Chemical Modification Of Lignocellulosic Materials

Chemical Modification of Lignocellulosic Materials ***Chemical Modification of Lignocellulosic Materials*** ***Biomass Preprocessing and Pretreatments for Production of Biofuels*** **Biosorption of Heavy Metals** ***Sugar Palm Biofibers, Biopolymers, and Biocomposites*** **Lignocellulosic Polymer Composites** ***Wood Modification*** **Isolation, Modification, and Characterization of the Constituents (Cellulose, Hemicellulose, Lignin, et al.) in Biomass and Their Bio-based Applications** ***Genetic and Metabolic Engineering for Improved Biofuel Production from Lignocellulosic Biomass*** **Functional Materials from Lignin Ultrastructural and Physicochemical Modifications Within Ammonia Treated Lignocellulosic Cell Walls and Their Influence on Enzymatic Digestibility Characterization of Lignocellulosic Materials Pretreatment of Biomass Lignocellulosic Biomass to Liquid Biofuels Lignocellulosic Fibers and Wood Handbook** ***Sustainable Degradation of Lignocellulosic Biomass Lignocellulose Conversion*** **Surface Modification of Biopolymers Pretreatment of Lignocellulosic Biomass for Biofuel Production Handbook on Coal, Coke, Cotton, Lignin, Hemicellulose, Wood, Wood-Polymer Composites, Lignocellulosic-Plastic Composites from Recycled Materials, Wood Fiber, Rosin and Rosin Derivatives Lignocellulosic Fibre and Biomass-Based Composite Materials Lignocellulosic Biomass to Value-Added Products** ***Lignocellulosic Materials and Their Use in Bio-based Packaging*** **Lignocellulose-Based Bioproducts Green Chemistry and Water Remediation: Research and Applications Biomass Volume Estimation and Valorization for Energy** ***Lignocellulosic Biorefineries*** **Sustainable Ethanol and Climate Change Acetylation Of Wood Dust Using A Novel Solvent Adhesives for Wood and Lignocellulosic Materials** ***Biomass Modification, Characterization and Process Monitoring Analytics to Support Biofuel and Biomaterial Production*** **Surface Modification of Biopolymers** ***Biomass Recalcitrance*** **Science and Technology of Polymers and Advanced Materials Advances in Bioprocess Technology Lignocellulosic Biorefining Technologies Bioremediation Biodegradable Green Composites Hemicellulose Biorefinery: A Sustainable Solution for Value Addition to Bio-Based Products and Bioenergy Lignocellulosic Ethanol Production from a Biorefinery Perspective**

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Chemical Modification of Lignocellulosic Materials Jan 06 2023 This volume emphasizes the growing need for wood products with advanced engineering properties. It details the fundamental principles of cellulose technology and presents current techniques to modifying the basic chemistry of lignocellulosic materials. The work: discusses the cost-efficient use of cellulose derivatives in a variety of commodities; highlights the chemical modification of wood by methods such as etherification, esterification and thermoplasticization; considers recent progress in the lignocellulosic liquefaction of wood; and more.
Biomass Volume Estimation and Valorization for Energy Nov 11 2020 This book is the outcome of contributions by many experts in the field from different disciplines, various backgrounds, and diverse expertise. This book provides information on biomass volume calculation methods and biomass valorization for energy production. The chapters presented in this book include original research and review articles. I hope the research presented in this book will help to advance the use of biomass for bioenergy production and valorization. The key features of the book are: Providing information on

biomass volume estimation using direct, nondestructive and remote sensing methods Biomass valorization for energy using thermochemical (gasification and pyrolysis) and biochemical (fermentation) conversion processes.

Handbook on Coal, Coke, Cotton, Lignin, Hemicellulose, Wood, Wood-Polymer Composites, Lignocellulosic-Plastic Composites from Recycled Materials, Wood Fiber, Rosin and Rosin Derivatives **May 18 2021 Coal is the product of plants, mainly trees that died tens or hundreds of millions of years ago. Coal is a fossil fuel and is the altered remains of prehistoric vegetation that originally accumulated in swamps and peat bogs. The energy we get from coal today comes from the energy that plants absorbed from the sun millions of years ago. Coal is used primarily as an energy source, either for heat or electricity. It was once heavily used to heat homes and power locomotives and factories. Bituminous coal is also used to produce coke for making steel and other industrial process heating. Lignin is a constituent of the cell walls of almost all dry land plant cell walls. It is the second most abundant natural polymer in the world, surpassed only by cellulose. Lignin is found in all vascular plants, mostly between the cells, but also within the cells, and in the cell walls. Wood is an aggregate of cells essentially cellulose in composition, which are cemented together by a substance called lignin. The cells are made of three substances called cellulose (about 50 percent), lignin (which makes up a fifth to a quarter of hardwoods but a quarter to a third of softwoods), and hemicellulose. Rosin refers to an extraction process that utilizes a combination of heat and pressure to nearly instantaneously squeeze resinous sap from your initial starting material In India's energy sector, coal accounts for the majority of primary commercial energy supply. With the economy poised to grow at the rate of 8-10% per annum, energy requirements will also rise at a reasonable level. The Indian coal industry aspires to reach the 1.5 billion tonne (BT) mark by FY 2020. In fore-coming years, the industry will naturally need to focus on building on the success, and be on track for reaching the FY 2020 goal. One of the primary goals of the Government of India is to ensure that it is able to meet the country's power generation needs. Another aim is to lower the country's reliance on coal imports by boosting the coal production quickly. The Major contents of the book are Coal, Analysis of Coal and Coke, Cotton, Lignin and Hemicelluloses, Degradation of Wood, CCA-Treated Wood, Wood-Polymer Composites, Lignocellulosic-Plastic Composites from Recycled Materials, Chemical Modification of Wood Fiber, Delignification of Wood with Pernitric Acid, Rosin and Rosin Derivatives, Polymerizable Half Esters of Rosin and Photographs of Plant & Machinery with Supplier's Contact Details. It will be a standard reference book for professionals, entrepreneurs, those studying and researching in this important area and others interested in the field of these industries.**

