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Book review

Cellulose: Structure, Modification and Hydrolysis: edited by RAYMOND A. YOUNG AND ROGER M. ROWELL, John Wiley & Sons Ltd., Chichester, 1986, xix + 370 pages + Subject Index, £ 61.75.

Understanding of processes involving delignification, derivatization, solution, and depolymerization depends on a knowledge of cell-wall composition, molecular architecture, and morphology. Over the past 20 years, enormous progress has been made in analyzing the three-dimensional structure of cellulose and relating it to biosynthesis (Nature's technology) and commercial processes (man's technology). In brief, this book covers cellulose's three-dimensional structure and relates it to biosynthesis, as well as saccharification, of lignocellulosics.

It is fitting that this book be dedicated to R. D. Preston's leadership in the study of all aspects of cell-wall architecture. He extended the pioneering molecular biology of Astbury to carbohydrate polymers and thereby bridged the gap between botany and chemistry for the world's most abundant and useful biopolymer—cellulose. The first chapter, Natural Celluloses, by Preston himself, is a summary of his inspiring research. The editors, R. A. Young and R. M. Rowell, managed to convince some of the world's best cellulose specialists to contribute, on topics ranging from X-ray analysis of cellulose polymorphism to new processes for chemical modification and solution.

Chapters on X-ray diffraction from the Sarko and Blackwell schools are nicely tutorial. They both lead to models of how native celluloses take part in important polymorphic transformations related to new developments in cellulose technology. From these chapters, as well as one by Preston and Henrissat-Chanzy, a satisfying picture of the parallel-chain organization in the microfibrils of native cellulose emerges. In terms of basic science, some of the most elegant electron microscopy and X-ray analysis of polymers relates to cellulose.

The Henrissat-Chanzy chapter uses all the power of high-resolution electron microscopy coupled with the specificity of *exo*- and *endo*-cellulases to provide visual evidence of the parallel-chain structure in cellulose. The book could have been further enriched by some of the recent lattice-imaging and microfibril end-marking studies that are appearing in the literature, in order to add evidence for the parallel-chain organization of native-cellulose microfibrils.

Chapters dealing with technology range from pioneering process engineering to speculative economics. Also included are chapters that cover novel carbamate

derivatives, liquid-crystalline solution rheology, and cellulose hydrolysis. The last is the result of ongoing studies of wood saccharification prompted by the energy crisis of a decade ago. It is good to see that these publications keep coming, as they will probably catch the next crisis in full flight, making us better prepared to cope with it.

The book is a useful update and contains timely material. It shows that fundamental and technical cellulose is "alive and well". There is a hint that a new rayon-process may be introduced within a decade and also that cellulose could become an engineering plastic. But mostly, it is the physical biology of cellulose that is exciting; a much more focused research effort is needed to make cellulosics into "high-tech" products. This book reflects the renewed interest, worldwide, in cellulose as a unique and renewable macromolecule, and it should be in all industrial and academic libraries that devote space to the polysaccharide.

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