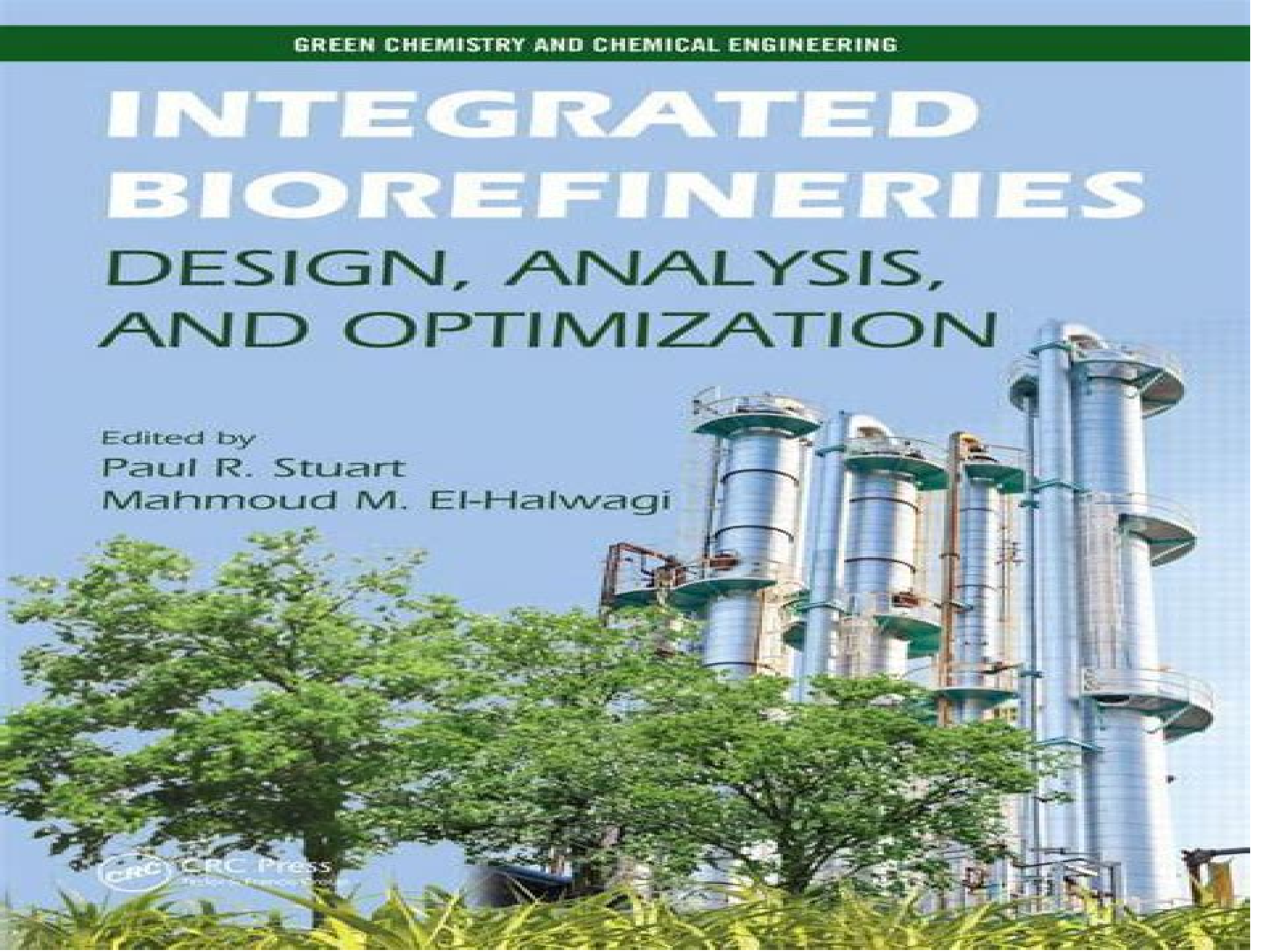


INTEGRATED BIOREFINERIES

DESIGN, ANALYSIS, AND OPTIMIZATION

Edited by
Paul R. Stuart
Mahmoud M. El-Halwagi



Integrated Biorefineries Design Analysis And Optimization Green Chemistry And Chemical Engineering

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Israel Gomez Castro**



Integrated Biorefineries Design Analysis And Optimization Green Chemistry And Chemical Engineering:

Integrated Biorefineries Paul R. Stuart, Mahmoud M. El-Halwagi, 2013 **Integrated Biorefineries** Paul R.

