

Green Energy and Technology

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Virtual Biorefinery

An Optimization Strategy for Renewable
Carbon Valorization



Springer

Virtual Biorefinery Optimization Valorization Technology

**Richa Kothari, Vinayak V Pathak, V V
Tyagi**



Virtual Biorefinery Optimization Valorization Technology:

Virtual Biorefinery Antonio Bonomi, Otavio Cavalett, Marcelo Pereira da Cunha, Marco A. P. Lima, 2015-12-09 This book presents a concise framework for assessing technical and sustainability impacts of existing biorefineries and provides a possible road map for development of novel biorefineries It offers a detailed integrated approach to evaluate the entire biomass production chain from the agricultural feedstock production and transportation to the industrial conversion and commercialization however the methods and concepts can be applied to almost any biomass alternative Chapters explore the main issues regarding biorefinery assessment including feedstock production and transportation modeling biofuels and green chemistry products as well as assessment of sustainability impacts This book is a valuable source of information to researchers in bioenergy green chemistry and sustainability fields It also provides a useful framework for government agencies investors and the energy industry to evaluate and predict the success of current and future biorefinery alternatives

Sugarcane Bioenergy for Sustainable Development Luis A. B. Cortez, Manoel Regis L. V. Leal, Luiz A. Horta Nogueira, 2018-10-25 In recent years there has been a rapid expansion of the growing of crops for use in bioenergy production rather than for food This has been particularly the case for sugarcane in Latin America and Africa This book examines the further potential in the context of the food versus fuel debate and as a strategy for sustainable development Detailed case studies of two countries Colombia and Mozambique are presented These address the key issues such as the balance between food security and energy security rural and land development policies and feasibility and production models for expanding bioenergy The authors then assess these issues in the context of broader sustainable development strategies including implications for economics employment generation and the environment The book will be of great interest to researchers and professionals in energy and agricultural development

Refining Biomass Residues for Sustainable Energy and Bioproducts R. Praveen Kumar, Edgard Gnansounou, Jegannathan Kenthorai Raman, Baskar Gurunathan, 2019-11-08 The utilization of various types of biomass residue to produce products such as biofuels and biochemicals means biorefinery technology using biomass residues may become a one stop solution to the increasing need for sustainable non fossil sources of energy and chemicals Refining Biomass Residues for Sustainable Energy and Bioproducts Technology Advances Life Cycle Assessment and Economics focuses on the various biorefineries currently available and discusses their uses challenges and future developments This book introduces the concept of integrated biorefinery systems as well as their operation and feedstock sourcing It explores the specificities current developments and potential end products of various types of residue from industrial and municipal to agricultural and marine as well as residue from food industries Sustainability issues are discussed at length including life cycle assessment economics and cost analysis of different biorefinery models In addition a number of global case studies examine successful experiences in different regions This book is an ideal resource for researchers and practitioners in the field of bioenergy and waste management who are looking to learn about technologies

involved in residue biorefinery systems how to reduce their environmental impacts and how to ensure their commercial viability Explores a range of different biorefinery categories such as industrial agricultural and marine biomass residues Includes a Life Cycle Assessment of biorefinery models in addition to costs and market analysis Features case studies from around the world and is written by an international team of authors *Sugarcane Biofuels* Muhammad Tahir Khan, Imtiaz Ahmed Khan, 2019-06-29 Sugarcane exhibits all the major characteristics of a promising bioenergy crop including high biomass yield C4 photosynthetic system perennial nature and ratooning ability Being the largest agricultural commodity of the world with respect to total production sugarcane biomass is abundantly available Brazil has already become a sugarcane biofuels centered economy while Thailand Colombia and South Africa are also significantly exploiting this energy source Other major cane producers include India China Pakistan Mexico Australia Indonesia and the United States It has been projected that sugarcane biofuels will be playing extremely important role in world's energy matrix in recent future This book analyzes the significance applications achievements and future avenues of biofuels and bioenergy production from sugarcane in top cane growing countries around the globe Moreover we also evaluate the barriers and areas of improvement for targeting efficient sustainable and cost effective biofuels from sugarcane to meet the world's energy needs and combat the climate change

