Combined cycle power plants are one of the most promising ways of improving fossil-fuel and biomass energy production. The combination of a gas and steam turbine working in tandem to produce power makes this type of plant highly efficient and allows for CO2 capture and sequestration before combustion. This book provides a comprehensive review of the design, engineering and operational issues of a range of advanced combined cycle plants. After introductory chapters on basic combined cycle power plant and advanced gas turbine design, the book reviews the main types of combined cycle system. Chapters discuss the technology, efficiency and emissions performance of natural gas-fired combined cycle (NGCC) and integrated gasification combined cycle (IGCC) as well as novel humid air cycle, oxy-combustion turbine cycle systems. The book also reviews pressured fluidized bed combustion (PFBC), externally fired combined cycle (ECC), hybrid fuel cell turbine (FC/GT), combined cycle and integrated solar combined cycle (ISCC) systems. The final chapter reviews techno-economic analysis of combined cycle systems. With its distinguished editor and international team of contributors, Combined cycle systems for near-zero emission power generation is a standard reference for both industry practitioners and academic researchers seeking to improve the efficiency and environmental impact of power plants. Provides a comprehensive review of the design, engineering and operational issues of a range of advanced combined cycle plants introduces basic combined cycle power plant and advanced gas turbine design and reviews the main types of combined cycle systems Discusses the technology, efficiency and emissions performance of natural gas-fired combined cycle (NGCC) systems and integrated gasification combined cycle (IGCC) systems, as well as novel humid air cycle systems and oxy-combustion turbine cycle systems

This volume provides an overview of recent trends in bioremediation techniques. Gathering contributions by a multi-disciplinary team of authors, it reviews the available methodologies for the remediation of various types of waste, e.g. e-waste, wastewater, municipal solid waste and algal blooms. Bioprocessing techniques are not only used for environmental cleanup but also for the production of valuable added products from waste biomass. Accordingly, this book provides the reader with an update on current valorization techniques for biofuels, algal biorefineries, and the hydrothermal conversion of biomass. Given its interdisciplinary scope, the book offers a valuable asset for students, researchers and engineers working in biotechnology, environmental engineering, wastewater management, chemical engineering and related areas.

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Read Book Hydrothermal Conversion Of Lipid Extracted Microalgae

important and timely look into this rapidly expanding field. The 40 chapters that comprise Advanced Biofuels and Bioproducts are handily organized into the following 8 sections: · Introduction and Brazil’s biofuel success · Smokeless biomass pyrolysis for advanced biofuels production and global biochar carbon sequestration · Cellulosic Biofuels · Photobiological production of advanced biofuels with synthetic biology · Lipids-based biodiesels · Life-cycle energy and economics analysis · High-value algal products and biomethane · Electrofuels

With the high interest in renewable resources, the field of algal biotechnology has undergone a huge leap in importance. This book treats the biological fundamentals of microalgal biotechnology in physiology and molecular biology. It provides an overview of applications and products as well as a survey of the state-of-the-art in process engineering of algae cultivation. So this book will be of interest to active people in the area of sustainable production of high value products or mass production of food and fuel for the future.

Direct Thermochemical Liquefaction for Energy Applications presents the state-of-the-art of the value chains associated with these biomass conversion technologies. It covers multiple feedstock availability and feedstock composition impact on process chemistry and product quality and composition. Expert authors from around the world explore co-processing benefits, process parameters, implementation and scaling, upgrading to drop-in liquid biofuels or integration into existing petrochemical refinery infrastructure. Finally, these topics are put into a sustainability perspective by establishing an LCA framework for this type of process. Its focus on implementation based on the most comprehensive knowledge makes this book particularly useful for researchers and graduate students from all sorts of background working in the field of biomass and biofuels. It is also a valuable reference for engineers working to commercialize DTL technologies, engineering specialists designing process equipment, refinery professionals and developers. Focuses on implementation and scaling of direct thermochemical liquefaction technologies for biomass conversion into biofuels Covers the state-of-the-art of the technologies, as well as technical and sustainability implementation aspects Includes new approaches and concepts developed around the world within the different DTL technologies

This book addresses a key innovative technology for decarbonization of the energy system: hydrothermal processing. It basically consists of treating biomass and wastes in a wet form, under pressure and temperature condition. This approach is becoming more and more attractive, as new feedstock and applications are appearing on the scene of bioeconomy and bioenergy. The hydrothermal processing of various type of biomass, waste, and residues, thus, raised the interest of many researchers and companies around the world, together with downstream upgrading processes and technologies: solid products as biochar, for instance, or liquid ones as crude bioliquids, are finding new market opportunities in circular economy schemes. The Special Issue collects recent innovative research works in the field, from basic to applied research, as well as pilot industrial applications/demo. It is a valuable set of references for those investing time and effort in research in the field.

