

# Book Reviews

**Cycloaddition Reactions in Organic Synthesis.** Edited by S. Kobayashi (The University of Tokyo) and K. A. Jorgensen (Aarhus University). Wiley-VCH Verlag, Weinheim, Germany. 2002. xii + 332 pp. 17 × 24 cm. \$135.00. ISBN 3-52730-159-3.

This book is a well-rounded review of a collection of metal-catalyzed cycloaddition reactions written by experts in the field which covers many interesting aspects of the development of this valuable class of reaction in the modern synthesis of natural products and molecules with biological activity.

The first chapter, Catalytic Asymmetric Diels–Alder Reactions, reviews those catalytic asymmetric homo-Diels–Alder reactions proceeding in an enantiomeric excess (ee) greater than 90%. Chiral Lewis acid-catalyzed reactions are organized by metal and only the catalysts are numbered, which makes the reading easier. This section includes homo-Diels–Alder reactions for  $\alpha,\beta$ -unsaturated aldehydes, esters, and other dienophiles, and it also contains a section on the new base-catalyzed reaction.

A discussion of palladium-catalyzed cycloadditions of trimethylenemethane (TMM) and its analogues is presented in the second chapter. It provides some background information about TMM, its usefulness in the construction of five-member carbocyclic and heterocyclic systems, and applications in organic synthesis. Recent advances covered include catalytic systems, different TMM precursors, and inter- and intramolecular cycloadditions.

Chapter three reviews structural, mechanistic, and preparative studies of the zinc-mediated cyclopropanation reaction. It presents an elegant account of the Simmons–Smith cyclopropanation using auxiliary-based methods, chirally modified reagents, and chiral catalytic processes.

Some major developments in the catalytic asymmetric cycloaddition reactions of conjugated dienes with carbonyl compounds are covered in chapter four. The usefulness of 2+4 heterocycloaddition reactions in synthesis has led to a new era of chiral Lewis acid catalysts valuable for this kind of transformation.

The recent catalyzed asymmetric aza Diels–Alder reaction is surveyed in chapter five. Successful reactions of azadienes have been carried out with lanthanide triflates, while reactions of azadienophiles have been reported with Zr compounds. An area yet unexplored is the catalytic asymmetric intramolecular aza Diels–Alder reaction.

Chapter six includes an introduction to the basics of metal-catalyzed 1,3-dipolar cycloaddition reactions, and the sections are organized according to the metal catalysts applied for the reaction. Significant activity in this area is shown on the reactions of nitrones, where excellent ee has been achieved in several cases.

Chapter seven reviews the aqua complex Lewis acid transition metal catalysts. It covers their preparation, catalytic activity, chiral amplification, and application in several Diels–Alder, nitronone, nitronate, and diazoalkane enantioselective cycloaddition reactions. The chapter ends with a short review of conjugate additions of thiols, hydroxylamine, and nucleophilic carbons.

The last chapter ties together the cycloaddition reactions presented in the book and illustrates some new developments in the theoretical understanding of metal-catalyzed

reactions. It has now become possible to perform trustworthy calculations for metal systems to investigate reaction courses for metal-catalyzed cycloaddition reactions. Selected examples on carbo- and hetero-Diels–Alder and 1,3-dipolar cycloadditions are described on the basis of the frontier molecular orbital approach.

In summary, this excellent book illustrates recent advancements in catalytic asymmetric cycloadditions directed toward organic synthesis. This book will be appreciated by chemists in academia and industry interested in updating their knowledge in the field.

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**Essential Oils Analysis by Capillary Gas Chromatography and Carbon-13 NMR Spectroscopy, 2nd Edition.** By K.-H. Kubeczka (University of Hamburg, Germany). John Wiley and Sons, Inc., New York. 2002. xviii + 461 pp. 21.5 × 27.5 cm. \$225.00. ISBN 0-471-32633-X.