A Sustainable Bioeconomy Mika Sillanpää, Chaker Ncibi, 2017-04-13 An authoritative and comprehensive volume of knowledge and green technologies wholly focused on the future of the bioeconomy The authors present data show opportunities discuss R D findings analyze strategies assess the wider economic impact showcase achievements criticize policies and propose solutions for the green revolution in biofuels biochemicals and biomaterials production and power generation A fascinating range of case studies from the US China and many European countries are used to inform readers about the impact of this field on society and how various technologies are currently being implemented Additionally the role of industry on this green industrial revolution is outlined with contributions from several major companies such as DuPont US UPM Kymmene Oy Finland Anhui BBKA Biochemical Co China

Chemistry of Renewables Arno Behr, Thomas Seidensticker, 2020-10-29 This textbook introduces the industrial production and processing of natural resources It is divided into six major topics fats and oils carbohydrates lignin terpenoids other natural products biorefinery which are divided into a total of 20 chapters Each chapter is self contained and therefore a compact learning unit which can be worked on by students in self study or presented by lecturers Clear illustrations flow diagrams apparatus drawings and photos facilitate the understanding of the subject matter All chapters end with a succinct summary the Take Home Messages Each chapter is supplemented by ten short test questions which can be solved quickly after working through the chapter the answers are at the end of the book All chapters contain bibliographical references that focus on essential textbooks and reference works As a prior knowledge only basic knowledge of chemistry is required

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

Green Biorefinery Solutions Sanjiv K. Soni, Raman Soni, 2025-07-26 This book delves into the innovative concept of biorefineries as a sustainable approach for managing biodegradable waste and producing valuable resources It highlights the pressing need to address environmental challenges such as waste accumulation and resource depletion while meeting the increasing demand for renewable energy and bio based products The book introduces the concept of biorefineries which are analogous to conventional oil refineries but focus on converting biomass and biodegradable waste into a range of high value products These products include biofuels biochemicals bioplastics biofertilizers and other materials that can replace fossil derived equivalents The author explores various technological pathways and processes involved in efficiently transforming different types of biodegradable waste such as agricultural residues food waste and organic byproducts into usable resources Readers are guided through the principles of biorefinery design integration of various unit operations and the optimization of conversion processes to achieve maximum resource utilization and minimal environmental impact The book emphasizes the importance of circular economy concepts where waste is considered a valuable input rather than a burden It also discusses the economic social and environmental benefits of adopting biorefinery solutions in different sectors from agriculture to industry The book is a valuable resource for researchers policymakers industry professionals and students interested in exploring innovative approaches to waste management resource recovery and the transition towards a more sustainable and circular bioeconomy By highlighting the transformative potential of biorefineries the book contributes to the ongoing dialogue on creating a more environmentally conscious and resource efficient future

[Handbook of Waste Biorefinery](#) Eduardo Jacob-Lopes, Leila Queiroz Zepka, Mariany Costa Deprá, 2022-09-01 This handbook discusses the latest developments in biorefinery technologies for waste to energy conversion The growing global population and the accompanying increase in consumption and waste production make it urgent to find the best possible use of our resources A sustainable waste management under the biorefinery concept has great potential to support a sustainable circular economy and green energy production This handbook is divided into four parts First the reader is introduced to the fundamentals and recent trends of waste to energy technologies The second part describes in detail the current status challenges and potential of the different feedstocks used for waste to energy conversion Here municipal solid waste sewage sludge oils and greases generated during food preparation industrial wastewaters and agricultural wastes to name a few are introduced In the third part numerous waste to energy technologies are discussed in detail including anaerobic digestion composting gasification plasma technology thermal cracking and others Advantages and optimization potentials of these technologies for efficient residue