This book addresses key innovative technology for decarbonization of the energy system: hydrothermal processing. It basically consists of treating biomass and wastes in a wet form, under pressure and temperature condition. This approach is becoming more and more attractive, as new feedstock and applications are appearing on the scene of bioeconomy and bioenergy. The hydrothermal processing of various type of biomass, waste, and residues, thus, raised the interest of many researchers and companies around the world, together with downstream upgrading processes and technologies: solid products as biochar, for instance, or liquid ones as crude bioliquids, are finding new market opportunities in circular economy schemes. The Special Issue collects recent innovative research works in the field, from basic to applied research, as well as pilot industrial applications/demo. It is a valuable set of references for those investing time and effort in research in the field.

This book is the outcome of contributions by many experts in the field from different disciplines, various backgrounds, and diverse expertise. This book provides information on biomass volume calculation methods and biomass valorization for energy production. The chapters presented in this book include original research and review articles. I hope the research presented in this book will help to advance the use of biomass for bioenergy production and valorization. The key features of the book are: Providing information on biomass volume estimation using direct, nondestructive and remote sensing methods Biomass valorization for energy using thermochemical (gasification and pyrolysis) and biochemical (fermentation) conversion processes.

Advances in Feedstock Conversion Technologies for Alternative Fuels and Bioproducts: New Technologies, Challenges and Opportunities highlights the novel applications of, and new methodologies for, the advancement of biological, biochemical, thermochemical and chemical conversion systems that are required for biofuels production. The book addresses the environmental impact of value added bio-products and agricultural modernization, along with the risk assessment of industrial scaling. The book also stresses the urgency in finding creative, efficient and sustainable solutions for environmentally conscious biofuels, while underlining pertinent technical, environmental, economic, regulatory and social issues. Users will find a basis for technology assessments, current research capability, progress, and advances, as well as the challenges associated with biofuels at an industrial scale, with insights towards forthcoming developments in the industry. Presents a thorough overview of new discoveries in biofuels research and the inherent challenges associated with scale-up Highlights the novel applications and advancements for biological, biochemical, thermochemical and chemical conversion systems that are required for biofuels production Evaluates risk
management concerns, addressing the environmental impact of value added bio-products and agricultural modernization, and the risk assessment of industrial scaling.

This book reviews the recent advances in hydrothermal conversion of biomass into chemicals and fuels, and consists of 15 chapters. It introduces the properties of high-temperature water, the merits of hydrothermal conversion of biomass, and some novel hydrothermal conversion processes, mainly including hydrothermal production of value-added products, hydrothermal gasification, hydrothermal liquefaction and hydrothermal carbonization. This book introduces a new concept for counteracting the imbalance in the carbon cycle, which is caused by the rapid consumption of fossil fuels in anthropogenic activities in combination with the slow formation of fossil fuels. Accordingly, the book is useful in conveying a fundamental understanding of hydrothermal conversion of biomass in the carbon cycle so that a contribution can be made to achieving sustainable energy and environment. It is also interesting to a wide readership in various fields including chemical, geologic and environmental science and engineering. Fangming Jin is a Distinguished Professor at the School of Environmental Science & Engineering, Shanghai Jiao Tong University, China.

Algae biomass has enormous potential to produce fuels and value-added products. Algae-derived biofuels and bioproducts offer great promise in contributing to U.S. energy security and in mitigating the environmental concerns associated with conventional fuels. A algae’s ability to grow in low quality water/wastewater and to accumulate lipids has encouraged scientists to investigate algae as a medium for wastewater treatment and a potential source of fuel and bioproducts. There are growing demands for biomass-based transportation fuels, including biodiesel, bio-oil, biomethane, biohydrogen, and other high-value products (nutraceuticals, proteins, omega-3 etc.). A algae can help address these needs. The topic of algae energy includes the production and characterization of algae cultures, conversion into fuel feedstocks and high value products, and optimization of product isolation and use. In view of the increasing efforts in algae biomass production and conversion into energy and high-value products, the current research topic covers important aspects of algal strain selection, culture systems, inorganic carbon utilization, lipid metabolism and quality, biomass harvesting, extraction of lipids and proteins, and thermochemical conversion of algal feedstocks into biocrude.

