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Carbohydrate Polymers 63 (2006) 141–144
Carbohydrate Polymers
www.elsevier.com/locate/carbpol

Book reviews

Kevin J. Yarema (Ed.), Handbook of Carbohydrate Engineering, CRC Press, Taylor and Francis Group, Boca Raton, FL, USA 2005 (xxiii + 904 pp., £115.00, ISBN 1-57444-472-7)

Built from the association of monosaccharide units into linear or branched biopolymers, carbohydrates are essential components of living cells. The enormous structural diversity of carbohydrates makes their study a vast and daunting enterprise requiring the integration of many scientific disciplines. Carbohydrate engineering refers to the study of carbohydrates and their biosynthetic processes for the amelioration of their existing applications and the search of novel ones. Aspects of basic biology, synthetic chemistry, enzymology, modeling and complex instrumentation are involved in carbohydrate production. Theoretical and technical knowledge covering all these areas is necessary to overcome the challenging complexity of carbohydrates and their glycosylation processes as well as widen the scope of their potential utilisations. Current application areas of carbohydrates engineering comprise biomedicine, environmental remediation, food technology and agriculture.

The *Handbook of Carbohydrate Engineering* aims both at giving carbohydrate engineers an overview of the tools available and at detailing more technical information for specialists of the field. The 29 chapters contributed by 77 international experts cover a broad range of subjects, from glycosylation mechanisms in mammalian, insect, bacterial or plant cells to the exploitation of cell metabolism for the production of carbohydrates with desired properties. Cell-free enzymatic methods for oligosaccharide preparation and traditional chemical synthesis are also discussed, along with the increasingly popular semi-synthetic techniques that combine the use of organic chemistry with recombinant enzymes and nucleotide sugar donors. Methods for isolation, purification and characterization of carbohydrates are described, including two-dimension gel electrophoresis, HPLC analysis, nuclear magnetic resonance and mass spectrometry. Although environmental, agricultural or industrial applications are discussed, many chapters focus on the role of carbohydrates in health and disease and their consequent importance in biomedicine (antibody and tissue engineering, vaccine development, drug and gene delivery). Biological functions of various carbohydrates are reviewed; mammalian glycoproteins and their N-linked oligosaccharides are thoroughly detailed, along with sialic acid and glycolipids.

Well-illustrated and documented, this volume covers many aspects of interest for current and future research methodologies. Because it provides background information for the characterization and synthesis of carbohydrates it can be recommended to non-specialised readers. Experts of the glycobiology field can also pore over the mine of results collected from chemists, biologists and chemical engineers and investigate further the issues discussed using the references listed at the end of every chapter. In other words, this book should soon find its place in every carbohydrate engineering laboratory.

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Available online 7 November 2005

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doi:10.1016/j.carbpol.2005.08.020

Susanne Brakmann and Andreas Schwienhorst, editors. Evolutionary Methods in Biotechnology (2004, Wiley-VCH Verlag GmbH, Weinheim, Germany) (xiii+214pp., ISBN 3-527-30799-0 (€129.00))

During the past decade, bioscience laboratories have benefited from a new range of methods originating from the Darwin evolution principles. The evolutionary approach has enabled scientists to quickly identify molecules with the desired properties, thus obtaining results where other methods had failed. *Evolutionary Methods in Biotechnology* reviews the evolutionary-based tools nowadays available in this interdisciplinary research area. Designed as an inspirational starting point for scientists to develop their own variations around the methodologies discussed, this textbook provides a collection of detailed protocols with a strong orientation towards practical matters. Written in a simple yet accurate style, it can be easily read by all laboratory staff, from students and technicians to senior specialists.