Sugar Palm Biofibers, Biopolymers, and Biocomposites **Sep 02 2022 Natural fibre composites are increasingly being viewed as viable and environmentally responsible alternatives to synthetic fibre composites and plastics. Sugar Palm Biofibers, Biopolymers, and Biocomposites considers the use of sugar palm fibres for materials development and application. It offers original research on the properties and behavior of sugar palm's fibres, polymers, and biocomposites, covering mechanical, physical, thermal, chemical, environmental, morphological properties, as well as optimal design. It discusses sugar palm fibre thermosetting composites, sugar palm fibre thermoplastic composites, impregnation of sugar palm fibre, various lengths of sugar palm fibres, forms and arrangements such as particulate, continuous roving, and woven fabrics. The book also discusses innovations in commercialized products derived from sugar palm.**

Wood Modification **Jun 30 2022 This book is exclusively concerned with wood modification, although many of these processes are generic and can be applied to other lignocellulosic materials. There have been many rapid developments in wood modification over the past decade and, in particular, there has been considerable progress made in the commercialisation of technologies. Topics covered include: The use of timber in the 21st century Modifying the properties of wood Chemical modification of wood: Acetic Anhydride Modification and reaction with other chemicals Thermal modification of wood Surface modification Impregnation modification Commercialisation of wood modification Environmental consideration and future developments This is the first time that a book has covered all wood modification technologies in one text. Although the book covers the main research developments in wood modification, it also puts wood modification into context and additionally deals with aspects of commercialisation and**

environmental impact. This book is very timely, because wood modification is undergoing huge developments at the present time, driven in part by environmental concerns regarding the use of wood treated with certain preservatives. There has been considerable commercial interest shown in wood modification over the past decade, with products based upon thermal modification, and furfurylation now being actively being marketed. The next few years will see the commercialisation of acetylation and impregnation modification. This is a new industry, but one that has enormous potential. This book will prove useful to all those with an interest in wood modification including researchers, technologists and professionals working in wood science and timber engineering, wood preservation, and well as professionals in the paper and pulp industries, and those with an interest in the development of renewable materials.

Pretreatment of Biomass Dec 25 2021 Pretreatment of Biomass provides general information, basic data, and knowledge on one of the most promising renewable energy sources—biomass for their pretreatment—which is one of the most essential and critical aspects of biomass-based processes development. The quest to make the environment greener, less polluted, and less hazardous has led to the concept of biorefineries for developing bio-based processes and products using biomass as a feedstock. Each kind of biomass requires some kind of pretreatment to make it suitable for bioprocess. This book provides state-of-art information on the methods currently available for this. This book provides data-based scientific information on the most advanced and innovative pretreatment of lignocellulosic and algal biomass for further processing. Pretreatment of biomass is considered one of the most expensive steps in the overall processing in a biomass-to-biofuel program. With the strong advancement in developing lignocellulose biomass- and algal biomass-based biorefineries, global focus has been on developing pretreatment methods and technologies that are technically and economically feasible. This book provides a comprehensive overview of the latest developments in methods used for the pretreatment of biomass. An entire section is devoted to the methods and technologies of algal biomass due to the increasing global attention of its use. Provides information on the most advanced and innovative pretreatament processes and technologies for biomass Covers information on lignocellulosic and algal biomass to work on the principles of biorefinery Useful for researchers intending to study scale-up Provides information on integration of processes and technologies for the pretreatment of biomass

Surface Modification of Biopolymers Jul 20 2021 This book addresses surface modification techniques, which are critical for tailoring and broadening the applications of naturally occurring biopolymers. Biopolymers represent a sustainable solution to the need for new materials in the auto, waste removal, biomedical device, building material, defense, and paper industries. Features: First comprehensive summary of biopolymer modification methods to enhance compatibility, flexibility, enhanced physicochemical properties, thermal stability, impact response, and rigidity, among others Address of a green, eco-friendly materials that is increasing in use, underscoring the roles of material scientists in the future of new "green" bioolymer material use Coverage applications in automotive development, hazardous waste removal, biomedical engineering, pulp and paper industries, development of new building materials, and defense-related technologies Facilitation of technology transfer

