Chemicals From Biomass Springer

Carbon Dioxide Capture and Conversion: Advanced Materials and Processes provides fundamental principles, updated knowledge and recent developments of various advanced processes for CO2 mitigation and transformation. This comprehensive overview of CO2 capture and conversion covers nanoporous materials, biomaterials, innovative solvents, advanced membrane technology, nanocatalyst synthesis and design, cutting-edge characterization techniques, and intrinsic mechanisms and kinetics. In addition to techno-economical evaluation and lifecycle assessment for CO2 capture and conversion processes, the future perspectives, opportunities and current challenges regarding these processes in terms of industrial applications are systematically provided in this book. Offers fundamental understanding and industrial applications of CO2 capture and conversion technology Covers all aspects of recent developments in nanomaterials and advanced processes implemented for CO2 capture and conversions Contains state-of-the-art CO2 capture and conversion technology written by leading international experts in the field Provides a valuable and updated reference for academic and industrial researchers, postgraduates, scientists and engineers Offers advanced techniques of nanomaterial synthesis, characterization, evaluation and industrial implementation in a wide range of CO2

This book addresses the highly relevant subject of emerging pollutants, which are especially alarming since most of the available treatment technologies are unable to degrade them. It discusses the sources of these pollutants and their fate in the environment, and the main tools available for their analysis. It also describes the representative environmental matrices (air, soil and water) and appropriate analytical methods for each matrix. Furthermore, it examines aspects of toxicology, chemometrics, sample preparation and green analytical chemistry. As such, it provides a broad overview of the potential analytical approaches for monitoring and controlling emerging pollutants. This book fills a gap in the literature, and is a valuable resource for all professionals concerned with emerging pollutant control in real-world situations.

Nanostructured Photocatalysts: From Fundamental to Practical Applications offers a good opportunity for academic, industrial researchers and engineers to gain insights on the fundamental principles and updated knowledge on the engineering aspects and various practical applications of photocatalysis. This book comprehensively and systematically reviews photocatalytic fundamental aspects, ranging from reaction mechanism, kinetic modeling, nanocatalyst synthesis and design, essential material characterization using advanced techniques, and novel reactor design and scale-up. Future perspectives, techno-economical evaluation and lifecycle assessment of photocatalytic processes are also provided. Finally, a wide range of practical, important and emerging photocatalytic

applications, namely wastewater treatment, air pollution remediation, renewable and green energy generation, and vital chemical production are thoroughly covered, making this book useful and beneficial for engineers, scientists, academic researchers, undergraduates and postgraduates. Provides a fundamental understanding of photocatalysis Covers all aspects of recent developments in photocatalytic processes and photocatalytic materials Focuses on advanced photocatalytic applications and future research advancements on energy, environment, biomedical, and other specialty fields Contains contributions from leading international experts in photocatalysis Presents a valuable reference for academic and industrial researchers, scientists and engineers

The book describes the valorization of biomass-derived compounds over gold catalysts. Since biomass is a rich renewable feedstock for diverse platform molecules, including those currently derived from petroleum, the interest in various transformation routes has become intense. Catalytic conversion of biomass is one of the main approaches to improving the economic viability of biorefineries. In addition, Gold catalysts were found to have outstanding activity and selectivity in many key reactions. This book collects information about transformations of the most promising and important compounds derived from cellulose, hemicelluloses, and woody biomass extractives. Since gold catalysts possess high stability under oxidative conditions, selective oxidation reactions were discussed more thoroughly than other critical reactions such as partial hydrogenation,

acetalization, and isomerization. The influence of reaction conditions, the role of the catalyst, and the advantages and disadvantages of using gold are presented for all of the reactions mentioned above. This book provides an overview of the recent research results focusing on application of gold catalysts for synthesis of valuable chemicals using renewable feedstocks.

