

Ravindra Pogaku · Awang Bono
Christopher Chu *Editors*

Developments in Sustainable Chemical and Bioprocess Technology

 Springer

Developments In Sustainable Chemical And Bioprocess Technology

Siddharth Venkatesh



Developments In Sustainable Chemical And Bioprocess Technology:

Developments in Sustainable Chemical and Bioprocess Technology Ravindra Pogaku, Awang Bono, Christopher Chu, 2013-11-26 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 whole 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 maximal amounts of energy from sources to limit waste. Finally, a section on safety and control will be presented, which has been poorly covered in other publications.

Biodiesel Technology and Applications Inamuddin, Mohd Imran Ahamed, Rajender Boddula, Mashallah Rezakazemi, 2021-07-21 BIODIESEL This outstanding new volume provides a comprehensive overview on biodiesel technologies covering a broad range of topics and practical applications, edited by one of the most well respected and prolific engineers in the world and his team. Energy technologies have attracted great attention due to the fast development of sustainable energy. Biodiesel technologies have been identified as the sustainable route through which overdependence on fossil fuels can be reduced. Biodiesel has played a key role in handling the growing challenge of a global climate change policy. Biodiesel is defined as the monoalkyl esters of vegetable oils or animal fats. Biodiesel is a cost effective, renewable, and sustainable fuel that can be made from vegetable oils and animal fats. Compared to petroleum based diesel, biodiesel would offer a non-toxicity, biodegradability, improved air quality, and positive impact on the environment, energy security, safe to handle, store, and transport, and so on. Biodiesels have been used as a replacement of petroleum diesel in transport vehicles, heavy duty trucks, locomotives, heat oils, hydrogen production, electricity generators, agriculture, mining, construction, and forestry equipment. This book describes a comprehensive overview covering a broad range of topics on biodiesel technologies and allied applications. Chapters cover history, properties, resources, fabrication methods, parameters, formulations, reactors, catalysis, transformations, analysis, in situ spectroscopies, key issues, and applications of biodiesel technology. It also includes biodiesel methods, extraction strategies, biowaste utilization, oleochemical resources, non-edible feedstocks, heterogeneous

catalysts patents and case studies Progress challenges future directions and state of the art biodiesel commercial technologies are discussed in detail This book is an invaluable resource guide for professionals faculty students chemical engineers biotechnologists and environmentalists in these research and development areas This outstanding new volume Summarizes the recent developments in this rapidly developing multi disciplinary field Provides the reader with a practical understanding of biodiesel technology toward the real world applications Formulates concepts case studies patents and applications helpful in decision making and problem solving in a single resource Delivers state of the art information on biodiesel technology Audience Chemical and process engineers and other professionals faculty students scientists biotechnologists and environmental engineers Chemical and Bioprocess Engineering Siddharth Venkatesh,2025-02-20

Chemical and Bioprocess Engineering Innovations is a comprehensive and accessible guide exploring the intricate world where chemistry and biology converge Tailored for a global audience with a focus on the United States this book is an indispensable resource for students professionals and researchers in chemical and bioprocess engineering The book demystifies complex concepts offering a user friendly journey through fundamental principles such as chemical engineering thermodynamics and fluid mechanics Grounded in real world applications each chapter bridges theory and practice emphasizing the role of chemical and bioprocess engineering in shaping the nation s technological landscape Uniquely this book addresses traditional chemical processes and delves into bioprocessing covering genetic engineering fermentation and bioseparations As the US leads in technological innovation readers gain the knowledge and skills to navigate challenges and opportunities in chemical and biological processes Emphasizing sustainability and green engineering the book includes real world case studies from diverse industries highlighting eco friendly practices It integrates the latest advancements in bio based materials preparing the next generation of engineers for sustainable and ethical practices Promoting a holistic understanding that transcends traditional boundaries the book draws from biology chemistry and engineering Exercises and practical examples in each chapter foster critical thinking and problem solving skills encouraging active contribution to the field Chemical and Bioprocess Engineering Innovations serves as a valuable reference for seasoned professionals and a companion for learners keeping readers abreast of the latest developments in this ever evolving field *Current Trends and Future Developments on (Bio-) Membranes* Angelo Basile,Alfredo Cassano,Alberto Figoli,2018-09-12

