Book Review

# Metathesis Polymerization. Advances in Polymer Science, Volume 176 Edited by Michael R. Buchmeiser (University of Innsbruck). Springer: Berlin, Heidelberg, New York. 2005. xii + 142 pp. $139.00. ISBN 3-540-23358-X.

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*J. Am. Chem. Soc.*, **2005**, 127 (42), 14950-14951• DOI: 10.1021/ja0597597 • Publication Date (Web): 21 September 2005

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BOOK REVIEWS

**Silicon-Mediated Transformations of Functional Groups**. By Helmut Vorbrüggen (Free University, Berlin). Wiley-VCH Verlag GmbH & Co. KgaA: Weinheim, Germany. 2004. xii + 364 pp. $120.00. ISBN 3-527-30668-4.

This is a welcome monograph in which the author has admirably assembled a collection of important functional-group transformations mediated by silicon that have appeared in a wide variety of publications. The book should have wide appeal to organic chemists who, although well aware of the use of silicon reagents as protecting groups and for initiating transformations of alcohols and ethers, may not be aware of their application in a variety of functional-group transformations. In addition to reviewing these various transformations, the author also suggests possible transformations that have yet to be attempted. The book also includes several welcome examples of reactions with experimental details at the end of each chapter.

It is indeed unfortunate that there are a number of errors throughout the book, and the reaction schemes have been drawn in a very crowded manner. Some examples of errors include (1) incorrect nomenclature, such as *tert*-butanol and isopropanol, to name a couple, (2) use of two names for the same compound (trimethylchlorosilane versus trimethylsilyl chloride and tetramethoxysilane versus tetramethyl orthosilicate), (3) use of the wrong compound numbers or compound numbers in the narrative that differ from those in the reaction schemes, and (4) faulty phrasings, such as "Cu-catalyzed 1,4-additions of Grignard reagents of Li alkyls to $\alpha/\beta$-unsaturated carbonyl compounds...". These are very distracting to all readers and could be very confusing to the novice reader.

Even with the above shortcomings, however, the monograph is very informative and should be of great interest to practicing organic chemists.

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JA0597202

10.1021/ja0597202

**Chemoinformatics in Drug Discovery, Volume 23**. Edited by Tudor I. Oprea (University of New Mexico). From the series Methods and Principles in Medicinal Chemistry. Edited by R. Mannhold, H. Kubinyi, and G. Folkers. Wiley-VCH Verlag GmbH & Co. KgaA: Weinheim, Germany. xxii + 494 pp. $185. ISBN 3-527-30753-2.

This latest contribution to the *Methods and Principles in Medicinal Chemistry* series was a pleasure to read and an honor to review. Showcasing the large and growing—figuratively and literally—field of chemoinformatics in drug discovery, the book contains 17 chapters divided into four parts: Virtual Screening, Hit and Lead Discovery, Databases and Libraries, and Chemoinformatics Applications. These logical divisions allow the reader to focus on specific areas of interest, although one should not be deterred from reading the entire book. Indeed, each chapter is expertly crafted by distinguished leaders and practitioners in the multifaceted world of chemoinformatics. The reader is treated to a wealth of concepts and illustrations, with an ample number of case studies that bridge the gap between theory and practice. Especially impressive is the fact that overlap and redundancy are avoided in the book, which pays tribute to the editor and authors and speaks to the enormous breadth encompassed by chemoinformatics. This book should appeal to both novice and expert in search of a single compendium of modern techniques, resources, examples, strategies, lessons, and even opinions on the topic. The references given within each chapter are extensive and current, many of them in the range 2000−2004. This review would be remiss not to mention the welcomed contributions by Marshall and Abraham, two grand masters of the art. While Marshall offers an appetizer in Chapter 1 with a personal account of his broad experience with chemoinformatics in drug discovery, Abraham serves dessert in Chapter 17 with a practical guide for those academicians-turned entrepreneurs in the realm of drug discovery—truly a delightful beginning and ending to a thoroughly superb reading that is worth the price of admission.

