Book Review

Hydroboration and Organic Synthesis: 9-Borabicyclo[3.3.1]nonane (9-BBN) By Ranjit S. Dhillon (Punjab Agricultural University, Ludhiana, India). Springer: Berlin, Heidelberg, New York. 2007. xiv + 586 pp. $269.00. ISBN 978-3-540-49075-3.

J. Am. Chem. Soc., **2008**, 130 (1), 382-382 • DOI: 10.1021/ja077003x

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BOOK REVIEWS

Hydroboration and Organic Synthesis: 9-Borabicyclo[3.3.1]nonane (9-BBN). By Ranjit S. Dhillon (Punjab Agricultural University, Ludhiana, India). Springer: Berlin, Heidelberg, New York. 2007. xiv + 586 pp. $269.00. ISBN 978-3-540-49075-3.

In this book, the author explores the chemistry of *B*-R-9-BBN as derived from 9-borabicyclo[3.3.1]nonane (9-BBN) and classifies and reviews a variety of organic reactions of *B*-R-9-BBN to aid synthetic organic chemists in designing organic syntheses. Although there are many references, they generally do not go beyond the 1990s. A subject index completes the book.

JA077003X

10.1021/ja077003x

CRC Handbook of Chemistry and Physics, 88th ed Editor-in-Chief: David R. Lide (National Institute of Standards and Technology). CRC Press/Taylor & Francis Group: Boca Raton, FL. 2007. 2640 pp. $139.95. ISBN 0-8493-0488-1.

The 88th edition of the CRC Handbook of Chemistry and Physics continues to provide well-documented and critically evaluated chemical and physical data in a one-volume format. Some additions to this volume include tables on the following new topics: Ionic Liquids; Solubility of Organic Compounds in Pressurized Hot Water; Solubility of Hydrocarbons in Seawater; Nutrient Values in Foods; and Properties of Organic Semiconductors. Major updates and expansions have also been incorporated into the tables that cover critical temperature and pressure of fluids; enthalpy of vaporization of inorganic and organic compounds; thermodynamic properties of air; aqueous solubility of organic compounds; dipole moments of molecules; bond dissociation energies; and properties of fundamental particles, according to the Preface. This volume also presents a new Foreword by Harry W. Kroto, a 1996 Nobel Laureate in Chemistry.

JA077011D

10.1012/ja077011d

Explosives: Completely Revised 6th ed. By Rudolf Meyer (formerly of WASAG Chemie, Essen, Germany), Josef Köhler (Schardenberg, Austria), and Axel Homburg (Dynamit Nobel GmbH, Troisdorf, Germany). Wiley-VCH Verlag GmbH: Weinheim. 2007.viii + 422 pp. $240. ISBN 978-3-527- 31656-4.

This handbook contains approximately 500 alphabetically arranged entries providing comprehensive fundamental information about explosives, e.g., formulas, properties, manufacturing methods, applications, and, in the case of key explosives, standard purity specifications. In addition to covering explosive chemicals, this book also includes information about additives, fuels, and oxidizing agents. An extensive index and a CD-ROM containing thermodynamic data from the Fraunhofer Institute of Chemical Technology are also included.

JA0770126

10.1021/ja0770126

Analytical Methods in Supramolecular Chemistry. Edited by Christoph A. Schalley (Universität Berlin). Wiley-VCH Verlag GmbH & Co. KgaA: Weinheim. 2007. xvi + 484 pp. $190.00. ISBN 978-3-527-31505-5.

Supramolecular chemistry is a branch of chemistry concerned with the design and characterization of noncovalent molecular assemblies, the understanding of the mechanisms governing their association, and the creation of their functions. It covers a broad range of topics and concepts, from the structuration of solvent molecules forming a dissolving medium and the resulting solute−solvent associations to the living cell and mineralization. To review in a single book the analytical methods that are used to describe, measure, and study the whole field of supramolecular chemistry is quite ambitious, but this book succeeds in covering several of these methods in a useful and attractive manner.

The 12 chapters of this book, written by 24 authors, are not written as a catalog of spectroscopic or spectrometric methods and their applications but rather are a mix of method- and concept-based subjects. For example, one chapter covers the methods of determining binding constants, and another focuses on the characterization of synthetic ion channels and pores, whereas others emphasize a particular technique, such as circular dichroism spectroscopy, mass spectrometry, or diffusion NMR spectroscopy. Theoretical methods are addressed in the final chapter.