This book offers a comprehensive review on biomass resources, examples of biorefineries and corresponding products. The first part of this book covers topics such as different biorefinery resources from agriculture, wood processing residues and transport logistics of plant biomass. In the second part, expert contributors present biorefinery concepts of different biomass feedstocks, including vegetable-oils, sugarcane, starch, lignocellulose and microalgae. Readers will find here a summary of the syngas utilization and the bio-oil characterization and potential use as an alternative renewable fuel and source for chemical feedstocks. Particular attention is also given to the anaerobic digestion-based and Organosolv biorefineries. The last part of the book examines relevant products and components such as alcohols, hydrocarbons, bioplastics and lignin, and offers a sustainability evaluation of biorefineries.

This edited book provides knowledge about hemicelluloses biorefinery approaching production life cycle, circular economy, and valorization by obtaining value-added bioproducts and bioenergy. A special focus is dedicated to chemical and biochemical compounds produced from the hemicelluloses derivatives platform.

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

biomass and waste conversion, valorization, and chemical products from hemicelluloses

This book investigates the main vegetable biomass types, their chemical characteristics and their potential to replace oil as raw material for the chemical industry, according to the principles of green chemistry. Authors from different scientific and technical backgrounds, from industry and academia, give an overview of the state of the art and ongoing developments. Aspects including bioeconomy, biorefineries, renewable chemistry and sustainability are also considered, given their relevance in this context. Furthermore, the book reviews green chemistry principles and their relation to biomass, while also exploring the main processes for converting biomass into bioproducts. The need to develop renewable feedstock for the chemical industry to replace oil has been identified as a major strategic challenge for the 21st century. In this context, the use of different types of vegetable biomass – starch, lignocellulosic, oleaginous, saccharide and algae – can be seen as a viable alternative to the use of non-renewable, more expensive raw materials. Furthermore, it offers a model for adding economic value to the agro industrial chains such as soybean, sugarcane, corn and forests, among others. This will in turn contribute to the sustainability of a wide range of chemicals, mainly organics and their transformation processes, which are widely used by modern society.

Volume I mainly focuses on the current understanding of the reaction pathways and mechanisms involved in several important catalytic conversions of cellulose and

carbohydrates. It starts with nanoscale illustrations of biomass structures and describes various reactions including cellulose depolymerization to sugars, catalytic aldose-ketose isomerization and dehydration, selective oxidation, hydrogenolysis of cellulose and sugars, and the conversion of short carbohydrates. The specificity and function of different catalysts and reaction media in relation to the catalytic performances for these reactions are discussed with significant mechanistic details. Marcel Schlaf, PhD, is a Professor at the Department of Chemistry, University of Guelph, Canada. Z. Conrad Zhang, PhD, is a Professor at the Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China.

This book considers the pollutants formed by the combustion of solid biomass fuels. The availability and potential use of solid biofuels is first discussed because this is the key to the development of biomass as a source of energy. This is followed by details of the methods used for characterisation of biomass and their classification. The various steps in the combustion mechanisms are given together with a compilation of the kinetic data. The chemical mechanisms for the formation of the pollutants: NOx, smoke and unburned hydrocarbons, SOx, Cl compounds, and particulate metal aerosols are given in detail. Combustion kinetics required for the application for design purposes are given. Examples are given of emission levels of a range different types of combustion equipment. Data is given of

NOx, particulates and other pollutant arising from combustion of different fuels in fixed bed combustion, fluidized bed combustion and pulverised biomass combustion and co-firing. Modeling methods including computational fluid dynamics for the various pollutants are outlined. The consequential issues arising from the wide scale use of biomass and future trends are then discussed. In particular the role of carbon capture and storage in large biomass combustion plants is considered as well as the opportunity of reducing the concentration of atmospheric concentration of carbon dioxide.

Methanol - The Chemical and Energy Feedstock of the Future offers a visionary yet unbiased view of methanol technology. Based on the groundbreaking 1986 publication "Methanol" by Friedrich Asinger, this book includes contributions by more than 40 experts from industry and academia. The authors and editors provide a comprehensive exposition of methanol chemistry and technology which is useful for a wide variety of scientists working in chemistry and energy related industries as well as academic researchers and even decision-makers and organisations concerned with the future of chemical and energy feedstocks.