This book, which is dedicated to the memory of Viktor Formáček, the coauthor of the first edition, is the second edition of a work first published in 1982. Like the first edition, it remains essentially a data collection of capillary gas chromatograms and  $^{13}\text{C}$  NMR spectra of 41 essential oils. Some of the oils are accessed from more than one source, so that altogether analyses of 60 oils are presented. The second edition differs from the first by the inclusion of data on additional oils and pure compounds.

The section for each oil includes a short introduction giving information about the source and uses of the oil. This is followed by good quality reproductions of the oil's capillary gas chromatograph, obtained under standard conditions on a 50 m glass capillary column wall coated with WG 11 (for oils from the 1st edition) or on a 30 m DB-Wax column (for the newly reported oils). Unfortunately the GC conditions used for each individual oil are not specified, but each chromatogram is followed by a table giving the identity and amount of each component. The  $^{13}\text{C}$  NMR spectra of each oil follow, and the peaks due to the major components are identified. Each spectrum is given complete and in two or three expanded versions, depending on the complexity of the mixture.

The volume concludes with a set of  $^{13}\text{C}$  NMR spectra of 188 pure substances, mainly mono- and sesquiterpenoids, found in the oils; 67 of these are new to this edition.

As before, the volume will be an essential handbook in laboratories concerned with essential oils analysis.

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**Tetrahedron Organic Chemistry Series. Vol. 21: Biodiversity and Natural Product Diversity.** By Francesco Pietra (Universita di Trento, Trento, Italy). Elsevier Science, Amsterdam, The Netherlands. 2002. xiv + 351pp. 16.5 × 24 cm. \$45.00. ISBN 0-08-043706-0.

This book, which is Volume 21 of the *Tetrahedron Organic Chemistry Series*, surveys the diversity of natural products, their functional roles, and commercial uses. It was with curiosity that I undertook to review this volume, especially as a wealth of information on the biodiversity of natural products is scattered in numerous publications but is lacking any systematic order. This book provides a good starting place for a comprehensive and rapid reference on the structural classes of natural products present in all forms of biota. The author has compiled a voluminous body of literature and summarized it in tables and charts complete with a section of abbreviations and definitions.

The volume, with 17 chapters organized in six parts, offers adequate and recent references. In Part I, Chapter 1 defines biodiversity at the species, higher taxonomic, genetic, and ecosystem levels, while Chapter 2 summarizes the evolution of biodiversity in four pages. Part II, composed of Chapters 3, 4, and 5, briefly describes the relationships between biodiversity and natural products diversity; the challenges encountered with unculturable species receives only a half-page treatment. The more substantial Part III covers natural products diversity at the ecosystem level in Chapters 6–11. This section offers numerous tables and charts that include natural products

found in terrestrial and freshwater biomes (Chapter 6) and in the oceans (Chapter 7). Chapters 8–10 offer information on marine and extremophile natural products, whereas Chapter 11 provides a graphic analysis of the skeletal diversity and complexity of natural products.

Natural products diversity at the functional level is presented in two chapters in Part IV. Chapter 12 is dedicated to signaling, defensive, and environmentally relevant metabolites, including antifeedant, antimicrobial, recruiting, alarming, and growth stimulating agents, in addition to tables containing information on toxins and environmentally noxious metabolites. Chapter 13 describes the uses of natural products as foods, additives, drugs, phytomedicines, fragrances, cosmetics, laboratory tools, and drugs of abuse. Each category is summarized in tables.

Part V, also two chapters, describes the products obtained by biotechnology, biocatalysis, and chemical synthesis. The final two chapters of Part VI present the diverse nature of threats facing natural products diversity and (in five pages) the management of living organisms to prevent extinction and the creation of gene banks as repositories of genetic material for conservation.

I was a bit disappointed at the inconsistency and depth of coverage for the various chapter topics. This volume is a compilation of research in the field but without a substantial analysis and discussion of topics. It would also have been useful to discuss the Convention on Biological Diversity as it relates to the current challenges that bioprospecting projects face with regard to legal permits for access to biodiversity as well as intellectual property rights in host countries. Despite these omissions, this book is a useful reference that will be a worthy purchase for libraries and those with an interest in natural products diversity and biodiversity.

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