The 13 chapters have been arranged to reflect the steps of a standard evolution-directed experiment. After an introductory chapter, chapter 2 focuses on the methods available to generate molecular diversity and build mutant libraries. It particularly discusses mutagenesis PCR and mutator strain passage. Chapters 3 and 4 deal with in vitro recombination and describe

DNA shuffling and Staggered Extension Process (StEP). Chapters 5 to 9 present several selection and mass screening techniques: Fluorescence-Activated Cell Sorting (FACS) i.e. screening of proteins displayed on *E. coli* cells (chapter 5); phage-displayed enzymes selection (chapter 6); aptamers selection (chapter 7); generation of catalytic nucleic acids (chapter 8); and high-throughput screening approaches for the production of enantioselective biocatalysts (chapter 9). Chapters 10 to 12 deal with computer-based methods predicting the interesting molecular species among all the ones generated. They also detail how to use the software for library design, selection of mutagenesis positions and predictive algorithms that are featured in the CD-Rom provided with the book. The last chapter discusses patenting issues for academics.

Each chapter gives an introductory background to the method presented, followed by a protocol description and a list of the materials needed. Troubleshooting hints on frequently encountered difficulties are also included. The chapters end with a description of the methods main applications and a list of references.

Benefiting from the contribution of 27 international scientists, this textbook should be of interest to a number of academics and industrials working in the biotechnology area. With an easy-to-read and concise style, it puts the practical issues of evolutionary methods into focus thus constituting a laboratory reference. In this regard, the troubleshooting paragraphs should be particularly appreciated. On the minus side, charts and graphs legibility could probably be enhanced by the use of colors and some scientific terms could be explained a bit further. Nevertheless, this volume can be recommended to novices desirous to get started with evolutionary methods as well as experienced scientists of the field.

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Available online 7 November 2005

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doi:10.1016/j.carbpol.2005.08.019

J.R. Dutcher and A.G. Marangoni, Soft Materials: Structure and Dynamics (2005, Marcel Dekker, Inc., New York, USA) (ix + 409 pp., £99.00, ISBN: 0-8247-5358-5)

Soft Materials, such as polymers, biopolymers, liquid crystals, gels, and foams, have physical properties that can be very different from conventional materials, giving rise to intriguing behaviour. Soft Materials provides a comprehensive overview of current scientific and technological advancements in soft materials analysis and application. *Soft Materials: Structure and Dynamics documents new and emerging challenges* in this burgeoning field is divided into four sections on synthetic polymers, complex fluids, biomaterials, and food materials.

The opening chapter of section one is concerned with the motion of polymer molecules confined to thin films. The next chapter researches the crystallization of thin polymer films: crystallinity, kinetics, and morphology. Some basic theoretical ideas as well as several problems related to deformed polymers in good solutions are also discussed (chapter 3). In the last decade, with the explosive development of different kinds of nanoparticles and nanostructural molecules have been developed and researched. In the last chapter of section one, science and engineering of nanoparticle-polymer composites are researched through insights from computer simulation.

The first chapter of section two explores the techniques that have been employed to control the cystallization of *n*-alkanes form crude oils and fuels. The effects of confinement on complex fluids are of great technological and fundamental interest. The second chapter of section two offers the knowledge of confinement and shear effects on the structure of a smectic liquid-crystal complex fluid. For the purpose of this chapter, confinement effects can occur at many length scales, depending on the intrinsic structure found in the complex fluid. The last chapter of this section reviews the macroscopic rheological behaviour of dilute and concentrated dispersions of soft solid particles in liquids.

The physical properties of proteins can be understood by studying statistical-physics models of polymers that capture the essential characteristics of real system. The first chapter of section three introduces the computer simulations of mechanical micromanipulation of protein. The research undertaken on the use of genetic engineering techniques to refine the structure-function relationship of food-related protein (particularly aspartic proteinases) at a fundamental, molecular level is discussed in the next chapter. And the computer simulation of soft mespscopic systems using dissipative particle dynamics is presented in the last chapter of section three.

Recently a deeper scientific effort has been undertaken to elucidate the principles on the effect of shear which exists in manufacturing facilities where bulk fats are processed. The opening chapter of section four presents the state of the art in scientific findings on the effects of shear on crystallization of fats from the melt. Food freezing has become a well-established food preservation technique. The objective of second chapter of section four is not to provide a comprehensive review of food freezing or frozen food quality but focuses on structure and structural changes of frozen foods. The next chapter offers the knowledge of biogenic cellular solids. The last chapter gives the knowledge of modelling of formation and rheology of protein particle gels.