Environmental sustainability and development is of critical importance. Technological advances in the production of new energy sources are making their way into our lives in more and more depth every day.

However, there is an urgent need to address the technological challenges and advancement of the various chemical and bio-processes to maintain the dynamic sustainability of our energy needs. Toward that end, an attempt is being made to look at recent advances, key issues still faced and where possible, offer suggestions on alternative technologies to optimize sustainable processes. Still considered a new area of science, energy sources themselves are still being 'discovered'...meaning, what is financially viable in the current marketplace is changing. For example, energy from plants has not been financially viable in the past because of the high cost of growing, harvesting, breaking down cell walls, disposal of waste products, etc. Materials used to derive energy from sustainable resources is changing, making previously high-cost processes more efficient. It is crucial that the industry as a while works in tandem to develop crops that new technological advances make financially feasible. This book will cover recent advances in the chemicals, bioprocesses and other materials used in growing and extracting energy from sustainable products. Membrane/cell wall digestion issues will also be covered as well as recovering mamixal amounts of energy from sources to limit waste. Finally a section on safety and control will be presented with has been poorly covered in other publications. ?

The consumption of petroleum has surged during the 20th century, at least partially because of the rise of the automobile industry. Today, fossil fuels such as coal, oil, and natural gas provide more than three quarters of the world's energy. Unfortunately, the growing demand for fossil fuel resources comes at a time of diminishing reserves of these nonrenewable resources. The worldwide reserves of oil are sufficient to supply energy and chemicals for only about another 40 years, causing widening concerns about rising oil prices. The use of biomass to produce energy is only one form of renewable energy that can be utilized to reduce the impact of energy production and use on the global environment. Biomass can be converted into three main products such as energy, biofuels and fine chemicals using a number of different processes. Today, it is a great challenge for researchers to find new environmentally benign methodology for biomass conversion, which are industrially profitable as well. This book focuses on the conversion of biomass to biofuels, bioenergy and fine chemicals with the interface of biotechnology, microbiology, chemistry and materials science. An international scientific authorship summarizes the state-of-the-art of the current research and gives an outlook on future developments.

There have been many developments in the science and technology of thermo chemical biomass

conversion since the previous conference on Advances in Thermochemical Biomass Conversion in Interlaken, Switzerland, in 1992. This fourth conference again covers all aspects of thermal biomass conversion systems from fundamental research through applied research and development to demon stration and commercial applications to reflect the progress made in the last four years. All aspects of bioenergy systems are covered from pretreatment through to end-user applications with increased consideration paid to the environmental benefits and problems of implementing bio-energy systems. There was an excellent response with over 200 papers offered and over 180 delegates from 29 countries attending the conference. The programme was divided into five main areas covering pyrolysis, pretreatment, gasification, combustion and system studies and this division is reflected in the structure of these conference proceedings. Each main section was preceded by a state-of-the-art review to provide a focus for the ensuing presentations and an authoritative reference. All the papers included have been subject to a full peer review process. As with any international conference, an important aim was to exchange ideas and discuss problems with fellow researchers, as well as to hear about the latest research and development and applications. A workshop programme was included to encourage this interaction in areas of interest selected by

participants. The resul tant workshop reports provide a summary of topical problems and opportunities. Biomass, Biofuels, Biochemicals: Lignin Biorefinery discusses the scientific and technical information relating to the structure and physico-chemical characteristics of lignin. The book covers the different processes (biological, thermal and catalytic routes) available for lignin conversion into specialty chemicals or fuels, activity relationships, and how optimized process parameters help establish the feasible size of the commercial plant in a centralized or decentralized model. In addition, the advantages and limitations of different technologies are discussed, considering local energy, chemicals, biopolymers, drug intermediates, activated carbons, and much more. Includes information on the most advanced and innovative processes for lignin conversion Covers information on biochemical and thermo-chemical processes for lignin valorization Provides information on lignin chemistry and its conversion into high value chemicals and fuels Presents a book designed as a text book, not merely a collection of research articles