Stuart, Mahmoud M. El-Halwagi, 2012-12-10 *Integrated Biorefineries Design Analysis and Optimization* examines how to create a competitive edge in biorefinery innovation through integration into existing processes and infrastructure. Leading experts from around the world working in design, synthesis, and optimization of integrated biorefineries present the various aspects of this complex process, capturing the state of the art in the advancing bioeconomy. The book defines an integrated biorefinery as a processing facility that transforms biomass into value-added products from biofuels and biochemicals to food and pharmaceuticals. The chapters cover biorefinery product and process design, supply chains, process analysis, feedstocks, technologies, and policy and environmental analysis. They focus on second-generation feedstocks including forestry resources, energy crops, agricultural residues, oils, and various waste materials. With the growing interest in sustainability in general and in renewable resources in industrial facilities, biorefineries are likely to play increasingly significant roles and have greater economic, environmental, and societal impact. This book fills an information gap by presenting cutting-edge advances that can effectively guide engineers and decision makers in the synthesis, selection, design, analysis, and optimization of biorefineries.

Biorefineries Carlos Ariel Cardona Alzate, Jonathan Moncada Botero, Valentina Aristizábal Marulanda, 2018-09-03. Aimed at presenting a systematic design of biorefineries, the book initiates with an overview about relevance and applications, explained through origin of raw materials, transformation routes, and products. Then, concepts as hierarchy, sequencing, and integration are considered, which helps in generating a sustainable and strategic design of biorefineries. Further framework for biorefineries based on techno-economic, environmental, and social aspects is analyzed with examples to show the applications. Finally, some mass energy and economic indices are considered to assess the biorefinery sustainability and key challenges for future development of biorefineries. **Key Features:** Presents current state of the art of the biorefineries design and analyses for in-depth understanding of biofuels and biomaterials. Explores conceptual design of processes. Concepts discussed with strong engineering approach including design strategies and techno-economic analyses. Includes bio-based materials, natural products, and food products in the biorefinery concept. Presentation of structured method to calculate indices of performance of biorefineries. [Handbook of Emerging Materials for Sustainable Energy](#) Naveen V.

Kulkarni, Boris I. Kharissov, 2024-02-28. *Handbook of Emerging Materials for Sustainable Energy* provides a comprehensive accounting on the fundamentals, current developments, challenges, and future prospects of emerging materials for the development of sustainable energy. Each chapter addresses a distinct and important area within the energy field and includes comprehensive data to support the materials being presented. Sections cover Batteries, Capacitors, and Supercapacitors, Fuel cells, Thermoelectrics, Novel illumination sources and techniques, Photovoltaics, Solar cells, Alternative energy sources, hydrogen as an energy source including hydrogen production and fuel generation, the use of Biofuels, and Carbon dioxide. The

book concludes with three chapters related to advanced materials under development for energy conservation and environmental protection including theories methodologies and simulations established for advanced materials Covers a broad scope of advanced materials that have been developed for energy and environmental sustainability Provides detailed and updated information about the structural and functional features of various emerging materials and their multifaceted applications Includes supplementary data alongside each chapter *Biofuels and Biorefining* Claudia Gutierrez-Antonio, Fernando Israel Gomez Castro, 2022-05-27 Biofuels and Biorefining Volume Two Intensified Processes and Biorefineries considers intensification and optimization processes for biofuels and biomass derived products in single and biorefinery schemes Chapters cover production processes for liquid biofuels introducing all feasible intensification alternatives for each process process intensification methods for the production of value added products the importance of detailed CFD based studies controllability studies strategies for risk analysis in intensified processes the concept of biorefinery for the co production of biofuels biomass derived value added products and the importance of process intensification in the biorefinery scheme Final chapters discuss how to ensure the sustainability of the intensified process and minimize the societal impact of biorefineries through various strategies including supply chain optimization and lifecycle analysis Each chapter is supported by industry case studies that address key aspects and impacts of intensification and optimization processes Integrates basic concepts of process intensification and its application to the production of biofuels in a single resource Includes case studies related to modeling safety control supply chain lifecycle analysis and the CFD of biofuel production processes Provides a sustainability assessment of biorefinery systems from a lifecycle perspective

