Enzymes in Degradation of the Lignocellulosic Wastes

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Foreword by Dr. Chaitanya Kumar Jha

Waste generation and management in the world is a very serious issue from the point of environmental protection and human, animal and plant health. Huge amount of lignocellulosic wastes, viz. peanut shell, corn cob, rice straw, wheat straw, bagasse, press mud, and coconut husk are generated which is either incinerated or directly disposed to the landfills. The degradation of lignocellulosic wastes is not very easy and requires solution.

The book *Enzymes in Degradation of the Lignocellulosic Wastes* gives detailed information and knowledge about the use of enzymes in degradation of lignocellulosic wastes. This book highlights the information of cellulase, hemicellulase, ligninase, pectinase, and lipase enzymes and the detail mechanisms of these enzymes in degradation of lignocellulosic wastes.

This book gives the idea of different cellulase, hemicellulase-producing microorganisms, and their catalytic mechanisms to breakdown cellulose and hemicellulose, respectively. The detail role of ligninase enzymes, viz. laccases, peroxidases, manganese peroxidase, and versatile peroxidase (VP) for degradation of lignin, is also mentioned. The aspect of pectinase enzyme in degradation of lignocellulosic wastes is also focused, where the pectic substances and mechanism of action of the pectinolytic enzymes are described. The catalytic mechanism of lipases in degradation of lignocellulosic wastes and lipase-producing microorganisms is also described.

This book also focuses on the assays methods for cellulase, hemicellulase, ligninase, pectinase, and lipase enzymes as well as applications of each of these enzymes. This book is useful to college students, researchers, and other scientists and is an excellent guide that provides solution for degradation of lignocellulosic wastes which is very important.

I have no doubt; this book will be an important milestone in this direction.

I wish the authors all the very best!

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Foreword by Dr. Manojkumar Z. Chopda

Waste is generated in huge amount which is a serious problem. The lignocellulosic wastes, viz. peanut shell, corn cob, rice straw, wheat straw, bagasse, press mud, and coconut husk are generated which are either incinerated or directly disposed to the landfills. The degradation of lignocellulosic wastes is difficult and requires to be solved.

The book *Enzymes in Degradation of the Lignocellulosic Wastes* gives information and knowledge about different enzymes which can degrade lignocellulosic wastes. This book highlights the use of enzymes, viz. cellulase, hemicellulase, ligninase, pectinase, and lipases and mechanisms of these enzymes in degradation of lignocellulosic wastes.

This book gives the idea of different cellulase, hemicellulase-producing microorganisms and their catalytic mechanisms to breakdown cellulose and hemicellulose, respectively. The role of ligninase enzymes for degradation of lignin is also described. The aspect of pectinase enzyme in degradation of lignocellulosic wastes is also focused, where the pectic substances and mechanism of action of the pectinolytic enzymes is described. The lipase-producing microorganisms and mechanism of lipases in degradation of lignocellulosic wastes are also described.

This book also focuses on assays methods for cellulase, hemicellulase, ligninase, pectinase, and lipase enzymes and applications of these enzymes. This book will be useful to college students, researchers, and other scientists and is an excellent guide that will provide solution for degradation of lignocellulosic wastes which is very important.

I wish the authors all the very best!

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Foreword by Dr. Dilan Sanjitha Rajapakshe

I am happy to give the foreword for the book *Enzymes in Degradation of the Lignocellulosic Wastes*. Different types of wastes are generated in the world which is a very serious issue from the point of environmental protection and human, animal, and plant health. In the category of wastes, huge amount of lignocellulosic wastes, viz. peanut shell, corn cob, rice straw, wheat straw, bagasse, press mud, and coconut husk are also generated. These lignocellulosic wastes are either incinerated or disposed to the landfills. The degradation of lignocellulosic wastes needs to be solved.