***Lignocellulosic Materials and Their Use in Bio-based Packaging* Feb 12 2021 This brief provides a comprehensive review of lignocellulosic materials and their primary role in the future development of bio-based packaging. Topics such as: sources and extraction methods of lignocellulosic materials; main constituents of lignocellulosic materials; functionality of lignocellulosic materials; the development of bio-based and biodegradable packaging; incorporation of lignocellulosic materials in bio-based packaging materials; properties and functionality of bio-based packaging, are discussed by authors who are experts in the field.**

Lignocellulosic Biomass to Liquid Biofuels Nov 23 2021 Lignocellulosic Biomass to Liquid Biofuels explores the existing technologies and most recent developments for the production of second generation liquid biofuels, providing an introduction to lignocellulosic biomass and the processes for its conversion into biofuels. The book demonstrates biorefinery concepts compared with petro refinery, as well as the challenges of second generation biofuels processing. In addition to current pre-treatment techniques and

their technical, environmental and economic implications, chapters included also further examine the particularities of conversion processes for bioethanol, biobutanol and biodiesel through chemical, biochemical and combined approaches. Finally, the book looks into concepts and tools for techno-economic and environmental analysis, which include supply chain assessment, by-products, zero-waste techniques and process evaluation and optimization. Lignocellulosic Biomass to Liquid Biofuels is particularly useful for researchers in the field of liquid biofuels seeking alternative chemical and biochemical pathways or those interested advanced methods to calculate maximum yield for each process and methods to simulate the implications and costs of scaling up. Furthermore, with the introduction provided by this volume, researchers and graduate students entering the field will be able to quickly get up to speed and identify knowledge gaps in existing and upcoming technology the book's comprehensive overview. Examines the state-of-the-art technology for liquid biofuels production from lignocellulosic biomass Provides a comprehensive overview of the existing chemical and biochemical processes for second generation biofuel conversion Presents tools for the techno-economic and environmental analysis of technologies, as well as for the scale-up simulation of conversion processes

Biodegradable Green Composites Oct 30 2019 This book comprehensively addresses surface modification of natural fibers to make them more effective, cost-efficient, and environmentally friendly. Topics include the elucidation of important aspects surrounding chemical and green approaches for the surface modification of natural fibers, the use of recycled waste, properties of biodegradable polyesters, methods such as electrospinning, and applications of hybrid composite materials.

Lignocellulosic Biorefineries **Oct 11 2020 One of the great technological issues of this 21st century involves the effort of man to manage climate change through the reduction of fossil-fuel consumption. Part of this plan calls for the gradually replacement of petroleum refineries with biorefineries that use biomass as its renewable feedstock. Lignocellulosic biomass represents a huge potential reservoir for the production of renewable energy, chemicals and materials, which could have a significant impact in our society's efforts to manage greenhouse gas emissions while reducing petroleum consumption. The book describes the current status, development, and future prospects for the critical technology of second-generation biorefineries, specifically with a focus on lignocellulosic materials as feedstock. The book will primarily serve scientists and engineers in chemistry and biochemistry, working both in academia and in industry. But with its careful development of the main points, and many dozens of color illustrations, it is also accessible to a broader public, such as policy makers and students.**

Biomass Modification, Characterization and Process Monitoring Analytics to Support Biofuel and Biomaterial Production **Jun 06 2020 The conversion of lignocellulosic biomass into renewable fuels and other commodities has provided an appealing alternative towards supplanting global dependence on fossil fuels. The suitability of multitudes of plants for deconstruction to useful precursor molecules and products is currently being evaluated. These studies have probed a variety of phenotypic traits, including cellulose, non-cellulosic polysaccharide, lignin, and lignin monomer composition, glucose and xylose production following enzymatic hydrolysis, and an assessment of lignin-carbohydrate and lignin-lignin linkages, to name a few. These quintessential traits can provide an assessment of biomass recalcitrance, enabling researchers to devise appropriate deconstruction strategies. Plants with high polysaccharide and lower lignin contents have been shown to breakdown to monomeric sugars more readily. Not all plants contain ideal proportions of the various cell wall constituents, however. The capabilities of biotechnology can alleviate this conundrum by tailoring the chemical composition of plants to be more favorable for conversion to sugars, fuels, etc. Increases in the total biomass yield, cellulose content, or conversion efficiency through, for example, a reduction in lignin content, are pathways being evaluated to genetically improve plants for use in manufacturing biofuels and bio-based chemicals. Although plants have been previously domesticated for food and fiber production, the collection of phenotypic traits prerequisite for biofuel production may necessitate new genetic breeding schemes. Given the plethora of potential plants available for exploration, rapid analytical methods are needed to more efficiently screen through the bulk of samples to hone in on which feedstocks contain the desired chemistry for subsequent conversion to valuable, renewable commodities. The standard methods for analyzing biomass and related intermediates and finished**