24th European Symposium on Computer Aided Process Engineering ,2014-06-20 The 24th European Symposium on Computer Aided Process Engineering creates an international forum where scientific and industrial contributions of computer aided techniques are presented with applications in process modeling and simulation process synthesis and design operation and process optimization The organizers have broadened the boundaries of Process Systems Engineering by inviting contributions at different scales of modeling and demonstrating vertical and horizontal integration Contributions range from applications at the molecular level to the strategic level of the supply chain and sustainable development They cover major classical themes at the same time exploring a new range of applications that address the production of renewable forms of energy environmental footprints and sustainable use of resources and water **Chemical Processes for a Sustainable Future** Trevor Letcher, Janet Scott, Darrell Patterson, 2015-11-09 This comprehensive book approaches sustainability from two directions the reduction of pollution and the maintaining of existing resources both of which are addressed in a thorough examination of the main chemical processes and their impact Divided into five sections each introduced by a leading expert in the field the book takes the reader through the various types of chemical processes demonstrating how we must find ways to lower the environmental cost of both pollution and contributions to climate change

of producing chemicals Each section consists of several chapters presenting the latest facts and opinion on the methodologies being adopted by the chemical industry to provide a more sustainable future A follow up to Materials for a Sustainable Future Royal Society of Chemistry 2012 this book will appeal to the same broad readership industrialists and investors policy makers in local and central governments students teachers scientists and engineers working in the field and finally editors journalists and the general public who need information on the increasingly popular concepts of sustainable living

Sustainability in the Design, Synthesis and Analysis of Chemical Engineering Processes Gerardo Ruiz Mercado, Heriberto Cabezas, 2016-06-09 Sustainability in the Design Synthesis and Analysis of Chemical Engineering Processes is an edited collection of contributions from leaders in their field It takes a holistic view of sustainability in chemical and process engineering design and incorporates economic analysis and human dimensions Ruiz Mercado and Cabezas have brought to this book their experience of researching sustainable process design and life cycle sustainability evaluation to assist with development in government industry and academia This book takes a practical step by step approach to designing sustainable plants and processes by starting from chemical engineering fundamentals This method enables readers to achieve new process design approaches with high influence and less complexity It will also help to incorporate sustainability at the early stages of project life and build up multiple systems level perspectives Ruiz Mercado and Cabezas book is the only book on the market that looks at process sustainability from a chemical engineering fundamentals perspective Improve plants processes and products with sustainability in mind from conceptual design to life cycle assessment Avoid retro fitting costs by planning for sustainability concerns at the start of the design process Link sustainability to the chemical engineering fundamentals

Hemicelluloses and Lignin in Biorefineries Jean-Luc Wertz, Magali Deleu, Séverine Coppée, Aurore Richel, 2017-10-16 Hemicelluloses and Lignin in Biorefineries provides an understanding of lignocellulosic biomass which is mainly composed of cellulose hemicelluloses and lignin It promotes the valorization of these molecules in the context of the bioeconomy and presents hemicelluloses and lignin which are generated in lignocellulosic biorefineries as the molecules of the future The viability of these molecules lies in their renewability and potential This book covers all aspects of hemicelluloses and lignin including structure biosynthesis extraction biodegradation and conversion The book also looks ahead to the socioeconomic and environmental value of biobased industry and emphasizes an understanding of the potential of lignocellulosic biomass

Sustainable Water Technologies Daniel H. Chen, 2016-10-14 Development of advanced technologies is a critical component in overcoming the looming water crisis Stressing emerging technologies and strategies that facilitate water sustainability for future generations the second volume in the two volume set Sustainable Water Management and Technologies provides current and forthcoming technologies research development and applications to help ensure availability of water for all The book emphasizes emerging nanotechnology biotechnology and information technology applications as well as sustainable processes and products to

protect the environment and human health save water and energy and minimize material use It also discusses such topics as groundwater transport protection and remediation industrial and wastewater treatment reuse and disposal membrane technology for water purification and desalination treatment and disposal in unconventional oil and gas development biodegradation and bioremediation for soil and water Stresses emerging technologies and strategies that facilitate water sustainability Covers a wide array of topics including drinking water wastewater and groundwater treatment protection and remediation Discusses oil and gas drilling impacts and pollution prevention membrane technology for water desalination and purification biodegradation and bioremediation for soil and water Details emerging nanotechnology biotechnology and information technology applications as well as sustainable processes and products Environmental Transport Phenomena