This book critically discusses different aspects of algal production systems and several of the drawbacks related to microalgal biomass production, namely, low biomass yield, and energy-consuming harvesting, dewatering, drying and extraction processes. These provide a background to the state-of-the-art technologies for algal cultivation, CO2 sequestration, and large-scale application of these systems. In order to tap the commercial potential of algae, a biorefinery concept has been proposed that could help to extract maximum benefits from algal biomass. This refinery concept promotes the harvesting of multiple products from the feedstock so as to make the process economically attractive. For the last few decades, algal biomass has been explored for use in various products such as fuel, agricultural crops, pigments and pharmaceuticals, as well as in bioremediation. To meet the huge demand, there has been a focus on large-scale production of algal biomass in closed or open photobioreactors. Different nutritional conditions for algal growth have been explored, such as photoautotrophic, heterotrophic, mixotrophic and oleaginous. This book is aimed at a wide audience, including undergraduates, postgraduates, academics, energy researchers, scientists in industry, energy specialists, policy makers and others who wish to understand algal biorefineries and also keep abreast of the latest developments.

Hydrothermal liquefaction is one of the conversion processes for the production of biofuels that is gaining attention form last decade. Several researchers studied this process for biofuel production using different feedstock. HTL directly converts whole algae into fuel. This process also extracts sugars and lipids when operated at lower temperatures and converts algae directly into fuel intermediate when operated at high temperatures. Hydrothermal liquefaction of Chlorella sorokiniana, Coelastrella and Galdieria Sulphuraria algae. These three algal species were hydrothermally liquefied separately to do a comparative study of different algal species with different chemical composition. The carbon content for all the biocrude oils increased to above 75% where the initial carbon content in the raw materials was less than 55% in all the cases. The nitrogen content in the biochar oil was lower than the fresh and the oxygen content was significantly reduced during the HTL process. The higher heating value of the biocrude oil was above 34 MJ kg\(^{-1}\) and is higher than the HHV of all the micro algae which were less than 24 MJ kg\(^{-1}\). The HHV’s of the biochar ranged from 17 to 23 MJ kg\(^{-1}\). For all the algae, the ammoniacal and total nitrogen levels increased with temperature and the phosphate levels decreased with the temperature rise. The total and ammoniacal nitrogen extracted from galdieria at 300°C are 2-4 times higher than the other two algal species. The phosphate levels extracted at 180°C for galdieria were 7 times higher than the other two species. The...
introduction of catalysts into HTL system increases both the biocrude oil yield and the water soluble compounds yield and delivers better quality fuel. Four homogeneous catalysts including two base catalysts and two acid catalysts were used in the catalytic HTL process in this study. A maximum biocrude yield of 21.22% was obtained using catalytic HTL. The HHV’s of biocrude oil ranged from 26-32 MJ/Kg without catalysts and increased to 33.76 MJ/Kg with catalysts. The introduction of catalysts into the reaction mixture increased the biocrude oil yield as well as high heating values. The HHV’s of biochar ranged from 20 to 27.78 MJ/Kg without catalyst and dropped as 11.74 MJ/Kg with catalysts. The algal species and biocrude oil was analyzed with thermo gravimetric analyzer for the stability. The high heating values of biocrude oil and biochar were determined using bomb calorimeter. Qualitative analysis of biocrude oil using TOFMS revealed the compounds present in the biocrude oil and are convinced with the assumed HTL reaction pathways. Aqueous phase analysis was conducted for the presence of nutrients and valuable co products. A round 20000 mg/L of carbohydrates was extracted during the HTL of Cyanidioschyzon merolae algal species. The increase in temperature increased the extraction of ammonical nitrogen, total nitrogen but decreased the phosphate, carbohydrate and soluble protein levels. The catalysts in the reaction mixture decreased the nutrient extraction and increased the coproduits extraction. Hydrothermal liquefaction of Galdieria sulphuraria algal species was also conducted. A maximum biocrude yield of 18.92% was obtained using direct HTL. The increase in temperature increased the extraction of ammonical nitrogen, total nitrogen but decreased the phosphate, carbohydrate and soluble protein levels. Based on the water analysis, a second step sequential HTL was conducted to extract carbohydrates and soluble proteins at lower temperatures and to convert the remaining residue to biocrude oil at higher temperatures. Sequential hydrothermal liquefaction process helps extracting valuable co products at lower temperatures and biocrude oil at higher temperatures. The biocrude oil obtained using the 2step process is higher than the biocrude oil obtained using direct HTL when galdieria algal biomass was used. The HHV’s of the two biocrude oils are similar. The toxicity studies showed that the biocrude oil is more toxic than the biochar, aqueous phase and the microalgae. The nitrogen levels in the aqueous phase increased with temperature and the phosphate levels increased initially but showed less extraction at higher temperatures. The ICP-OES analysis revealed that the elemental phosphorous in the biochar was less than the raw material at lower temperatures. The phosphorous concentration in the biochar increased with the temperature and further increased with the sequential HTL. A high lipid algal biomass was used for hydrothermal liquefaction in batch and continuous processes. The biomass has 21.2% lipid content with high heating value of 23.86 MJ.kg. The biocrude oil yields obtained were 38.25% for batch process and 21.51% for continuous process based on the ash free dry weight. The reaction times were 30 min and 10 min for batch and continuous process respectively. The continuous process seems to be helpful for solvent free extraction by separating biochar at high temperature and pressure conditions. The compounds detected in the biocrude oils were similar but the major compounds with high area% were different in both the batch and continuous processes. The effect of coliquefaction and process water recycle on biocrude oil yield was studied with different algal species. In the coliquefaction experiments, the biocrude oil obtained when pure Coelastrella was used is 15.63% and biocrude oil obtained when pure chlorella was used is 24.6%. The 80-20 mixture tend to decrease the biocrude oil yield but the increase in the percentage of chlorella algae in the mixture increased the yield. Synergetic effect was observed with Coe-Chl: 40-60 where the biocrude oil increased to 25.99% which is greater than the biocrude oil when pure species was used. In the process water experiments, the biocrude oil obtained at 300°C with Nannochloropsis and chlorella are 30.44 and 30.17% respectively with the initial run without HTL water recycle. For Nannochloropsis, the biocrude oil increased when the HTL was recycled from 30.44% to 38.87% after three recycles. For chlorella, the biocrude oil yield increased from 30.17 to 40.43 with two recycles and the third recycle reduced the biocrude oil yield to 35.21%. This increase was due to the catalytic effect of the water soluble compounds such as acetic acid on the conversion process.