products are laborious, potentially toxic, and/or destructive. They may also necessitate a complex data analysis, significantly increasing the experimental time and add unwanted delays in process monitoring, where delays can incur in significant costs. Advances in thermochemical and spectroscopic techniques have enabled the screening of thousands of plants for different phenotypes, such as cell-wall cellulose, non-cellulosic polysaccharide, and lignin composition, lignin monomer composition, or monomeric sugar release. Some instrumental methods have been coupled with multivariate analysis, providing elegant chemometric predictive models enabling the accelerated identification of potential feedstocks. In addition to the use of high-throughput analytical methods for the characterization of feedstocks based on phenotypic metrics, rapid instrumental techniques have been developed for the real-time monitoring of diverse processes, such as the efficacy of a specific pretreatment strategy, or the formation of end products, such as biofuels and biomaterials. Real-time process monitoring techniques are needed for all stages of the feedstocks-to-biofuels conversion process in order to maximize efficiency and lower costs by monitoring and optimizing performance. These approaches allow researchers to adjust experimental conditions during, rather than at the conclusion, of a process, thereby decreasing overhead expenses. This Frontiers Research Topic explores options for the modification of biomass composition and the conversion of these feedstocks into to biofuels or biomaterials and the related innovations in methods for the analysis of the composition of plant biomass, and advances in assessing up- and downstream processes in real-time. Finally, a review of the computational models available for techno-economic modeling and lifecycle analysis will be presented.

Green Chemistry and Water Remediation: Research and Applications Dec 13 2020 Green Chemistry and Water Remediation: Research and Applications explores how integrating the principles of green chemistry into remediation research and practice can have a great impact from multiple directions. This volume reviews both common sources of chemical pollution and how using green chemistry as the basis for new or improved remediation techniques can ensure that remediation itself is conducted in a sustainable way. By outlining the main types of chemical pollutants in water and sustainable ways to address them, the authors hope to help chemists identify key areas and encourage them to integrate green chemistry into the design of new processes and products. In addition, the books highlights and encourages the use of the growing range of green remediation approaches available to experts, helping researchers, planners and managers make informed decisions in their selection of remediation techniques. Puts the naturally-aligned fields of green chemistry and environmental remediation in context, providing key background to both Highlights the use of both established and cutting-edge techniques for sustainable water remediation, including nanotechnology, biofiltration and phytoremediation Explores the potential impact sustainability goals in chemical waste production and water remediation

Science and Technology of Polymers and Advanced Materials Mar 04 2020 This book summarizes the state ofthe art research presented at the Fourth International Conference on Frontiers of Polymersand Advanced Materialsheld in Cairo, Egypt in January 4-9, 1997. This conference follows the successful conferences held in Kuala Lumpur, Malaysia in 1995, in Jakarta, Indonesia in 1993 andin New Delhi, India in 1991. These conferences focussed on the most recent and important advances in a wide range of carefully chosen subject areas dealing with advanced materials, their science and technology and new business opportunities resulting from recent technological advances. As its predecessors, the conference held in Cairo was truly international with strong participation of 488 deiegales representing 37 countries from the USA and Egypt, as weil as Europe, South East Asia, Japan, South Africa and the Middle East. The conference was organized by the Egyptian Academy of Scientific Research and Technology, The Arab Society ofMaterials Science and the State University ofNew Y ork at Butfalo. The stated goals ofthe conference were: • To highlight advances and new. findings in the general area of polymers and advanced materials. - • T o foster global collaboration between the USA, Egypt and other nations in the general field of polymers and advanced materials. • To promote the development of scientific ilifrastructure in this field among the different participating countries, especially in the Middle East. • To create a basisforfuture long-term scientific exchanges between the USA and Egypt, and/or other countries.

***Lignocellulose Conversion* Aug 21 2021 Bioethanol has been recognized as a potential alternative to**

petroleum-derived transportation fuels. Even if cellulosic biomass is less expensive than corn and sugarcane, the higher costs for its conversion make the near-term price of cellulosic ethanol higher than that of corn ethanol and even more than that of sugarcane ethanol. Conventional process for bioethanol production from lignocellulose includes a chemical/physical pre-treatment of lignocellulose for lignin removal, mostly based on auto hydrolysis and acid hydrolysis, followed by saccharification of the free accessible cellulose portions of the biomass. The highest yields of fermentable sugars from cellulose portion are achieved by means of enzymatic hydrolysis, currently carried out using a mix of cellulases from the fungus Trichoderma reesei. Reduction of (hemi)cellulases production costs is strongly required to increase competitiveness of second generation bioethanol production. The final step is the fermentation of sugars obtained from saccharification, typically performed by the yeast Saccharomyces cerevisiae. The current process is optimized for 6-carbon sugars fermentation, since most of yeasts cannot ferment 5-carbon sugars. Thus, research is aimed at exploring new engineered yeasts abilities to co-ferment 5- and 6-carbon sugars. Among the main routes to advance cellulosic ethanol, consolidate bio-processing, namely direct conversion of biomass into ethanol by a genetically modified microbes, holds tremendous potential to reduce ethanol production costs. Finally, the use of all the components of lignocellulose to produce a large spectra of biobased products is another challenge for further improving competitiveness of second generation bioethanol production, developing a biorefinery.