A. Eduardo Sáez, James C. Baygents, 2014-12-01 This book offers a detailed yet accessible introduction to transport phenomena It begins by explaining the underlying principles and mechanisms that govern mass transport and continues by tackling practical problems spanning all subdisciplines of environmental science and chemical engineering Assuming some knowledge of ordinary differential equations and a familiarity with basic fluid mechanics applications this classroom tested text addresses mass conservation and macroscopic mass balances placing a special emphasis on applications to environmental processes and presenting a mathematical framework for formulating and solving transport phenomena problems *Sustainable Water Management* Daniel H. Chen, 2016-10-14 While the world's population continues to grow the availability of water remains constant Facing the looming water crisis society needs to tackle strategic management issues as an integrated part of the solution toward water sustainability The first volume in the two volume set *Sustainable Water Management and Technologies* offers readers a practical and comprehensive look at such key water management topics as water resource planning and governance water infrastructure planning and adaption proper regulations and water scarcity and inequality It discusses best management practices for water resource allocation ground water protection and water quality assurance especially for rural arid and underdeveloped regions of the world Timely topics such as drought ecosystem sustainability climate change and water management for shale oil and gas development are presented Discusses best practices for water resource allocation ground water protection and water quality assurance Offers chapters on urban rural arid and underdeveloped regions of the world Describes timely topics such as drought ecosystem sustainability climate change and water management for shale oil and gas development Covers water resource planning and governance water infrastructure planning and adaptation proper regulations and water scarcity and inequality Discusses water resource monitoring efficiency and quality management The Water-Food-Energy Nexus I. M. Mujtaba, R. Srinivasan, N. O. Elbashir, 2017-09-11 Exponential growth of the worldwide population requires increasing amounts of water food and energy However as the quantity of available fresh water and energy sources directly affecting cost of food production and transportation diminishes technological solutions are necessary to secure sustainable supplies In direct response to this

reality this book focuses on the water energy food nexus and describes in depth the challenges and processes involved in efficient water and energy production and management wastewater treatment and impact upon food and essential commodities The book is organized into 4 sections on water food energy and the future of sustainability highlighting the interplay among these topics The first section emphasizes water desalination water management and wastewater treatment The second section discusses cereal processing sustainable food security bioenergy in food production water and energy consumption in food processing and mathematical modeling for food undergoing phase changes The third section discusses fossil fuels biofuels synthetic fuels renewable energy and carbon capture Finally the book concludes with a discussion of the future of sustainability including coverage of the role of molecular thermodynamics in developing processes and products green engineering in process systems petrochemical water splitting petrochemical approaches to solar hydrogen generation design and operation strategy of energy efficient processes and the sustainability of process supply chain and enterprise

Platform Chemical Biorefinery Satinder Kaur Brar, Saurabh Jyoti Sarma, Kannan Pakshirajan, 2016-06-02 Platform Chemical Biorefinery Future Green Chemistry provides information on three different aspects of platform chemical biorefinery The book first presents a basic introduction to the industry beneficial for university students then provides engineering details of existing or potential platform chemical biorefinery processes helpful to technical staff of biorefineries Finally the book presents a critical review of the entire platform chemical biorefinery process including extensive global biorefinery practices and their potential environmental and market related consequences Platform chemicals are building blocks of different valuable chemicals The book evaluates the possibility of renewable feedstock based platform chemical production and the fundamental challenges associated with this objective Thus the book is a useful reference for both academic readers and industry technical workers The book guides the research community working in the field of platform chemical biorefinery to develop new pathways and technologies in combination with their market value and desirability Offers comprehensive coverage of platform chemicals biorefineries recent advances and technology developments potential issues for preventing commercialization and solutions Discusses existing technologies for platform chemicals production highlighting benefits as well their possible adverse effects on the environment and food security Includes a global market analysis of platform chemicals and outlines industry opportunities Serves as a useful reference for both academic readers and industry technical workers

Integrated Design and Simulation of Chemical Processes Alexandre C. Dimian, Costin Sorin Bildea, Anton A. Kiss, 2014-09-18 This comprehensive work shows how to design and develop innovative optimal and sustainable chemical processes by applying the principles of process systems engineering leading to integrated sustainable processes with green attributes Generic systematic methods are employed supported by intensive use of computer simulation as a powerful tool for mastering the complexity of physical models New to the second edition are chapters on product design and batch processes with applications in specialty chemicals process intensification methods for

designing compact equipment with high energetic efficiency plantwide control for managing the key factors affecting the plant dynamics and operation health safety and environment issues as well as sustainability analysis for achieving high environmental performance All chapters are completely rewritten or have been revised This new edition is suitable as teaching material for Chemical Process and Product Design courses for graduate MSc students being compatible with academic requirements world wide The inclusion of the newest design methods will be of great value to professional chemical engineers Systematic approach to developing innovative and sustainable chemical processes Presents generic principles of process simulation for analysis creation and assessment Emphasis on sustainable development for the future of process industries

