

Microwave Assisted Degradation Of Lignin To Monolignols

A comprehensive reference to the use of innovative catalysts and processes to turn biomass into value-added chemicals. *Chemical Catalysts for Biomass Upgrading* offers detailed descriptions of catalysts and catalytic processes employed in the synthesis of chemicals and fuels from the most abundant and important biomass types. The contributors—*noted experts on the topic*—focus on the application of catalysts to the pyrolysis of whole biomass and to the upgrading of bio-oils. The authors discuss catalytic approaches to the processing of biomass-derived oxygenates, as exemplified by sugars, via reactions such as reforming, hydrogenation, oxidation, and condensation reactions. Additionally, the book provides an overview of catalysts for lignin valorization via oxidative and reductive methods and considers the conversion of fats and oils to fuels and terminal olefins by means of esterification/transesterification, hydrodeoxygenation, and decarboxylation/decarbonylation processes. The authors also provide an overview of conversion processes based on terpenes and chitin, two emerging feedstocks with a rich chemistry, and summarize some of the emerging trends in the field. This important book:

- Provides a comprehensive review of innovative catalysts, catalytic processes, and catalyst design
- Offers a guide to one of the most promising ways to find useful alternatives for fossil fuel resources
- Includes information on the most abundant and important types of biomass feedstocks
- Examines fields such as catalytic cracking, pyrolysis, depolymerization, and many more

Written for catalytic chemists, process engineers, environmental chemists, bioengineers, organic chemists, and polymer chemists, *Chemical Catalysts for Biomass Upgrading* presents deep insights on the most important aspects of biomass upgrading and their various types.

This book provides a knowledge-based view to the dynamic capabilities in an organization. The author integrates two existing views on gaining competitive advantage: the Knowledge View which suggests that the capability of organizations to learn faster than competitors is the only source of competitiveness; and the Dynamic Capability View which speculates that a firm's competitive advantage rests on its ability to adapt to changes in the business environment. Using the IT sector in India as a case study, this book provides and tests a new framework—Knowledge-Based Dynamic Capabilities—in the prediction of competitive advantage in organizations.

The interest in biofuel production and application is governed by the depletion of fossil fuel resources and the threatening pollution of the atmosphere because of the extensive emissions of greenhouse gases, which the present global vegetation cannot cope with. A remedy against the greenhouse gas emissions is the use of biomass presently grown as a source for biofuels. Biofuels can be further utilized as substrates for bulk chemical products. This approach is known as the biorefinery concept as an analogue to the oil-based refineries. The present book offers some examples and new ideas for the broader applications of biofuels and the resulting raw materials for energy and chemical products as alternatives to the traditional fossil fuels.

This *Microbiology Monographs* volume covers the latest advances in laccase applications in bioremediation and waste valorisation. The first three chapters provide a comprehensive introduction to fungal and bacterial laccases (the two most important enzyme groups from an application viewpoint) and their practical use in bioremediation and lignocellulosic waste valorisation. Subsequent chapters discuss possible combinations of laccases and further potentially collaborating enzymes, and offer in-depth insights into laccase immobilisation for wastewater treatment and environmental biosensor applications of laccases. Lastly, the book addresses the quest for enzymes with improved and better-fitting properties, covering laccase engineering by directed and computational evolution, and novel enzymes from extreme environments. As such, it is a fascinating read for microbiologists in both industry and academia.

Explores the use of conventional and novel technologies to enhance fermentation processes. *Fermentation Processes* reviews the application of both conventional and emerging technologies for enhancing fermentation conditions, examining the principles and mechanisms of fermentation processes, the microorganisms used in bioprocesses, their implementation in industrial fermentation, and more. Designed for scientists and industry professionals alike, this authoritative and up-to-date volume describes how non-conventional technologies can be used to increase accessibility and bioavailability of substrates by microorganisms during fermentation, which in turn promotes microbial growth and can improve processes and productivity across the agri-food, nutraceutical, pharmaceutical, and beverage industries. The text begins by covering the conventional fermentation process, discussing cell division and growth kinetics, current technologies and developments in industrial fermentation processes, the parameters and modes of fermentation, various culture media, and the impact of culture conditions on fermentation processes. Subsequent chapters provide in-depth examination of the use of emerging technologies—such as pulsed electric fields, ultrasound, high-hydrostatic pressure, and microwave irradiation—for biomass fractionation and microbial stimulation. This authoritative resource:

- Explores emerging technologies that shorten fermentation time, accelerate substrate consumption, and increase microbial biomass
- Describes enhancing fermentation at conventional conditions by changing oxygenation, agitation, temperature, and other medium conditions
- Highlights the advantages of new technologies, such as reduced energy consumption and increased efficiency
- Discusses the integration and implementation of conventional and emerging technologies to meet consumer and industry demand
- Offers perspectives on the future direction of fermentation technologies and applications

Fermentation Processes: Emerging and Conventional Technologies is ideal for microbiologists and bioprocess technologists in need of an up-to-date overview of the subject, and for instructors and students in courses such as bioprocess technology, microbiology, new product development, fermentation, food processing, biotechnology, and bioprocess engineering.

