Available online at www.sciencedirect.com
SCIENCE DIRECT
Carbohydrate Polymers 64 (2006) 603–604
Carbohydrate Polymers
www.elsevier.com/locate/carbpol

Book reviews

L. Cao, Carrier-bound Immobilized Enzymes: Principles, Applications and Design, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany: 2005, xv + 563 pp., £140.00, ISBN 3-527-31232-3

Enzymes, also called biocatalysts have wide range of potential applications in various industrial processes. These macromolecules have fascinated scientists and technologists for many decades. The driving force in the development of enzyme technology has been and will continue to be the development of new and better products with economic viability. Immobilization has been found to be the convenient method to improve the economic viability of a process through re-utilisation of biocatalysts, higher cell densities in bioreactors and easier purification of the final product. Moreover, the continuous operation is more easily and efficiently controlled while using this technology. An immobilized enzyme, by definition, must comprise two essential functions, namely the non-catalytic functions that are designed to aid separation and the catalytic functions that are designed to convert the target compounds or substrates within the time and space desired. It is usually the peculiarities of these two essential components that dictate the scope of the final application of the immobilized enzymes obtained.

Carrier-bound Immobilized Enzymes provides an overview of various immobilization procedures used in enzyme technology. The volume opens with an introductory chapter, which deals with the history, methods and prospects of immobilized enzymes. Adsorption-based immobilization, which was among the first enzyme immobilization methods, is described in the subsequent chapter. Both conventional adsorption based enzyme-immobilization methods and various new variations developed in the last few decades are presented in this chapter.

Covalently binding of enzymes to a suitable carrier is the second method developed for enzyme immobilization. In strict sense, covalently immobilized enzymes on carriers can be regarded as chemically/physically modified enzymes, whose physical and chemical nature is modified by the carrier used. Chapter 3 covers the detailed information on the different strategies employed in covalent enzyme immobilization.

Entrapment of enzymes implies to the enzyme molecules or enzyme preparations confined in a matrix formed by dispersing the catalytic component (biocatalyst) in a fluid medium (polymer solution). Different aspects of enzyme entrapment are detailed in the Chapter 4 of the book. Methods for preparation of encapsulated enzymes are discussed in the subsequent chapter. The last chapter on unconventional enzyme immobilization deals with the novel combined immobilization techniques. It provides the useful hints to design a desired immobilized enzyme, when conventional method does not fulfil the desired requirements.

In conclusion, the volume provides excellent and comprehensive review on the important field of enzyme immobilization technology covering both the history and present state of immobilization procedures. Numerous tables and figures throughout the volume provide illustrative material to support the detailed information presented in the text, and make this volume an excellent resource for biotechnologists, biochemists, biochemical engineers and enzyme technologists.

Parmjit S. Panesar
John F. Kennedy
Chembiotech Laboratories, Institute of Research & Development, University of Birmingham Research Park, Birmingham B15 2Q1, UK

Available online 20 February 2006

doi:10.1016/j.carbpol.2005.10.015

D. E. Levy, P. Fugedi (Eds.), The Organic Chemistry of Sugars, CRC Press, Taylor and Francis Group, Boca Raton, FL, USA, 2006 (xxiii + 880 pp., £115.00, ISBN 0-8247-5355-0)

Sugars have been known to humankind since prehistoric times. The chemical modification of sugars to sugar derivatives or non-sugar products has been extensively studied as a strategy to prepare products ranging from rare sugars to novel chiral substances and to complex natural products. The methods used in the initial transformations are generally drawn from the principles of mainstream organic chemistry. The unique chemical and physiological properties of sugars have propelled them into new and exciting areas of application in molecular biology, drug design, and other fields of direct impact on our quality of life. New areas relating to glycochemistry and glycobiology have emerged in conjunction with the important interface with proteins, nucleic acids, and other biological macromolecules.

