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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).

There are a number of applications of alcoholic fuels. Alcoholic, direct fuel cells are used for portable power generation. Methanol, because of its toxicity and miscibility, is less applicable than ethanol. Moreover, ethanol, being renewable and environmentally friendly, plays a role as an alternative supply of hydrogen obtained in the steam reforming process. Biofuel cells, utilizing enzymes (dehydrogenases) as a catalyst for alcohol oxidization, are alternatives for chemical cells. The role of catalysts is taken by enzymes instead of heavy or precious metals. There is also no need to use polymer electrolyte membranes, the most costly part of fuel cell (Chapter 12, Section 3). These applications can be implemented in order to reduce dependency on oil and environmentally toxic power sources.

The book provides chemists, engineers and scientists with information about alternative energy sources and gives clues for managers that concern implementation of alcoholic fuels in a variety of energy conversion devices. Shown examples broaden the scope of view with respect to alternative energy technologies.

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Available online 28 December 2007

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doi:10.1016/j.carbpol.2007.12.016

Units and Symbols in Physical Chemistry, Richard E. Cohen, Tomislav Cvitas, Jeremy G. Frey, Bertil Holstrm, Kozo Kuchitsu, Roberto Marquardt, Ian Mills, Franco Pavese, Martin Quack, Jurgen Stohner, Herbert L. Strauss, Michio Takami, Anders J. Thor, Quantities, The Royal Society of Chemistry, Cambridge, UK, 2007 (xiv + 234 pp., £39.95, ISBN: 0-85404-433-7)

The first IUPAC Manual of Symbols and Terminology for Physicochemical Quantities and Units of which this book is a successor, was published in 1969, with the objective of 'securing clarity and precision, and wider agreement in the use of symbols, in different countries, among physicists, chemists and engineers, and by editors of scientific journals.' Attempts to provide a readable compilation of widely used terms, general rules and symbols from many sources for better understandable definitions and explanations of best practise were successful. Thus the current aim is to continue to create this manual to improve the exchange of scientific information among the readers in different disciplines and across different nations.

The first part includes a section on surface structure, and then describes the use of the International System of units (SI) and a few other systems including mathematical symbols, their use in print and conventions in optical spectroscopy. A glossary of terms used in chemical kinetics, photochemistry, electrochemistry, colloid and surface chemistry is given (Chap. 2–4). Revision of the previous editions' material describing fundamental physical constants, properties of elementary particles, elements and nuclides is also provided (Chap. 5–6). Final chapters include equations of electricity, magnetism, outlines for the treatment of uncertainty in physical measurements and provision of relevant references (Chap. 7–10).

For modern industrial economy precise scientific language is important and can be encoded by appropriate definitions of quantities, units and symbols which are crucial for international exchanges in science and technology with important consequences. *Quantities, Units and Symbols in Physical Chemistry* is designed for scientists, science publishers and organisations working across a multitude of disciplines requiring the use of internationally confirmed nomenclature in Physical Chemistry.

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Available online 28 December 2007

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doi:10.1016/j.carbpol.2007.12.015

Handbook of fruits and fruit processing, Y.H. Hui (ed.), Blackwell Publishing, Ames, Iowa, USA, 2006 (xii + 697 pp., £125, ISBN: 0-8138-1981-4)

The processing of fruits continues to undergo rapid change. Fruits have always played an important role in human nutrition and we should remember that. *Handbook of fruits and fruit processing* describes the processing of fruits from four perspectives: a scientific basic, production techniques, manufacturing and engineering principles and processing of individual fruits.

Part I presents information about fundamental aspects and processing technology, starting with receipt of fruits and fruit products at the processing plant. There is a prelude to commercial production, describing technological and engineering principles involved in processing fruits. As examples, microbiology, nutrition, heat treatment, freezing, drying, pulsed electric fields, minimal processing, fresh-cut fruits, additives, and waste management are all discussed. Investigating a wide range of food additives including sweeteners, polyols, discussions focus on sugar alcohols, saccharin, cyclamate and aspartame, with applications and the view of the regulatory boards in the USA