This book covers topics related to bioenergy production from various biomass sources, including agricultural residues and waste biomass from both domestic and industrial use. It includes useful data, illustrations, and case studies of bioenergy production facilities. The contents of this book will be of interest to readers looking to scale up production and evaluate the selection and optimization of resources in order to overcome the current limitations of biomass to bioenergy conversions. The book will be of interest to researchers and industry professional alike.

"Microalgae Biotechnology for Food, Health and High Value Products" presents the latest technological innovations in microalgae production, market status of algal biomass-based products, and future prospects for microalgal applications. It provides stimulating overviews from different perspectives of application that demonstrate how rapidly the commercial production of microalgae-based food, health and high value
products is advancing. It also addresses a range of open questions and challenges in this field. The book highlights the latest advances of interest to those already working in the field, while providing a comprehensive overview for those readers just beginning to learn about the promise of microalgae as a sustainable source of both specialty and commercial products. It offers a valuable asset for commercial algae producers, algae product developers, scientific researchers and students who are dedicated to the advancement of microalgae biotechnology for applications in health, diet, nutrition, cosmetics, biomaterials etc.

The Handbook of Microalgae-based Processes and Products provides a complete overview of all aspects involved in the production and utilization of microalgae resources at commercial scale. Divided into four parts (fundamentals, microalgae-based processes, microalgae-based products, and engineering approaches applied to microalgal processes and products), the book explores the microbiology and metabolic aspects of microalgae, microalgal production systems, wastewater treatment based in microalgae, CO2 capture using microalgae, microalgae harvesting techniques, and extraction and purification of biomolecules from microalgae. It covers the largest number of microalgal products of commercial relevance, including biogas, biodiesel, bioethanol, biohydrogen, single-cell protein, single-cell oil, biofertilizers, pigments, polyunsaturated fatty acids, bioactive proteins, peptides and amino acids, bioactive polysaccharides, sterols, bioplastics, UV-screening compounds, and volatile organic compounds. Moreover, it presents and discusses the available engineering tools applied to microalgae biotechnology, such as process integration, process intensification, and techno-economic analysis applied to microalgal processes and products, microalgal biorefineries, life cycle assessment, and exergy analysis of microalgae-based processes and products. The coverage of a broad range of potential microalgae processes and products in a single volume makes this handbook an indispensable reference for engineering researchers in academia and industry in the fields of bioenergy, sustainable development, and high-value compounds from biomass, as well as graduate students exploring those areas. Engineering professionals in bio-based industries will also find valuable information here when planning or implementing the use of microalgal technologies. Covers theoretical background information and results of recent research. Discusses all commercially relevant microalgae-based processes and products. Explores the main emerging engineering tools applied to microalgae processes, including techno-economic analysis, process integration, process intensification, life cycle assessment, and exergy analyses.

