

Book review

Enzymes for Carbohydrate Engineering, Edited by K.-H. Park, J.F. Robyt, and Y.-D. Choi, Elsevier, Amsterdam, 1996. ISBN 0-444-82408, pp v + 215, Dfl. 235.00/US\$ 147.00

This volume derives from two symposia held in Korea in 1994 and 1995 and presents papers from Korean laboratories and from the laboratories of guest speakers. My initial reaction on glancing at the volume was disappointment in that only a narrow range of enzymes were considered, almost exclusively those catalyzing the synthesis or modification of glucose polymers with no mention of the synthesis or modification of the more complex oligosaccharides or polysaccharides. If you are seeking new information on glycosyltransferases this volume is not for you.

Those interested in the modification of bulk, glucose-based, carbohydrates, however, will find this a valuable source of information, perhaps more on the potential for engineering carbohydrates than on the achievement of major modifications to carbohydrate structures and functions. Several of the chapters contain sizeable sections on the **protein** engineering of carbohydrate modifying enzymes.

John Robyt provides the opening chapter, a comprehensive survey of the synthetic mechanisms and actions of glucansucrases. There is fascinating description of the mechanisms by which the various branched dextrans and mutans are synthesized. Readers excited by unusual oligosaccharide structures will revel in the list of materials which can be synthesized by glucansucrases provided with preformed oligosaccharides as acceptors. A later chapter by Robyt with Doman Kim describes work on mutant strains of *Leuconostoc mesenteroides* which produce glucansucrases constitutively and presents information on the characterization of the enzymes. Carbohydrate engineering is described in this chapter, an elegant production of controlled, limited-sized dextrans by the co-culture of *Leuconostoc mesenteroides* with a dextranase-producing yeast, *Lipomyces starkeyi*.

Several papers describe modifications of starch and of amylases. Shoichi Kobayashi surveys the characterization and mode of action of the cyclodex-

tringlucosyltransferase from *Bacillus macerans*, a paper which will be of interest to those involved in cyclodextrin production and devotees of oligosaccharide production. Ann MacGregor's chapter brings together information on the structures of the many enzymes which can metabolize starch, showing the common features of their structures and the differences in structure which result in differences in specificity. Other chapters follow logically (but not sequentially) from this. A group of Korean authors describe the production of branched gluco-oligosaccharides using a maltogenic amylase, first to saccharify starch, then to extend the resulting oligosaccharides by transglucosylation. A pleasing element of the purification of the product is the use of yeast immobilized in calcium alginate beads to remove the unwanted glucose and maltose from the reaction mixtures. Later, in the last chapter of the volume, Seo and colleagues describe the overproduction of the maltogenic amylase as a recombinant enzyme in *Escherichia coli*. Shin and Byun then provide detailed information on the production of maltotetraose using an α -amylase from an alkalophilic *Bacillus* strain. Song and others describe the determination of the crystal structure of the α -amylase from *Bacillus licheniformis* at 1.7 Å.

It is increasingly apparent that thermostable examples of most enzymes can be found, given time and persistence. Gregory Zeikus describes the properties of two 'thermozymes', amylopullulanase from *Thermoanaerobacter ethanolicus* and glucose isomerase from various thermophiles; a 'take-home message' is that the thermophilic enzymes have lower contents of asparagine and glutamine than their mesophilic counterparts.

Finally, Peter Goodenough provides a very thorough survey of the structures of the cellulases, pectinases, and xylanases involved in the breakdown of plant cell walls, and David Stalker and colleagues

from Calgene survey the potential for the manipulation of storage compounds, including lipids as well as carbohydrates, in transgenic plants.

There is an index of authors, which is superfluous in a slim volume, but no subject index.

This volume should be available in any library providing a service to enzyme technologists and those involved in carbohydrate technology. I suspect that much of its content will prove ephemeral; it describes subjects that are moving very rapidly and is likely to be superseded by new volumes, perhaps covering

carbohydrate engineering more comprehensively, in the near future.

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