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JA0597404

10.1021/ja0597404

**Metathesis Polymerization. Advances in Polymer Science, Volume 176**. Edited by Michael R. Buchmeiser (University of Innsbruck). Springer: Berlin, Heidelberg, New York. 2005. xii + 142 pp. $139.00. ISBN 3-540-23358-X.

This monograph is a short book containing three chapters on the use of olefin metathesis polymerization for the synthesis of selected types of specialty polymers. Olefin metathesis has undergone an explosion of research in the last 10 years, owing to the development of new catalysts and the ever-expanding use of metathesis in organic synthesis. As a result, review articles and books on the subject have also proliferated, and there is much overlap of the present volume with previous publications.

In Chapter 1, Baughman and Wagener provide a nice introduction to acyclic diene metathesis (ADMET) chemistry and a summary of some recent research in the field, primarily from their own laboratories. Included in the introduction is a nice summary of the advantages and disadvantages of the main classes of catalysts used for ADMET. Topics include the preparation of functionalized polyethylenes via ADMET routes and the preparation of telechelic and amino acid- and silicon-containing polymers. This chapter is well-written and provides a good, albeit noncomprehensive, overview of the field. However, there are many errors and mistakes within the

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10.1021/ja0597202 CCC: $30.25 

schemes, particularly when the authors are describing work from other laboratories. For example, Scheme 12 should show phosphazene rings, not protonated benzenes. Readers are therefore advised to pay careful attention to the contents of the schemes.

Chapter 2, "Liquid Crystalline Polymers by Metathesis Polymerization" by Trimmel et al., is a detailed review of research spanning the 15 years since the first use of well-defined metathesis catalysts for the preparation of liquid crystalline polymers. Much information is crammed into 41 pages, and the net result is an impenetrable fortress of tables of phase transition data. Although these tables will be useful references for workers in the field, the chapter as a whole is difficult to read. Many of the references are pre-1998 and have been covered in other reviews.

In Chapter 3, Buchmeiser covers the polymerization of various alkynes. As was the case in Chapter 2, the author describes the development of the area starting with the use of the first well-defined metathesis catalysts in the late 1980s. This material has been mentioned briefly in prior reviews but has not previously been the subject of a full review. Unlike Chapter 1 or 2, more attention is given to the choice of catalyst and the mechanism of the metathesis reaction, as well as the resulting implications for polymer structure. Topics include the polymerization of ferrocenyl-substituted alkynes and the cyclopolymerization of 1,6-diynes. Although most of the described polymerizations used well-defined Mo imido alkylidene catalysts, newer catalyst systems, including Ru catalysts and multicomponent mixtures, are discussed at the end of the chapter.

This book should be of interest to chemists working in the field of metathesis polymerization; however, it is highly specialized and much of the information contained within has been previously reviewed.

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JA0597597

10.1021/ja0597597

**Enantioselective Synthesis of *β*-Amino Acids, 2nd ed**. Edited by Eusebio Juaristi (Cinvestav-IPN, Mexico) and Vadim A. Soloshonok (University of Oklahoma, Norman). John Wiley & Sons, Inc.: Hoboken, NJ. 2005. xx + 634 pp. $175.00. ISBN 0-471-46738-3.

This book is an eclectic mix of topics spread over 23 chapters and includes new chapters focused on synthesis and discussions of structural types, applications of $\beta$-amino acids to the secondary structure of $\beta$-peptides, natural products containing $\beta$-amino acids, and combinatorial applications for the syntheses of $\beta$-amino acids. It offers something for all flavors of organic chemistry and is the most comprehensive and timely compilation of reviews on $\beta$-amino acids that is currently available.

