Book Reviews

Chiral Auxiliaries and Ligands in Asymmetric Synthesis. By J. Seyden-Penne. Wiley: New York, 1995, 716 pp, hardback. £ 55. ISBN 0-471-11607-6.

"Chiral Auxiliaries and Ligands in Asymmetric Synthesis" is the updated translation of the French title "Synthèse et Catalyse Asymétrique" published 1994 by InterEditions and CNRS Editions.

The book addresses the widespread applications of chiral auxiliaries and ligands in asymmetric synthesis with the aim to provide for a highly actual survey of these outstanding "synthetic tools" for chemists working in the field of synthetic organic and organometallic chemistry. The material of the monography is organized into eleven parts with numerous sub-chapters. The book begins with a short introduction about theory and models in asymmetric synthesis. Besides kinetic features of one-step and multi-step reactions, also stereoelectronic (HOMO-LUMO-interactions) and polar effects, bonding and non-bonding interactions (hydrogen bonding, p-p-interactions), conformational effects etc. are discussed. Brief attention is given to the most prominent models describing the steric course of the electrophilic and nucleophilic attack to prochiral p-systems or radicals, respectively, advocated by Cram, Anh, Houk, Cieplak, Seebach, Curran, Giese and others. Adequately, other familiar concepts to control the efficiency of asymmetric transformations such as the respective control concept by Achiwa (asymmetric hydrogenation) and the principle of double stereodifferentiation are considered.

This theoretic part is followed by three chapters (Chapters 1-3) introducing a broad and well selected collection of representative and widely utilized chiral auxiliaries (e.g. alcohols, amines, acids, lactams, sulfoxides and transition metals), chiral ligands (proton donors, chiral bases, hydrides, organometallic reagents, enolates, boranes, silanes and stannanes), and chiral catalysts (aminoalcohols, Lewis acids, transition metal catalysts).

Based on this knowledge, in the following eight main chapters the author reviews exhaustively the utilization of these chiral external or internal auxiliaries in asymmetric stoichiometric and catalytic reactions. The "application" part opens with a short, but informative passage about asymmetric protonations and deprotonations (Chapter 4). This section is succeeded by a survey about various methods of stereodifferentiating alkylations of substituted carbanions and metal enolates (Chapter 5). Chapter 6 covers the nucleophilic addition to C=O and C=N double bonds. Herein, particular attention is given to the reaction of boron, silyl and stannyl substituted chiral carbonyl derivatives. The subsequent part is devoted to current aspects of asymmetric hydrogenation, hydroxylation and related additions to C=C double bonds. Especially valuable here as in other sections is the depiction of transition states and generally accepted reaction mechanisms allowing for convenient comprehension of the considered matter. Chapter 8 focuses on the addition reactions to double bonds bearing heteroatoms. This part is completed by some considerations addressing the scope of the important oxidation of sulfides. Chapter 9 deals with the major aspects of asymmetric cycloadditions. Here, the author amply discusses recent results in the different reaction modes of ketenes, diazo compounds, nitrile oxides and related double bond systems in [2+2]-, [2+3]- or [2+4]-cycloadditions, respectively. In the last part of this chapter the stereodifferentiating potential of chiral Lewis acids and asymmetry inducing auxiliaries directly attached to the diene or dienophile is analyzed. A special section (Chapter 10) is devoted to [2,3]-sigmatropic rearrangements covering the most reputed transformations (rearrangements of carbanions, Cope-, Claisen and related rearrangements). Finally, in the last chapter of the book those transition metal catalyzed asymmetric reactions which have not been considered in prior sections are presented. Among them major aspects of nickel catalyzed C-C-coupling reactions, Heck reaction, isomerization of allylamines and the Pauson-Khand reaction are included.

One of the outstanding features of this book is the coverage of the literature. The book relies on more than 1600 references mostly dating between 1990 and 1994. The well-chosen selection of review articles can expose the reader to a more detailed discussion of the individual topic.

Minor criticism I would bring concerns several misleading and unusual legends below depicted compounds and the quotation of frequently utilized chiral auxiliaries in equations as simple numbers. This referring system requires a sometimes time-consuming search in preceding chapters and affects the fluent readability of the text, which is in general succinctly and coherently written.

Overall, the author has compiled a salient monography containing much state of the art in-

formation in the field of asymmetric synthesis. I think this book will be of value, not only for academic and industrial chemical libraries, but also to advanced students, who are interested in this rapidly growing area of organic chemistry.

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The Chemistry of *C*-Glycosides. By D. E. Levy, C. Tang. Pergamon: Oxford, 1995, 291 pp, paperback. £ 30, $ 48. ISBN 0-08-042081-8.

This book, like others in the Tetrahedron Organic Chemistry Series, represents a timely review of the rapidly burgeoning field in carbohydrate chemistry. The emphasis of this book is on the synthetic perspective of C-glycosides. It consists of 8 chapters. The first introductory chapter concisely outlines the importance of the area ranging from nomenclature to the potential biological applications. A comparison of O-glycosides vs C-glycosides has been treated briefly. The following five chapters center around the syntheses of the glycosidic carbon-carbon bond from natural sugar derivatives. Through specific examples, various reactions associated with C-glycosides are presented. The influence of reaction conditions on the product distributions and/or stereochemical outcome is discussed to a certain extent. Chapter 2 deals extensively with electrophilic substitutions (the anomeric carbon as an electrophile) for the formation of C-glycosides. Transition metal-mediated carbonylations and reactions involving anomeric carbenes are also included in this chapter, although, strictly speaking, the carbon-carbon bond formation at the anomeric center by using these reactions may not necessarily belong to the electrophilic substitution. In particular, the alkenes used in the illustrations on cyclopropanation (Schemes 2.12.1 and 2.12.2) are all electron deficient. Chapter 3 discusses the nucleophilic substitutions by using the substrates having anionic anomeric carbon. The uses of the transition metal mediated cross coupling reactions and radical reactions for the glycosidic carbon-carbon bond formation are presented in Chapters 4 and 5, respectively. Chapter 6 summarizes the rearrangements and cycloaddition reactions for the preparation of C-glycosides. Chapter 7 deviates from the approach discussed in Chapters 2-6. The formation of sugar rings in the C-glycosides from acyclic starting materials or other sugar derivatives is addressed. The advances of the syntheses of C-di and trisaccharides over a period of more than a decade (1983-94) are presented chronologically in the last Chapter. The examples not only present the actual C-glycosidations but also utilize them in the preparation of increasingly more complex target molecules. The book is concisely written and the schemes are neatly drawn. Graduate students and researchers interested in organic synthesis related to carbohydrates will find this useful, as the book serves an excellent introductory overview of the subject it covers. References are up to 1993 and some works published in 1994 have also been included. This reviewer recommends this book enthusiastically.

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