Book Review

Homogeneous Catalysis: Understanding the Art By Piet W. N. M. van Leeuwen (University of Amsterdam). Kluwer Academic Publishers: Dordrecht, Boston, London. 2004. xiv + 408 pp. $150.00. ISBN 1-4020-1999-8.

Ross A. Widenhoefer

J. Am. Chem. Soc., **2005**, 127 (25), 9309-9310• DOI: 10.1021/ja040992z • Publication Date (Web): 04 June 2005

J|A|C|S
BOOK REVIEWS

TTF Chemistry: Fundamentals and Applications of Tetrathiafulvalene. Edited by Jun-ichi Yamada (Himeji Institute of Technology, Hyogo, Japan) and Toyonari Sugimoto (Osaka Prefecture University). Kodansha Ltd: Tokyo and Springer-Verlag: Berlin, Heidelberg, New York. 2004. xviii + 446 pp. $229.00. ISBN 4-06-211164-0 (Kodansha) and 3-540-21004-0 (Springer).

Research on tetrathiafulvalene, its derivatives, and analogues has undergone explosive growth over the past three decades. On one hand, the need to have synthetic access to these compounds has stimulated the identification of an arsenal of experimental methodologies for their preparation. On the other, the unique structural and electronic properties of tetrathiafulvalenes have encouraged a wealth of electrochemical, spectroscopic, and crystallographic investigations. Combined efforts in both directions have eventually led, and continue to lead, to promising materials for a host of potential applications. Indeed, tetrathiafulvalene is presently one of the most common building blocks in materials chemistry and supramolecular science. A comprehensive book on the chemistry of tetrathiafulvalenes is more than needed at the present stage of development of this growing and topical field of research.

The book is composed of four parts. The first includes seven chapters and is devoted to functionalized tetrathiafulvalenes. Synthetic strategies to prepare symmetrical and unsymmetrical tetrathiafulvalenes with a diversity of substituents are illustrated, together with methods to assemble their oxygen and selenium analogues. The second part comprises three chapters and covers the chemistry of dimeric tetrathiafulvalenes. The synthetic component of this section is particularly emphasized and covers protocols to integrate two tetrathiafulvalene cores within the same molecular skeleton. The third part, which has four chapters, is devoted to 1,3-dithiol-2-ylidenes. In particular, the synthesis and properties of dihydrotetrathiafulvalenes and expanded tetrathiafulvalenes incorporating a broad selection of spacers between their 1,3-dithiol-2-ylidene ends are discussed here. The final part of the book is intended to highlight the applications of tetrathiafulvalenes and is divided into three chapters. This section provides a general overview of dendritic, macrocyclic, multicomponent, polymeric, and supramolecular systems, all of which are based on tetrathiafulvalene building blocks.

The book is well structured and provides up-to-date references for most of the topics. Its main strength is its excellent coverage of the synthesis of tetrathiafulvalenes, which is certainly the dominant component of the book and is very well developed. Strategies to prepare a diversity of tetrathiafulvalenes can be found throughout the 17 chapters. In this context, the book has achieved its intended scope and will certainly be a precious source of inspiration to synthetic chemists interested in tetrathiafulvalenes. The portion of the book devoted to properties is less developed. Electrochemical and structural data for a good number of compounds are discussed, where appropriate, but there is hardly any mention of the spectroscopic properties of this class of molecules. Along the same lines, the part assigned to applications could have been expanded significantly. A good portion of it is again centered on the applications of tetrathiafulvalenes in synthesis, whereas systems such as electrochemical sensors, Langmuir−Blodgett films, modified electrodes, and self-assembled monolayers based on tetrathiafulvalenes are hardly discussed. In summary, this book will be particularly useful to researchers interested in designing synthetic strategies to assemble tetrathiafulvalenes. Here, they will find precious insights and a vast selection of references.

Françisco M. Raymo, *University of Miami*

JA041039X

10.1021/ja041039x

Homogeneous Catalysis: Understanding the Art. By Piet W. N. M. van Leeuwen (University of Amsterdam). Kluwer Academic Publishers: Dordrecht, Boston, London. 2004. xiv + 408 pp. $150.00. ISBN 1-4020-1999-8.

The employment of soluble transition metal complexes as catalysts for organic transformations has grown increasingly prevalent in recent years. In response to this growing interest, numerous books and monographs have been published that document the applications of homogeneous transition metal-catalyzed processes to the synthesis of complex organic molecules, commodity chemicals, and polymers. Similarly, homogeneous catalysis is invariably covered in any general publication about organotransition metal chemistry. Lacking, however, is an overview of homogeneous catalysis as it pertains to a diverse range of fields. *Homogenous Catalysis: Understanding the Art* strives to fill this void by providing the reader with an introduction to the field of transition metal-based homogeneous catalysis as well as an appreciation of the importance of catalysis in both academic and industrial settings.