Production of Biofuels and Chemicals with Microwave Springer

This book is a comprehensive introduction to "green" or environmentally friendly polymer composites developed using renewable polymers of natural origin such as starch, lignin, cellulose acetate, poly-lactic acid (PLA),

polyhydroxylalkanoates (PHA), polyhydroxybutyrate (PHB), etc., and the development of modern technologies for preparing green composites with various applications. The book also discusses major applications of green polymer composites in industries such as medicine, biotechnology, fine chemicals and engineering.

Micro and Nanolignin in Aqueous Dispersions and Polymers: Interactions, Properties, and Applications presents the very latest research on lignin biorefinery treatments, production, chemistry, and refining, exploring a range of innovative applications of lignin and lignin-based composites at both the micro and the nanoscale. The book begins by presenting the latest developments in extraction methods and properties, with topics including methods for value-added microlignin, color characteristics, refining and functionalization, depolymerization for phenolic monomer production, and production of sulphur-free lignin nanoparticles. This is followed by in-depth sections focusing on the preparation of lignin for advanced applications at the microscale, then at the nanoscale, covering a range of areas such as construction, fiber manufacturing, food packaging, biomedicine, wood preservation, wastewater treatment, and agriculture. This valuable resource enables the reader to identify the high added value of a biomass residue and supports possible development and use for mass and niche high impact application sectors. This information is of interest to researchers, scientists, and advanced students, across bio-based polymers and bio-composites, polymer science and engineering, nanomaterials, chemistry, sustainable materials, materials science, and chemical engineering. Moreover, it is also addressed to the professionals that as well as those in an R&D industrial setting to are looking on ideas and perspectives on how to utilize bio-based materials in advanced industrial applications. Provides detailed information on extraction methods, properties, refining and functionalization processes Guides the reader through the preparation of lignin both at the micro and nanoscale, as a filler, a matrix, and in all-lignin composites Takes a design-for-application approach, opening the door to high value applications across a range of sectors

This book presents a collection of studies on state-of-art techniques for converting biomass to chemical products by means of pyrolysis, which are widely applicable to the valorization of biomass. In addition to discussing the fundamentals and mechanisms for producing bio-oils, chemicals, gases and biochar using pyrolysis, it outlines key reaction parameters and reactor configurations for various types of biomass. Written by leading experts and providing a broad range of perspectives on cutting-edge applications, the book is a comprehensive reference guide for academic researchers and industrial engineers in the fields of natural renewable materials, biorefinery of lignocellulose, biofuels, and environmental engineering, and a valuable resource for university students in the fields of chemical engineering, material science and environmental engineering.

This book offers insights into the current focus and recent advances in bioremediation and green technology applications for waste minimization and pollution control. Increasing urbanization has an impact on the environment, agriculture and industry, exacerbating the pollution problem and creating an urgent need for sustainable and green eco-friendly remediation technology. Currently, there is heightened interest in environmental research, especially in the area of pollution remediation and waste conversion, and alternative, eco-friendly methods involving better usage of agricultural residues as economically viable substrates for environmental cleanup are still required. The book offers researchers and scholars inspiration, and suggests directions for specific waste management and pollution control. The research presented makes a valuable contribution toward a sustainable and eco-friendly societal environment.

Collection of selected, peer reviewed papers from the 5th International Engineering Conference 2014 (KKU-IENC 2014) "Engineering and Technological Responses to Global Challenges" March 27-29, 2014, Khon Kaen, Thailand. The 317 papers are grouped as follows: I: Material Science, Chemical Engineering and Biotechnology, II: Building Materials and Technologies in Construction, III: Urban Planning and Transportation, IV: Environmental Materials, Engineering and Management, V: Power and Electrical Engineering, Microelectronics and Communication, VI: Energy and Energy Saving Technologies, Thermal Engineering, VII: Mechatronics and Control, VIII: Computer and Information Technology, Data Processing, IX: Agricultural Engineering and Food Technology, X: Industrial Engineering

