

## Book Review

**Industrial Polysaccharides.** Edited by M. Yalpani, Elsevier, Amsterdam and New York, 1987, 408 pp. ISBN 0 444 42906 9. Price: US\$131.75.

This book, the third in the Progress in Biotechnology series, covers the proceedings of a symposium held at the 193rd national meeting of the American Chemical Society. All contributors are internationally renowned scientists working in the field of polysaccharide chemistry, and to cover such a diverse field the book consists of five separate parts, all of which are in camera ready format. The general format of each part consists of a review to provide readers unfamiliar with the area some background information, followed by a series of original research papers.

Part 1 which consists of genetic engineering and enzymatic modification of polysaccharides is the largest part of the entire volume. In one chapter analysis of lipid-linked oligosaccharides and sugar nucleotide precursors has led to the biochemical characterisation of mutants of *Xanthomonas campestris* which produce xanthan-like polysaccharides with truncated side chains containing only acetylated  $\alpha$ -D-mannose, which suggests that genetic manipulation of xanthan biosynthesis can yield a family of xanthan-like polymers with a variety of side chain structures. Similarly, the polyhydroxybutyrate biosynthesis pathway, which is known to give a biodegradable polymer, has been altered by the application of recombinant DNA technology and provides an excellent model for biopolymer engineering. The same cloning technology has been used to produce novel materials from *Z. ramigera*, and to control the degree of  $(1 \rightarrow 6)$ - $\beta$ -D-branching in yeast glucan particles. This has led to the development of micron-size glucan particles with a potential range of novel applications being biosynthesised *in vivo*. The effects of physiological conditions for polysaccharide modification are also discussed.

Other contributions in this first part of the book include the isolation and characterisation of a thermostable bacterial cyclodextrin glycosyl-

transferase, which is likely to improve industrial production of cyclodextrins to meet ever growing demands, and over production of chitinase and chitobiase from genetically engineered *S. liquefaciens*. The bacterial degradation of xanthan is discussed, as is the mild acid hydrolysis of an *O*-phosphomannan which has led to the development of a new affinity ligand for D-mannose-6-phosphate with applications in research into mammalian phosphomannosyl receptors.

The next section, Part 2, of the book concentrates on chemical modification of polysaccharides. Contributions include the synthesis of ethers which have vicinal dihydroxy groups capable of adopting *cis* geometry, thereby making them reactive towards multivalent cations, resulting in improved gelation properties, and a section on synthetic derivatives of agarose which have great utility in biochemical separations. Modification of the *N*-acetyl groups for *N*-propionyl groups in the group B meningococcal polysaccharide has led to the development of human vaccines, whereas oxidation of maltodextrins above DP10 has given rise to excellent calcium complexing agents which have the potential of replacing sodium triphosphate in applications such as detergents. A series of chitin and chitosan derivatives have been prepared and novel applications are discussed.

Structure/property relationships in polysaccharides are discussed in Part 3. All contributions in this section relate to factors, such as degree of acetylation, pyruvylation and side chain constituents, concerned with the conformational properties of a variety of well-known polysaccharides.

In the section on the characterisation of polysaccharides, Part 4, a variety of contributions using a variety of physical techniques such as rheological assessments, various forms of nmr spectroscopy and circular dichroism are presented for various polysaccharides. One particularly interesting contribution is concerned with the characterisation of cellulosic ethers, and the mechanisms of their formation using  $^{13}\text{C}$  nmr spectroscopy.

Novel applications for polysaccharides are covered in the final section, Part 5, and are a particularly strong area in such an excellent book. This review chapter discusses markets and catalogues a series of new polysaccharide derivatives with novel applications; it contains some 167 references. Individual contributions include the improved metal binding capacities of chemically modified chitin, and a list of new applications for cationic binding by chitosan. A new starch-polyethylene glycol based phase separation system is reported which gives results similar to those of the more expensive dextran-polyethylene glycol systems. Biomedical applications include chapters on the immunological

aspects of chitin derivatives and a chapter on the modification of dextran for use in controlled-delivery drug systems.

All contributions presented in this book are of an exceptionally high standard, and all review chapters contain numerous up-to-date references. The book, which is available from the Amsterdam and New York offices of Elsevier, is probably too expensive for most individual purchasers but should be considered as an essential for all companies who use polysaccharides and for all libraries which cater for people actively involved in carbohydrate research. In our opinion this book is perhaps the most important publication in polysaccharide chemistry to emerge in recent years, and will serve polysaccharide chemists in active research for some years to come.

**David L. Stevenson**  
**John F. Kennedy**