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BOOK REVIEWS

Supramolecular Chirality. Topics in Current Chemistry, 265. Edited by Mercedes Crego-Calama and David N. Reinhoudt (University of Twente, Enschede, The Netherland). Springer: Berlin, Heidelberg, New York. 2006. xii + 312 pp. $299.00. ISBN 3-540-32151-9.

Unlike traditional chemical synthesis where molecules are stitched together atom by atom through covalent bonds, supramolecular chemistry deals with noncovalent interactions that utilize a combination of weak and reversible interacting forces to organize and assemble molecules into well-defined systems. This book is a description of the next level of molecular organization—i.e., how chemical building blocks, both chiral and achiral, are organized and assembled into asymmetric (chiral) supramolecular assemblies—and its application in various science and engineering fields. Not only does it provide an excellent overview of the field, listing key literature reviews, and some of the latest findings, the volume is well organized and written by experts who detail the principles and applications of each topic.

The first chapter provides an introduction to the concept of supramolecular chemistry and a description of the various noncovalent interactions involved, including various examples of supramolecular assemblies found in nature and those developed in the laboratory. Chapter 2 deals with a fascinating topic in molecular assembly, specifically, how molecules, both large (oligomers and polymers) and small, are organized and assembled into helical structures. The concepts of chiral sensing and amplification are introduced, while highlighting their importance in molecular recognition and self-assembly. Supramolecular chirogenesis in host−guest systems containing porphorigenoids is described in the next chapter, followed by a discussion of supramolecular chirality in coordination chemistry. This latter chapter provides a comprehensive overview of how metal−ligand coordination is used to organize molecules into sophisticated, three-dimensional architectures. In the succeeding chapter, the readers are taken into the realm of molecular shuttles and motors, where supramolecular chemistry meets molecular motion. The design and construction of various molecular machines are described, along with their potential applications in storing information, displays, and switchable catalysis. The next chapter deals with supramolecular surface chemistry. Chiral induction and recognition due to surface-confinement are discussed. The final chapter covers supramolecular chiral functional materials, specifically, how supramolecular chiral induction can be used to produce functional systems with new and interesting properties.

Overall, the book is well written and provides a comprehensive overview of the field of supramolecular chemistry, with emphasis on molecular chirality. It is a very useful and informative book to have as a reference. I highly recommend it for anyone who is interested in molecular organization and self-assembly, both novice and practitioner alike.

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Principles of Mass Spectrometry Applied to Biomolecules. Edited by Julia Laskin (Pacific Northwest National Lab, Richland, Washington) and Chava Lifshitz (The Hebrew University, Jerusalem, Israel). From the Wiley-Interscience Series on Mass Spectrometry. Series Edited by Dominic Desiderio and Nico Nibbering. John Wiley & Sons, Inc.: Hoboken, NJ. 2006. xviii + 688 pp. $150.00. ISBN 0-471-72184-0.

This book is a compilation of chapters written by various authors on topics related to the spectroscopy, reactions, structures, interactions, dissociation, conformations, and thermochemistry of biological molecules in the gas phase. Because the chapters have different authors, they provide expert content and very up-to-date perspectives on the topics, although at the expense of some background and transitional material that would integrate the chapters in a more seamless fashion. In general, the book is very well written with numerous companion figures and tables and extensive up-to-date references to help guide readers to related material and key recent studies published in peer-reviewed journals. It is not geared for novices, nor does it offer a tutorial approach. It is most appropriate for those possessing a strong background in mass spectrometry who wish to expand their knowledge to some of the fundamental areas of mass spectrometry applied to biomolecules. There are 16 chapters divided into three thematic sections: Structures and Dynamics of Gas-Phase Biomolecules; Activation, Dissociation and Reactivity; and Thermochemistry and Energetics. The chapters are logically grouped and authored by some of the most recognized leaders in the field.