This volume presents a state-of-the-art research in biochemistry, molecular biology and medical application. A glossary of specialized terms is appended. Each chapter is contributed by an expert or group of experts dedicated to increase our understanding of Dunaliella. All the chapters were reviewed internally by their colleagues, editors, and external reviewers; this was followed by a final revision. The book provides a balanced multi-disciplinary communication and contributes to our understanding of this unique alga. It is addressed to graduate students and scientists as a summary of current thoughts on Dunaliella.

The edited volume presents the progress of first and second generation biofuel production technology in selected countries. Possibility of producing alternative fuels containing biocomponents and selected research methods of biofuels exploitation characteristics (also aviation fuels) was characterized. The book shows also some aspects of the environmental impact of the production and biofuels using, and describes perspectives of biofuel production technology development. It provides the review of biorefinery processes with a particular focus on pretreatment methods of selected primary and secondary raw materials. The discussion includes also a possibility of sustainable development of presented advanced biorefinery processes.

This book examines the utilization of algae for the development of useful products and processes with the emphasis towards green technologies and processes, and the requirements to make these viable. Serving as a complete reference guide to the production of biofuels and other value-added products from micro and macro algae, it covers various aspects of algal biotechnology from the basics to large scale cultivation, harvesting and processing for a variety of products. It is authored and edited by respected world experts in the field of algal biotechnology and provides the most up-to-date and cutting edge information on developments in the field. Over the past decade there has been substantial focus and related literature on the application of algal biomass for the generation of novel processes and products. ‘Algae Biotechnology: Products and Processes’ encompasses a holistic approach to critically evaluating developments in the field of algal biotechnology whilst taking into account recent advances and building on the body of knowledge. Apects of the effects of harmful algae are also discussed, as well as the potential commercial application of algal biotechnology, the techno-economic feasibility of algal biodiesel production and the use of genetic and metabolic engineering for the
improvement of yield. Other bioenergy sources such as alcohol fuels, aviation fuels, biohydrogen and biogas are also covered. This book is intended for postgraduates and researchers working in the biofuels and algal industry; it constitutes ideal reference material for both early stage and established researchers.

The biorefinery, integration of processes and technologies for biomass conversion, demands efficient utilization of all components. Hydrothermal processing is a potential clean technology to convert raw materials such as lignocellulosic and aquatic biomass into bioenergy and high added-value compounds. This book aims to show fundamental concepts and key technological developments that enabled industrial application of hydrothermal processing. The scope of this book is primarily for scientists working in the biorefinery field as well as engineers from industry and potential investors in biofuels. Therefore, the information in this book will provide an overview of this technology applied to lignocellulosic materials and aquatic biomass, and especially new knowledge. Critically, this book brings together experts in the application of hydrothermal processes on lignocellulosic and aquatic biomass.

Algae offer potential to produce renewable chemicals and fuels using solar energy and carbon dioxide from atmosphere or in flue gases while simultaneously reducing the generation of greenhouse gases. Since these can be grown on marginal lands with micronutrients and macronutrients often present in waste streams, algae-based chemicals and fuels do not compete with foods. Still large-scale production of algae-based fuels and chemicals faces considerable technological and economical challenges and it would by necessity require a biorefinery approach wherein all the possible algal components are converted into value-added compounds. The present series on algal biorefineries represents a forum for reporting the state of the art of different technologies as well as the latest advances in this field. The volume II of this series complements the volume I in terms of the current state of the art. Different chapters in this volume address diverse issues ranging from genetically modifies algae to new products to life-cycle analysis of algal products.