The introduction is a concise, brief, but quite complete and comprehensive overview of the field, in which the basic concepts, including, but not limited to, molecular recognition, chelate effects, cooperativity, and self-assembly, are discussed. Although supramolecular architectures are aesthetic and appeal to our sense of beauty, they are more and more reaching the state of functionality, such as their use as catalysts and molecular devices or sensors. Obviously, all the techniques used so far cannot be covered in 12 chapters. However, it is regrettable that NMR spectroscopic methods, given their importance, were not given a more prominent place in this book; only their use for determining binding constants and in the specific technique of diffusion is covered here. There is no mention of NMR kinetic studies or the application of solid-state NMR spectroscopy to clathrates, for example. It is also unfortunate that the examples are almost exclusively oriented to organic or biochemical systems. Large subfields of supramolecular chemistry involving inorganic, mineral, and/or polymeric systems seem to have been

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10.1021/ja077003x CCC: $40.75

neglected. However, perhaps this book is not the right place to discuss topics such as nanocomposites, for example. Indeed, the purpose of this book was not to replace the series *Comprehensive Supramolecular Chemistry*. Rather, it is a collection of a series of topics relevant to the field of supramolecular chemistry, presented in a useful and attractive manner. For example, the chapter on scanning probe microscopy, which focuses particularly on scanning tunneling microscopy, offers a nice comprehensive description of the method and of applications to supramolecular assemblies, including tutorial inserts on vibrational damping, calibration, etc.

This timely book should have its place in laboratories dealing with supramolecular objects. It will be a source of reference for graduate students and more experienced researchers and could induce new ideas on the use of techniques other than those usually used in the laboratory.

Christian Detellier, *The University of Ottawa*

JA0769649

10.1021/ja0769649

Spectroscopy in Catalysis: An Introduction, Third, Completely Revised and Enlarged Edition. By J. W. Niemantsverdriet (Eindhoven University of Technology, The Netherlands). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2007. xviii + 326 pp. $135. ISBN 978-3-527-31651-9.

In his *Short History of Chemistry* (1894), Francis Venable described the evolution of our discipline as "first the groping after causes, and then the struggle to frame laws. There are intellectual revolutions, bitter controversial conflicts, and the crash and wreck of fallen philosophies". Catalysis has certainly contributed its share to this tumultuous past. Principles have formulated slowly over the past two centuries as catalysis has evolved from an empirical field to one that demands expert use of modern methods of characterization. The panoply of techniques, mainly but not exclusively spectroscopic, and their application to the characterization of heterogeneous catalysts are the subject of this new edition of Niemantsverdriet's introductory book.

The text is neither a detailed tutorial nor a comprehensive reference work. It was not the author's aim to describe in detail the principles of spectroscopy or catalysis. Instead, this book is a uniquely helpful guide to many of the major (and some minor) techniques used to investigate the structures of solid catalysts and model systems and is written from the perspective of a prolific researcher in the field. The writing is enjoyable to read, the illustrations are clear, and the reader is guided efficiently to key technical references for further details, so that the book is remarkably uncluttered. This edition is not appreciably longer than the previous one, and the range of techniques it covers is almost identical (with the addition of XANES). However, many new examples are drawn from the recent literature, giving it a contemporary feel: for example, the use of synchrotron radiation for *in situ* XPS of a CO oxidation catalyst and time-resolved Quick EXAFS for the analysis of a catalyst for the synthesis of methanol.

The intended reader is the beginning graduate student with a solid background in physical chemistry who needs to acquire familiarity with the capabilities, and incapabilities, of different techniques for the characterization of catalysts. To this end, the book empowers new users to make informed choices about how best to extract information about their catalytic systems, either *in vacuo* or *in situ*. For example, the structural information provided by XRD, a bulk technique for ordered systems; LEED, a surface technique for ordered systems; and EXAFS, a bulk technique for systems lacking long-range order, is compared. Problems and their solutions in the use of each technique are highlighted, such as sample-charging in XPS and sample fluorescence in Raman spectroscopy. Although technique-specific catalytic applications are found in every section, the book ends with a chapter of case studies illustrating how multiple techniques must be combined to elucidate the structure and function of catalysts.

Techniques in homogeneous catalysis are not addressed, and there are some omissions even among the heterogeneous methods of characterization presented, e.g., magnetic resonance, whereas some minor techniques, such as Mössbauer spectroscopy, are discussed at length. Nevertheless, even more experienced researchers will find some topics of interest here, since the range of spectroscopies used in catalysis is very broad and most of us are intimately familiar with only a handful of them. The book is particularly valuable for its cautionary notes to the unwary, such as the influence of the pumping system on temperature-programmed desorption (TPD) of H_2 and the unreliability of X-ray line broadening for assessing particle sizes. I recommend it highly for graduate students and researchers in the field.

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JA0770072

10.1021/ja0770072

Fullerenes: Principles and Applications. Edited by Fernando Langa (University of Castilla La Mancha, Toledo, Spain) and Jean-François Nierengarten (CNRS, Toulouse, France). Royal Society of Chemistry: Cambridge. 2007. xii + 398 pp. $169. ISBN 978-0-85404-551-8.