In the first chapter, Gerhards covers spectroscopy of neutral peptides in the gas phase. He offers an overview of some of the spectroscopic tools used to evaluate the electronic states of biomolecules and then largely focuses on double-resonance and microwave spectroscopy of amino acids to reveal structural details of different electronic states. The chapter closes with a discussion of the calculation and assignment of vibrational frequencies. In the next chapter, Yang et al. describe the electronic structure of Fe−S clusters by anion photoelectron spectroscopy. Fe−S clusters are relevant in the scope of biological molecules because of their role as electron-transfer centers in metalloproteins; however, this chapter really focuses on the electronic structure of Fe−S clusters and not on their biological implications. The structural characterization of biomolecules by ion−molecule reactions and H/D exchange is the topic of the third chapter by Green and Lebrilla. It provides

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informative background material that will help bring nonexperts up to speed while also nicely rationalizing the importance of ion−molecule reactions in the context of probing structures of gas-phase biomolecules. The fourth chapter by Sobott and Robinson covers the challenge of investigating protein interactions based on transferring intact noncovalent complexes into the gas phase and analyzing the masses prior to and after high-energy collisions that cause dissociation of the complexes. The authors present several elegant examples with supporting figures that nicely illustrate the concepts and relevant applications. Breuker is the sole author of the fifth chapter on protein structure and folding in the gas phase, with particular emphasis on ubiquitin and cytochrome *c*. This chapter offers a brief overview of some of the methods used to evaluate protein structure and energetics in the gas phase, such as ion mobility, H/D exchange, and electron-capture dissociation, but the bulk of the chapter summarizes specific structural studies. The sixth chapter by Shemesh and Gerber covers the methodology and applications of photoionization of small biological molecules, including glycine and tryptophan, with emphasis on dynamical simulations. In the final chapter of this section, Lifshitz discusses the impact of intramolecular vibrational energy redistribution and ergodic behavior on the dissociation of biological molecules. She begins the chapter with a nice historical perspective on the topic and then provides a well-balanced discussion of the potential for nonergodic behavior in biomolecules in terms of ionization and excitation processes. Readers will enjoy this chapter because the author provides numerous relevant examples and also offers a critical assessment of the results.

The next section begins with a chapter by Wysocki et al. who present a concise but highly informative overview of peptide fragmentation, including nomenclature, typical fragment ion structures, and the impact of charge site and secondary structure, in the gas phase. This is followed by a chapter by Hopkinson and Siu focusing on the formation and dissociation of peptide radical cations in contrast to conventional protonated peptides. Dunbar covers the photodissociation of small ions, including both spectroscopic and activation approaches, in Chapter 10. Chemical dynamics simulations is the topic of Chapter 11 by Rahaman et al. with an emphasis on energy transfer and unimolecular decomposition in collision-induced dissociation and surface-induced dissociation of some clusters and small biological ions. In Chapter 12, Gologan et al. provide an overview of the methodology and applications of ion soft landing in which polyatomic ions are gently landed on a surface, and in the succeeding chapter, Zubarev presents an informative description of electron capture dissociation and electron detachment dissociation, two methods applied for structural characterization of biological molecules. McLuckey focuses on ion−ion reactions in the gas phase in the last chapter of this section, emphasizing reaction thermodynamics and dynamics rather than instrumentation and applications, which have been covered in other recent reviews.

The final section contains two chapters. The first, Chapter 15 by Wesdemiotis and Wang, covers methods and applications of thermochemical determinations of biomolecules, including those related to metal ion complexes, clusters, and proton transfer reactions of amino acids and peptides. Laskin presents the final chapter in which she describes effects of energy and entropy on the dissociation of peptides and proteins and includes an overview of experimental methods.

Many of the chapters close with short sections on future directions, segments that readers will find helpful for recognizing remaining challenges and emerging areas of interest. Each chapter has an average of 75 to 100 references, in which complete titles are given, making assessment of the relevance of each very easy. A fairly extensive index is also provided at the end of the book but is of modest utility as a search tool because of the contrast of topics in each chapter.

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Colloidal Particles at Liquid Interfaces. Edited by Bernard P. Binks and Tommy S. Horozov (University of Hull, U.K.). Cambridge University Press: Cambridge. 2006. XIV + 504 pp. $145.00. ISBN 0-521-84846-6.

This book presents a comprehensive overview of the behavior and effects of particles at liquid interfaces. Although this is a topic of great importance, it receives only limited attention in many books on colloids and interfaces. This particular book, therefore, is a welcome addition to the literature.

The book opens with a 69-page introduction to the subject by Binks and Horozov. Containing over 144 references, this chapter is one of the strong points of the book and is a great resource for someone new to the topic who wishes to learn more. The remainder of the book is divided into two sections: "Particles at Planar Liquid Interfaces" (containing three chapters) and "Particles and Curved Liquid Interfaces" (containing seven chapters). The first section focuses on the fundamental behavior of particles at liquid interfaces and includes a chapter on the structure of particle monolayers, a theoretical description of the interactions between particles at liquid interfaces, and a chapter on particle-assisted wetting.