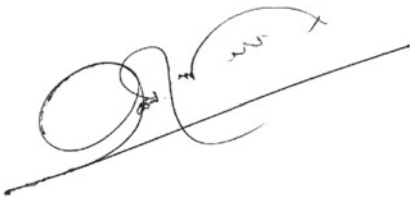
This book *Enzymes in Degradation of the Lignocellulosic Wastes* describes in detail about the use of different enzymes, viz. cellulase, hemicellulase, ligninase, pectinase, and lipases for the degradation of lignocellulosic wastes.

This book mentions different cellulase, hemicellulase-producing microorganisms, and their mechanisms to breakdown cellulose and hemicellulose, respectively. The ligninase enzymes, viz. laccases, peroxidases, manganese peroxidase, and versatile peroxidase (VP) for the degradation of lignin, are also highlighted. The important pectinase- and lipase-producing microorganisms are mentioned in this book. The catalytic mechanisms of action of the pectinolytic and lipases enzymes in degradation of lignocellulosic wastes are also described.

This book also focuses on the assays methods for cellulase, hemicellulase, ligninase, pectinase, and lipase enzymes along with applications of each of these enzymes. This book is helpful to college students, researchers and other scientists, and also best guide that provides solution for degradation of lignocellulosic wastes.

I have no doubt; this book will be a real wonderful milestone in this direction.

I wish the authors all the very best!



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Preface

The lignocellulosic wastes are generated in large amount and degradation of lignocellulosic wastes is a very serious issue and which needs to be given attention. Different lignocellulosic wastes are generated, viz. wheat bran, corn cob, sawdust, rice straw, coconut husk, bagasse, and peanut shell. The degradation of these lignocellulosic wastes needs to be solved. The book *Enzymes in Degradation of the Lignocellulosic Wastes* deals with the use of enzymes for the degradation of lignocellulosic wastes. The authors have contributed on various enzymes and their mechanisms for this aspect.

Chapter 1 gives the introduction part which gives information on different lignocellulosic wastes and their components and problems in degradation of lignocellulosic wastes. The value-added products from lignocellulosic wastes are also mentioned. The classification of enzymes and their advantages in degradation of lignocellulosic wastes is described. The microorganism-degrading lignocellulosic wastes are also mentioned.

Chapter 2 describes the role of cellulase in degradation of lignocellulosic wastes. The chapter here describes the structure of cellulose; cellulase production by fermentation; cellulose-degrading microorganisms; and enzymes which breakdown cellulose and cellulase systems of microorganisms. The chapter also focuses on cellulosomes to degrade cellulose; cellulose hydrolysis mechanisms; determination of cellulase activity; and applications of cellulase enzyme.

Chapter 3 describes the role of hemicellulase in degradation of lignocellulosic wastes. The chapter mentions the structure of hemicellulose; families of hemicellulase enzyme; and hemicellulase production by microorganisms. The chapter also describes fungi in degradation of hemicellulose; role of transcriptional regulators in regulation of xylanolytic gene expression; hemicellulase enzymes and their activity; and applications of hemicellulase enzyme.

Chapter 4 describes the role of ligninase for degradation of lignocellulosic wastes. Microorganisms produce ligninase enzymes, viz. lignin peroxidase, manganese peroxidase, versatile peroxidase, and laccase. These enzymes play an important role in lignin degradation, and this chapter describes the role of these enzymes for degradation of lignocellulosic wastes.

Chapter 5 describes in detail the pectic substances and mechanism of various pectinase enzymes in degradation of lignocellulosic wastes.

Chapter 6 describes the role of lipases enzyme in degradation of lignocellulosic wastes. The chapter describes the classification and structure of lipase enzyme. It also mentions catalytic mechanisms of lipase enzyme. The chapter also focuses on lipase-producing microorganisms; assays for lipase activity, and various applications of lipases enzyme.

The target audience for this book will be students from schools, colleges, and universities and researchers working worldwide on lignocellulosic wastes. This book will provide a guide for the degradation of lignocellulosic wastes by the enzymes and also help researchers develop new ideas for the study of enzymes and their mechanisms in degradation of lignocellulosic wastes.

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