This book provides general information and data on one of the most promising renewable energy sources: biomass for its thermochemical conversion. During the last few years, there has been increasing focus on developing the processes and technologies for the conversion of biomass to liquid and gaseous fuels and chemicals, in particular to develop low-cost technologies. This book provides date-based scientific information on the most advanced and innovative processing of biomass as well as the process development elements on thermochemical processing of biomass for the production of biofuels and bio-products on (biomass-based biorefinery). The conversion of biomass to biofuels and other value-added products on the principle biorefinery offers potential from technological perspectives as alternate energy. The book covers intensive R&D and technological developments done during the last few years in the area of renewable energy utilizing biomass as feedstock and will be highly beneficial for the researchers, scientists and engineers working in the area of biomass-biofuels- biorefinery. Provides the most advanced and innovative thermochemical conversion technology for biomass Provides information on large scales such as thermochemical biorefinery Useful for researchers intending to study scale up Serves as both a textbook for graduate students and a reference book for researchers Provides information on integration of process and technology on thermochemical conversion of biomass As naturally occurring and abundant sources of non-fossil carbon, lignin and lignans offer exciting possibilities as a source of commercially valuable products, moving away from petrochemical-based feedstocks in favour of renewable raw materials. Lignin can be used directly in fields such as agriculture, livestock, soil rehabilitation, bioremediation and the polymer industry, or it can be chemically modified for the fabrication of specialty and high-value chemicals such as resins, adhesives, fuels and greases. Lignin and Lignans as Renewable Raw Materials presents a multidisciplinary overview of the state-of-the-art and future prospects of lignin and lignans. The book discusses the origin, structure, function and applications of both types of compounds, describing the main resources and values of these products as carbon raw materials. Topics covered include: • Structure and physicochemical properties • Lignin detection methods • Biosynthesis of lignin • Isolation methods • Characterization and modification of lignins • Applications of modified and unmodified lignins • Lignans: structure, chemical and biological properties • Future perspectives This book is a comprehensive resource for researchers, scientists and engineers in academia and industry working on new possibilities for the application of renewable raw materials. For more information on the Wiley Series in Renewable Resources, visit www.wiley.com/go/rrs

Conversion of biomass into chemicals and biofuels is an active research and development area as trends move to replace traditional fossil fuels with renewable resources. By integrating processing methods with microwave and ultrasound irradiation into biorefineries, the time-scale of many operations can be greatly reduced while the efficiency of the reactions can be remarkably increased so that process intensification can be achieved. "Production of Biofuels and Chemicals with Microwave" and "Production of Biofuels and Chemicals with Ultrasound" are two independent volumes in the Biofuels and Biorefineries series that take different, but complementary approaches for the pretreatment and chemical transformation of biomass into chemicals and biofuels. The volume "Microwave" provides current research advances and prospects in theoretical and practical aspects of microwave irradiation including properties, effects and temperature monitoring, design of chemical reactors, synergistic effects on combining microwave, ultrasound, hydrodynamic cavitation and high-shear mixing into

processes, chemical and catalytic conversion of lignin into chemicals, pyrolysis and gasification, syngas production from wastes, platform chemicals, algal biodiesel, cellulose-based nanocomposites, lignocellulosic biomass pretreatment, green chemistry metrics and energy consumption and techno-economic analysis for a catalytic pyrolysis facility that processes pellets into aromatics. Each of the 12 chapters has been peer-reviewed and edited to improve both the quality of the text and the scope and coverage of the topics. Both volumes “Microwave” and “Ultrasound” are references designed for students, researchers, academicians and industrialists in the fields of chemistry and chemical engineering and include introductory chapters to highlight present concepts of the fundamental technologies and their application. Dr. Zhen Fang is Professor in Bioenergy, Leader and founder of biomass group, Chinese Academy of Sciences, Xishuangbanna Tropical Botanical Garden and is also adjunct Professor of Life Sciences, University of Science and Technology of China. Dr. Richard L Smith, Jr. is Professor of Chemical Engineering, Graduate School of Environmental Studies, Research Center of Supercritical Fluid Technology, Tohoku University, Japan. Dr. Xinhua Qi is Professor of Environmental Science, Nankai University, China.

A comprehensive, interdisciplinary picture of how lignocellulosic biorefineries could potentially employ lignin valorization technologies. This book examines bioremediation technologies as a tool for environmental protection and management. It provides global perspectives on recent advances in the bioremediation of various environmental pollutants. Topics covered include comparative analysis of bio-gas electrification from anaerobic digesters, mathematical modeling in bioremediation, the evaluation of next-generation sequencing technologies for environmental monitoring in wastewater abatement; and the impact of diverse wastewater remediation techniques such as the use of nanofibers, microbes and genetically modified organisms; bioelectrochemical treatment; phytoremediation; and biosorption strategies. The book is targeted at scientists and researchers working in the field of bioremediation.