management quality and yield are highlighted Finally the handbook discusses social environmental and economic aspects of waste to energy biorefinery technologies Readers will learn more about the major bottlenecks and solutions in bioenergy commercialization the logistics of biomass supply and the carbon footprint of waste biorefineries The ideas and technologies presented in this book contribute to the UN Sustainable Development Goal SDG of Affordable and Clean Energy This book is a useful reference for postgraduate students and researchers interested in biorefinery and biofuel technologies both in academia and commercial laboratories Early career scientists can use it to fast track into the field Advanced scientists will find it helpful in gaining a broader overview of the field beyond their area of specialization *Algal Biofuel* Richa

Kothari,Vinayak V Pathak,V V Tyagi,2022-12-22 *Algal Biofuel Sustainable Solution* primarily focuses on the different aspects of bioenergy production using algal biomass as microalgae are considered the optimum feedstock for bioenergy production The major aim is to thoroughly review the available bioenergy options challenges in bioenergy production availability of bioenergy feedstock and biomass to bioenergy conversion process This book also highlights the feasibility of lignocellulosic biomass crop residues and non edible oil seeds for generation of different bioenergy products It will be helpful for researchers and other stakeholders working in the area of bioenergy production for development of innovative concepts in emerging areas of bioenergy Print edition not for sale in South Asia India Sri Lanka Nepal Bangladesh Pakistan and Bhutan

Waste-to-Energy Jingzheng Ren,2020-05-12 *Waste to Energy Multi criteria Decision Analysis for Sustainability Assessment and Ranking* offers a comprehensive view of the technologies and processes for energy generation as a path for waste treatment presenting all the necessary information and tools for selecting the most sustainable waste to energy solution under varying conditions The book combines methods such as lifecycle assessment sustainability assessment multi criteria decision making and multi objective optimization modes In addition it provides an overview of waste to energy feedstocks technologies and implementation then goes on to investigate the critical factors and key enablers that influence the sustainable development of the waste to energy industry The book proposes several decision making methods for the ranking and selection of waste to energy scenarios under different levels of certainty and information availability including multi criteria multi actor and multi attribute methods Finally the book employs lifecycle tools that allow the assessment of economic environmental and social sustainability of waste to energy systems Explores existing and state of the art waste to energy technologies and systems as well as their feedstock requirements Presents a wide perspective of sustainability issues of waste to energy technologies also discussing critical influential factors or key enablers for promoting the sustainable development of waste to energy solutions Provides multi dimensional decision making techniques for choosing the most suitable and sustainable waste to energy technologies for different scenarios *Proálcool 40 anos* Luís Augusto Barbosa Cortez,2018-03-07 Este livro apresenta informa es sobre a saga brasileira de produ o e uso de etanol veicular Foi realizado em comemora o aos 40 anos do lan amento do Pro lcool que aconteceu em novembro de 1975 Os autores destacam os fatos

mais relevantes dessa trajetória sobretudo do ponto de vista dos avanços da ciência e da tecnologia do etanol de cana-de-açúcar no Brasil e das relações entre a pesquisa realizada pelos setores privado e público. O livro inicia com um breve relato da evolução da cana-de-açúcar no Brasil colonial e trata do uso do etanol como combustível no século XX das dificuldades técnicas e políticas decorrentes dessa opção energética e mais recentemente do advento do Procool. São mostradas as etapas do Procool o envolvimento do setor sucroalcooleiro e das montadoras de veículos bem como as dificuldades de compatibilizar o uso do etanol em momentos de aumento do preço do açúcar e diminuição do preço do petróleo. Foram importantes as contribuições das universidades e dos institutos de pesquisa estaduais e federais na superação de dificuldades técnicas e na melhoria contínua da sustentabilidade do etanol combustível de cana-de-açúcar no Brasil uma iniciativa ainda sem par no mundo. Finalmente feita uma avaliação do momento atual e das oportunidades que ainda são reservadas à bioenergia de cana-de-açúcar nacional e internacionalmente.

