



Krzysztof J. Ptasinski

EFFICIENCY OF BIOMASS ENERGY

An Exergy Approach to Biofuels, Power, and Biorefineries

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Efficiency Of Biomass Energy An Exergy Approach To Biofuels Power And Biorefineries

Erik Dahlquist



Efficiency Of Biomass Energy An Exergy Approach To Biofuels Power And Biorefineries:

Efficiency of Biomass Energy Krzysztof J. Ptasinski, 2016-08-30 Details energy and exergy efficiencies of all major aspects of bioenergy systems Covers all major bioenergy processes starting from photosynthesis and cultivation of biomass feedstocks and ending with final bioenergy products like power biofuels and chemicals Each chapter includes historical developments chemistry major technologies applications as well as energy environmental and economic aspects in order to serve as an introduction to biomass and bioenergy A separate chapter introduces a beginner in easy accessible way to exergy analysis and the similarities and differences between energy and exergy efficiencies are underlined Includes case studies and illustrative examples of 1st 2nd and 3rd generation biofuels production power and heat generation thermal plants fuel cells boilers and biorefineries Traditional fossil fuels based technologies are also described in order to compare with the corresponding bioenergy systems

Sustainable Engineering Yasar Demirel, Marc A. Rosen, 2023-08-04 Sustainable engineering is of great importance for resilient and agile technology and society This book balances economics environment and societal elements of sustainable engineering by integrating process intensification energy analysis and artificial intelligence to reduce production costs improve the use of material and energy product quality safety societal well being and water usage The book provides comprehensive discussion of topics on process intensification energy analysis and artificial intelligence that include optimization energy integration green engineering pinch analysis exergy analysis feasibility analysis life cycle assessment circular economy bioeconomy data processing machine learning expert systems digital twins and self optimized plants for sustainable engineering

Sustainable Energy Development and Innovation Ali Sayigh, 2022-02-24 This book contains selected papers presented during the World Renewable Energy Congress WREC 2020 at the Instituto Superior Tecnico in Lisbon The WREC is dedicated to promoting renewable energy global development and features top international experts policy makers scientists engineers technology developers and business practitioners addressing the most current research and technological breakthroughs in sustainable energy development and innovation The contributions address policy and renewable energy technologies and applications in all sectors for heating and cooling agricultural applications water desalination industrial applications and for the transport sectors Presents cutting edge research in green building and renewable energy from all over the world Covers the most up to date research developments government policies business models best practices and innovations Contains case studies and examples to enhance practical application of the technologies

Sustainable Design for Renewable Processes Mariano Martin, 2021-10-31 Sustainable Design for Renewable Processes Principles and Case Studies covers the basic technologies to collect and process renewable resources and raw materials and transform them into useful products Starting with basic principles on process analysis integration and optimization that also addresses challenges the book then discusses applied principles using a number of examples and case studies that cover biomass waste solar water and wind as resources along with a set of technologies including gasification

pyrolysis hydrolysis digestion fermentation solar thermal solar photovoltaics electrolysis energy storage etc The book includes examples exercises and models using Python Julia MATLAB GAMS EXCEL CHEMCAD or ASPEN This book shows students the challenges posed by renewable based processes by presenting fundamentals case studies and step by step analyses of renewable resources Hence this is an ideal and comprehensive reference for Masters and PhD students engineers and designers Addresses the fundamentals and applications of renewable energy process design for all major resources including biomass solar wind geothermal waste and water Provides detailed case studies step by step instructions and guidance for each renewable energy technology Presents models and simulations for a wide variety of platforms including state of the art and open access platforms in addition to well known commercial software **Reactive Separation for**

Process Intensification and Sustainability Carlos Ariel Cardona Alzate, Mariana Ortiz Sanchez, Pisarenko Yury Andrianovich, 2019-12-23 This book describes analyses and discusses the main principles phenomena and design strategies of reactive separation processes with an emphasis on the intensification as a basis of the sustainability Different reactive separation processes are explained in detail to show the phenomena and with the purpose of understanding when their use allows advantages based on the output results Case examples are analysed and the perspective of these processes in the future is discussed The overall sustainability of reactive separation processes in the industry is also explained separately