The chapters in the second section cover a variety of topics addressing the effects of particles on the equilibrium and dynamic behavior of emulsions and foams. These include both fundamental topics, such as the rheology and coalescence of particles on liquid drops and the effect of nanoparticles on froth stability, as well as newer ideas, such as the creation of novel materials using particles at liquid interfaces. A number of very practical issues are also covered, such as the important effect of particle shape on foam stability and the role of particle-stabilized emulsions in oil processing and recovery. The book's final chapter is focused on particle stabilization of metal foams and provides a clear explanation of the similarities and significant differences between these unique materials and traditional aqueous foams.

Each of the chapters contains many photographs and diagrams to support the text. The writing is generally clear and easy to follow, and the references are current and numerous; for example, the chapter on novel materials contains over 300 references.

This book is clearly a significant contribution to the literature on colloids and interfacial science. The variety of topics covered

makes it a good resource for both experienced researchers and those new to the field of particles at liquid interfaces.

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Catalysis by Gold. By Geoffrey C. Bond (Brunel University, U.K.), Catherine Louis (Université Pierre et Marie Curie, France), and David T. Thompson (Consultant, World Gold Council, UK). From the Series: Catalytic Science Series, Volume 6. Series Edited by Graham J. Hutchings. Imperial College Press: London. 2006. xvi + 366 pp. $88.00. ISBN 1-86094-658-5.

As Hutchings, editor of the Catalytic Science Series, quotes in the Preface from Confucius, "Everything has its beauty but not everyone sees it". The outward beauty of gold is obvious, but gold has a "hidden inner beauty for a scientist interested in catalysis". Discovering the special, previously hidden, nonmonetary properties of gold—the world has been off the gold monetary standard only 35 years—has led to the writing of this timely book.

A well-written, general introduction to catalysis is followed by discussions of the general properties of gold and the physical properties of small gold clusters. A long (41 pp) chapter on the preparation of supported catalysts follows. Unfortunately the authors do not carefully differentiate metallic Au(0) clusters from the molecular clusters, such as the structurally characterized $[Au_{25}(PPh_3)_{10}(SC_nH_{2n+1})_5Cl_2][PF_6]_2$, which have varying charge and coordination with phosphines and halides. In this chapter, there is a relatively thorough description of the explosive, amorphous material named "fulminating gold", which was mentioned in Midgley's 1685 chemistry text. Its composition and structure still remain uncertain, although it must contain Au−N bonds. It can be hazardous when forming it in preparations that involve ammonia.

A chapter on the chemisorption of "simple" molecules on gold describes what is known about O_2, CO, and oxides of nitrogen with gold surfaces. Surprisingly, the authors felt compelled to include here a three-page Appendix: "Introduction to Density Functional Theory" by Short.

The discovery by Haruta in 1987 that CO is oxidized to CO_2 at room temperature and below by nanoparticle gold on suitable oxide supports is said to have led to the boom in catalysis with gold and gold clusters. Chapter 6 attempts to bring together what is currently known about this relatively simple reaction about which, as the authors suggest, "it is easier to list the unresolved questions than the definitive conclusions." The authoritative review by Chen and Goodman, *Catalysis Today* **2006**, *111*, 22−33, unfortunately appeared shortly after the book was completed.

In Chapters 7 through 10, the authors describe special catalytic uses of gold, including the important removal of CO from hydrogen, which is essential for fuel cells, hydrogen reactions, and the Water−Gas shift reaction. Important environmental reactions are then considered, such as catalysts for removal of NO_x and SO_2, destruction of chlorocarbons, etc. A short introduction to some of the homogeneous catalytic work being done largely with gold(III) catalysts follows. Apparently the interesting work done by the Toste group on carbon−carbon bond formation reactions involving gold(I) catalysts is too recent to be included. After a few pages devoted to miscellaneous reactions, some presently known commercial applications of gold catalysts are described.

Overall, the book is an essential addition to the library of the scientist working with noble metal catalysts and others interested in the general chemistry of this understudied element.

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Trace Chemical Sensing of Explosives. Edited by Ronald L. Woodfin (Sandia National Laboratories, New Mexico). John Wiley & Sons, Inc.: Hoboken, NJ. 2007. xxvi + 364 pp. $99.95. ISBN 0-471-73839-5.