The chapters are nicely organized according to the natural progression of the subject. The first two chapters are general in content and deal with fundamental understanding of $\beta$-amino acids, structural types, nomenclature, and historical background. Chapter 2, the longest and most comprehensive chapter in the book, is a discussion of natural products derived from $\beta$-amino acids and of their bioactivity. The authors of the next 20 chapters cover methodologies developed for the enantioselective synthesis of $\beta$-amino acids and evaluate the current status of $\beta$-amino acids in the design of bioactive compounds. The chapters are divided based on the key reaction sequence used to perform enantioselective synthesis of the $\beta$-amino acids and their derivatives. Some of the methods covered in the individual chapters for the preparation of enantiopure $\beta$-amino acids are homologation of $\alpha$-amino acids, asymmetric catalysis, radical reactions, catalytic Mannich reactions, the use of chiral Michael acceptors, organocatalytic reactions, stereoselective hydrogenation using rhodium and ruthenium complexes, enolate addition to *tert*-butanesulfinyl imines, conjugate addition of imine nucleophiles to unsaturated compounds, and methods utilizing $\beta$-lactam derivatives.

One chapter is dedicated to the synthesis of cyclic $\beta$-amino acids via cycloaddition reactions, and two other interesting chapters are focused on phosphonic analogues of $\beta$-amino acids. There is also a chapter on fluorine-containing $\beta$-amino acids, and another on the synthesis of $\beta$-amino acid derivatives using multicomponent condensation (MCC) reactions, covering some combinatorial aspects of the subject. Although several reviews have appeared in recent years on the latter subject, this chapter is a nice addition to the book and brings up some important challenges that still need to be achieved for enantioselectivity in MCC reactions. The last two chapters focus on peptides of $\beta$-amino acids and are targeted somewhat toward those with a specialized interest in the secondary structure and function of peptides. All chapters were written by authors who originally developed the methods and who provide deep insights into the synthetic strategy, potential of the method, and appropriate references.

One minor quibble is that Chapter 9 partly overlaps with Chapter 6. However, such overlap is difficult to avoid in a book that features multiple authors and chapters. All other authors did their best to minimize redundancies between the chapters. An important strength of this book is that some, *but not all*, synthetic chapters have a section on experimental procedures that should give a brief idea of synthetic feasibility for any reader and should be particularly handy for the chemist.

Overall, the book should serve as an important reference for anyone seeking knowledge about the structure, synthesis, and applications of $\beta$-amino acids. It is a "must have" handbook for any university library. Because of the reasonable price and high quality of the book, it should be on the bookshelves of organic chemists in academia as well as in the pharmaceutical industry.

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JA059764A

10.1021/ja059764a

**Modification and Blending of Synthetic and Natural Macromolecules**. Edited by Francesco Ciardelli (University of Pisa) and Stanislaw Penczek (Polish Academy of Science, Lodz). Kluwer Academic Publishers: Dordrecht, The Netherlands. 2004. xviii + 344 pp. $169.00. ISBN 1-4020-2733-8.

This book was developed from the lectures given at the NATO Advanced Study Institute entitled "Chemical Modifica

tion and Blending of Synthetic and Natural Macromolecules for Preparing Multiphase Structural and Functional Materials: Principles, Methods and Properties", which was held in Pisa, Italy, in October 2003. It comprises 15 chapters, a sampling of which includes "Combinations of Transition Metal Catalysts for Reactor Blending", "Well-Defined Organic (Co)Polymers", and "Characterization of Complex Polymer Systems by Fluorescence Spectroscopy". A subject index completes the book, which also includes a CD-ROM of its contents.

JA059788H

10.1021/ja059788h

**The Vocabulary and Concepts of Organic Chemistry, 2nd ed**. By Milton Orchin, Roger S. Macomber, Allan R. Pinhas, and R. Marshall Wilson (All at University of Cincinnati). John Wiley & Sons, Inc.: Hoboken, NJ. 2005. viii + 894 pp. $125.00. ISBN 0-471-68028-1.