This thesis presents novel pathways for one step or two step modifications of different types of lignin without the need of any catalyst. Such novel functional lignins were characterized in detail and are now ready for their utilization in novel polymeric materials and thus for new applications. Hereby the value of lignin can be increased by offering novel strategies of incorporating lignins as building block into polyurethanes, but also various other polymer matrices are thinkable for future studies.

Lignin-based Materials for Biomedical Applications: Preparation, Characterization, and Implementation explores the emerging area of lignin-based materials as a platform for advanced biomedical applications, guiding the reader from source through to implementation. The first part of the book introduces the basics of lignin, including extraction methods, chemical modifications, structure and composition, and properties that make lignin suitable for biomedical applications. In addition, structural characterization techniques are described in detail. The next chapters focus on the preparation of lignin-based materials for biomedical applications, presenting methodologies for lignin-based nanoparticles, hydrogels, aerogels, and nanofibers, and providing in-depth coverage of lignin-based materials with specific properties—including antioxidant properties, UV absorbing capability, antimicrobial properties, and colloidal particles with tailored properties—and applications, such as drug and gene delivery, and tissue engineering. Finally, future perspectives and possible new applications are considered. This is an essential reference for all those with an interest in lignin-based materials and their biomedical applications, including researchers and advanced students across bio-based polymers, polymer science, polymer chemistry, biomaterials, nanotechnology, materials science and engineering, drug delivery, and biomedical engineering, as well as industrial R&D and scientists involved with bio-based polymers, specifically for biomedical applications. Unlocks the potential of lignin-based materials with advanced properties for cutting-edge applications in areas such as drug delivery, gene delivery and tissue engineering Presents state-of-the-art methodologies used in the development of lignin-based nanoparticles, hydrogels, aerogels and nanofibers Explains the fundamentals of lignin, including structure and composition, extraction and isolation methods, types and properties, chemical modifications, and characterization techniques

Advances in Microwave Chemistry discusses the novel bond formation methodologies, synergistic effects of microwaves with other entities, sample preparation including digestion, combustion, and extraction techniques, as well as selectivity in chemical processes. Recent updates are provided on microwave-assisted syntheses of pharmacologically significant aza-, oxo- and other heterocycles, including lactams, nucleosides, bile acids and sterols, the preparation of nanomaterials, composites, and absorber layer materials for thin film. This book also incorporates comparative discussions involving microwave irradiation with conventional methods in different aspects of organic, inorganic, medicinal, and green chemistry. Key Features: Provides a comparative discussion on microwave irradiation with conventional methods in different aspects of organic, inorganic, medicinal, and green chemistry Presents recent applications of microwave radiation in biocatalysis Offers a complete package correlating various aspects of microwaves in organic syntheses, the biological impact of products formed in reactions, pharmacological features, and environmental sustainability of the procedures Explains microwave-induced reactions on structurally complex bile acids and sterols Stands as a valuable and unique addition to the well-established book series, New Directions in Organic and Biological Chemistry

Recent Advances in Bioconversion of Lignocellulose to Biofuels and Value Added Chemicals within the Biorefinery Concept covers the latest developments on biorefineries, along with their potential use for the transformation of residues into a broad range of more valuable products. Within this context, the book discusses the enzymatic conversion process of lignocellulosic biomass to generate fuels and other products in a unified approach. It focuses on new approaches to increase enzymatic production by microorganisms, the action of microbial inhibitors, and strategies for their removal. Furthermore, it outlines the benefits of this integrated approach for generating value-added products and the benefits to social and economic aspects, circular bio economy, HUBs and perspectives. Covers the mechanisms of enzymatic conversion of biomass into value-added products Discusses bioproducts derived from lignocellulose and their applications Includes discussions on design, development and the technologies needed for the sustainable manufacture of materials and chemicals Offers a techno-economic evaluation of biorefineries for integrated sustainability assessments Discusses the socioeconomic and cultural-economic perspectives of the lignocellulosic biorefinery Presents a virtual biorefinery as an integrated approach to evaluate the lignocellulose production chain

This book offers a broad understanding of bioethanol production from sugarcane, although a few other substrates, except corn, will also be mentioned. The 10 chapters are grouped in five sections. The Fuel Ethanol Production from Sugarcane in Brazil section consists of two chapters dealing with the first-generation ethanol Brazilian industrial process. The Strategies for Sugarcane Bagasse Pretreatment section deals with emerging physicochemical methods for biomass pretreatment, and the non-conventional biomass source for lignocellulosic ethanol production addresses the potential of weed biomass as alternative feedstock. In the Recent Approaches for Increasing Fermentation Efficiency of Lignocellulosic Ethanol section, potential and research progress using thermophile bacteria and yeasts is presented, taking advantage of microorganisms involved in consolidating or simultaneous hydrolysis and fermentation processes. Finally, the Recent Advances in Ethanol Fermentation section presents the use of cold plasma and hydrostatic pressure to increase ethanol production efficiency. Also in this section the use of metabolic-engineered autotrophic cyanobacteria to produce ethanol from carbon dioxide is mentioned.