A comprehensive examination of the large number of possible pathways for converting biomass into fuels and power through thermochemical processes. Bringing together a widely scattered body of information into a single volume, this book provides complete coverage of the many ways that thermochemical processes are used to transform biomass into fuels, chemicals and power. Fully revised and updated, this new edition highlights the substantial progress and recent developments that have been made in this rapidly growing field since publication of the first edition and incorporates up-to-date information in each chapter. Thermochemical Processing of Biomass: Conversion into Fuels, Chemicals and Power, 2nd Edition incorporates two new chapters covering: condensed phased reactions of thermal deconstruction of biomass and life cycle analysis of thermochemical processing systems. It offers a new introductory chapter that provides a more comprehensive overview of thermochemical technologies. The book also features fresh perspectives from new authors covering such evolving areas as solvent liquefaction and hybrid processing. Other chapters cover combustion, gasification, fast pyrolysis, upgrading of syngas and bio-oil to liquid transportation fuels, and the economics of thermochemically producing fuels and power, and more. Features contributions by a distinguished group of European and American researchers offering a broad and unified description of thermochemical processing options for biomass. Combines an overview of the current status of thermochemical biomass conversion as well as engineering aspects to appeal to the broadest audience. Edited by one of Biofuels Digest's "Top 100 People" in bioenergy for six consecutive years. Thermochemical Processing of Biomass: Conversion into Fuels, Chemicals and Power, 2nd Edition will appeal to all academic researchers, process chemists, and engineers working in the field of biomass conversion to fuels and chemicals. It is also an excellent book for graduate and advanced undergraduate students studying biomass, biofuels, renewable resources, and energy and power generation.

Handbook of Biofuels Production, Second Edition, discusses advanced chemical, biochemical, and thermochemical biofuels production routes that are fast being developed to address the global increase in energy usage. Research and development in this field is aimed at improving the quality and environmental impact of biofuels production, as well as the overall efficiency and output of biofuels production plants. The book provides a comprehensive and systematic reference on the range of biomass conversion processes and technology. Key changes for this second edition include increased coverage of emerging feedstocks, including microalgae, more emphasis on by-product valorization for biofuels' production, additional chapters on emerging biofuel production methods, and discussion of the emissions associated with biofuel use in engines. The editorial team is strengthened by the addition of two extra members, and a number of new contributors have been invited to work with authors from the first edition to revise existing chapters, thus offering fresh perspectives. Provides systematic and detailed coverage of the processes and technologies being used for...
Biofuel production discusses advanced chemical, biochemical, and thermochemical biofuels production routes that are fast being developed to address the global increase in energy usage. Reviews the production of both first and second generation biofuels. Addresses integrated biofuel production in biorefineries and the use of waste materials as feedstocks.

Renewable fuel research and process development requires interdisciplinary approaches involving chemists and physicists from both scientific and engineering backgrounds. Here is an important volume that emphasizes green chemistry and green engineering principles for sustainable process development from an interdisciplinary point of view. It creates an enriching knowledge base on green chemistry of biofuel production, sustainable process development, and green engineering principles for renewable fuel production. This book includes chapters contributed by both research scientists and research engineers with significant experience in biofuel chemistry and processes. The book offers an abundance of scientific experimental methods and analytical procedures and interpretation of the results that capture the state-of-the-art knowledge in this field. The wide range of topics make this book a valuable resource for academicians, researchers, industrial practitioners and scientists, and engineers in various renewable energy fields. Key features: • Emphasizes green chemistry and green engineering principles for sustainable process development for biofuel production • Discusses a wide array of biofuels from algal biomass to waste-to-energy technologies and wastewater treatment and activated sludge processes • Presents advances and developments in biofuel green chemistry and green engineering, including process intensification (microwaves/ultrasound), ionic liquids, and green catalysis • Looks at environmental assessment and economic impact of biofuel production

Sub- and Supercritical Hydrothermal Technology: Industrial Applications offers a practical view of a variety of industrial applications and their challenges, offering a deep understanding of the application of sub- and supercritical fluids and their techno-economic viability. This book covers a wide range of applications of hydrothermal processing that result in almost zero waste, high energy efficiency, sustainable chemical processes, and minimal impact over the life cycle. These applications include processing of hazardous waste, bioproducts, coal, lipids, heavy oil and bitumen, and carbon materials. The use of hot-compressed water instead of different organic solvents, such as methanol, acetone, and hexane, is an environmentally benign, green, and sustainable option which can help to design chemical processes that support green chemistry and engineering. This book is pertinent for researchers and professionals in the fields of chemical engineering, industrial chemistry, environmental engineering, materials engineering, and manufacturing.

