable data for experimentalists involved with the reactions of sulfur or polysulfides. Such individuals will find this chapter eminently helpful for the interpretation of the UV−vis, vibrational, and mass spectra of sulfur species, information that is not always distributed so efficiently in compendia.

Skipping to Chapter 5, Takeda, Tokitoh, and Okazaki discuss synthesis, structural properties, and reactions of polysulfido complexes of main group and transition metals. The coverage of this topic obviously cannot be comprehensive in a text of only 49 pages. The authors provide a selective overview of recent works on the subject and highlight their own contributions (30 references from a total of 150). The style of presentation lacks cohesion for critical analysis of the material, in my opinion. A clearer organization of the material, e.g., grouping the examples according to the periodic table of the elements, would have provided a more understandable presentation.

In Chapters 3, 4, and 6, Steudel discusses inorganic polysulfanes, polysulfides, and sulfur-rich oxides, respectively. A simple and concise account on the homologous series of these compounds is given. The references are somewhat dated, but nonetheless they are relevant to the information presented, since these three chapters summarize the results of long-term research efforts in a field that is not among the most rapidly growing branches of chemistry.

Overall, the book is expertly written and provides the reader with both a theoretical and practical approach to the chemistry of sulfur-rich compounds. However, it falls short of achieving the goal declared by the "Topics in Current Chemistry" series, which is to give the nonspecialist reader a conceptual review by concentrating on methodological thinking. Rather, it can be recommended to the specialists working with sulfur and/or polysulfides. Because of its hefty price tag, unfortunately, this book most likely will be relegated to the bookshelves of libraries.

Pavel Afanasiev, *Institut de Recherches sur la Catalyse*

JA0409199

10.1021/ja0409199

Chemometrics in Analytical Spectroscopy, 2nd ed. By Mike J. Adams (RMIT University, Melbourne, Australia). Royal Society of Chemistry: Cambridge. 2004. xi + 224 pp. $229.00. ISBN 0-85404-595-3.

A modern trend in analytical chemistry is to perform real-time measurements of selected solutes within complex systems. Such real-time information can be used to monitor the process of interest and, perhaps, control the outcome. Spectroscopy is one approach to real-time monitoring in which an in situ spectrum is collected from the raw, unprocessed sample and the desired analytical information is extracted from the resulting spectrum. Given the complexity of the sample matrix, accurate analytical information typically demands the use of sophisticated chemometric methods of data analysis. Indeed, nearly all modern spectrometers are equipped with a chemometric software package for data analysis, including programs for pattern recognition, analysis of principal components, and calibration using methods of multivariate regression. While these methods of analysis can be very powerful in accurately extracting the desired analytical information, they are also prone to inaccuracies when misused by the operator. It is imperative that users of these chemometric techniques have a basic understanding of their fundamental principles and limitations.

This monograph provides an excellent description of basic chemometric techniques with an emphasis on applications in analytical spectroscopy. Adams succinctly describes the most commonly applied methods for processing data and procedures for multivariate calibration. Topics covered include basic statistics, issues related to signal-to-noise ratios, methods for selecting and enhancing the targeted analytical signal, pattern recognition techniques, and methods of regression analysis. Two of the six chapters are devoted to techniques of pattern recognition. Each chapter begins with a fairly simple concept that should be familiar to all chemists and then builds in a logical manner to the more sophisticated concepts. An extensive set of outstanding examples is provided to illustrate the major points and to aid in understanding the material. The reader is assisted by the inclusion of numerous tables and figures that accompany each example.

Adams intentionally does not provide a set of software tools for implementing the various chemometric methods described in the book. According to Adams, an array of such software is widely available, and the interested reader should have no trouble implementing the basic concepts with commercial and professional software packages. This is a sound rationale that allows the user to write programs in a familiar software environ-

10.1021/ja0409199 CCC: $27.50

ment. An appendix provides a very useful tutorial on the simple matrix operations needed to implement these algorithms.

Although this monograph is not intended as a textbook for a course, the writing and examples are both straightforward and effective, which would make this book a valuable source of supplemental material for a course on chemometrics. It should be noted, however, that problems are not provided and certain topics commonly covered in such courses, such as experimental design, are not covered.