Current Trends and Future Developments in Bio Membranes Renewable Energy Integrated with Membrane Operations offers an overview of advanced technologies in the field of water desalination wastewater treatment and hydrogen production that is coupled with renewable energy sources Membrane processes are well recognized technologies in the field of water and wastewater treatment This book reviews their potential and lists new technologies which allow for the use of solar hydroelectric wind hydrothermal and other forms of renewable energy with the same effect In addition it highlights what has already been achieved in the integration of membrane reactors and energy produced by biomass Provides an overview of the

interconnections between membrane technology and renewable energy sources Provides a comprehensive review of advanced research on membrane processes for water desalination wastewater treatment and hydrogen production Relates the various processes to energy sources including solar wind biomass and geothermal energy Addresses key issues involved in the use of renewable energy in wastewater treatment

Advances in Natural Gas: Formation, Processing, and Applications. Volume 2: Natural Gas Sweetening Mohammad Reza Rahimpour, Mohammad Amin Makarem, Maryam Meshksar, 2024-02-10

Advances in Natural Gas Formation Processing and Applications is a comprehensive eight volume set of books that discusses in detail the theoretical basics and practical methods of various aspects of natural gas from exploration and extraction to synthesizing processing and purifying producing valuable chemicals and energy The volumes introduce transportation and storage challenges as well as hydrates formation extraction and prevention Volume 2 titled *Natural Gas Sweetening* introduces in detail different natural gas sweetening methods The book covers absorption with different solvents such as alkalis amin blends ionic liquids etc which is one of the important sweetening techniques as well as natural gas sweetening with adsorption based technologies utilizing various materials including zeolites carbonaceous sorbents metal oxides etc Is also discusses membrane based processes with various types such as ionic liquid polymeric MOF mixed matrix dense metal membranes and includes novel technologies for sweetening natural gas by using plasma and supersonic separators Introduces natural gas sweetening concepts and challenges Describes various absorption and adsorption processes for natural gas sweetening Includes various membrane technologies for natural gas sweetening

Biofiller-Reinforced Biodegradable Polymer Composites R. Jumaidin, S. M. Sapuan, H. Ismail, 2020-10-27 Presenting a comprehensive overview of the field *Biofiller Reinforced Biodegradable Polymer Composites* examines biodegradable composites derived from biofiller and biodegradable polymers while providing critical information for efficient use of biocomposites developed from natural resources Discusses advanced techniques for the use of both biofiller and biodegradable polymers as the matrix for composites Highlights application of both natural fiber and natural matrix for composites in the development of environmentally friendly and sustainable materials Introduces the basics of biocomposites the processing and characteristics of new composite materials and new combinations of composites such as soy protein and nanocellulose Elaborates on the introduction of new materials to develop biodegradable polymers This book has been written for researchers advanced students and professional engineers and materials scientists working in the area of bio based polymers natural fiber composites and biocomposites

Starch-based Blends, Composites and Nanocomposites Visakh P. M., Long Yu, 2016 A comprehensive overview of recent developments in starch based materials ideal for students and researchers working in bio based and biodegradable polymers and composites

Bionanotechnology to Save the Environment Pierfrancesco Morganti, 2019-02-19 Nanotechnology is the science of manipulating atoms and molecules in the nanoscale thousand times smaller than the width of a human hair The world market for products that contain nanomaterials

is expected to increase enormously in the future The use of nanotechnology has stretched across various streams of science from electronics to medicine and has also found applications in the field of cosmetics How will this revolution impact our lifestyle and our planet Very often the progresses of science human knowledge and evolution of our lifestyle has been associated with devastating effects on our forests oceans and more in general on our planet The real challenge in the years to come is the sustainability of human evolution The reader of this interesting book will discover how nanotechnology and in particular nanomaterials derived from plant biomass and fishery s waste can improve the quality of our environment by reducing carbon emissions improving the recycling of materials and even in the long run became a profitable business Green nanotechnologies can be applied to a huge number of products ranging from intelligent textiles to smart drugs or functional polymers which can have a big impact on our daily lives but nevertheless help us in saving our biodiversity and our planet However to fully achieve all these benefits companies and scientists should be supported by National and International Agencies and Institutions in order to facilitate and support scientific development in this field allowing from one side the protection of intellectual property but on the other giving accessibility of these technologies to emerging countries for improving the quality of life and the environment all over the world equally