The Organic Chemistry of Sugars explores the different aspects of organic chemistry that apply to sugars and sugar-like substances. The contents of the volume are divided in to four parts. Part I begins with the introductory chapters on the historical perspective of carbohydrate chemistry, and carbohydrates. Protective group strategies, glycosylation methods,

and oligosaccharide synthesis are described in the subsequent chapters. The detailed information on functionalization of sugars, strategies towards *C*-glycosides, from sugars to carbasugars, and sugars with endocyclic heteroatoms other than oxygen is provided in Part II.

Carbohydrates are prominent among the chiral raw materials available from nature. This is because of several factors, such as the high enantiomeric purity of sugars and the number of available chiral centers. Part III explores the sugars as tools, chiral pool starting materials and formidable synthetic targets. It consists of four chapters, which discuss sugar as chiral auxiliaries, sugars as chiral starting materials in enantiospecific synthesis, synthesis of carbohydrate containing natural compounds, and total asymmetric synthesis of monosaccharides and analogs.

In recent years, interest in chemical glycobiology has grown significantly because of the involvement of carbohydrates and carbohydrate conjugates in the vital biological processes. In Part IV, additional topics are presented, which are focussed on combinatorial carbohydrate chemistry, glycopeptides, and carbohydrate mimetics in drug discovery.

Numerous examples throughout the volume provide excellent illustrative material to support the detailed information presented in the text. In conclusion, this comprehensive volume would be highly useful to all the persons working in this area. It may not only support research and development but also be suitable for teaching.

Parmjit S. Panesar
John F. Kennedy*
Chembiotech Laboratories, Institute of Research & Development, University of Birmingham Research Park, Birmingham B15 2Q2, UK

Available online 20 February 2006

* Corresponding author
doi:10.1016/j.carbpol.2005.10.014

R. Smith, editor. Biodegradable Polymers for Industrial Application (2005, Woodhead Publishing Ltd/CRC Press, Cambridge, UK/Boca Raton, FL, USA) (xvi + 531 pp., £135.00, ISBN 0-8493-3466-7)

Biodegradable polymers can be classified according to their origin into two groups, natural polymers and synthetic polymers. Natural polymers are the polymers coming from natural resources and, synthetic polymers are synthesized from crude oil. Biopolymers from natural origin include six sub-groups, namely polysaccharides, proteins, lipids, polyesters produced by microorganisms/plants, polyesters synthesized from bio-derived monomers, and miscellaneous polymers. Biopolymers from mineral origins include four sub-groups called aliphatic polyesters, aromatic polyesters, polyvinylalcohols and modified polyolefins. In view of the environmental problems due to the disposal of plastic products, the production of biodegradable polymers has attracted the attention of the researchers.

Biodegradable Polymers for Industrial Applications explores the classification, production, and applications of biodegradable polymers. The volume is divided into four parts. Part I discusses the classification and development of biopolymers. It includes the chapters on classification, polyhydroxyalkanoates, oxo-biodegradable polyolefins, new developments in aliphatic polyesters synthesis, biodegradable polyesteramides, and thermoplastic starch biodegradable polymers. Part II is focussed on the materials for production of biodegradable polymers. It provides the information on the biopolymers from sugars, natural fibres, renewable forest resources, poly(lactic acid)-based bioplastics, and biodegradable protein-nanoparticle composites.

The properties and mechanisms of degradation of biopolymers are explained in Part III of the book. It includes the chapters on standards for environmentally biodegradable plastics, material properties of biodegradable polymers, mechanism of biodegradation, and enzymatic degradation of polymers. Part IV is focussed on the industrial applications, in which topics on oxo-biodegradable polyolefins in packaging, biodegradable plastics in agriculture, generation of biodegradable polycaprolactone foams in supercritical carbon dioxide, and biodegradable polymers in agricultural applications are discussed.

In conclusion, this comprehensive volume explores the different aspects of biodegradable polymers from fundamental issues to industrial applications, and would be highly useful for all the individuals working in the area of polymers. It may not only support research and development but may also be suitable for teaching.

John F. Kennedy*
Parmjit S. Panesar
Chembiotech Laboratories, Institute of Research&Development, University of Birmingham Research Park, Birmingham B15 2Q3, UK

Available online 2 February 2006

* Corresponding author
doi:10.1016/j.carbpol.2005.10.012