Research on fullerenes and fullerene derivatives has undergone explosive growth since Krätschmer, Lamb, Fostiropoulos, and Huffmann reported a practical synthesis of C_{60} and C_{70} in 1990. Indeed, efforts to find applications of these enabling materials are now in full bloom. *Fullerenes* will be a welcome addition to any library at this stage of development as the breadth of coverage gives it a unique character. The quality of the book is enhanced by the fact that many of the authors are excellent practitioners of their respective areas.

Fullerenes comprises 11 chapters and begins with a short, sparsely referenced (91) account of early developments by one of the pioneers of fullerene chemistry, the late Roger Taylor and coauthor Glenn Burley. This is followed by the contribution of Langa and de la Cruz in which the chemical reactivity of fullerenes is presented. Cycloaddition reactions are highlighted in this chapter, and references through 2005 have been included.

As stated in the Preface, "Fullerene-based derivatives have shown a wide range of physical and chemical properties that make them attractive for the preparation of supramolecular assemblies, nanostructures and new advanced materials for

optoelectronic devices." Chapters 3−9 expose the reader to coverage of the various areas related to these potential applications. A thorough account of the electrochemistry of fullerenes appears in Chapter 3. Chapter 4 is a well-referenced description of the light-induced processes that occur in fullerene systems. This is followed by descriptions of C_{60} encapsulated into dendritic materials and of hydrogen-bonded donor−acceptor complexes.

Chapter 7, entitled "Fullerenes for Materials Science", provides a discussion—and over 200 references—of some of the most promising applications of fullerene-derived materials. This chapter focuses primarily on derivatives of C_{60}. The authors of Chapter 8 provide a well-referenced, lucid account of organic^{60} fullerene-based photovoltaic cells. Chapter 9 follows with a description of potential applications of fullerenes in materials science.

The penultimate chapter addresses recent work involving biological applications of fullerenes. References from 2003 to 2005 are covered along with references to earlier review articles. In the final chapter, the reader is presented with an up-to-date, well-written, and referenced account of carbon nanotube chemistry. Readers who plan to enter this field will find this chapter to be of great value.

Fullerenes will be a valuable source of information for researchers who plan to enter this field as well as to those already participating in this emerging field. It is a resource that should be added to institutional collections and perhaps even to the collection of researchers in this area.

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JA076974+

10.1021/ja076974+

Methods and Reagents for Green Chemistry: An Introduction. Edited by Pietro Tundo, Alvise Perosa, and Fulvio Zecchini (The Ca' Foscari University of Venise and National Interuniversity Consortium, "Chemistry for the Environment", Venice, Italy). John Wiley & Sons, Inc.: Hoboken, NJ. 2007. xviii + 314 pp. $100. ISBN 978-0-471-75400-8.

This book demonstrates the importance of sustainable chemistry and provides methods by which to conduct it. With a format very similar to the successful program "The Summer School on Green chemistry", this book can provide the reader with a resource to develop environmentally benign chemical processes. It is separated into three parts: the first focuses on green reagents, the second, on alternative reaction conditions, and the third, on green catalysis and biocatalysis.

The four chapters of the first part address the effectiveness of multicomponent reactions, the use of carbohydrates as a renewable feedstock, the use of light instead of conventional thermal heating as a source of energy, and the use of dimethyl carbonate as a "green" methylating agent and methoxycarbonylating agent. Each chapter provides very good insight on how to use these reagents in order to "greenify" an industrial process. Further, each account provides a good description of how the use of each reagent would be more environmentally benign than traditional methods. Although each chapter is well written and potentially helpful, only a small number of chemists will be able to take advantage of this section due to its limited scope. For example, the chapter on photoinitiated chemical synthesis is only practical for reactions that undergo clean photochemistry.

The second part of the book focuses on alternative reaction conditions. This section is separated into chapters on the use of ionic liquids; the use of multiphasic reaction conditions; conducting organic reactions in water; and the mechanism, formation, and minimization of chlorinated micropollutants. It provides political, social, and economical reasons for using environmentally benign reaction conditions and does a good job of explaining to the reader both the pros and cons of each method described. Overall, this section is very well organized, although the chapter on chlorinated micropollutants seems rather out of place and does not add much to the section.

The third and final part of the book on catalysis is the most diverse, covering seven separate chapters on a variety of topics in this field. Although its chapters are shorter than those in the previous sections, this part gives the reader a good introduction to the subject and provides thorough references by which a deeper understanding of the subject can be developed. This section was the highlight of the book, in my opinion.

In summary, the authors of the various chapters do an excellent job of explaining the importance of developing sustainable chemistry, specifically in the focused areas. Given the emergence and importance of green chemistry, this is a book that provides methodology that can be very helpful in the development of sustainable reaction conditions and would be a good starting resource for readers seeking to employ sustainable chemistry. However, the book's limited scope in certain sections significantly narrows its effectiveness.

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JA076991Z

10.1021/ja076991z