Biopolymers and Their Industrial Applications Sabu Thomas, Sreeraj Gopi, Augustine Amalraj, 2020-10-31 Biopolymers and Their Industrial Applications From Plant Animal and Marine Sources to Functional Products is a detailed guide to the use of biopolymers for advanced applications across a range of key industries In terms of processing and cost bio based polymers are becoming increasingly viable for an ever broadening range of novel industrial applications The book begins with an overview of biopolymers explaining resources demands sustainability life cycle assessment LCA modeling and simulation and classifications Further in depth chapters explore the latest techniques and methodologies for isolation and physicochemical characterization materials selection and processing for blends and composites Chapters 6 to 14 each focus on the preparation and applications of biopolymers in a specific industrial area including food science and nutraceuticals medicine and pharmaceuticals textiles cosmeceutical packaging adhesives and automotive 3D printing super capacitor and energy storage devices and environmental applications The final chapter compares and analyzes biopolymers alongside synthetic polymers also offering valuable insight into social economic and environmental aspects This is an essential resource for those seeking to understand research or utilize biopolymers in industrial applications This includes researchers scientists and advanced students working in biopolymers polymer science polymer chemistry biomaterials materials science nanotechnology composites and biotechnology This is a highly valuable book for scientists R D professionals designers and engineers across multiple industries and disciplines who are looking to utilize biopolymers for components and products Introduces a broad range of industrial application areas including food medicine textiles cosmetics packaging automotive 3D printing energy and more Offers an industry oriented approach addressing challenges and explaining the preparation and application of biopolymers

for functional products and parts Considers important factors such as resources classification sustainability and life cycle assessment LCA modeling and simulation Compares and analyzes biopolymers alongside synthetic polymers also offering valuable insight into social economic and environmental aspects Biorefinery Production Technologies for Chemicals and Energy Arindam Kuila, Mainak Mukhopadhyay, 2020-09-22 This book covers almost all of the diverse aspects of utilizing lignocellulosic biomass for valuable biorefinery product development of chemicals alternative fuels and energy The world has shifted towards sustainable development for the generation of energy and industrially valuable chemicals Biorefinery plays an important role in the integration of conversion process with high end equipment facilities for the generation of energy fuels and chemicals The book is divided into four parts The first part Basic Principles of Biorefinery covers the concept of biorefinery its application in industrial bioprocessing the utilization of biomass for biorefinery application and its future prospects and economic performance The second part Biorefinery for Production of Chemicals covers the production of bioactive compounds gallic acid C4 C5 and C6 compounds etc from a variety of substrates The third part Biorefinery for Production of Alternative Fuel and Energy covers sustainable production of bioethanol biodiesel and biogas from different types of substrates The last part of this book discusses sequential utilization of wheat straw material balance and biorefinery approach The approaches presented in this book will help readers users from different areas like process engineering and biochemistry to plan integrated and inventive methods to trim down the expenditure of the industrial manufacture process to accomplish cost effective feasible products in biorefinery **Advances in Bioprocess Technology** Pogaku

Ravindra, 2015-08-13 This book provides an extensive overview of the latest research in environmentally benign integrated bioprocess technology The cutting edge bioprocess technologies highlighted in the book include bioenergy from lignocellulose materials biomass gasification ethanol butanol biodiesel from agro waste enzymatic bioprocess technology food fermentation with starter cultures and intellectual property rights for bioprocesses This book further addresses niche technologies in bioprocesses that broadens readers understanding of downstream processing for bio products and membrane technology for bioprocesses The latest developments in biomass and bioenergy technology are reviewed exhaustively including IPR rights nanotechnology for bioenergy products biomass gasification and biomass combustion This is an ideal book for scientists engineers students as well as members of industry and policy makers This book also Addresses cutting edge technologies in bioprocesses Broadens readers understanding of metabolic engineering downstream processing for bioproducts and membrane technology for bioprocesses Reviews exhaustively the latest developments in biomass and bioenergy technology including nanotechnology for bioenergy products biomass gasification biomass combustion and more