As academia and industry are now striving to substitute fossil-based chemicals with alternative renewable resources, second-generation lignocellulosic biomass which does not depend on the food cycle has become increasingly important. Lignocellulosic biomass is composed of three major

polymeric components - lignin, cellulose and hemicellulose. The polymers can be degraded into monomeric counterparts through selective conversion routes like hydrolysis of cellulose to glucose and of hemicellulose to xylose. Biochemicals and Materials Production from Sustainable Biomass Resources provides a detailed overview of the experimentally developed approaches and strategies that facilitate carbon-based materials and fine chemicals derivation from biomass feedstocks with robust catalyst systems and renewed conversion routes. It also highlights theoretical methods like techno-economic analysis of biobutanol synthesis. Includes the recent development of biomass-derived high-value chemicals and functional materials Describes theoretical and technical details of specific conversion routes and preparation methods Covers jointly organic transformations, catalytic synthesis, reaction mechanisms, thermal stability, reaction parameters and solvent effects

Production of Biofuels and Chemicals with PyrolysisSpringer

This substantially revised and updated classic reference offers a valuable overview and myriad details on current chemical processes, products, and practices. No other source offers as much data on the chemistry, engineering, economics, and infrastructure of the industry. The two volume Handbook serves a spectrum

of individuals, from those who are directly involved in the chemical industry to others in related industries and activities. Industrial processes and products can be much enhanced through observing the tenets and applying the methodologies found in the book's new chapters.

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 ultrasound and microwave 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 Ultrasound" and "Production of Biofuels and Chemicals with Microwave" 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 "Ultrasound" provides current research advances and prospects in mechanistic principles of acoustic cavitation in sonochemistry, physical and chemical mechanisms in biofuel synthesis, reactor design for transesterification and esterification reactions, lipid extraction from algal biomass, microalgae extraction, biodiesel and bioethanol synthesis, practical technologies and systems, pretreatment of biomass waste sources including lignocellulosic materials, manures and sludges for biogas production, vibration-assisted pelleting, combined chemical-mechanical

methods, valorization of starch-based wastes and techno-economic methodology. 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 “Ultrasound” and “Microwave” 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.

The application of ionic liquids to biomass for producing biofuels and chemicals will be one of the hot research areas during the next decade due to the fascinating properties of these versatile group of solvents that allow them to dissolve lignocellulosic materials. The present text provides up-to-date fundamentals, state-of-the-art reviews, current assessments and prospects in this area, including aspects of pretreatment, fermentation, biomass dissolution, cellulose transformation, reaction kinetics and physical properties, as well as the subsequent production of biofuels and platform chemicals such as

sugars, aldehydes and acids. Auxiliary methods such as catalysis, microwave and enzymatic techniques used in the transformations are covered. Both researchers and practitioners are certain to find a wealth of information in the individual chapters, which were written by experts in the field to provide an essential basis for assessing possible pretreatment and transformation routes of biomass using ionic liquids, and for developing new methods and chemical processes. Dr. Zhen Fang is Professor of Bioenergy, head of the Chinese Academy of Sciences' Biomass Group, Xishuangbanna Tropical Botanical Garden and is also an Adjunct Professor of Life Sciences, University of Science and Technology of China. Dr. Richard L Smith, Jr. is Professor of Chemical Engineering at the Graduate School of Environmental Studies, Research Center of Supercritical Fluid Technology, Tohoku University, Japan. Dr. Xinhua Qi is Professor of Environmental Science at Nankai University, China.