The book begins with a three-chapter introduction to the general concepts associated with transition metal-based homogeneous catalysis and assumes the reader possesses a working knowledge of the principles of metal−ligand bonding and chemical kinetics. Chapter 1 includes a discussion of selectivity, ligand types, and ligand parameters germane to homogeneous catalysis. Chapter 2 is a description of the elementary transformations of organotransition metal complexes in the context of and tailored to homogeneous catalysis. Chapter 3 provides an overview of the kinetics of catalytic transformations and includes discussions of various mechanistic scenarios and the corresponding kinetic outcomes, methods for obtaining and analyzing kinetic data, and some of the pitfalls associated with the interpretation of the kinetics of transition metal-catalyzed transformations.

The subsequent chapters (4−19) provide an overview of 16 of the more important classes of transformations catalyzed by soluble transition metal complexes including hydrogenation,

olefin isomerization, carbonylation, epoxidation, olefin oligomerization/polymerization, cross-coupling, oxidation, olefin metathesis, and C−H functionalization. With respect to organization, these chapters first introduce the general transformation and then cover one or more key catalytic systems in greater detail, including descriptions of the historical development, scope and limitations, and the kinetics and mechanisms of the specific system(s). In the case of industrially significant processes, a description of reactor/process design is also typically included. These chapters also provide additional background information as required, notably the discussions of molecular weight distribution and the mechanisms of control (site versus chain end) and the spectroscopic analysis of polymer microstructure found in Chapters 9 and 10.

The book achieves a good balance between applications of transition metal-based homogeneous catalysis to small-scale organic synthesis and to large-scale industrial processes. As a result, the book nicely illustrates the breadth and impact of catalysis across a diverse range of environments. The principal shortcoming of the book is that the discussion occasionally bogs down in an unnecessarily detailed discussion of ligand effects that does little to illustrate the more general underlying principles. Furthermore, the organization of the chapters is awkward at times. For example, Chapter 15, "Oxidation with Dioxygen", is organized with respect to the oxidant as opposed to the type of reaction and contains transformations as disparate as the Wacker oxidation and the radical-mediated oxidation of *para*-xylene. Despite these minor shortcomings, *Homogeneous Catalysis: Understanding the Art* should be a useful and informative introduction to transition metal-based homogeneous catalysis for researchers new to the field in both academic and industrial environments and would be suitable for use as a textbook for a graduate-level course on homogeneous catalysis.

Ross A. Widenhoefer, *Duke University*

JA040992Z

10.1021/ja040992z

Chromatography: Concepts and Contrasts, 2nd ed. By James M. Miller (Drew University, Madison). John Wiley & Sons, Inc.: Hoboken, NJ. 2005. xxvi + 490 pp. $94.50. ISBN 0-471-47207-7.

This is an excellent book that may take its place as the best, mid-level textbook on the subject because it provides a unified treatment of all chromatographic techniques. It is also very readable and provides a balanced approach to the theories and practices of liquid chromatography, gas chromatography, capillary electrophoresis, and the emerging technique of capillary electrochromatography.

This book also offers several important chapters that are often not covered in books, which should be invaluable to practitioners and to students about to enter the job market. For example, the introductory chapter is an excellent reference chapter on the different industrial and governmental bodies that affect chromatographic practices. Often this information is hard to find, and it is certainly not as well summarized. There are summaries of the various chromatographic methods specified by the U.S. Environmental Protection Agency as well as descriptions of standards and standardization specifications covered by the National Institute of Standards and Technology and other federal agencies, such as the Food and Drug Administration, the National Institute of Occupational Safety and Health, and the Occupational Safety and Health Administration. There are valuable explanations and a list, with accompanying Web sites, of nongovernmental agencies and societies as well as international organizations, such as the International Organization for Standardization, the International Union of Pure and Applied Chemistry, and the International Conference on Harmonization.

Another invaluable and very readable chapter, "Quantitation: Detectors and Methods", covers modern data acquisition and processing methods. The chapter on sample preparation, an important preliminary step in many chromatographic methods, is a complete and well-balanced presentation that all practitioners will find useful to refer to as the need develops. The chapter on special applications, which includes discussions of affinity chromatography, the rapidly developing area of biological applications, and chiral separations, is well-organized and up-to-date. The weakest chapter in the book is the one on chromatography with mass spectral detection and other hyphenated methods. Nevertheless, this book is an excellent introduction to all of the chromatographic techniques for both the industrial practitioner and the upper level undergraduate or beginning graduate student because of its unified treatment, its modern approach, and up-to-date references.

James D. Stuart, *University of Connecticut*

JA0410284

10.1021/ja0410284