Lignocellulosic Biorefining Technologies Jan 02 2020 A text to the advances and development of novel technologies in the production of high-value products from economically viable raw materials Lignocellulosic Biorefining Technologiesis an essential guide to the most recent advances and developments of novel technologies in the production of various high-value products from economically viable raw materials. Written by a team of experts on the topic, the book covers important topics specifically on production of economical and sustainable products such as various biofuels, organic acids, enzymes, biopigments, biosurfactants, etc. The book highlights the important aspects of lignocellulosic biorefining including structure, function, and chemical composition of the plant cell wall and reviews the details about the various components present in the lignocellulosic biomass and their characterizations. The authors explore the various approaches available for processing lignocellulosic biomass into second generation sugars and focus on the possibilities of utilization of lignocellulosic feedstocks for the production of biofuels and biochemicals. Each chapter includes a range of clear, informative tables and figures, and contains relevant references of published articles. This important text: Provides cutting-edge information on the recent developments in lignocellulose biorefinery Reviews production of various economically important and sustainable products, such as biofuels, organic acids, biopigments, and biosurfactants Highlights several broad-ranging areas of recent advances in the utilization of a variety of lignocellulosic feedstocks Provides a valuable, authoritative reference for anyone interested in the topic Written for post-graduate students and researchers in disciplines such as biotechnology, bioengineering, forestry, agriculture, and chemical industry, Lignocellulosic Biorefining Technologies is an authoritative and updated guide to the knowledge about various biorefining technologies.

Functional Materials from Lignin Mar 28 2022 Lignin is one of the most abundant plant-derived feedstock on earth and qualifies as a renewable material. However, lignin is widely recognized as waste byproduct of the cellulosic ethanol and pulp and paper industry. How to properly modify lignin and develop it into functional polymers is a huge challenge, but an attractive research topic in both industry and academia. This book brings together leading engineering approaches to address the challenges of lignin valorization. It presents the chemistry and properties of different types of lignin, and explores the cutting-edge approaches of lignin modifications. Unlike any existing texts, this book not only summarizes the traditional ways of using lignin, but also presents various potential applications of lignin materials together with advanced processing techniques. The basis of lignin (its chemistry, types and properties) is described, as are different approaches to modify it. The features of lignin and its copolymers are explored and aligned with their potential applications. In addition to the carbon materials from lignin, the advanced fabrication approaches to engineer lignin-based micro/nano-structural materials are summarized.

Lignocellulose-Based Bioproducts Jan 14 2021 This volume provides the technical information required

for the production of biofuels and chemicals from lignocellulosic biomass. It starts with a brief overview of the importance, applications, and production processes of different lignocellulosic products. Further chapters review the perspectives of waste-based biofuels and biochemicals; the pretreatment of lignocellulosic biomass for biofuel production; cellulolytic enzyme systems for the hydrolysis of lignocelluloses; and basic and applied aspects of the production of bioethanol, biogas, biohydrogen, and biobutanol from lignocelluloses. This book is recommended for researchers and engineers and particularly students taking biofuel courses at graduate level.

Adhesives for Wood and Lignocellulosic Materials Jul 08 2020 The book is a comprehensive treatment of the subject covering a wide range of subjects uniquely available in a single source for the first time. A material science approach has been adopted in dealing with wood adhesion and adhesives. The approach of the authors was to bring out hierarchical cellular and porous characteristics of wood with polymeric cell wall structure, along with the associated non-cell wall extractives, which greatly influence the interaction of wood substrate with polymeric adhesives in a very unique manner not existent in the case of other adherends. Environmental aspects, in particular formaldehyde emission from adhesive bonded wood products, has been included. A significant feature of the book is the inclusion of polymeric matrix materials for wood polymer composites.

Characterization of Lignocellulosic Materials Jan 26 2022 Lignocellulosic materials are a natural, abundant and renewable resource essential to the functioning of industrial societies and critical to the development of a sustainable global economy. As wood and paper products, they have played an important role in the evolution of civilization. Improvement of the quality and manufacturing efficiency of such products has often been hampered by the lack of understanding of the complex structures and chemical compositions of the materials. Due to increasing economic and environmental issues concerning the use of petrochemicals, lignocellulosic materials will be relied upon as feedstock for the production of chemicals, fuels and biocompatible materials. Significant progress has been made to use lignocellulosic materials for the production of fuel ethanol and as a reinforcing component in polymer composites. Effective and economical methods for such uses, however, remain underdeveloped, partly due to the difficulties encountered in the characterization of the structures of native lignocelluloses and lignocelluloses-based materials. Improved methods for the characterization of lignocellulosic materials are needed. Characterization of Lignocellulosic Materials covers recent advances in the characterization of wood, pulp fibres and papers. It also describes the analyses of native and modified lignocellulosic fibres and materials using a range of advanced techniques such as time-of-flight secondary ion mass spectrometry, 2D heteronuclear single quantum correlation NMR, and Raman microscopy. The book provides a survey of state-of-the-art characterization methods for lignocellulosic materials, for both academic and industrial researchers who work in the fields of wood and paper, lignocelluloses-based composites and polymer blends, and bio-based fuels and materials.

Sustainable Ethanol and Climate Change Sep 09 2020 This book amalgamates the facts on carbon dioxide capture from ethanol fermentation of sugarcane molasses and its impact on climate changes. Learning objectives will be achieved through tables and figures that guide professional and students alike through a user-friendly format. The book presents advanced information on CO2 production from ethanol facilities, impact on climate changes and global warming. Utilization of CO2 in various chemical industries, carbonated beverage industry, and processing and preservation of food are illustrated. The book is equally invaluable to students of the relevant disciplines and to those taking more specialized climate change/sustainability courses. Industry employees involved in product development, production management and quality management will benefit as well. Academics in teaching, research and personnel involved in environment regulatory capacity should also find this book ideal for their use.