The gradual increase of population and the consequential rise in the energy demands in the recent years have led to the overwhelming use of fossil fuels. Hydrogen has recently gained substantial interest because of its outstanding features to be used as clean energy carrier and energy vector. Moreover, hydrogen appears to be an effective alternative to tackle the issues of energy security and greenhouse gas emissions given that it is widely recognized as a clean fuel with high energy capacity. Hydrogen can be produced by various techniques such as thermochemical, hydrothermal, electrochemical, electrolytic, biological and photocatalytic

methods as well as hybrid systems. New Dimensions in Production and Utilization of Hydrogen emphasizes on the research, development and innovations in the production and utilization of hydrogen in the industrial biorefining, hydrotreating and hydrogenation technologies, fuel cells, aerospace sector, pharmaceuticals, metallurgy, as well as bio-oil upgrading. Moreover, the supply chain analysis, lifecycle assessment, techno-economic analysis, as well as strengths and threats of global hydrogen market are covered in the book. This book provides many significant insights and scientific findings of key technologies for hydrogen production, storage and emerging applications. The book serves as a reference material for chemical and biochemical engineers, mechanical engineers, physicists, chemists, biologists, biomedical scientists and scholars working in the field of sustainable energy and materials. Discusses the efficient usage of hydrogen as standalone fuel or feedstock in downstream processing Outlines key technologies for hydrogen production and their emerging applications Includes innovative approaches to the research and applications of hydrogen, including hydrotreating technologies, fuel cell vehicles and green fuel synthesis, the aerospace sector, pharmaceuticals, carbon dioxide hydrogenation, and bio-oils upgrading Serves as a reference for chemical, biochemical, and mechanical engineers, physicists, chemists, biologists, and biomedical scientists working in sustainable energy and materials

Lignocellulosic biomass is composed of three major polymeric components: lignin, cellulose and

hemicellulose. These polymers can be converted into monomer compounds through selective hydrolysis like, for example, cellulose to glucose and hemicellulose to xylose. Recent Advances in Development of Platform Chemicals provides a detailed overview on the experimentally developed methods that facilitate platform chemicals derivation from biomass-based substrates with robust catalyst systems. The book also highlights the green chemistry approach towards platform chemical production. Initially, the book provides an introduction to platform chemicals and global market volumes of platform chemicals are discussed against their current applications. The book further covers optimization of process schemes and reaction parameters with respect to achieving a high yield of targeted platform chemicals, such as sugars and furonic compounds, by modifying the respective catalytic system. The book also covers the influence of solvent on the reaction selectivity and product distribution as well as long-term stability of the employed catalysts. Overall, the objectives of the book are to provide the reader with: The understanding of the societal importance of platform chemicals The assessing of the techno-economic viability of biomass valorization processes The catalyst design for a specific reaction The design of a catalytic system Covers recent developments on platform chemicals Provides comprehensive technological developments on specific platform chemicals Covers organic transformations, catalytic synthesis, thermal stability, reaction parameters and solvent effect Includes Case Studies for the production of a number of chemicals such as Levulinic acid, Glycerol,

Phenol derivatives, etc

This book reviews efforts to produce chemicals and fuels from forest and plant products, agricultural residues and more. Algae can potentially capture solar energy and atmospheric CO2; the book details needed research and legislative initiatives.

This book focuses on the properties of deep eutectic solvents (DESs) and recent advances in their application in lignocellulosic biomass processing. Lignocellulosic biomass conversion to biofuels, biochemicals and other value-added products has attracted global attention because it is a readily available, inexpensive and renewable resource. However, in order for biomass technologies to be commercially viable, biomass recalcitrance needs to be cost-effectively reduced. Deep eutectic solvents (DESs) are new ‘green' solvents that have the high potential for biomass processing thanks to their low cost, low toxicity, biodegradability, and easy recycling and reuse. After an overview of the current lignocellulosic biomass pretreatment, the book discusses the synthesis and physiochemical properties of DESs, as well as key findings on the effects of DES on cellulose, hemicellulose and lignin solubilization, biomass pretreatment and biomass crystallinity. It then addresses the enzymatic hydrolysis performance of DES-pretreated solids, compatibility of DESs with enzymes and microorganisms, and the recycling potential of DESs. Lastly, it compares DESs with ionic liquids, and examines the challenges and opportunities relating to extending the use of DESs in lignocellulosic processing.

