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Carbohydrate Polymers 73 (2008) 676–678
Carbohydrate Polymers
www.elsevier.com/locate/carbpol

Book reviews

Carbohydrate Chemistry and Biochemistry, Michael L. Sinnott, The Royal Society of Chemistry, Cambridge, UK, 2007 (xviii + 748 pp., £59, ISBN: 0-85404-256-2)

Carbohydrates are important because of their extensive involvement in biology. Carbohydrate polymers are a main component of the cell walls of organisms and energy storage materials. Simple sugars, and their phosphate esters, are important in primary metabolism. The interactions between glycoproteins and glycolipids serve a role in many recognition phenomena. *Carbohydrate Chemistry and Biochemistry* is a broad ranging title and therefore as could be expected it covers both large and small molecular weight carbohydrates in both simple and complicated forms.

Carbohydrate nomenclature is very complex, therefore it is treated in some detail in the book. Structural nomenclature is used for most of the concerned compounds, but for the key compounds also IUPAC names are given.

As carbohydrates can be highly polar molecules and their conformation is different in different solvents, their structure is unlikely to be computed by *ab initio* methods. Therefore Angyal's instability factors, which is a purely empirical way of estimating conformations, are still used. Although most oligosaccharides have definite structures, many polysaccharides have an element of randomness. Determination of their primary sequence is therefore a matter of frontal assault on the problem by wet chemistry, mass spectrometry and multi-dimensional NMR.

Most nucleophilic substitutions at the anomeric centres fall between two mechanistic extremes. On the one hand, glycosyl cations are stable enough to be solvent-equilibrated intermediates, whose fates are independent of their method of generation; on the other hand, nucleophiles such as azide or appropriately-positioned intramolecular nucleophiles attack the anomeric centre in unambiguous $S_N^{2'}$ reactions. Enzymic glycosyl transfer proceeds through transition states similar to those for non-enzymic glycosyl transfer. There are two fundamentally different kinetic mechanisms: the first is 'ping pong' and the second is a ternary complex mechanism.

Different mechanisms of reactions catalysed by glycosyl transferases and glycoside hydrolases warrant special attention. There are several types of other chemical reactions related to sugars and some of them, including rearrangements of reducing sugars, aromatisation, nucleophilic reactions of OH groups, oxidations, and eliminations and additions are considered. Reactions involving intermediates with unpaired electrons are considered separately in the book. There are classes of radical reactions of carbohydrates given and also there is an insight into the methods of investigation of radicals.

The book is written for graduate and undergraduate students and for new researchers in chemistry. It could also be useful for researchers working in carbohydrate processing industries, such as the pulp and paper, textiles and food industries.

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Available online 28 December 2007

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doi:10.1016/j.carbpol.2007.12.017

Alcoholic fuels, Minteer, S., CRC Press, Boca Raton, FL, USA, 2006 (296 pp., £ 56.99, ISBN: 0-8493-3944-8)

Development of research within the last century has lead us to the point at which using alcohol-based fuels for transportation applications has become a reality. Over the last two decades alcoholic fuels have been introduced into the market as an alcohol-gasoline.

Advantageous features of alcoholic fuels are that they can be obtained from a variety of biomass sources (corn, wood, landfill waste). Most viable fuels on the market are methanol and ethanol, being fuels in themselves or additives for biodiesel (Section 1). Ethanol blends are used to produce fuel with lower hydrocarbon emissions (decreasing green-house gases). However, aldehyde emissions are then increased (Section 2, Chapter 7). Ethanol can be a main component or comprise a small percentage of fuel for engines (E85 fuel and E-10, E-Diesel, respectively). It is a good choice as an oxygenator for diesel. It has minimal effects on engine power, dramatically decreasing particulate matter and carbon monoxide emission.

Because of a vapour pressure difference that has an environmental advantage, butanol could play a significant role as a fuel blend. However, its cost and efficiency of production still needs to be improved (Chapter 6, Section 1).