Recent Advances in Bioprocess Engineering and Bioreactor Design Swasti Dhagat, Satya Eswari Jujavarapu, N.S. Sampath Kumar, Chinmaya Mahapatra, 2024-05-13 This book provides insights into the recent developments in the field of bioprocess technology and bioreactor design Bioprocess engineering or biochemical engineering is a subcomponent of

chemical engineering which encompasses designing and developing those processes and equipment that are required for the manufacturing of products from biological materials and sources such as agriculture pharmaceutical chemicals polymers food etc or for the treatment of environmental process for example waste water The main focus of this book is to highlight the advancements in the field of bioprocess technology and bioreactor design The book is divided into various chapters briefing all aspects of bioprocess engineering and focusing on the advances in bioprocess engineering The book summarizes introduction to bioprocess technology and microbiology isolation and maintenance of microbial strains and sterilization techniques for advanced level students and researchers Different models depicting kinetics of microbial growth substrate consumption and product formation are discussed The applications of enzymes have increased tremendously and therefore understanding their metabolic pathways to increase yields is also briefly discussed The calculations of mass and energy balances associated with entropy changes and free energy This book also covers the approaches for handling different types of cell cultures and current advancements in the area of bioprocess strategies for different culture types which scientists and researchers working in the different cell cultures can refer to The downstream processing of various industrially important products is also a part of this book Apart from that the process economics which ensures the feasibility and quality of any biological process is also dealt with as the last section of the book **Comprehensive Biotechnology** ,2019-07-17

Comprehensive Biotechnology Third Edition Six Volume Set unifies in a single source a huge amount of information in this growing field The book covers scientific fundamentals along with engineering considerations and applications in industry agriculture medicine the environment and socio economics including the related government regulatory overviews This new edition builds on the solid basis provided by previous editions incorporating all recent advances in the field since the second edition was published in 2011 Offers researchers a one stop shop for information on the subject of biotechnology Provides in depth treatment of relevant topics from recognized authorities including the contributions of a Nobel laureate Presents the perspective of researchers in different fields such as biochemistry agriculture engineering biomedicine and environmental science **Anaerobic Digestion Processes** Nigel Horan,Abu Zahrim Yaser,Newati Wid,2018-04-18 This book presents new application processes in the context of anaerobic digestion AD such as phosphorus recovery microbial fuel cells MFCs and seaweed digestion In addition it introduces a new technique for the modeling and optimization of AD processes Chapters 1 and 2 review AD as a technique for converting a range of organic wastes into biogas while Chapter 3 discusses the recovery of phosphorus from anaerobically digested liquor Chapters 4 and 5 focus on new techniques for modeling and optimizing AD Chapters 6 and 7 then describe the state of the art in AD effluent treatment The book s final three chapters focus on more recent developments including microbial fuel cells MFCs Chapter 8 seaweed production Chapter 9 and enzyme technologies Chapter 10 **Applications of Advanced Nanomaterials in Water Treatment** Dinesh Kumar,Meena Nemiwal,2022-12-21

Water is the most vital substance in every aspect of life and its contamination because of the activity of mankind poses a big

global challenge Addressing this issue for drinking purposes and environmental protection is the current big issue Many research groups worldwide have been working on effective treatment technologies based on nanomaterials during the last two decades Water and wastewater treatment by nanomaterial based technologies has become an aid in finding possible solutions for contaminated wastewater released from various water sources Nanoscale materials can be seen to take on unique and unpredictable properties that make them more robust flexible lighter and faster and the particular material used for the development of devices and systems Features This book presents the use of different advanced nanomaterials to treat water and wastewater The uses of carbon based nanomaterials metal organic frameworks MOFs and biopolymer supported nanomaterials for water treatment are explored focusing on new generation materials Water purification methods such as the disinfection of water using green synthesized nanomaterials adsorption through nanomaterial based adsorbents and nanofiltration techniques are discussed We emphasize efficient water treatment methods and the use of new emerging nanomaterials in the toxicological study of nanomaterials Nanomaterials provide high performance and cost effective treatment for water treatment Various nanomaterials and electrochemical methods are used to stop remove or neutralize water harmful organic and inorganic contaminants in water through adsorption filtration and disinfection *New and Future Developments in Microbial Biotechnology and Bioengineering* Vijai G. Gupta, Anita Pandey, 2019-06-14 *New and Future Developments in Microbial Biotechnology and Bioengineering* Microbial Secondary Metabolites Biochemistry and Applications examines the areas of biotechnology and chemical engineering covering aspects of plants bacteria and machines and using microbes as factories The book is aimed at undergraduates post graduates and researchers studying microbial secondary metabolites and is an invaluable reference source for biochemical engineers working in biotechnology manipulating microbes and developing new uses for bacteria and fungi The applications of secondary metabolites in biotechnology pharmaceuticals diagnostics and medical device development are also extensively covered The book integrates the aforementioned frontline branches into an interdisciplinary research work to satisfy those working in biotechnology chemical engineering alternative fuel development diagnostics and pharmaceuticals Chapters related to important research work on applications of microbial secondary metabolites are written by specialists in the various disciplines from the international community Compiles the latest developments in the area of microbial secondary metabolites Authored by the top international researchers in this area Includes information related to nearly all areas of a microbial secondary metabolites system **Marine Bioprocess Engineering** J.G. Burgess, R. Osinga, R.H. Wijffels, 1999-11-19 This book contains full papers of both oral and poster presentations of the international symposium Marine Bioprocess Engineering which was held in Noordwijkerhout The Netherlands 1998 The symposium focused on the bioprocessing of marine natural products Bioprocess engineering has been the key to success in the commercialization of biotechnology especially with respect to biopharmaceuticals In marine biotechnology both new and existing biotechnological techniques are developed an

