

Book review

Analysis of Carbohydrates by GLC and MS: edited by Christopher J. Biermann and Gary D. McGinnis; CRC Press, Boca Raton, FL, 1989, ix + 292 pages, \$149.95 in U.S., \$176.00 elsewhere.

Despite the recent advances in h.p.l.c., supercritical fluid chromatography, capillary zone electrophoresis and other emerging analytical techniques, g.l.c. and m.s. still play a crucial role in the structural analysis of important oligo- and poly-saccharides. Details of, and advances in, this important topic are scattered in numerous reviews, handbooks, and publications. For this reason, the editors have endeavored to place together, in one volume, a “comprehensive guide to analysis of carbohydrates by gas–liquid chromatography and mass spectrometry”.

The book contains 12 chapters that have been contributed by a total of 16 different authors and co-authors. Normally, when a book is constructed in this manner, one expects to see differences in style and quality from chapter to chapter. In this regard, this book is no exception, with the quality ranging from marginal to outstanding. The overall quality of the book is, however, very good.

Chapter 1 has an over-ambitious goal: an introduction to carbohydrate chemistry and stereochemistry, a review of derivatization procedures for sugars, and a review of various g.l.c. stationary phases that are available. The information is useful and interesting, but unfortunately contains some flagrant errors that were not caught during the editorial process: the structures of glucuronic acid, *N*-acetylneuraminic acid, and L-glucose are all incorrectly drawn; details on the assignment of α and β anomers are incorrectly given; and some of the nomenclature is incorrect or inconsistent. However, readers should not judge the entire book by these unfortunate errors as the quality improves dramatically after Chapter 1.

Chapter 2 discusses the h.p.l.c. of carbohydrates. This chapter is appropriately brief, as it is not relevant to the title of the book. It is a useful guide, with references to most of the advances in the field.

Chapter 3 is a useful and much needed overview of techniques used to hydrolyze various polysaccharides prior to g.l.c. analysis. Problems associated with hydrolysis, methanolysis, and reductive cleavage of glycoconjugates, woody materials, gums, D-fructans, and other polysaccharides are discussed.

Chapter 4 is a scholarly work on silyl ethers of carbohydrates. It includes excellent subsections on the silylation reaction, on procedures for conducting silylations, and on procedures for optimal chromatographic separations and for mass-spectral analysis. Applications of the methods to all of the different classes of carbohydrates from various sources are carefully described.

Chapter 5 covers the preparation of alditol acetates, and their analysis by g.l.c. and m.s. It is similar to Chapter 4 in style: it is well written and provides excellent information about the historical development and current status of the method. The chapter covers, in great detail, the practical aspects of polysaccharide hydrolysis, pre-derivatization clean-up, reduction, acetylation, and g.l.c. and mass-spectral analysis. Useful subsections cover optimal conditions for specific neutral and ionic sugars, and for compositional analysis of a number of bacterial polysaccharides.

Chapters 6, 7, and 8 provide useful information on per-*O*-acetylated aldononitrile derivatives, on trifluoroacetate derivatives, and on various *O*-alkyloxime derivatives of monosaccharides, respectively. By reading through these chapters, one develops a sense of the strengths and limitations of each method, and is able to choose accordingly. As usual, derivatization, separation, and m.s. analysis are covered. Even a section on chiral separations is included in Chapter 7.

Chapter 9 provides one of the more useful resources to date on linkage analysis of polysaccharides by g.l.c.-m.s. of partially methylated alditol acetates. Although the chapter is not quite as well organized as some, it is a storehouse of knowledge on the preparation of samples, the methylation reaction, hydrolyses, per-*O*-methylated alditol acetate preparation, and g.l.c.-m.s. This chapter should be required reading for anyone interested in the linkage and structural analysis of polysaccharides.

Chapter 10 is an extremely well-written chapter on fast-atom-bombardment-mass spectrometry (f.a.b.-m.s.). Few researchers could not benefit from this carefully crafted chapter, which discusses the principles of the fast-atom-bombardment procedure, the theoretical aspects of the f.a.b. spectrum, and the limitations of the method, and its very carefully described applications to small and large oligosaccharides, polysaccharides, sulfated oligosaccharides, glycopeptides, glycolipids, and glycoproteins.

Chapter 11 provides a useful guide to available methods for determining substituents on cellulose derivatives. Its main use would be by industrial researchers in this area.

Chapter 12 covers such miscellaneous topics as analysis of sugar phosphates, methods for determining the degree of polymerization of polysaccharides, and for determining absolute configuration of sugars by chiral chromatography, periodate oxidation techniques, and several other useful items.

This volume was written to be "particularly useful to those scientists who require analysis of carbohydrates but are not yet experts in gas-chromatographic analysis of carbohydrates". Additionally, the authors suggest that the volume "will be useful to the more seasoned carbohydrate analyst as a reference book". The reviewer agrees on both counts and while few individuals will purchase personal copies of this book, it is suggested that all laboratories conducting carbohydrate research would benefit from having a copy of this volume available.

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