

Preface

Biotechnology of Lignocellulose focuses on biotechnologies in the application of natural lignocellulosic materials, which has not been fully utilized because of the concomitant formation of cellulose, hemicellulose, and lignin. In this book, the concept of natural lignocellulose has two meanings: One refers to renewable resources synthesized through photosynthesis, and the other refers to such resources that have a complex intertwined structure of cellulose, hemicellulose, and lignin.

Natural lignocellulosic materials are the most abundant renewable organic matter on Earth. Biomass in large numbers and a wide variety exists from the forest to the sea, and new biomass is constantly generated through photosynthesis. According to statistics, there are about 180 billion tons of biomass above the ground, 40 million tons in the oceans, and almost an equal amount in soil as there is above the ground. Most of the natural lignocellulosic materials are decomposed and transformed by a variety of microbes in the natural environment and ultimately converted into CO₂ and H₂O. This is an important part of the carbon cycle ecosystem but undoubtedly a huge waste for humans from the point of natural resources utilization.

Along with the rise of green chemistry, the proposal of recycling economy and sustainable development strategies, conversion, and research in the application of natural lignocellulosic feedstock are highly valued and widely used. The development of biotechnology especially provides a broad technology platform for the comprehensive utilization of natural lignocellulosic materials. The strategic task of green chemistry is to make biomass as raw materials for chemicals. Since the late 1960s, humans have gradually recognized the negative impact of the coal and petroleum chemical industry on the environment. Therefore, scientists have begun to consider how to reuse biomass instead of coal and oil to produce chemical substances that satisfy human requirements. Fortunately, lignocellulose biotechnology has achieved rapid development and expanded the research field significantly in recent decades. To communicate some accumulated experience acquired during these decades and recent progress in the biotechnology of lignocellulose with researchers around the world, *Biotechnology of Lignocellulose* was prepared using a large literature base and research progress in lignocellulose biotechnology concerning our own research field.

Biotechnology of Lignocellulose embodies the recent new ideas, new methods, and new progress of our research group. Concepts and ideas, such as primary refining of raw materials, fractionation and directional conversion of each component, and selective structural fractionation, were proposed because of the chemical and structural characteristics of lignocellulose. In these concepts and ideas, lignocellulose is considered a multilevel resource. Through bioconversion, lignocellulose can play roles in ecological agriculture, bioenergy, chemical industry, pulping and papermaking industry, and more and then be used for establishing a distinctive ecoindustrial park.

My achievements in this field were gained from 20 years of research under the conductive guidance of Professors Peiji Gao and Yinbo Qu from the State Key Laboratory of Microbial Technology at Shandong University and the engineering education and selfless help given by Professor Zuohu Li from the Institute of Process Engineering, Chinese Academy of Sciences. All these individuals encouraged me to obtain systematic training in lignocellulose biotechnology. Research on the biotechnology of lignocellulose has support from the National Key Basic Research Development Program of China (973 Project, No. 2011CB707401), the National Key Project of Scientific and Technical Supporting Program of China (No. 2011BAD22B02), and the Knowledge Innovation Program of the Chinese Academy of Sciences (KSCX1-YW-11A; KGCX2-YW-328).

In addition, the works of my doctors and masters were essential preconditions for publishing this book. Dr. Weihua Qiu, Master Xiaoguo Fu, Yuzhen Zhang, and Jianli Ding; and graduate students Xiang Zhang, Junying Zhao, Guanhua Wang, Lianhua Zhang, Wenjie Sui, and Zhimin Zhao participated in writing this book. Especially, Weihua Qiu and Guanhua Wang participated in the book's revision and review. Many references of our predecessors and colleagues are cited. I wish to express my sincere thanks to all of them.

Biotechnology of Lignocellulose is available for researchers engaged in lignocellulose science, scientific and technical personnel, and graduates. It also provides a reference for researchers and administrators engaged in the utilization and industrial development of agricultural resources.

Some errors may exist in this book. I sincerely hope to receive criticism and guidance from readers in this regard.

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December 2012

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Biotechnology of Lignocellulose

Theory and Practice

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2014, XVIII, 510 p. 75 illus., 28 illus. in color., Hardcover

ISBN: 978-94-007-6897-0