Overall, this monograph provides an excellent overview of chemometric methods of analysis. The fundamental concepts are presented in a straightforward manner, with an emphasis on providing a basic understanding that permits an effective use of these techniques. This book is highly recommended for all practicing analytical spectroscopists who wish to use these techniques in order to enhance the quality and robustness of their analytical measurements.

Mark A. Arnold, *University of Iowa*

JA040928H

10.1021/ja040928h

Nanostructures and Nanomaterials: Synthesis, Properties and Applications. By Guozhang Cao (University of Washington). Imperial College Press (distributed by World Scientific): London. 2004. xiv + 434 pp. $78.00. ISBN 1-86094-415-9.

This book grew out of a graduate course taught by the author on the processing of inorganic nanomaterials. As such, it is focused on providing a general overview of the area of nanomaterials for graduate or upper-level undergraduate students or for scientists new to this area. Despite the title, the book is most useful for its description of synthetic methodologies. These are organized according to the dimensionality of the material: 0-D (nanoparticles), 1-D (nanorods), and 2-D (thin films). There is an additional "catch-all" chapter entitled "Special Nanomaterials" that describes the preparation of nanostructures (mesoporous materials, zeolites) as well as materials that do not fit comfortably into the preceding chapters (carbon nanotubes, core−shell nanoparticles). These chapters largely emphasize "bottom-up" methodologies for nanomaterial production, but there is a separate chapter on "top-down" methods, where lithographic techniques are described. The introductory chapter of the book provides an overview of the importance, potential applications, and challenges in the synthesis of nanomaterials, and is immediately followed by chapters focused on synthetic methodologies. However, readers less familiar with the properties of nanomaterials, which provide the impetus for better synthetic control on the nanoscale, may want to start with later chapters, in which physical properties and applications are described, before delving into the issue of synthesis.

What the author does best in this book is describe the fundamental physical principles behind the control of size and shape in the nanoregime. Indeed, before giving specific descriptions of nanomaterial synthesis, the author has provided a chapter covering the physical chemistry of solid surfaces, including specific theories governing the interactions of particles. This is then built on in the subsequent chapters, providing a clear rationale for how nanoscale dimensionality is controlled by fundamental processes. The author also demystifies a lot of the jargon in the field, making the material that much more digestible.

Less satisfying is the discussion of the properties of materials, which is presented in a scant 30 pages. A respectable, though condensed, account of the influence of nanoparticle size on optical and electronic properties is given, but magnetic properties are barely touched upon. Additionally, a description of the influence of dimensionality on the resultant physical properties is missing, despite the emphasis on controlling dimensionality in the chapters addressing the synthesis of nanomaterials. It should also be noted that an appreciation of the general physical properties of materials (semiconductors, metals, magnetic materials) is expected on the part of the reader, although any good textbook on materials could provide the necessary background.

The book concludes with some of the applications of nanomaterials, mixing together some pie-in-the-sky-type applications (nanobots) with well-developed science (catalysis). The intention is to provide a taste of the potential that these systems have to impact our world; at that, the author succeeds by selecting specific examples to emphasize his points, rather than providing a detailed list.

Overall, the book does an excellent job of assembling a wide variety of synthetic techniques and describing how they can be applied to a range of materials for design on the nanoscale. The references range from the classic to the very recent, giving a broad perspective of the area, and an index provides cross-referencing. Unfortunately, the editor has not done a particularly good job of correcting English grammar, though for the most part this does not impede comprehension on the part of the reader.

Stephanie L. Brock, *Wayne State University*

JA0409457

10.1021/ja0409457

Modern Trends in Chemical Reaction Dynamics: Experiment and Theory (Part I). Advanced Series in Physical Chemistry, Volume 14. Edited by Xueming Yang and Kopin Liu (Academia Sinica, Taiwan). World Scientific Publishing Co. Pte. Ltd: Singapore, River Edge, NJ, London. 2004. xii + 638 pp. $98.00. ISBN 981-238-568-1.

