Microwave Assisted Degradation Of Lignin To Monolignols

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 contains selected papers presented during the World Renewable Energy Network’s 28th anniversary congress at the University of Kingston in London. The forum highlighted the integration of renewables and sustainable buildings as the best means to combat climate change. In-depth chapters written by the world’s leading experts highlight the most current research and technological breakthroughs and discuss policy, renewable energy technologies and applications in all sectors – for heating and cooling, agricultural applications, water, desalination, industrial applications and for the transport sectors. Presents cutting-edge research in green building and renewable energy from all over the world; Covers the most up-to-date research developments, government policies, business models, best practices and innovations; Contains case studies and examples to enhance practical application of the
technologies. 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 book provides an overview of eco-friendly resins and their composite materials covering their synthesis, sources, structures and properties for different industrial applications to support the ongoing research and development in eco-friendly and renewable commercial products. It provides comparative discussions on the properties of eco-friendly resins with other polymer composites. It is a useful reference on bio-based eco-friendly polymer resins, wood-based composites, natural fibers and biomass materials for the polymer scientists, engineers and material scientists. This exhaustive Handbook covers the synthesis and applications of nanomaterials that can be used in energy and environmental science applications. Given the pressing need for more efficient energy sources at lower costs, this book will help to provide a more cohesive understanding of nanocomposites and nanomaterials. Each chapter in this handbook is written by an expert in his or her field, and topics ranging from energy efficiency to material performance are presented. Catalysis, ceramic science, metallurgy, coatings, and green,
sustainable materials are included. This Handbook provides a comprehensive guide to the field of applied nanomaterials. It will drive interest and research in the use of nanocomposites and nanomaterials for energy and environmental applications.

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.

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 accessibly 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. 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

Alternative energy sources have become a hot topic in recent years. The supply of fossil fuel, which provides about 95 percent of total energy demand today, will eventually run out in a few decades. By contrast, biomass and biofuel have the potential to become one of the major global primary energy source along with other alternate energy sources in the years to come. A wide variety of biomass conversion options with different performance characteristics exists. The goal of this book is to provide the readers with current state of art about biomass and bioenergy production and some other environmental technologies such as Wastewater treatment, Biosorption and Bio-economics. Organized around providing recent methodology, current state of modelling and techniques of parameter estimation in gasification process are presented at length. As such, this volume can be used by undergraduate and graduate students as a reference book and by the researchers and environmental engineers for
reviewing the current state of knowledge on biomass and bioenergy production, biosorption and wastewater treatment.

Production of Biofuels and Chemicals with Microwave-Assisted Extraction of 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 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. 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.

A comprehensive, interdisciplinary picture of how lignocellulosic biorefineries could potentially employ lignin valorization technologies.

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.

A comprehensive overview covering the principles and preparation of catalysts, as well as reactor technology and applications in the field of organic synthesis, energy production, and environmental catalysis. Edited and authored by renowned and experienced scientists, this reference focuses on successful reaction procedures for applications in industry. Topics include catalyst preparation, the treatment of waste water and air, biomass and waste valorisation, hydrogen production, oil refining as well as organic synthesis in the presence of heterogeneous and homogeneous catalysts and continuous-flow reactions. With its practical relevance and successful methodologies, this is a valuable guide for chemists at universities working in the field of catalysis, organic synthesis, pharmaceutical or green chemistry, as well as researchers and engineers in the chemical industry.

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. 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. 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), polyhydroxylbutyrate (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.

Biomass Fractionation Technologies for a Lignocellulosic Feedstock-based Biorefinery reviews the extensive research and tremendous scientific and technological developments that have occurred in the area of biorefining, including industrial processes and product development using ‘green technologies’, often referred as white biotechnology. As there is a huge need for new design concepts for modern biorefineries as an alternative and amendment to industrial crude oil and gas refineries, this book presents the most important topics related to biomass fractionation, including advances, challenges, and perspectives, all with references to current literature for further study. Presented in 26 chapters by international field specialists, each chapter consists of review text that comprises the most recent advances, challenges, and perspectives for each fractionation technique. The book is an indispensable reference for all professionals, students, and workers involved in biomass biorefinery, assisting them in establishing efficient and economically viable process technologies for biomass fractionation. Provides information on the most advanced and innovative pretreatment processes and technologies for biomass. Reviews numerous valuable products from lignocellulose. Discusses integration of processes for complete biomass conversion with minimum waste generation. Identifies the research gaps in scale-up. Presents an
indispensable reference for all professionals, students, and workers involved in biomass biorefinery, assisting them in establishing efficient and economically viable process technologies for biomass fractionation.

Recent Developments in Bioenergy Research reviews all these topics, reports recent research findings, and presents potential solutions to challenging issues. The book consolidates the most recent research on the (bio)technologies, concepts and commercial developments that are currently in progress on different types of widely-used biofuels and integrated biorefineries across biochemistry, biotechnology, biochemical engineering and microbiology. Chapters include very recent/emerging topics, such as non-ionic and ionic liquids/surfactants for enhancement of lignocellulose enzymatic hydrolysis and lignocellulose biomass as a rich source of bio-ionic liquids. The book is a useful source of information for those working in the area of industrial wastewater treatment and microbial fuel cells, but is also a great resource for senior undergraduate and graduate students, researchers, professionals, biochemical engineers and other interested individuals/groups working in the field of biofuel/bioenergy. Provides unique information on biomass-based biofuels for fundamental and applied research. Outlines research advancements in the areas of bio-hydrogen, bioethanol, bio-methane and biorefineries. Includes emerging topics on biomass (including wastes) characterization and its uses as a resource for environmental bioremediation and bioenergy. Reviews enzyme engineering for biomass.
to bioproducts and biochemicals, lipids/bio-oil Focuses on biological/ biochemical routes, as these options have the greatest potential to be the most cost-effective methods for biofuel/bioenergy production.