Microalgae Cultivation for Biofuels Production explores the technological opportunities and challenges involved in producing economically competitive algal-derived biofuel. The book discusses efficient methods for cultivation, improvement of harvesting and lipid extraction techniques, optimization of conversion/production processes of fuels and co-products, the integration of microalgae biorefineries to several industries, environmental resilience by microalgae, and a techno-economic and lifecycle analysis of the production chain to gain maximum benefits from microalgae biorefineries. Provides an overview of the whole production chain of microalgal biofuels and other bioproducts. Presents an analysis of the economic and sustainability aspects of the production chain. Examines the integration of microalgae biorefineries into several industries.

Quartz, zeolites, gemstones, perovskite type oxides, ferrite, carbon allotropes, complex coordinated compounds and many more -- all products now being produced using hydrothermal technology. Handbook of Hydrothermal Technology brings together the latest techniques in this rapidly advancing field in one exceptionally useful, long-needed volume. The handbook provides a single source for understanding how aqueous solvents or mineralizers work under temperature and pressure to dissolve and recrystallize normally insoluble materials, and decompose or recycle any waste material. The result, as the authors show in the book, is technologically the most efficient method in crystal growth, materials processing, and waste treatment. The book gives scientists and technologists an overview of the entire subject including: • Evolution of the technology from geology to widespread industrial use. • Descriptions of equipment used in the process and how it works. • Problems involved with the growth of crystals, processing of technological materials, environmental and safety issues. • Analysis of the direction of today's technology. In addition, readers get a close look at the hydrothermal synthesis of zeolites, fluorides, sulfides, tungstates, and molybdates, as well as native elements and simple oxides. Delving into the commercial production of various types, the authors clarify the effects of temperature, pressure, solvents, and various other chemical components on the hydrothermal processes. Gives an overview of the evolution of Hydrothermal Technology from geology to widespread industrial use. Describes the equipment used in the process and how it works. Discusses problems.
involved with the growth of crystals, processing of technological materials, and environmental and safety issues.

This book discusses recent trends and developments in the microbial conversion process, which serves as an important route for biofuel production, with particular attention to bioreactors. It combines microbial conversion with multiphase flow and mass transfer, providing an alternative perspective for the understanding of microbial biomass and energy production process as well as enhancement strategy. This book is relevant to students and researchers who work in the fields of renewable energy, engineering and biotechnology. Policymakers, economists and industry engineers also benefit from this book, as it can be used as a resource for the implementation of renewable energy technologies.

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

Microalgae are an invaluable biomass source with potential uses that could lead to environmental and economic benefits for society. Biotechnological Applications of Microalgae: Biodiesel and Value Added Products presents the latest developments and recent research trends with a focus on potential biotechnologically related uses of microalgae. It gives an analysis of microalgal biology, ecology, biotechnology, and biofuel production capacity as well as a thorough discussion on the value added products that can be generated from diverse microalgae. The book provides a detailed discussion of microalgal strain selection for biodiesel production, a key factor in successful microalgal cultivation and generation of desired biofuel products. It also describes microalgal enumeration methods, harvesting and dewatering techniques, and the design, and the pros and cons, of the two most common methods for cultivation—open raceway ponds and photobioreactors. Chapters cover lipid extraction and identification, chemical and biological methods for transesterification of microalgal lipids, and procedures involved in life cycle analysis of microalgae. They also examine the importance of microalgal cultivation for climate change abatement through CO2 sequestration and microalgae involvement in phycoremediation of domestic and industrial wastewaters. The book concludes with a general discussion of microalgal biotechnology and its potential as a modern "green gold rush." The final chapter provides an overview of advanced techniques such as genetic engineering of microalgae to increase lipid yield. This book provides a one-stop benchmark reference on microalgal biotechnology, considering all aspects, from microalgal screening to production of biofuels and other value added products.