This is the first installment of a review volume, to be published in two parts, dedicated to describing experimental and theoretical advances in chemical reaction dynamics that have occurred over the last 10 years or so and geared primarily for an audience of graduate students and experts in the field. These objectives have been admirably fulfilled. Each of the 13 chapters is essentially a stand-alone review written by a world-recognized expert and treats a specific topic at the cutting edge of research in the field. There is a good balance between the coverage of theoretical and experimental subjects. The experimentally oriented chapters include determination of multiple-channel dynamics using universal crossed-beam methods, ion-imaging and coincident-imaging techniques, hydrogen-abstraction dynamics from polyatomic molecules, transition-state spectroscopy, time-resolved photoelectron spectroscopy and imaging, and the manipulation of cold molecules with nonresonant fields.

On the theoretical side, the topics include descriptions of new ab initio potential energy surfaces for large systems, advances in the quantum dynamical treatment of complex chemical reactions, quasi-classical trajectory studies of four-atom reactions, statistical rate theory of unimolecular and complex-forming reactions, and approaches to understanding nonadiabatic transitions and tunneling.

This volume will be an important resource for a diverse community of scholars for some time to come. Equations, schemes, and figures are of high quality and free of typographical errors. Each chapter is extensively referenced, with the bulk of the references occurring from 1998 to 2002. The problems chosen for study in this volume span a range of new and exciting intellectual pursuits at the forefront of research in chemical reaction dynamics.

C. Patrick Collier, *California Institute of Technology*

JA0409560

10.1021/ja0409560

Chiral Pollutants: Distribution, Toxicity and Analysis by Chromatography and Capillary Electrophoresis. By Imran Ali (National Institute of Hydrology, Roorkee, India) and Hassan Y. Aboul-Enein (King Faisal Specialist Hospital, Riyadh, Saudi Arabia). John Wiley & Sons: Chichester, U.K. 2004. xx + 344 pp. $175.00. ISBN 0-470-86780-9.

Both authors of this book are active researchers in fields dealing with chiral analysis. Ali's interests in this area have focused principally on biologically and environmentally active chiral compounds, whereas Aboul-Enein's interests are in pharmaceutical analysis and drug development. Aboul-Enein is particularly experienced in writing texts of this kind and has authored or coauthored a number of books in similar areas, for example, *Separation Techniques in Clinical Chemistry* and *Chiral Separations by Liquid Chromatography and Related Technologies*, a work written in collaboration with Ali. This combination of backgrounds has produced an interesting and much-needed book on the analysis of chiral pollutants. It is divided into 10 chapters covering the sources and distribution of chiral pollutants, their fate in biological systems and the environment, enantioselective toxicities, the preparation of samples, and the analysis of chiral pollutants by well-known chromatographic and electrophoretic methods. A short concluding chapter addresses regulatory issues on chirality in the USA, Europe, and Asia, with a brief mention of the need for and problems associated with the large-scale production of pure enantiomers.

Although chapters on chromatographic and electrophoretic methods contain much material that may be familiar to separation scientists, the book should be of interest to a much wider audience because it covers more than just techniques of separation. Chiral analysis can be difficult under any circumstance, and it becomes even more so when natural samples are involved. Chapter 5 on the preparation of samples provides insight into methods for dealing with the special problems associated with chiral pollutants that are present in very low concentrations and exist as only one of many possible contaminants. Chapter 2 on sources and distribution of chiral pollutants in the environment along with Chapter 3 on biotransformation, biodegradation, and metabolism provide a good background for those needing to understand the origins of chiral pollutants and how they can be changed in the environment or in living organisms. Finally, Chapter 4 provides a nice introduction to differences in toxicities that are often exhibited by pairs of enantiomers, the best-known example being thalidomide.

The references in this book are appropriate and contain many recent reviews, although there are number of research articles that predate 1998. On a more critical note, I wish that spectroscopic methods for chiral analysis had received more than a brief mention to round out the subject matter. However, chromatographic and electrophoretic techniques remain the overwhelming methods of choice in chiral analysis, and as such, they fit the stated purpose of the book.

Marianna Anderson Busch, *Baylor University*

JA040952V

10.1021/ja040952v