Pretreatment of Lignocellulosic Biomass for Biofuel Production Jun 18 2021 The book describes the pretreatment of lignocellulosic biomass for biomass-to-biofuel conversion processes, which is an important step in increasing ethanol production for biofuels. It also highlights the main challenges and suggests possible ways to make these technologies feasible for the biofuel industry. The biological conversion of cellulosic biomass into bioethanol is based on the chemical and biological breakdown of biomass into

aqueous sugars, for example using hydrolytic enzymes. The fermentable sugars can then be further processed into ethanol or other advanced biofuels. Pretreatment is required to break down the lignin structure and disrupt the crystalline structure of cellulose so that the acids or enzymes can easily access and hydrolyze the cellulose. Pre-treatment can be the most expensive process in converting biomass to fuel, but there is great potential for improving the efficiency and lowering costs through further research and development. This book is aimed at academics and industrial practitioners who are interested in the higher production of ethanol for biofuels.

Hemicellulose Biorefinery: A Sustainable Solution for Value Addition to Bio-Based Products and Bioenergy Sep 29 2019 This edited book provides knowledge about hemicelluloses biorefinery approaching production life cycle, circular economy, and valorization by obtaining value-added bioproducts and bioenergy. A special focus is dedicated to chemical and biochemical compounds produced from the hemicelluloses derivatives platform. Hemicelluloses are polysaccharides located into plant cell wall, with diverse chemical structures and properties. It is the second most spread organic polymer on nature and found in vast lignocellulosic materials from agro and industrial wastes, therefore, hemicelluloses are considered as abundant and renewable raw material/feedstock. Biorefinery concept contributes to hemicelluloses production associated with biomass industrial processes. Hemicelluloses are alternative sources of sugars for renewable fuels and as platform for chemicals production. This book reviews chemical processes for sugar production and degradation, obtaining of intermediate and final products, and challenges for pentose fermentation. Aspects of hemicelluloses chain chemical and enzymatic modifications are presented with focus on physicochemical properties improvement for bioplastic and biomaterial approaches. Hemicelluloses are presented as sources for advanced materials in biomedical and pharmaceutical uses, and as hydrogel for chemical and medicine deliveries. An interdisciplinary approach is needed to cover all the processes involving hemicelluloses, its conversion into final and intermediate value-added compounds, and bioenergy production. Covering this context, this book is of interest to teachers, students, researchers, and scientists dedicated to biomass valorization. This book is a knowledge source of basic aspects to advanced processing and application for graduate students, particularly. Besides, the book serves as additional reading material for undergraduate students (from different courses) with a deep interest in biomass and waste conversion, valorization, and chemical products from hemicelluloses

Lignocellulosic Ethanol Production from a Biorefinery Perspective Aug 28 2019 This book provides an overview of the multi-dimensional approach for the production of ethanol from lignocellulosic biomass. The sustainability of this biofuel, the current and future status of the technology and its role in waste valorization are also addressed. Bioethanol from lignocellulosic material has emerged as an alternative to the traditional first-generation bioethanol. The book also discusses various pretreatment methods for effective separation of the various components of lignocellulosic feedstock as well as their advantages, and limitations. It describes the valorization of lignocellulosic waste through the production of bioethanol and emphasizes the significance of waste utilization in managing the production cost of the fuel. Finally, the utilization of genetically engineered plants and microorganisms to increase the conversion efficiency is reviewed.

Lignocellulosic Polymer Composites Aug 01 2022 The book presents emerging economic and environmentally friendly lignocellulosic polymer composites materials that are free from side effects studied in the traditional synthetic materials. This book brings together panels of highly-accomplished leading experts in the field of lignocellulosic polymers & composites from academia, government, as well as research institutions across the globe and encompasses basic studies including preparation, characterization, properties and theory of polymers along with applications addressing new emerging topics of novel issues. Provide basic information and clear understanding of the present state and the growing utility of lignocellulosic materials from different natural resources Includes contributions from world-renowned experts on lignocellulosic polymer composites and discusses the combination of different kinds of lignocellulosic materials from natural resources Discusses the fundamental properties and applications of lignocellulosic polymers in comparison to traditional synthetic materials Explores various processing/ mechanical/ physic-chemical aspects of lignocellulosic polymer composites

Biosorption of Heavy Metals Oct 03 2022 This state-of-the-art volume represents the first comprehensively written book which focuses on the new field of biosorption. This fascinating work conveys essential fundamental information and outlines the perspectives of biosorption. It summarizes the metal-sorbing properties of nonliving bacterial, fungal, and algal biomass, plus highlights relevant metal-binding mechanisms. This volume also discusses the aspects of obtaining and processing microbial biomass and metal-chelating chemicals into industrially applicable biosorbent products. Microbiologists, chemists, and engineers with an interest in new technological and scientific horizons will find this reference indispensable.