applied to organisms from marine sources For marine biotechnology bioprocess engineering represents the link between discovery and commercialization The diversity of marine life points to a myriad of new bioproducts waiting to be discovered and developed commercially The volume begins to bridge the gap between the isolation of products from marine organisms in the laboratory and industrial applications by focusing on the bioprocess engineering aspects Reviews and recent developments in product discovery bio energy production cultivation of marine organisms scale up and product recovery are presented This publication should ensure that the engineering aspects of marine biotechnology will receive further attention in the future Exploration of new bioproducts from the ocean should be followed up by a sustainable exploitation of these valuable resources

Cellulose Abu Zahrim Yaser, Mohd Sani Sarjadi, Junidah Lamaming, 2023-09-26 Cellulose Development Processing and Applications covers topics related to advanced cellulose development and processing as well as the utilization of major agricultural and biomass waste It discusses the utilization of cellulose from other agricultural and biomass materials including oil palm biomass bamboo and other non wood forest products in emerging areas It covers the treatments used to improve the quality of cellulosic materials in specific applications Following that the book delves into the use of cellulosic materials in the application of composting science and technology Features Delves into the specific agriculture waste biomass waste materials used for the advanced cellulose based production Outlines the potential use of the covered materials for energy production and other emerging applications Includes composting technology and processes using the cellulosic materials Overviews industrial applications of cellulose from agricultural waste biomass waste and composting technology Discusses the main agricultural waste biomass in the Asian region This book is aimed at researchers and graduate students in chemical engineering bioprocessing composites and biotechnology

Advances in Food Bioproducts and Bioprocessing Technologies Monica Lizeth Chavez-Gonzalez, Nagamani Balagurusamy, Christobal N. Aguilar, 2019-10-16 The book explores and exploits the synergy and boundary between biotechnology bioprocessing and food engineering Divided into three parts Advances in Food Bioproducts and Bioprocessing Technologies includes contributions that deal with new developments in procedures bioproducts and bioprocesses that can be given quantitative expression Its 40 chapters will describe how research results can be used in engineering design include procedures to produce food additives and ingredients and discuss accounts of experimental or theoretical research and recent advances in food bioproducts and bioprocessing technologies

Cold Inflow-Free Solar Chimney Md. Mizanur Rahman, Chi-Ming Chu, 2021-05-28 This book highlights the design of a new type of solar chimney that has lower height and bigger diameter and discusses its applications The bigger diameter chimneys are introduced showing cold inflow phenomena that significantly reduced the performance of solar chimney The cold inflow free operation of solar chimneys restores the draft losses and enhances the performance of the solar chimneys Numerical and experimental investigation results will be presented to highlight the performance of cold inflow free solar chimney performance In addition this book covers the important basic design parameters that affect the

design of solar chimney for different applications mainly solar chimney assisted ventilation for passive cooling and power generation system

Unveiling the Magic of Words: A Overview of "**Developments In Sustainable Chemical And Bioprocess Technology**"

In a global defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their power to kindle emotions, provoke contemplation, and ignite transformative change is actually awe-inspiring. Enter the realm of "**Developments In Sustainable Chemical And Bioprocess Technology**," a mesmerizing literary masterpiece penned with a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve to the book is central themes, examine its distinctive writing style, and assess its profound impact on the souls of its readers.

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