The topics of this book are the technologies that have been and are being developed for trace chemical sensing of explosives. It is divided into four main parts—Fundamental Considerations; Field Experience; Example Sensing Technologies; and Supplementary Material—all of which combined provide an introduction to chemical sensing and the chemistry of explosives, information about the history of chemical sensing, a description of the conditions and procedures used for certain technologies, and a discussion of the various technologies being developed at the time of writing this book. The supplementary section includes the appendix "Organizations Involved in Searching for Hidden Explosives"; a list of definitions, symbols, and abbreviations; a specific list of explosive definitions; a bibliography; and an index.

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Applied Thin-Layer Chromatography: Best Practice and Avoidance of Mistakes, 2nd ed. (Revised and Enlarged). By Elke Hahn-Deinstrop (Eckental, Germany). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2007. xvi + 314 pp. $165.00. ISBN 978-3-527-31553-5.

This handbook offers step-by-step instructions on how to perform analyses using thin-layer chromatography (TLC), covering everything from the choice of materials for TLC and the proper TLC technique to new developments in the evaluation and documentation of the derived data. Many of the chapters include practical tips for performing a particular action as well as numerous illustrations. There is also a chapter on conforming to regulations on good manufacturing and laboratory practices. The book concludes with an appendix, which includes sections on CHROMart, references, abbreviations, acknowlegements, and

a market overview, as well as a section of photographs and a subject index.

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Fieser's Reagents for Organic Synthesis, Volume 23. By Tse-Lok Ho (National Chiao Tung University and Shanghai Institute of Organic Chemistry, China). John Wiley & Sons, Inc.: Hoboken, NJ. 2007. xvi + 534 pp. $125.00. ISBN 0-471-68243-8.

This volume of *Fieser's Reagents for Organic Synthesis* covers the literature from approximately 2003−2004. The formula remains the same: name of the reagent, short description of its preparation and/or uses, structural formula where possible, and references. The book opens with a list of general abbreviations and closes with an author and a subject index.

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Nanoscopic Materials: Size-Dependent Phenomena. By Emil Roduner (University of Stuttgart, Germany). Royal Society of Chemistry: Cambridge. 2006. xii + 286 pp. $69.95. ISBN 0-85404.857-X.

This text is a good primer for the influence of size on the electronic and magnetic properties of inorganic nanoscopic materials. Although the most recent reference is from 2004, this does not affect its utility as an introductory text on inorganic nanoscopic materials. To bring the reader up to speed, the author presents general information on the electronic and magnetic properties of bulk materials and reviews the influence of confinement to nanoscopic dimensions. The discussions on electronic and magnetic properties of nanostructured materials, the classical treatments of packing nanostructured materials—for example, magic numbers, nucleation and growth of nanostructured materials—and thermodynamics of nanoscopic systems are presented in a clear and understandable manner. Quite beneficial from the point of view of a primer are the suggested readings, and key points are tabulated at the end of each chapter. For those not interested in reading every page of a text, such condensed lists of important topics are useful because they allow the reader to pick and choose topics of interest and to recap those of importance in a given area. In addition, color figures are salted throughout the text, which makes it very easy to understand.

The text does fall short in the area of soft matter. Although surface wetting is treated in some depth, the discussion is rudimentary in nature and misses some of the most recent developments in the field. This is not surprising, given the rapidly changing nature of this branch of surface science. One also gets the impression that the discussions about soft matter were simply added on so that the book as a whole could be considered a "complete" treatise. This is far from the case. The text on soft matter could have benefited from a more thorough treatment of the topic since this is an important area in the field of nanoscience. Should this area be covered in a text on size-dependent phenomena? In my opinion, yes, since nanoscience is not relegated to inorganic materials alone, and soft matter is providing some unique and exciting inroads into the fabrication of nanostructured materials and phenomena.

Nanoscience has the opportunity to provide fundamental changes in the manner in which mankind exists. The author discusses some of the more obvious areas where nanoscience can have an impact, but the sense of excitement in the field is not fully conveyed. He most certainly wants to avoid the "hype", yet the future areas of impact that were presented were rather vanilla in quality. The text clearly points to the need for both discussion and development on the ethics, safety, and health issues of nanoscience. Yet, the reader does not get a sense of the full impact that research on nanostructured materials and nanotechnology will have. Spintronics and related areas are handled well, but other areas of impact are more like musings from the author, as opposed to visionary statements supported by expert opinion.

In conclusion, while the book is excellent as an introductory text to inorganic nanoscopic materials, it falls short on the organic side. It would be very difficult to write such a comprehensive primer, of course, and this text does an excellent job covering a limited area of nanoscience. Perhaps the title gives the promise of a more global treatment and the text simply falls short of this. Nonetheless, this book should serve as a very useful primer on inorganic nanoscopic materials.

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