Evolución de la industria química. Transición hacia las biorrefinerías Bilbao Duñabeitia, Rafael, 2018-03-14. La potenciación de la sostenibilidad de la industria química hace que en muchos países se plantee un cambio en la forma de obtener diversos productos químicos y energía. En este contexto se encuadra el concepto de biorrefinería que se basa en sustituir paulatinamente las actuales materias primas fósiles y finitas por materias primas renovables como la biomasa y en el aprovechamiento y valorización de subproductos y residuos.

Handbook of Biofuels Sanjay Sahay, 2021-10-31. Handbook of Biofuels looks at the many new developments in various types of bioenergy along with the significant constraints in their production and/or applications. Beyond introducing current approaches and possible future directions of research, this title covers sources and processing of raw materials to downstream processing constraints involved and research approaches to address and overcome these needs. Different combinations of products from the biorefinery are included along with the material to answer questions surrounding the optimum process conditions for conversion of different feedstocks to bioenergy: the basis for choosing conversion technology and what bioenergy products make economic sense. With chapters on the techno-economic analysis of biofuel production and concepts and step-by-step approaches in bioenergy processing, the objective of this book is to present a comprehensive and all-encompassing reference about bioenergy to students, teachers, researchers and professionals. Reviews all existing and emerging technologies surrounding the production of advanced biofuels including biodiesel and bioethanol. Includes biofuel applications with compatible global application case studies. Offers new pathways for converting biomass.

Valorization of Biomass

Wastes for Environmental Sustainability Arun Lal Srivastava, Abhishek Kumar Bhardwaj, Mukesh Kumar, 2024-03-14. This volume discusses the reduction, recycling and reuse of industrial and agricultural biomass wastes to develop value-added products using environmentally sustainable practices and technologies. Through these waste valorization approaches, biomass waste materials can be converted into useful biochemical products, sustainable construction materials, polymers, bioenergy and biofuel as sustainable alternatives to products and materials with negative environmental and health consequences. The

chapters highlight the development and implementation of eco friendly solutions to biomass waste production with the aim of reducing natural resource deterioration bolstering rural and small scale business systems in communities impacted by pollution and climate change and providing power from residual biomass to broadly reduce environmental impacts through improved waste management practices The book is intended to be a useful resource for researchers policymakers NGOs government agencies and local community authorities working in waste management and environmental sustainability

Biofuel from Microbes and Plants Nitish Kumar, 2021-10-25 Global concern for energy security and environmental protection has put great emphasis on the search for alternative energy sources particularly for the transport sector Biofuels have emerged as a highly promising source of alternative energy and have drawn global research and development for their production using biomass With the increasing worldwide demand for energy along with the depletion of conventional fossil fuel reserves there has been growing global interest in developing alternative sources of energy There has also been concern in growing economies regarding energy security Biofuels offer much promise on these frontiers In addition to these factors they also have a reduced environmental impact in comparison to fossil fuels Biofuels from Microbes and Plants provides state of the art information on the status of biofuel production and related aspects Academics researchers engineers and technologists will develop a greater understanding of the relevant concepts and solutions to the global issues related to achieving alternative energy applications for future energy security as well as environmental sustainability in medium and large scale industries Key Features Detailed overview of the alternative energy field and the role of biofuels as new energy sources Detailed accounts of the production of biodiesel from non conventional bio feedstocks such as algae microbes and vegetable oils Recent updates about biotechnological improvements of plant and microbial sources for biofuel production

