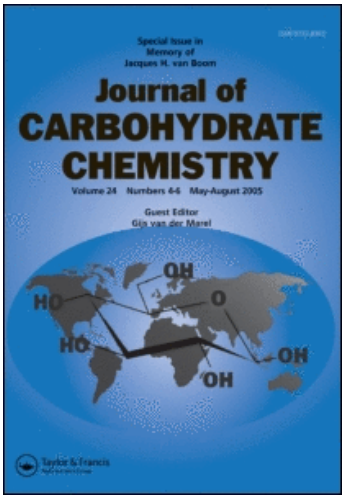

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Levoglucosenone and Levoglucosans, Chemistry and Application. Frontiers in Biomedicine and Biotechnology, Vol. 2, Edited by Zbigniew J. Witczak (University of Connecticut, Storrs, Connecticut), ATL Press Inc. 1994, iv 224 pp. $125.00 ISBN 1-882360-13-3.

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BOOK REVIEW

Levoglucosenone and Levoglucosans, Chemistry and Application. Frontiers in Biomedicine and Biotechnology, Vol. 2, Edited by Zbigniew J. Witczak (University of Connecticut, Storrs, Connecticut), ATL Press Inc. 1994, iv+ 224 pp. $125.00 ISBN 1-882360-13-3.

This book assembled from the Proceedings of the American Chemical Society Symposium on Levoglucosenone and Levoglucosans held at the 204th National Meeting, Washington, DC, August 25, 1992 is a collection of recent work on the production and utilization of the compounds for chiral synthesis.

The book is divided into two sections. The first section Levoglucosenone: Chemistry and Applications consists of nine chapters which discuss the history, preparation and utility of levoglucosenone in chiral synthetic reactions. The first chapter details the structure, synthesis and properties of levoglucosenone. The particular utility of the levoglucosenone molecule is that the 1,6-anhydro bridge eliminates the need to block the C-6 hydroxyl and anomeric carbon, fixes the conformation and sterically hinders the β-face of the molecule. While chapter 2 outlines a simple bench method for the synthesis of levoglucosenone by the traditional pyrolysis of cellulose route, chapter 3 describes its synthesis as an unwanted by-product of a Lewis acid catalyzed rearrangement of a silyl enol ether in the synthesis of Herbicidin B.

Uses of the levoglucosenone molecule as a regio- and stereoselective reagent in several syntheses are enumerated in the remaining six chapters. It can participate readily in Diels-Alder cycloaddition reactions as a dipolarophile, thus lending itself as a facile intermediate in a variety of natural product synthesis. A variety of uses as varied as preparation of analogs of a powerful herbicide which helped in determining the structural and functional requirements for the herbicidal activity, and as a chiral synthon in the preparation of several natural products with importance to the flavor and fragrance industries are also detailed. Additionally, the levoglucosenone molecule has been used for the synthesis of rare sugars and nucleoside analogs which have proved useful in the efficient and stereoselective synthesis of 2', 3'-didehydro-2',3'-dideoxythymidine (d_4T) which has been shown to have anti-HIV activity.

The second section Levoglucosans: Chemistry and Industrial Application contains five chapters. Chapter 10 presents a number of reactions which take advantage of the high degree of regio- and stereoselectivity afforded by several dianhydrohexopyranoses. Control of the selectivity of these reactions facilitates the preparation of various 1,6-anhydrohexopyranose derivatives at high purity and high yields, precluding the need for further purification steps.

In chapter 11 the equilibrium of the $^1C_4$ chair and the B_{03} boat conformations of levoglucosans is investigated via NMR and MM3 molecular mechanic calculations. It is

concluded that increasing the polarity of the solvent or bulky substituent groups decreases the extent to which the chair conformation is favored. MM3 calculations suggest that the polarity effect is caused by loss of intramolecular hydrogen bonds. Chapter 12 deals with use of the chemical and chemoenzymatic methods to achieving stereoselectivity in the synthesis of levoglucosan derivatives. Several methods are presented to gently cleave the 1,6-anhydro ring of these derivatives to control their stereochemistry. The large scale production of levoglucosan from cellulosics using the Waterloo fast fluid bed pyrolysis method is described in chapter 13. Various feedstocks and yields are discussed. The final chapter 14 presents the synthesis of some unique new carbohydrate polymers using the anionic ring opening polymerization of some epoxy derivatives of levoglucosan.

The book will provide a highly valuable and essential addition to institutional, as well as personal libraries of scientists engaged in research on the chemistry of carbohydrates, especially in the emerging field of carbohydrate synthons.

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