Book Reviews

Discrimination of Chiral Compounds Using NMR Spectroscopy. By Thomas J. Wenzel (Bates College). Wiley-Interscience, Hoboken. 2007. xxiii + 549 pp. 16 × 24 cm. $110.00. ISBN 0-471-76352-7.

The book presents a broad diversity of reagents used in small molecule NMR spectroscopy to solve the difficult and critical problems of optical purity and absolute configuration. Citing more than 1600 references, the author travels from the mid 1960s to the present, covering chiral derivatizing and solvating agents applied to a wide diversity of natural and synthetic compounds. The text is organized through 10 chapters based on the type of chiral NMR reagent, but, if a problem involves a particular class of compound, the very well designed index will direct the reader quickly to all possible methods based on functional groups.

After a very clear and concise introductory chapter explaining the ABCs of the different methodologies, in the second chapter the author describes the aryl-containing carboxylic acid reagents, including the well-known MTPA, or Mosher's, reagent. Chapter 3 contains a discussion of other carboxylic acids that have been used as either chiral derivatizing or solvating agents, mainly for the analysis of alcohols or amines. Hydroxyl- and thiol-containing reagents are covered in Chapter 4, with special emphasis in the use of 2,2,2-trifluoro-1-(9-anthryl)ethanol, one of the few reagents that can be used to assign absolute configuration. Chapter 5 describes the use of primary, secondary, and tertiary amines as chiral discriminating reagents. This chapter includes the application of many natural products including ephedrine, quinine, and amino acids. Chapter 6 presents a compendium of miscellaneous organic chiral reagents that have mostly been studied for a limited number of substrates.

While Chapters 2 through 6 discuss derivatizing reagents that require ^{1}H, ^{13}C, or ^{19}F NMR spectroscopy, Chapter 7 describes those specifically designed to incorporate phosphorus, selenium, boron, and silicon, adding the use of ^{31}P and ^{77}Se NMR to the game. Chapter 8 describes an elegant strategy: the use of host–guest complexation, including cyclodextrins, crown ethers, and very specialized receptor-like enzymes. Although the use of lanthanide shift reagents has diminished as high-field NMR spectrometers have become more accessible, an interesting variety of metal complexes is well explained in Chapter 9. Finally, Chapter 10 covers the use of liquid crystals, gels, polymers, and solid-state NMR spectroscopy for chiral discriminations. Some of these methods do not require a specific substrate–reagent interaction, increasing the possibility of finding a universal discriminating agent.

Overall, this is a very resourceful book for use in natural products and synthetic chemistry to discriminate enantiomeric mixtures, enantiotopic hydrogens, and chiral compounds by virtue of slow rotation or geometrical constraints.

Tamara L. Meragelman
National Cancer Institute
Frederick, Maryland

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