This reference comprises 18 chapters on key topics in the field of organic chemistry and related fields from atomic orbital theory to synthetic polymers to NMR spectroscopy. Important concepts are defined and explained, and examples and illustrations abound. The second edition includes new chapters on infrared, NMR, and mass spectroscopy as well as ultraviolet spectroscopy and photochemistry. It is not organized like a dictionary but rather as a "sequence of chapters that reflect the way the subject is taught", to quote from the preface. Each chapter ends with a list of suggested reading related to the topic at hand, and three indices—name, compound, and general—complete the book.

JA059793L

10.1021/ja059793l

**Thermal Analysis of Polymeric Materials**. By Bernhard Wunderlich (Knoxville, TN). Springer: Berlin, Heidelberg, New York. 2005. xvi + 894 pp. $89.95. ISBN 3-540-23629-5.

It is not surprising that Wunderlich has written another excellent, comprehensive text. After all, he is one of the most well-respected leaders in the field of physical chemistry of polymers. Mastering thermal analysis is a challenge for scientists and engineers in many different areas of research. This book is a perfect tool for polymer researchers interested in expanding their knowledge of physical properties of materials and for researchers in more classical fields who want to incorporate polymer science into their studies. The overall theme of the book "is to connect the new knowledge about materials to the classical topics". By stressing the difference between polymers and small molecules, this book provides the reader with an in-depth understanding of the thermal properties of all classes of molecules.

The book contains seven chapters on topics that range from basic physical chemistry to instrumentation and experimental methods. It opens with an introduction to small molecules and large, flexible, and rigid macromolecules. Readers who are not familiar with polymers will find that Chapter 1 gives an excellent background to the history and basic principles of polymer science. Basic thermal analysis and thermodynamics are covered in Chapter 2. The reader is introduced to phase transitions and mesophases, and the behavior of small molecules is compared to that of large molecules. Chapter 3 also delves into basic polymer science and provides a summary of synthetic methods and molecular weight distribution. Reaction and decomposition kinetics are discussed, followed by an in-depth description of crystallization and melting behavior. The history of thermal analysis as well as basic and sophisticated techniques in thermal analysis are presented in the next chapter. Most of the discussion is devoted to differential calorimetry (DSC). The reader should develop an understanding of the powerful technique of temperature-modulated calorimetry and its use in characterizing reversible and nonreversible transitions in materials from this chapter. Thermal gravimetric analysis, dynamic mechanical analysis, dielectric analysis, and dilatometry are also covered, but in less depth than DSC. The next two chapters focus on structure−property relations and phase transitions in glasses, crystals, mesophase structures, and liquids. The discussion of the relationship between crystalline and mesophase structures and their characterization via DSC should awaken in the reader an awareness of the profound effect of thermal history on the physical properties of materials. The effect of annealing and pressure in glasses is also probed via thermal analysis. The final chapter presents "the link between microscopic and macroscopic descriptions of multi-component macromolecules". Phase transitions in blends, copolymers, and solutions are explained via theory and experimental data.

Overall, this is one of the most comprehensive texts on thermal analysis of macromolecules. Wunderlich is a dedicated teacher of macromolecular physical chemistry, and this book represents years of effort devoted to perfecting a methodology for conveying his vast knowledge to his readers. At the same time, there is a plethora of the most current techniques and interpretations of new experimental findings. The text contains excellent references for further reading and appendices with a physical property data bank and additional experimental methods. However, I do have some comments concerning the illustrations and cover. First, there is too much information in many of the figures. Also, it is confusing when DSC traces shift the direction of the endotherm from one drawing to the next. Finally, the printing on the spine of the book needs to be edited.

I highly recommend this book for both classroom study and for individuals hungry to expand their knowledge of thermal analysis and materials chemistry. Overall, I give this text an excellent rating.

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JA059803I

10.1021/ja059803i