This book covers biomass modification to facilitate the

industrial degradation processing and other characteristics of feedstocks and new technologies for the conversion of lignocelluloses into biofuels and other products.

This up-to-date overview on the conversion of thermochemical biomass to fuels and chemicals is written by experts in the field.

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.

The increasing global demand for energy requires a versatile approach, prompting many researchers to focus on renewable bioenergy from different biomasses, especially cellulosic biomass. Such

biomasses can be agricultural wastes, municipal wastes or direct harvests from high-yield energy corps. If properly pre-treated, the subsequent enzyme hydrolysis step is much more effective and can effectively minimises the waste disposal. Green Biomass Pretreatment for Biofuels Production reviews a range of pretreatment methods such as ammonium fiber explosion, steam explosion, dilute acid hydrolysis, alkali hydrolysis, and supercritical carbon dioxide explosion focusing on their final sugar yields from hemicellulose, glucose yields from cellulose, as well as on their feasibilities in bioenergy production processes at various scales. This book emphasises the tactical mobile and on-farm scales applications that use green pretreatments and processing technologies without the need of on-site waste treatment. Because of the varieties of different biomasses, no single pretreatment is expected to be the universal choice. Some of the pretreatment methods present niche applications are also discussed.

This book provides an account of the state-of-the-art in thermochemical biomass conversion and arises from the third conference in a series sponsored by the International Energy Agency's Bioenergy Agreement. Fundamental and applied research topics are included, reflecting recent advances as well as demonstration and commercial innovation.

This book discusses the production of bioethanol

from water hyacinth, a potential source of lignocellulosic biomass. Biofuels, as an alternative to fossil fuels, not only ensure energy security but also mitigate air pollution and reduce greenhouse emissions. Biofuels can be produced from sugar- and starch-rich food crops (first-generation biofuel) or lignocellulosic biomass (second-generation biofuel). However, the overexploitation of conventional lignocellulosic sources such as agro-industrial residues, dedicated herbaceous, hardwoods and softwoods and forest residues may lead to problems in terms of land management and biodiversity conservation. Non-conventional sources include industrial cellulosic waste, municipal solid waste and weeds. Of these, weeds are an attractive lignocellulosic source due to their prevalence and easy availability. Eichhornia crassipes, commonly known as water hyacinth, is one of the world's most invasive weeds due to its rapid proliferation rate, efficient survival strategies in extreme conditions, and it has a significant impact on the environment, ecological communities, human health and socioeconomic development. Strategies including physical removal, chemical methods and biological control agents have proven inefficient in completely eradicating Eichhornia crassipes. On the other hand, water hyacinth has a low lignin and high holocellulose content and is a rich source of lignocellulosic biomass, and has therefore been

exploited as a raw material for the production of biofuel, biogas, animal and fish feed, compost and other valuable products. Further, being an aquatic plant, it does not compete with food crops for land resources. The bioethanol-generating capacity of water hyacinth is comparable to that of agricultural waste, making it a potential raw material for biofuel production.

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?The series Topics in Current Chemistry Collections presents critical reviews from the journal Topics in Current Chemistry organized in topical volumes. The scope of coverage is all areas of chemical science including the interfaces with related disciplines such as biology, medicine and materials science. The goal of each thematic volume is to give the non-specialist reader, whether in academia or industry, a comprehensive insight into an area where new research is emerging which is of interest to a larger scientific audience. Each review within the volume critically surveys one aspect of that topic and places it within the context of the volume as a whole. The most significant developments of the last 5 to 10 years are presented using selected examples to illustrate the principles discussed. The coverage is not intended to be an exhaustive summary of the field or include large quantities of data, but should rather be conceptual, concentrating on the

methodological thinking that will allow the non-specialist reader to understand the information presented. Contributions also offer an outlook on potential future developments in the field. Chapters "Sonocatalysis: A Potential Sustainable Pathway for the Valorization of Lignocellulosic Biomass and Derivatives," "Valorisation of Biowastes for the Production of Green Materials Using Chemical Methods" and "Green and Sustainable Separation of Natural Products from Agro-Industrial Waste: Challenges, Potentialities, and Perspectives on Emerging Approaches" are available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.