This edited book discusses various processes of feedstocks bioconversion such as bioconversion of food waste, human manure, industrial waste, beverage waste, kitchen waste, organic waste, fruit and vegetable, poultry waste, solid waste, agro-industrial waste, cow dung, steroid, lignocellulosic residue, biomass, natural gas etc. Nowadays, the industrial revolution and urbanization have made human life comfortable. However, this requires excess usage of natural resources starting from food and food products, to energy resources, materials as well as chemicals. The excess use of natural resources for human comfort is expected to high fuel prices, decline natural resources as well as cause a huge hike in the cost of raw materials. These factors are pushing researchers to grow environmentally friendly processes and techniques based on inexpensive and sustainable feedstock to accomplish such worldwide targets. Bioconversion, otherwise called biotransformation, is the change of natural materials, for example, plant or animal waste, into usable items or energy sources by microorganisms. Bioconversion is an environmentally friendly benevolent choice to supplant the well-established chemical procedures utilized these days for the production of chemicals and fuels. A variety of alternatives advancements are being considered and are directly accessible to acquire diverse valuable end-products through bioprocesses. This book discusses in detail the process and techniques of bioconversion by focusing on the organic feedstock of animal and plant origin. It brings solutions to the bioconversion of various feedstock into value-added products.

Second and Third Generation of Feedstocks: The Evolution of Biofuels presents a critical analysis of both the applications and potential of bioenergy production from second and third generation feedstocks. The book illustrates different aspects of the processes used for the production of biofuels, dealing specifically with second and third generation feedstocks from biomass and algae. The pretreatment of feedstocks and optimization of various forms of bioenergy are considered, along with the economic aspects of the various processes. In the last few years, industrial research efforts have focused on low cost, large-scale processing for lignocellulosic feedstocks originating from agricultural residues and municipal wastes for bioenergy production. This book shares an insight into the recent developments taking place in this industry, exploring transformation processes as well as biomass and algae conversions. Reviews existing lignocellulosic biomass feedstocks and their sources Includes processes for the conversion of various feedstocks to biofuels Discusses current research findings on second and third generation feedstocks Describes processes involved in the transformation of algal biomass into biofuels

This book offers a solutions-based approach to climate change problems which potentially impinge on human beings within the tropics. It largely comprises research articles with supplementary applications and illustrations. The effects of atmospheric phenomena, energy acquisition, wind power, CO₂ sequestration, are linked with soils, aquatic life, reducing deforestation, rainwater harvesting and clay pot farming, climate, plant disease and food security to show that no area of life is untouched by the phenomenon of climate change. It discusses specific problem areas and provides an overview of geotechnical and sustainable solutions to lessen the impact of climate.

Microwaves in Chemistry Applications: Fundamentals, Methods and Future Trends offers a number of benefits over conventional heating technologies, including acceleration of reaction rates, milder reaction conditions, higher chemical yields, lower energy usage and different reaction selectivity, all of which can improve the sustainability of processes. The book provides valuable insights into the underlying chemistry at play in microwave-assisted processes, introducing fundamental concepts, discussing the modeling of reactions in such processes, and also highlighting a range of key methods and applications of microwaves in chemistry for improved sustainability. Beginning with an introduction to microwave chemistry, Part One discusses foundational principles, equipment and approaches for modeling reactions and assessing the outputs of those models. Methods in microwave chemistry are then the focus of Part Two, with microwave-assisted synthesis, catalysis, reduction and reactions all explored in detail. Part Three reflects on the practical usage of these methods to address specific issues, covering a number of interesting applications. Provides guidance on the modeling and interpretation of microwave effects Discusses microwave chemistry in the context of green chemistry principles Outlines a range of important microwave methods, including microwave-assisted synthesis, catalysis, reactions and reductions

This book covers the applications of fungi used in biorefinery technology. As a great many different varieties of fungal species are available, the text focuses on the various applications of fungi for production of useful products including organic acids (lactic, citric, fumaric); hydrolytic enzymes (amylase, cellulases, xylanases, ligninases, lipases, pectinases, proteases); advanced biofuels (ethanol, single cell oils); polyols (xylitol); single cell protein (animal feed); secondary metabolites; and much more.