Bioethanol Production from Food Crops Ramesh C. Ray, S Ramachandran, 2018-08-20 Bioethanol Production from Food Crops Sustainable Sources Interventions and Challenges comprehensively covers the global scenario of ethanol production from both food and non food crops and other sources The book guides readers through the balancing of the debate on food vs fuel giving important insights into resource management and the environmental and economic impact of this balance between demands Sections cover Global Bioethanol from Food Crops and Forest Resource Bioethanol from Bagasse and Lignocellulosic wastes Bioethanol from algae and Economics and Challenges presenting a multidisciplinary approach to this complex topic As biofuels continue to grow as a vital alternative energy source it is imperative that the proper balance is reached between resource protection and human survival This book provides important insights into achieving that balance Presents technological interventions in ethanol production from plant biomass to food crops Addresses food security issues arising from bioethanol production Identifies development bottlenecks and areas where collaborative efforts can help develop more cost effective technology

Microbiology of Green Fuels Abu Yousuf, Elia Tomás-Pejó, 2023-03-10 The replacement of fossil derived compounds by bio based fuels and chemicals is crucial for the implementation of a sustainable bioeconomy

In this context microorganisms are key players for biofuels production from renewable sources. Biotechnological biofuel production processes require conversion microorganisms capable of both efficiently assimilating renewable low cost carbon sources and diverting their metabolisms towards the specific biofuel. Exploring the wide diversity of microorganisms available on Earth will surely aid to make the production of green fuels a reality. This book gives a wide overview of different microbial based processes for green fuels production. The book also includes techno economic analysis and highlights strategic commercial and environmental interests in promoting green fuels. All these facts make this book very valuable not only for the scientific community but also for biofuel companies and policy makers.

Artificial Intelligence in Internet of Things (IoT): Key Digital Trends Frank Lin, David Pastor, Nishtha Kesswani, Ashok Patel, Sushanta Bordoloi, Chaitali Koley, 2024-10-16. This book is a collection of high quality research papers presented at 8th International Conference on Internet of Things and Connected Technologies ICIoTCT 2023 held at National Institute of Technology NIT Mizoram India during 29-30 September 2023. This book presents recent advances on IoT and connected technologies. This book is designed for marketing managers, business professionals, researchers, academicians and graduate level students seeking to learn how IoT and connecting technologies increase the amount of data gained through devices, enhance customer experience and widen the scope of IoT analytics in enhancing customer marketing outcomes.

Nature-Positive Circular Bioeconomy: Sustainable Biomass, Biobased Products, Organic Waste Recycling, and Regenerative Land Use for Climate, Biodiversity, and Resource Efficiency Robert C. Brears. Nature Positive Circular Bioeconomy is a practical guide to building sustainable systems using biomass, biobased products and organic waste recycling. This book provides real world solutions for reducing resource use, increasing material circularity and restoring ecosystems through regenerative land use, circular economy strategies and climate positive practices. Designed for professionals, policymakers and sustainability practitioners, it shows how to align biobased systems with biodiversity protection, carbon reduction and waste management goals. Inside this book you will learn how to use sustainable biomass to replace fossil based raw materials in food, energy and industrial applications; design and manage biobased products that are recyclable, compostable and made from renewable biological resources; build systems for organic waste recycling including composting, anaerobic digestion and biogas production; apply regenerative agriculture and land restoration techniques to increase soil health and carbon sequestration; implement circular economy strategies for reducing waste and closing material loops in supply chains; integrate waste to resource technologies into city, region, food systems and industrial operations; use natural capital accounting and biodiversity metrics to monitor and report environmental performance; develop science based targets for climate and biodiversity within circular bioeconomy frameworks; improve public procurement and consumer awareness to drive demand for sustainable biobased products; support industrial symbiosis and regional bioeconomy hubs to scale local circular systems. This book is a complete resource for professionals working on sustainable biomass, biobased products, organic waste recycling and regenerative land use. It

offers proven tools and actionable strategies for building circular bioeconomy systems that deliver results for climate biodiversity and resource efficiency

The book delves into Virtual Biorefinery Optimization Valorization Technology. Virtual Biorefinery Optimization Valorization Technology is an essential topic that must be grasped by everyone, ranging from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Virtual Biorefinery Optimization Valorization Technology, encompassing both the fundamentals and more intricate discussions.

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- The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of Virtual Biorefinery Optimization Valorization Technology.

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