

Cycloaddition Reactions in Organic Synthesis. By S. Kobayashi, K. A. Jørgensen. Wiley-VCH: Chichester, 2002, cloth, \$135.00; ISBN 3-527-30159-3.

The contents of a book entitled 'Cycloaddition Reactions in Organic Synthesis' would vary tremendously depending on its editors and contributors. In this case, the editors are interested in enantioselective catalysis of organic reactions, and consequently this book highlights the recent developments in metal-catalyzed (enantioselective) cycloaddition reactions.

The opening chapter discusses catalytic asymmetric carbocyclic Diels–Alder reactions. The chapter is organized initially by the type of dienophile, and within each dienophile subheading a brief survey of 'useful' (ee's > 90%) chiral Lewis acids are presented. Recent advances in enantioselective Diels–Alder reactions using organocatalysts are only briefly presented. Unfortunately, no coverage of the reactions of '1-amino'-substituted dienes is presented. Especially useful is a concluding table that directly summarizes and compares a number of aluminum, boron, or titanium-containing chiral Lewis acids (as well as others) that have been used to promote the Diels–Alder reaction between standard test substrates (e.g. cyclopentadiene and acrolein).

Palladium catalyzed trimethylenemethane (TMM) cycloaddition is the subject of the following chapter. A survey of the use of Pd-TMM complexes in inter- and intramolecular cycloadditions to alkenes, carbonyl compounds, and imines in various manifolds ([3+2], [4+3], [6+3] and [3+3]) is presented. This chapter (and it admits this) focuses only on TMM chemistry developed using Trost's approach. Readers interested in alternate approaches to Pd-TMM chemistry are directed to two articles, the latest of those in 1991.

Enantioselective cyclopropanation using zinc carbenoids is the final chapter dealing with 'carbo-cycloadditions'. The authors present a thorough description of the background of this process including studies of the reagent's structure and dynamic behavior and its use in 'directed' reactions (and the resultant implications on reaction mechanism) before delving into modern catalytic asymmetric variants of cyclopropanation. This chapter is the longest in the book (~65 pages; > 90 references) and fulfills its intention to 'provide an integrated overview' of cyclopropanations using zinc carbenoids.

Hetero-Diels–Alder reactions are the subject of the following two chapters. Similar to the first chapter, the chap-

ter dealing with the hetero-Diels–Alder reactions of carbonyl compounds is organized initially on the basis of 'dienophile', then within each subsection a survey of chiral Lewis acids that have been effectively implemented is presented. Much rarer are 'aza-Diels–Alder' reactions, and the subsequent chapter discusses the problems and recent advances in the enantioselective catalysis of azadienes, α -imino esters and 2-azadienes.

The next two chapters delve into metal-catalyzed enantioselective 1,3-dipolar cycloaddition reactions. The first of these chapters, after a brief introduction of the basic aspects of metal-catalyzed 1,3-dipolar cycloaddition reactions, surveys the use of chiral Lewis acids that have been implemented for these types of reactions. Similar to previous chapters, the organization is organized initially in terms of the reacting 1,3-dipole (the majority of the material deals with the reactions of nitrones) and then as specific Lewis acid types of each metal. The second chapter is organized much differently as it summarizes the use of specific Lewis acid catalysts ('DBFOX') and their abilities to catalyze asymmetric 1,3-dipolar cycloadditions of nitrones, nitronates and diazo compounds. Incongruously, the concluding material of this chapter are conjugate addition reactions of nitrogen, sulfur and carbon based nucleophiles catalyzed by these Lewis acids.

The final chapter summarizes recent work by theoretical chemists investigating the mechanistic underpinnings of metal-catalyzed cycloaddition reactions. Comparisons between catalyzed and uncatalyzed versions of cycloadditions are presented.

The chapters are well organized, and one can easily get to one's interest using the Table of Contents. The index is inadequate. The schemes and figures are not standardized between chapters (e.g. one chapter's depiction of a transition state structure is a cartoon, another is a 'ball and stick' model). These are minor points, though, and despite its general title 'Cycloaddition Reactions in Organic Synthesis' will serve as an excellent introduction to enantioselective metal-catalyzed (or promoted) cycloaddition reactions for undergraduate and graduate students. Practicing academic and industrial chemists will also undoubtedly find highly useful coverage of these rapidly expanding research areas.

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