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. 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 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 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. Recent economic trends, especially the worldwide decline in oil prices, and an altered political climate in the United States have combined to bring about major reductions in research on renewable energy resources. Yet there is no escaping the "facts of life" with regard to these resources. The days of inexpensive fossil energy are clearly numbered, the credibility of nuclear energy has fallen to a new low, and fusion energy stands decades or more from practical realization. Sooner than we may wish, we will have to turn to renewable raw materials - plant "biomass" and, especially, wood - as significant suppliers of energy for both industry and everyday needs. It is therefore especially important to have a single, comprehensive and current source of information on a key step in any process for the technological exploitation of woody materials, cellulose hydrolysis. Further more, it is essential that any such treatment be unbiased with respect to the two methods - chemical and biochemical - for the breakdown of cellulose to sugars. Researchers on cellulose hydrolysis have frequently been chided by persons from industry, especially those individuals concerned with determining the economic feasibility of various technological alternatives. They tell us that schemes for the utilization of wood and other such resources fly in the face of economic realities. 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.

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

Synthesis Using Vilsmeier Reagents presents a comprehensive account of the whole of Vilsmeier chemistry, including the formation of over 50 functional groups and over 50 different ring systems by means of Vilsmeier reagents. The highly structured ordering, by means of functional groups and extensive cross-referencing, enables even the non-specialist to gain an immediate grasp of the subject matter. The potential and versatility of Vilsmeier chemistry makes this major reference work essential for every industrial and academic chemistry library. It should be consulted by every practicing organic chemist and owned by every specialist.

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

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.
With increasing energy prices and the drive to reduce CO2 emissions, food industries are challenged to find new technologies in order to reduce energy consumption, to meet legal requirements on emissions, product/process safety and control, and for cost reduction and increased quality as well as functionality. Extraction is one of the promising innovation themes that could contribute to sustainable growth in the chemical and food industries. For example, existing extraction technologies have considerable technological and scientific bottlenecks to overcome, such as often requiring up to 50% of investments in a new plant and more than 70% of total process energy used in food, fine chemicals and pharmaceutical industries. These shortcomings have led to the consideration of the use of new "green" techniques in extraction, which typically use less solvent and energy, such as microwave extraction. Extraction under extreme or non-classical conditions is currently a dynamically developing area in applied research and industry. Using microwaves, extraction and distillation can now be completed in minutes instead of hours with high reproducibility, reducing the consumption of solvent, simplifying manipulation and work-up, giving higher purity of the final product, eliminating post-treatment of waste water and consuming only a fraction of the energy normally needed for a conventional extraction method. Several classes of compounds such as essential oils, aromas, anti-oxidants, pigments, colours, fats and oils,
carbohydrates, and other bioactive compounds have been extracted efficiently from a
variety of matrices (mainly animal tissues, food, and plant materials). The advantages
of using microwave energy, which is a non-contact heat source, includes more effective
heating, faster energy transfer, reduced thermal gradients, selective heating, reduced
equipment size, faster response to process heating control, faster start-up, increased
production, and elimination of process steps. This book will present a complete picture
of the current knowledge on microwave-assisted extraction (MAE) of bioactive
compounds from food and natural products. It will provide the necessary theoretical
background and details about extraction by microwaves, including information on the
technique, the mechanism, protocols, industrial applications, safety precautions, and
environmental impacts.
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 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.
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.

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
Renewable Resources and Biorefineries presents an authoritative and comprehensive overview of biobased technologies for the production of fuels, food/feed, and materials. This book provides an insight into future developments in each field and an extensive bibliography. It will be an essential resource for researchers and academic and industry professionals in the renewable resources field.
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 Biomass as Renewable Raw Material to Obtain Bioproducts of High-tech Value examines the use of biomass as a raw material, including terrestrial and aquatic sources to obtain extracts (e.g. polyphenols), biofuels, and/or intermediates (furfural, levulinates) through chemical and biochemical processes. The book also covers the production of natural polymers using biomass and the biosynthetic process, cellulose modified by biochemical and chemical methods, and other biochemicals that can be used in the synthesis of various pharmaceuticals. Featuring case studies, discussions of sustainability, and nanomedical, biomedical, and pharmaceutical applications, Biomass as Renewable Raw Material to Obtain Bioproducts of High-tech Value is a crucial resource for biotechnologists, biochemical engineers, biochemists, microbiologists, and research students in these areas, as well as entrepreneurs, policy makers, stakeholders, and politicians. Reviews biomass resources and compounds with bioactive properties Describes chemical and biochemical processes for creating biofuels from biomass Outlines production of polysaccharides and cellulose derivatives Features applications in the fields of medicine and pharmacy 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.

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