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

Pretreatment of Biomass provides general information, basic data, and knowledge on one of the most promising renewable energy sources—biomass for their pretreatment—which is one of the most essential and critical aspects of biomass-based processes development. The quest to make the environment greener, less polluted, and less hazardous has led to the concept of biorefineries for developing bio-based processes and products using biomass as a feedstock. Each kind of biomass requires some kind of pretreatment to make it suitable for bioprocess. This book provides state-of-art information on the methods currently available for this. This book provides data-based scientific information on the most advanced and innovative pretreatment of lignocellulosic and algal biomass for further processing. Pretreatment of biomass is considered one of the most expensive steps in the overall processing in a biomass-to-biofuel program. With the strong advancement in developing lignocellulose biomass- and algal biomass-based biorefineries, global focus has been on developing pretreatment methods and technologies that are technically and economically feasible. This book provides a comprehensive overview of the latest developments in methods used for the pretreatment of biomass. A new section is devoted to the methods and technologies of algal biomass due to the increasing global attention of its use. Provides information on the most advanced and innovative pretreatment processes and technologies for biomass Covers information on lignocellulosic and algal biomass to work on the principles of biorefinery Useful for researchers intending to study scale-up Provides information on
Biofuels made from algae are gaining attention as a domestic source of renewable fuel. However, with current technologies, scaling up production of algal biofuels to meet even 5 percent of U.S. transportation fuel needs could create unsustainable demands for energy, water, and nutrient resources. Continued research and development could yield innovations to address these challenges, but determining if algal biofuel is a viable fuel alternative will involve comparing the environmental, economic and social impacts of algal biofuel production and use to those associated with petroleum-based fuels and other fuel sources. Sustainable Development of Algal Biofuels was produced at the request of the U.S. Department of Energy.

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 edited volume focuses on comprehensive state-of-the-art information about the practical aspects of cultivation, harvesting, biomass processing and biofuel production from algae. Chapters cover topics such as synthetic ecological engineering approaches towards sustainable production of biofuel feedstock, and algal biofuel production processes using wastewater. Readers will also discover more about the role of biotechnological engineering in improving ecophysiology, biomass and lipid yields. Particular attention is given to opportunities of commercialization of algal biofuels that provides a realistic assessment of various techno-economical aspects of pilot scale algal biofuel production. The authors also explore the pre-treatment of biomass, catalytic conversion of algal lipids and hydrothermal liquefaction with the biorefinery approach in detail. In a nutshell, this volume will provide a wealth of information based on a realistic evaluation of contemporary developments in algal biofuel research with an emphasis on pilot scale studies. Researchers studying and working in the areas of environmental science, biotechnology, genetic engineering and biochemistry will find this work instructive and informative.

Microalgae-Based Biofuels and Bioproducts: From Feedstock Cultivation to End Products compiles contributions from authors from different areas and backgrounds who explore the cultivation and utilization of microalgae biomass for sustainable fuels and chemicals. With a strong focus in emerging industrial and large scale applications, the book summarizes the new achievements in recent years in this field by critically evaluating developments in the field of algal biotechnology, whilst taking into account sustainability issues and techno-economic parameters. It includes information on microalgae cultivation, harvesting, and conversion processes for the production of liquid and gaseous biofuels, such as biogas, bioethanol, biodiesel and biohydrogen. Microalgae biorefinery and biotechnology applications, including for pharmaceuticals, its use as food and feed, and value added bioproducts are also covered. This book’s comprehensive scope makes it an ideal reference for both early stage and consolidated researchers, engineers and graduate students in the algal field, especially in energy, chemical and environmental engineering, biotechnology, biology and agriculture. Presents the most current information on the uses and untapped potential of microalgae in the production of bio-based fuels and chemicals Critically reviews the state-of-the-art feedstock cultivation of biofuels and bioproducts mass production from microalgae, including intermediate stages, such as harvesting and extraction of specific compounds Includes topics in economics and sustainability of large-scale microalgal cultivation and conversion technologies
The worldwide consumption of fossil fuel continues to increase at unsustainable levels, which will lead to progressive scarcity, if immediate and innovative measures are not taken for its sustainable use. This scarcity necessitates the development of renewable and sustainable alternatives for fossil fuels. A possible solution to today's energy challenges can be provided by biofuels. This book intends to provide the reader with a comprehensive overview of the current status and the future implications of biofuels. Diverse and aptly covered comprehensive information in this book will directly enhance both basic and applied research in biofuels and will particularly be useful for students, scientists, breeders, growers, ecologists, industrialists and policy makers. It will be a valuable reference point to improve biofuels in the areas of ecologically and economically sustainable bioenergy research.

Highlighting the role of dietary fats in foods, human health, and disease, this book offers comprehensive presentations of lipids in food. Furnishing a solid background in lipid nomenclature and classification, it contains over 3600 bibliographic citations for more in-depth exploration of specific topics and over 530 illustrations, tables, and equa