This book provides an indispensable reference guide to the sustainable control and treatment of biomass residues from a wide variety of agroindustrial sources, e.g. sugarcane, livestock, pulp & paper, food wastes, among others. Pursuing a structured and clear approach, the book opens with a general introduction to biomass, sustainability and environmental chemistry aspects, and on how the use of biomass as a renewable material ties into the UN’s Sustainable Development Goals. The book subsequently presents analytical methods applied to different biomass types and their residues and reviews monitoring and treatment strategies in order to avoid pollution of the same. The book closes by describing the value chains, bioeconomy and circular

economy for globally relevant agroindustrial biomass. The book is intended for researchers in academia and industry alike and shows how, in addition to sustainability criteria and life cycle assessments, integrating environmental chemistry aspects can contribute to a holistic approach, and unlock the economic potential of biomass in the age of circular economy and sustainable development. The topic of this thesis is catalytic conversion of non-food, abundant, and renewable biomass such as cellulose and chitin to chemicals. In biorefinery, chemical transformation of polymers to valuable compounds has attracted worldwide interest for building sustainable societies. First, the current situation of this hot research area has been summarized well in the general introduction of the thesis, which helps readers to become familiar with this topic. Next, the author explains high-yielding production of glucose from cellulose by using an alkali-activated carbon as a catalyst, resulting in a yield of glucose as high as 88%, which is one of the highest yields ever reported. The characterization of carbon materials has indicated that weak acid sites on the catalyst promote the reaction, which is markedly different from reported catalytic systems that require strong acids. In addition, the first catalytic transformation of chitin with retention of N-acetyl groups has been developed. The combination of mechanocatalytic hydrolysis and thermal

solvolysis enables the production of N-acetylated monomers in good yields of up to 70%. The catalytic systems demonstrated in this thesis are unique in the fields of both chemistry and chemical engineering, and their high efficiencies can contribute to green and sustainable chemistry in the future. Meanwhile, mechanistic studies based on characterization, thermodynamics, kinetics, and model reactions have also been performed to reveal the roles of catalysts during the reactions. The results will be helpful for readers to design and develop new catalysts and reaction systems.

This book introduces readers to the use of formic acid for efficient organic synthesis. It describes the N-methylation of aromatic and aliphatic amines with formic acid using a boron-based catalyst [B(C6F5)3] in combination with silanes and without the need for an expensive transition metal catalyst. It also shows that formic acid interacts with alkynes and allyl alcohols through a carbonylation process that generates carbon monoxide in situ from nickel and palladium catalysis, respectively, doing away with the need to use high-pressure CO gas and offering a user-friendly and practical method for preparing functionalized ?, ?- and ?, ?-unsaturated carboxylic acids. The findings presented not only enrich the field of ‘C1 chemistry,’ but also support the advancement of green and sustainable chemistry.

Throughout the world many projects have been

underway to investigate the conversion of renewable biomass into energy and synthetic fuels by thermo chemical methods such as combustion, pyrolysis, gasification and lique faction. While many of these represent prior art used during the early 20th century, the recent decade since the 1970s oil shock has immeasurably increased the knowledge base for such processes. Much of the new knowledge has been gained by persons who were not trained in classical wood chemistry and there have not yet been many attempts to synthesize the knowledge into a corpus of systematic information. To bring this about the International Energy Agency's Forestry Energy collaboration, the Gas Research Institute, the National Research Council of Canada and the US Department of Energy jointly sponsored a conference on the Fundamentals of Thermochemical Biomass Conversion in Estes Park, Colorado which was held on October 18-22, 1982. The Conference, which was structured around invited plenary papers and contributions from researchers, served as the basis for the papers in this volume which reflect the substantial conclusions of the Conference. During the planning for the Conference, it was realized by the editors in their capacity as Co-chairmen that a major problem in biomass research was the lack of reproducibility between reported experiments and their inter comparison on account of the heterogeneity of biomass materials. A well known

wood chemist, George M.