The rapid growth of industries has resulted in the generation of high volume of solid and liquid waste. Today, there is a need of Clean and Green technology for the sustainable waste management. Biochemical and Environmental Bioprocessing: Challenges and Developments explore the State-of-art green technologies to manage the waste and to recover value added products.

Microbes play an important role in the bioremediation. Bioprocess engineering an interdisciplinary connects the Science and Technology. The bioconversion and bioremediation is essentially required for the management of various hazardous substances in

the environment. This book will give an intensive knowledge on the application of Biochemical and Bioprocess technologies for the eco-friendly management of pollution. This book serves as a fundamental to the students, researchers, academicians and Engineers working in the area of Environmental Bioremediation and in the exploration of various bioproducts from waste. Features Reviews various biological methods for the treatment of effluents from Industries by using biomass and biopolymers. Highlights the applications of various bioreactors like Anaerobic Sequential Batch Reactor, Continuously stirred anaerobic digester, Up-flow anaerobic sludge blanket reactor, Fluidized and expanded bed reactors. Presents the cultivation of algae in Open Pond, Closed loop System, and Photo-bioreactors for bioenergy production. Discusses the intensified and integrated biorefinery approach by Microwave Irradiation, Pyrolysis, Acoustic cavitation, Hydrodynamic cavitation, Electron beam irradiation, High pressure Autoclave reactor, Steam explosion and photochemical oxidation. Outlines the usage of microbial fuel cell (MFC) for the production bioelectricity generation in different modules Tubular MFC, Stacked MFC, Separate electrode modules Cutting edge research of synthesis of biogenic nanoparticles and Pigments by green route for the health care and environment management.

Bioethanol Production from Food Crops: Sustainable Sources, Interventions and Challenges comprehensively covers the global scenario of ethanol production from both food and non-food crops and other sources. The book guides readers through the balancing of the debate on food vs. fuel, giving important insights into resource management and the environmental and economic impact of this balance between demands. Sections cover Global Bioethanol from Food Crops and Forest Resource, Bioethanol from Bagasse and Lignocellulosic wastes, Bioethanol from algae, and Economics and Challenges, presenting a multidisciplinary approach to this complex topic. As biofuels continue to grow as a vital alternative energy source, it is imperative that the proper balance is reached between resource protection and human survival. This book provides important insights into achieving that balance. Presents technological interventions in ethanol production, from plant biomass, to food crops Addresses food security issues arising from bioethanol production Identifies development bottlenecks and areas where collaborative efforts can help develop more cost-effective technology

Biopolymers are becoming an increasingly important area of research as traditional chemical feedstocks run low and concerns about environmental impacts increase. One area of particular interest is their use for more sustainable development of metal nanoparticles. Biopolymer-based Metal Nanoparticle Chemistry for Sustainability Applications, Volume 1 reviews key polymers found in nature, their characterization and modification, and processes for using them in the development of metal nanoparticles. Beginning with an introduction to both green chemistry and biopolymers in Part 1, the book goes on to outline the classification of biopolymers in Part 2, with specific details on polysaccharides, proteins and polypeptides, lignin, and polylactic acid. Properties of biopolymers, including biodegradability and toxicity, are the focus of Part 3, before Part 4 goes on to discuss synthesis and characterization. Reviews novel sources of polymers with high potential as green media for synthesizing nanostructures Provides technological details on the synthesis of natural polymer-based metal nanoparticles Highlights the use of natural polymer supports and the impact of their properties on stability, morphology and scale of nanostructures

This book focuses on chemical syntheses and processes for biofuel production mediated by microwave energy. This is the first contribution in this area serving as a resource and guidance manual for understanding the principles, mechanisms, design, and applications of microwaves in biofuel process chemistry. Green chemistry of microwave-mediated biofuel reactions and thermodynamic potentials for the process biochemistry are the focus of this book. Microwave generation, wave propagation, process design, development and configurations, and biofuel applications are discussed in detail.

Cost-Effective Technologies for Solid Waste and Wastewater Treatment synthesizes methods, case studies, and analyses of various state-of-the-art techniques for removing contaminants from wastewater, solid waste, or sewage and converting or reusing the waste with minimum impact on the environment. Focusing on innovative treatment strategies, as well as recent modifications to conventional processes, the book covers methods for a complex variety of emerging pollutants including organic matter, chemicals, and micropollutants resulting from developmental and industrial activities. Serving as a practical guide to state-of-the-art methods, Cost-Effective Technologies for Solid Waste and Wastewater Treatment also delivers foundational information on the practical design of treatment and reuse systems and explains the treatments in terms of scale, efficiency, and effectiveness. It focuses on cost-effective technologies that are particularly applicable to environmental clean-up, such as bioaugmentation and biostimulation of plastics, activated carbon, phytoremediation, crude oil pollution stress, adsorbents, contaminants of emerging concern, anaerobic digestion, in situ chemical oxidation (ISCO), biosorption, bioremediation, radioactive contaminants, constructed wetlands, nanoremediation, and rainwater. As such, it is a valuable and practical resource for researchers, students, and managers in the fields of environmental science and engineering, as well as wastewater management, chemical engineering, and biotechnology. • Presents low-cost treatment technologies for both solid waste and wastewater • Analyzes the efficiency and effectiveness of state-of-the-art technologies • Includes methods and case studies for practical application