Lignocellulosic Biomass to Value-Added Products Mar 16 2021 Lignocellulosic Biomass to Value-Added Products: Fundamental Strategies and Technological Advancements focuses on fundamental and advanced topics surrounding technologies for the conversion process of lignocellulosic biomass. Each and every concept related to the utilization of biomass in the process of conversion is elaborately explained, with importance given to minute details. Advanced level technologies involved in the conversion of biomass into biofuels, like bioethanol and biobutanol, are addressed, along with the process of pyrolysis. Readers of this book will become fully acquainted with the field of lignocellulosic conversion, from its basics to current research accomplishments. The uniqueness of the book lies in the fact that it covers each and every topic related to biomass and its conversion into value-added products. Technologies involved in the major areas of pretreatment, hydrolysis and fermentation are explained precisely. Additional emphasis is given to the analytical part, especially the established protocols for rapid and accurate quantification of total sugars obtained from lignocellulosic biomass. Includes chapters arranged in a flow-through manner Discusses mechanistic insights in different phenomena using colorful figures for quick understanding Provides the most up-to-date information on all aspects of the conversion of individual components of lignocellulosic biomass

Lignocellulosic Fibre and Biomass-Based Composite Materials Apr 16 2021 Lignocellulosic Fibre and Biomass-Based Composite Materials reviews the development, characterization and applications of composite materials developed from the effective use of lignocellulosic fibre and biomass. The book gathers together a wide spectrum of cutting-edge research on biomass fillers and reinforcements used for the fabrication and synthesis of composites. The book takes a systematic approach, investigating processing, design, characterization and applications of biocomposites, in order to establish their important relationship as a general guideline for end-user applications. Beginning with an introduction to biomass and its composites, a team of leading experts in the field cover rice husk, kenaf, oil palm, alfa and doum fibres, bamboo, cork, and many other materials, considering a range of applications, along with key issues such as performance and sustainability. The groundbreaking research presented opens the door to obtaining advanced material characteristics and significant enhancements in physical, mechanical, and thermal properties. This will be become an extremely useful reference and technical guide for academic and industrial researchers in composite materials, as well as for advanced students and industrialists working in material commercialization. Gathers together a wide spectrum of research on lignocellulosic fiber and biomass fillers and reinforcements used for the fabrication and synthesis of composites Presents multidisciplinary work in relation to materials engineering, polymer chemistry and physics, materials processing, organic synthesis and industrial design and applications Demonstrates systematic approaches and investigations from processing, design, characterization and applications of biocomposites

***Biomass Recalcitrance* Apr 04 2020 This book examines the connection between biomass structure, ultrastructure, and composition, to resistance to enzymatic deconstruction, with the aim of discovering new cost-effective technologies for biorefineries. It contains chapters on topics extending from the highest levels of biorefinery design and biomass life-cycle analysis, to detailed aspects of plant cell wall structure, chemical treatments, enzymatic hydrolysis, and product fermentation options."--Pub. desc.**

Lignocellulosic Fibers and Wood Handbook Oct 23 2021 This book will focus on lignocellulosic fibres as a raw material for several applications. It will start with wood chemistry and morphology. Then, some fibre isolation processes will be given, before moving to composites, panel and paper manufacturing, characterization and aging.

Chemical Modification of Lignocellulosic Materials **Dec 05 2022 This volume emphasizes the growing need for wood products with advanced engineering properties. It details the fundamental principles of cellulose technology and presents current techniques to modifying the basic chemistry of lignocellulosic materials. The work: discusses the cost-efficient use of cellulose derivatives in a variety of commodities; highlights the chemical modification of wood by methods such as etherification, esterification and thermoplasticization; considers recent progress in the lignocellulosic liquefaction of wood; and more.**

Sustainable Degradation of Lignocellulosic Biomass **Sep 21 2021 This book provides important aspects of sustainable degradation of lignocellulosic biomass which has a pivotal role for the economic production of several value-added products and biofuels with safe environment. Different pretreatment techniques and enzymatic hydrolysis process along with the characterization of cell wall components have been discussed broadly. The following features of this book attribute its distinctiveness: This book comprehensively covers the improvement in methodologies for the biomass pretreatment, hemicellulose and cellulose breakdown into fermentable sugars, the analytical methods for biomass characterization, and bioconversion of cellulosics into biofuels. In addition, mechanistic analysis of biomass pretreatment and enzymatic hydrolysis have been discussed in details, highlighting key factors influencing these processes at industrial scale.**

Advances in Bioprocess Technology **Feb 01 2020 This book provides an extensive overview of the latest research in environmentally benign integrated bioprocess technology. The cutting edge bioprocess technologies highlighted in the book include bioenergy from lignocellulose materials, biomass gasification, ethanol, butanol, biodiesel from agro waste, enzymatic bioprocess technology, food fermentation with starter cultures, and intellectual property rights for bioprocesses. This book further addresses niche technologies in bioprocesses that broadens readers' understanding of downstream processing for bio products and membrane technology for bioprocesses. The latest developments in biomass and bioenergy technology are reviewed exhaustively, including IPR rights, nanotechnology for bioenergy products, biomass gasification, and biomass combustion. This is an ideal book for scientists, engineers, students, as well as members of industry and policy-makers. This book also: Addresses cutting-edge technologies in bioprocesses Broadens readers' understanding of metabolic engineering, downstream processing for bioproducts, and membrane technology for bioprocesses Reviews exhaustively the latest developments in biomass and bioenergy technology, including nanotechnology for bioenergy products, biomass gasification, biomass combustion, and more**