This book discusses the biorefinery of biomass feedstocks. In-depth chapters highlight the scientific and technical aspects and present a techno-economic analysis of such systems. By using a TEA approach, the authors present feasible pathways for conversion of biomass (both residual biomass, energy crops and algae biomass), showing the different possibilities for the production of biochemical materials, biofuels, and fertilizers. The concepts presented in this book will link companies, investors, and governments by providing a framework that will help reduce pollutants and create a biomass related economy that incorporates the newest developments and technologies in the area. The book describes the pretreatment of lignocellulosic biomass for biomass-to-biofuel conversion processes, which is an important step in increasing ethanol production for biofuels. It also highlights the main challenges and suggests possible ways to make these technologies feasible for the biofuel industry. The biological conversion of cellulosic biomass into bioethanol is based on the chemical and biological breakdown of biomass into aqueous sugars, for example using hydrolytic enzymes. The fermentable sugars can then be further processed into ethanol or other advanced biofuels. Pretreatment is required to break down the lignin structure and disrupt the crystalline structure of

cellulose so that the acids or enzymes can easily access and hydrolyze the cellulose. Pre-treatment can be the most expensive process in converting biomass to fuel, but there is great potential for improving the efficiency and lowering costs through further research and development. This book is aimed at academics and industrial practitioners who are interested in the higher production of ethanol for biofuels.

Chemical Issues in Biomass Burning in Sub-Saharan Africa explores all the aspects relevant to biomass burning in Sub-SaharanAfrica, with special focus on chemistry aspects. Biomass burning implies emission of combustion products into the air(including greenhouse gases) and the waste/loss of biomass that could beutilized as valuable material resource. The extent of biomass burning in Sub-Saharan Africa, and the complexity of the aspects involved, constitutes animportant motivation to view it as a problem deserving priorityChemical Issues in Biomass Burning in Sub-Saharan Africa is aimed at undergraduates, graduates, and policy makers working in Chemistry, Environmental Science, and Science Education.

Innovations in Thermochemical Technologies for Biofuel Processing broadly covers current technologies in alternate fuels and chemical production, a few of which include biomass-to-liquid, biomass-to-gas and gas-to-liquid biomass

conversion technologies. The topics in this book include elaborative discussions on biomass feedstocks, biomass-to-liquid technologies (liquefaction, pyrolysis and transesterification), biomass-to-gas technologies (gasification), gas-to-liquid technologies (syngas fermentation and Fischer-Tropsch synthesis), co-processing technologies, fuel upgrading technologies (hydrotreating and reforming), novel catalyst development for biorefining, biorefining process optimization, unit operations, reaction kinetics, artificial neural network, and much more. The book comprehensively discusses the strengths, weaknesses, opportunities and threats of notable biofuels (e.g., bio-oil, biocrude oil, biodiesel, bioethanol, biobutanol, bio-jet fuels, biohydrogen, biomethane, synthesis gas, hydrocarbon fuels, etc.). Addresses solutions for clean fuel, energy security, waste management, waste valorization, reduced greenhouse gas emissions, carbon capture and sequestration, circular economy and climate change mitigation Includes applications of thermochemical conversion and reforming technologies for waste biomass to biofuels Covers current technologies in alternate fuels and chemicals production, a few of which include conversion technologies (i.e., liquefaction, gasification, pyrolysis, torrefaction, transesterification, organic transformation, carbon-carbon and carbon-heteroatom coupling reactions,

oxidation, and reforming processes, etc.), hydrotreating technologies (i.e., hydrogenation, hydrodesulfurization, hydrodenitrogenation, hydrodearomatization and hydrodemetalization) and catalytic processes.

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