Addresses a Global Challenge to Sustainable Development Advances in Biodegradation and Bioremediation of Industrial Waste examines and compiles the latest information on the industrial waste biodegradation process and provides a comprehensive review. Dedicated to reducing pollutants generated by agriculturally contaminated soil, and plastic waste from various industries, this text is a book that begs the question: Is a pollution-free environment possible? The book combines with current available data with the expert knowledge of specialists from around the world to evaluate various aspects of environmental microbiology and biotechnology. It emphasizes the role of different bioreactors for the treatment of complex industrial waste and provides specific chapters on bioreactors and membrane process integrated with biodegradation process. It also places special emphasis on phytoremediation and the role of wetland plant rhizosphere bacterial ecology and the bioremediation of complex industrial wastewater. The authors address the microbiological, biochemical, and molecular aspects of biodegradation and bioremediation which cover numerous topics, including microbial genomics and proteomics for the bioremediation of industrial waste. This text contains 14 chapters and covers: Bioprocess engineering and mathematical modelling with a focus on environmental engineering The roles of siderophores and the rhizosphere bacterial community for phytoremediation of heavy metals Current advances in phytoremediation, especially as it relates to the mechanism of phytoremediation of soil polluted with heavy metals Microbial degradation of aromatic compounds and pesticides: Challenges and solution Bioremediation of hydrocarbon contaminated wastewater of refinery plants The role of biosurfactants for bioremediation and biodegradation of various pollutants discharged from industrial waste as they are tools of biotechnology The role of potential microbial enzymatic processes for bioremediation of industrial waste The latest knowledge regarding the biodegradation of tannery and textile waste A resource for students interested in the field of environment, microbiology, industrial engineering, biotechnology, botany, and agricultural sciences, Advances in

Biodegradation and Bioremediation of Industrial Waste provides recent knowledge and approaches on the bioremediation of complex industrial waste.

This book presents a comprehensive overview on origin, structure, properties, modification strategies and applications of the biopolymer lignin. It is organized into four themed parts. The first part focuses on the analysis and characterization of the second most abundant biopolymer. The following part is devoted to the biological aspects of lignin such as biosynthesis and degradation. In the third part, chemical modification strategies and the preparation of composites as well as nano- and microparticles are discussed. The final part addresses the industrial application of lignin and its derivatives, as well as lignin materials. The usage for synthesis of biofuels, fine chemicals and in agriculture and food industry is covered. This book is a comprehensive source for researchers, scientists and engineers working in the field of biopolymers as well as renewable materials and sources.

This will be a comprehensive multi-contributed reference work, with the Editors being highly regarded alternative fuels experts from India and Switzerland. There will be a strong orientation toward production of biofuels covering such topics as biodiesel from renewable sources, biofuels from biomass, vegetable based feedstocks from biofuel production, global demand for biofuels and economic aspects of biofuel production. Book covers the latest advances in all product areas relative to biofuels. Discusses coverage of public opinion related to biofuels. Chapters will be authored by world class researchers and practitioners in various aspects of biofuels. Provides good comprehensive coverage of biofuels for algae. Presents extensive discussion of future prospects in biofuels.

Reactive and functional polymers are manufactured with the aim of improving the performance of unmodified polymers or providing functionality for different applications. These polymers are created mainly through chemical reactions, but there are other important modifications that can be carried out by physical alterations in order to obtain reactive and functional polymers. This volume presents a comprehensive analysis of these reactive and functional polymers. Reactive and Functional Polymers Volume One provides the principles and foundations for the design, development, manufacture and processing of reactive and functional polymers based primarily on biopolymers, polyesters and polyurethanes. The text provides an in-depth review of updated sources on reactive resins and silicones. In this book, world-renowned researchers have participated, including Dr. Runcang Sun (Associate editor for the journal 'Carbohydrate Polymers'). With its comprehensive scope and up-to-date coverage of issues and trends in Reactive and Functional Polymers, this is an outstanding book for students, professors, researchers and industrialists working in the field of polymers and plastic materials.