Biomass Preprocessing and Pretreatments for Production of Biofuels **Nov 04 2022 Engineering the physical, chemical, and energy properties of lignocellulosic biomass is important to produce high-quality consistent feedstocks with reduced variability for biofuels production. The emphasis of this book will be the beneficial impacts that mechanical, chemical, and thermal preprocessing methods can have on lignocellulosic biomass quality attributes or specifications for solid and liquid biofuels and biopower production technologies. "Preprocessing" refers to treatments that can occur at a distance from conversion and result in an intermediate with added value, with improved conversion performance and efficiency. This book explores the effects of mechanical, chemical, and thermal preprocessing methods on lignocellulosic biomass physical properties and chemical composition and their suitability for biofuels production. For example, biomass mechanical preprocessing methods like size reduction (which impacts the particle size and distribution) and densification (density and size and shape) are important for feedstocks to meet the quality requirements for both biochemical and thermochemical conversion methods like enzymatic conversion, gasification, and pyrolysis process. Thermal preprocessing methods like drying, deep drying, torrefaction, steam explosion, hydrothermal carbonization, and hydrothermal liquefaction effect feedstock's proximate, ultimate and energy property, making biomass suitable for both solid and liquid fuel production. Chemical preprocessing which includes washing, leaching, acid, alkali, and ammonia fiber explosion that can enable biochemical composition, such as modification of lignin and hemicellulose, and impacts the enzymatic conversion application for liquid fuels production. This book also explores the integration of these preprocessing technologies to achieve desired lignocellulosic biomass quality attributes for biofuels production.**

Ultrastructural and Physicochemical Modifications Within Ammonia Treated Lignocellulosic Cell Walls and Their Influence on Enzymatic Digestibility Feb 24 2022

Genetic and Metabolic Engineering for Improved Biofuel Production from Lignocellulosic Biomass **Apr 28 2022 Genetic and Metabolic Engineering for Improved Biofuel Production from Lignocellulosic Biomass describes the different aspects of biofuel production from lignocellulosic biomass. Each chapter presents different technological approaches for cost effective liquid biofuel production from agroresidues/biomass. Two chapters cover future direction and the possibilities of biomass-based biofuel production at the industrial level. The book provides a genetic and metabolic engineering approach for improved cellulase production and the potential of strains that can ferment both pentose and hexose sugars. The book also gives direction on how to overcome challenges for the further advancement of lignocellulosic biomass-based biofuel production. Covers genetic engineering approaches for higher cellulase production from fungi Includes genetic and metabolic engineering approaches for development of potential pentose and hexose fermenting strain which can tolerate high ethanol and toxic phenolic compounds Describe different bioreactors used in different steps of biomass-based biofuel production Outlines future prospects and potential of biofuel production from lignocellulosic biomass**

Bioremediation Dec 01 2019 Bioremediation: A Sustainable Approach to Preserving Earth's Water discusses the latest research in green chemistry practices and principles that are involved in water remediation and the quality improvement of water. The presence of heavy metals, dyes, fluoride, dissolved solids and many other pollutants are responsible for water pollution and poor water quality. The removal of these pollutants in water resources is necessary, yet challenging. Water preservation is of great importance globally and researchers are making significant progress in ensuring this precious commodity is safe and potable. This volume illustrates how bioremediation in particular is a promising green technique globally. Features: Addresses bioremediation of all the major water pollutants Approaches the chemistry of water and the concept of water as a renewable resource from a green chemistry aspect Discusses environmental chemistry and the practice of industrial ecology Explains the global concern of adequate high quality water supplies, and how bioremediation can resolve this Explores sustainable development through green engineering

Surface Modification of Biopolymers May 06 2020 This book addresses surface modification techniques, which are critical for tailoring and broadening the applications of naturally occurring biopolymers. Biopolymers represent a sustainable solution to the need for new materials in the auto, waste removal, biomedical device, building material, defense, and paper industries. Features: First comprehensive summary of biopolymer modification methods to enhance compatibility, flexibility, enhanced physicochemical properties, thermal stability, impact response, and rigidity, among others Address of a green, eco-friendly materials that is increasing in use, underscoring the roles of material scientists in the future of new "green" bioolymer material use Coverage applications in automotive development, hazardous waste removal, biomedical engineering, pulp and paper industries, development of new building materials, and defense-related technologies Facilitation of technology transfer

Isolation, Modification, and Characterization of the Constituents (Cellulose, Hemicellulose, Lignin, et al.) in Biomass and Their Bio-based Applications May 30 2022

Acetylation Of Wood Dust Using A Novel Solvent Aug 09 2020 This book contains an introductory chapter on the chemistry of vinegar and acetic anhydride. The chemistry of wood and lignocellulosic fibres, wood modifications with various reagents with emphasis on acetylation of wood/cellulose for improvement of physical and chemical properties for protection against both chemical and physical degradative agents and for enhanced surface properties for proper surface interactions with synthetic polymers. In this book is contained brief literature on acetylating reagents used in wood/fibre modification. The Chapter two of this book deals with the detailed synthesis pedagogue used for wood-dust/flour modification. In this book is contained the application of a readily available and low cost novel solvent for acetylation of wood/natural fibres. Dissolution of polyethylene and preparation of blends was also included. Chapter three deal with the experimental results of the study of acetylated products.