27th European Symposium on Computer Aided Process Engineering, 2017-09-21 27th European Symposium on Computer Aided Process Engineering Volume 40 contains the papers presented at the 27th European Society of Computer Aided Process Engineering ESCAPE event held in Barcelona October 1 5 2017 It is a valuable resource for chemical engineers chemical process engineers researchers in industry and academia students and consultants for chemical industries Presents findings and discussions from the 27th European Society of Computer Aided Process Engineering ESCAPE event

Advances in Carbon Management Technologies Subhas K. Sikdar, Frank Princiotta, 2021-01-31 Volume 2 of *Advances in Carbon Management Technologies* has 21 chapters It presents the introductory chapter again for framing the challenges that confront the proposed solutions discussed in this volume Section 4 presents various ways biomass and biomass wastes can be manipulated to provide a low carbon footprint of the generation of power heat and co products and of recovery and reuse of biomass wastes for beneficial purposes Section 5 provides potential carbon management solutions in urban and manufacturing environments This section also provides state of the art of battery technologies for the transportation sector The chapters in section 6 deals with electricity and the grid and how decarbonization can be practiced in the electricity sector The overall topic of advances in carbon management is too broad to be covered in a book of this size It was not intended to cover every possible aspect that is relevant to the topic Attempts were made however to highlight the most important issues of decarbonization from technological viewpoints Over the years carbon intensity of products and processes has decreased but the proportion of energy derived from fossil fuels has been stubbornly stuck at about 80% This has occurred despite very rapid development of renewable fuels because at the same time the use of fossil fuels has also increased Thus the challenges are truly daunting It is hoped that the technology choices provided here will show the myriad ways that solutions will evolve While policy decisions are the driving forces for technology development the book was not designed to cover policy solutions

Recent Developments in Bioenergy Research Vijai G. Gupta, Helen Treichel, Ramesh Chander Kuhad, Susana Rodriguez-Couto, 2020-06-21 *Recent Developments in Bioenergy Research* reviews all these topics reports recent research findings and presents potential solutions to challenging issues The book consolidates the most recent research on the bio technologies concepts and commercial developments that are currently in progress on

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

Green Sustainable Process for Chemical and Environmental Engineering and Science Rajender Boddula,Abdullah M. Asiri,2021-11-17 Green Sustainable Process for Chemical and Environmental Engineering and Science Switchable Solvents explores the preparation properties chemical processes and applications of this class of green solvents The book provides an in depth overview on the area of switchable solvents in various industrial applications focusing on the purification and extraction of chemical compounds utilizing green chemistry protocols that include liquid liquid solid liquid liquid gas and lipids separation technologies In addition it includes recent advances in greener extraction and separation processes This book will be an invaluable guide to students professors scientists and R D industrial specialists working in the field of sustainable chemistry organic analytical chemical engineering environmental and pharmaceutical sciences Provides a broad overview of switchable solvents in sustainable chemical processes Compares the use of switchable solvents as greener solvents over conventional solvents Outlines eco friendly organic synthesis and chemical processes using switchable solvents Lists various industrial separations extraction processes using switchable solvents

Handbook of Alternative Fuel Technologies, Second Edition Sunggyu Lee,James G. Speight,Sudarshan K. Loyalka,2014-07-08 While strides are being made in the research and development of environmentally acceptable and more sustainable alternative fuels including efforts to reduce emissions of air pollutants associated with combustion processes from electric power generation and vehicular transportation fossil fuel resources are limited and may soon be on the verge of depletion in the near future Measuring the correlation between quality of life energy consumption and the efficient utilization of energy the Handbook of Alternative Fuel Technologies Second Edition thoroughly examines the science and technology of alternative fuels and their processing technologies It focuses specifically on environmental technoeconomic and socioeconomic issues associated with the use of alternative energy sources such as sustainability applicable technologies modes of utilization and impacts on society Written with research and development scientists and

engineers in mind the material in this handbook provides a detailed description and an assessment of available and feasible technologies environmental health and safety issues governmental regulations and issues and agendas for R D It also includes alternative energy networks for production distribution and consumption What s New in This Edition Contains several new chapters of emerging interest and updates various chapters throughout Includes coverage of coal gasification and liquefaction hydrogen technology and safety shale fuel by hydraulic fracturing ethanol from lignocellulosics biodiesel algae fuels and energy from waste products Covers statistics current concerns and future trends A single volume complete reference the Handbook of Alternative Fuel Technologies Second Edition contains relevant information on chemistry technology and novel approaches as well as scientific foundations for further enhancements and breakthroughs In addition to its purposes as a handbook for practicing scientists and engineers it can also be used as a textbook or as a reference book on fuel science and engineering energy and environment chemical process design and energy and environmental policy

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