As the range of feedstocks, process technologies and products expand, biorefineries will become increasingly complex manufacturing systems. Biorefineries and Chemical Processes: Design, Integration and Sustainability Analysis presents process modelling and integration, and whole system life cycle analysis tools for the synthesis, design, operation and sustainable development of biorefinery and chemical processes. Topics covered include: Introduction: An introduction to the concept and development of biorefineries. Tools: Included here are the methods for detailed economic and environmental impact analyses; combined economic value and environmental impact analysis; life cycle assessment (LCA); multi-criteria analysis; heat integration and utility system design; mathematical programming based optimization and genetic algorithms. Process synthesis and design: Focuses on modern unit operations and innovative process flowsheets. Discusses thermochemical and biochemical processing of biomass, production of chemicals and polymers from biomass, and processes for carbon dioxide capture. Biorefinery systems: Presents biorefinery process synthesis using whole system analysis. Discusses bio-oil and algae biorefineries, integrated fuel cells and renewables, and heterogeneous catalytic reactors. Companion website: Four case studies, additional exercises and examples are available online, together with three supplementary chapters which address waste and emission minimization, energy storage and control systems, and the optimization and reuse of water. This textbook is designed to bridge a gap between engineering design and sustainability assessment, for advanced students and practicing process designers and engineers.

Bioenergy Research: Advances and Applications brings biology and engineering together to address the challenges of future energy needs. The book consolidates the most recent research on current technologies, concepts, and commercial developments in various types of widely used biofuels and integrated biorefineries, across the disciplines of biochemistry, biotechnology, phytology, and microbiology. All the chapters in the book are derived from international scientific experts in their respective research areas. They provide you with clear and concise information on both standard and more recent bioenergy production methods, including hydrolysis and microbial fermentation. Chapters are also designed to facilitate early stage researchers, and enables you to easily grasp the concepts, methodologies and application of bioenergy technologies. Each chapter in the book describes the merits and drawbacks of each technology as well as its usefulness. The book provides information on recent approaches to graduates, post-graduates, researchers and practitioners studying and working in field of the bioenergy. It is an invaluable information resource on biomass-based biofuels for fundamental and applied research, catering to researchers in the areas of bio-hydrogen, bioethanol, bio-methane and biorefineries, and the use of microbial processes in the conversion of biomass into biofuels. Reviews all existing and promising technologies for production of advanced biofuels in addition to bioenergy policies and research funding Cutting-edge research concepts for biofuels production using biological and biochemical routes, including microbial fuel cells Includes production methods and conversion processes for all types of biofuels, including bioethanol and biohydrogen, and outlines the pros and cons of each

The valorization of lignocellulosic biomass, in the form of forest and agricultural wastes, industrial processing side-streams, and dedicated energy crops, toward chemicals, fuels and added-value products has become a major research area with increasing exploitation potential. The efficient and tailored depolymerization of biomass or its primary structural components (hemicellulose, cellulose, and lignin) to platform chemicals, i.e., sugars, phenolics, furans, ketones, organic acids, etc. is highly dependent on the development of novel or modified chemo- and bio-catalytic processes that take into account the peculiarities and recalcitrance of biomass as feedstock, compared for example to petroleum fractions. The present Research Topic in Frontiers in Chemistry, Section of Green and Sustainable Chemistry, entitled "Nano-(bio)catalysis in lignocellulosic biomass valorization" aims to further contribute to the momentum of research and development in the (bio)catalytic conversion of biomass, by featuring original research papers as well as two review papers, authored and reviewed by experts in the field. The Research Topic addresses various representative reactions and processes in biomass valorization, highlighting the importance of developing novel, efficient and stable nano-(bio)catalysts with tailored properties according to the nature of the reactant/feedstock and the targeted products.

Bioreactors: Sustainable Design and Industrial Applications in Mitigation of GHG Emissions presents and compares the foundational concepts, state-of-the-art design and fabrication of bioreactors. Solidly based on theoretical fundamentals, the book examines various aspects of the commercially available bioreactors, such as construction and fabrication, design, modeling and simulation, development, operation, maintenance, management and target applications for biofuels production and bio-waste management. Emerging issues in commercial feasibility are explored, constraints and pathways for upscaling, and techno-economic assessment are also covered. This book provides researchers and engineers in the biofuels and waste management sectors a clear, at-a-glance understanding of the actual potential of different advanced bioreactors for their requirements. It is a must-have reference for better-informed decisions when selecting the appropriate technology models for sustainable systems development and commercialization. Focuses on sustainable bioreactor processes and applications in bioenergy and bio-waste management Explores techno-economic and sustainability assessment aspects through a comparative approach, catering to diverse arrays and applications Offers comprehensive coverage of the most recent technology, from fundamentals to applications

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