Banana Peels Valorization Mejdi Jeguirim, Besma Khiari, 2024-05-21 Banana Peels Valorization Sustainable and Eco friendly Applications provides a global overview of world production physicochemical and microbiological characteristics of Banana Peels and the various pathways for their valorization considering the advantages disadvantages and factors impacting on each way of valorization Each chapter deals with sustainable applications based on the sector category Such structure helps the audience from a specific field to easily identify the specific application Successful case study of a banana processing by products valorization is also presented Written by a team of interdisciplinary experts this is the ultimate valuable resource for agricultural or food engineers who work in the banana groves and in the banana processing industry and also for Researchers working in correlated areas of food environmental and energy fields Provides a global overview of world production physicochemical and microbiological characteristics of banana peels Explores banana tree and fruit wastes including their quantification and classification Discusses each sustainable application of banana peels in a specific chapter based on the sector category **Comprehensive Energy Systems** Ibrahim Dincer, 2018-02-07 Comprehensive Energy

Systems Seven Volume Set provides a unified source of information covering the entire spectrum of energy one of the most significant issues humanity has to face This comprehensive book describes traditional and novel energy systems from single generation to multi generation also covering theory and applications In addition it also presents high level coverage on energy policies strategies environmental impacts and sustainable development No other published work covers such breadth of topics in similar depth High level sections include Energy Fundamentals Energy Materials Energy Production Energy

Conversion and Energy Management Offers the most comprehensive resource available on the topic of energy systems Presents an authoritative resource authored and edited by leading experts in the field Consolidates information currently scattered in publications from different research fields engineering as well as physics chemistry environmental sciences and economics thus ensuring a common standard and language

Innovative Energy Conversion from Biomass Waste Arif Darmawan, Muhammad Aziz, 2021-08-21 Innovative Energy Conversion from Biomass Waste offers a new approach to optimizing energy recovery from waste using thermochemical conversion Instead of conventional pinch technology the book proposes integrated systems employing exergy recovery and process integration technologies to minimize exergy loss due to entropy generation This innovative approach is demonstrated in three case studies using high potential low rank fuels from industrial waste products with high moisture content high volatile matter and high hemicellulose content From these case studies readers are provided with three different examples of biomass type pre treatment route and conversion from fruit bunch cofired within existing coal power plants black liquor in a stand alone system and rice waste processing integrated into existing agricultural systems Innovative Energy Conversion from Biomass Waste is a valuable resource for researchers and practitioners alike and will be of interest to environmental scientists biotechnologists and chemical engineers working in waste to energy and renewable energy Provides a new approach to developing systems based on exergy recovery and process integration technologies Discusses the possible routes of energy recovery in different scenarios from selected low rank fuels from industrial waste biomass Includes a replicable and applicable efficiency improvement method for different process developments

Bioenergy and Renewable Power Methane in Integrated 100% Renewable Energy Systems.

Limiting Global Warming by Transforming Energy Systems Michael Sterner, 2009 Front Cover Reihentitel Titelseite Impressum Abstract Zusammenfassung Resumen Acknowledgements Contents Acronyms and abbreviations 0 Introduction 0 1 Main research questions 0 2 Structure of thesis and new approaches 1 Status quo threats and potentials in the triangle of bioenergy climate energy and land use 1 1 Climate change climate protection 1 1 1 Status quo 1 1 2 Threats 1 2 Energy systems 1 2 1 Status quo 1 2 2 Threats 1 2 3 Potentials for a climate friendly and energy efficient supply 1 3 Land use 1 3 1 Status quo 1 3 2 Threats 1 3 3 Potentials of land use for climate protection and bioenergy supply 2 Analysis of 78 biomass pathways 2 1 Principle and selected pathways 2 1 1 Principle pathways 2 1 2 Selected modern bioenergy pathways cropping systems and residues 2 2 Technical analysis 2 2 1 Conversion efficiency 2 2 2 Yields per hectare for raw biomass and target energy 2 2 3 Conversion efficiency of traditional biomass and bioenergy in rural applications 2 3 Economic analysis 2 3 1 Production cost 2 3 2 Production cost of traditional biomass and improved cooking stoves 2 4 Ecological analysis greenhouse gas balances and mitigation costs 2 4 1 Effect of direct and indirect land use change caused by bioenergy 2 4 2 Fossil reference systems 2 4 3 Greenhouse gas reductions 2 4 4 Greenhouse gas mitigation costs 2 4 5 Greenhouse gas reductions and mitigation costs of replacing traditional biomass 2 5 Synthesis 2 5 1 Techno economic synthesis 2 5 2 Techno ecologic

synthesis 2 5 3 Economic ecologic synthesis 3 Integrated assessment role of bioenergy in land use energy systems and climate change 3 1 Role of bioenergy in land use two faces of one coin

Practices and Perspectives in Sustainable Bioenergy Madhumi Mitra, Abhijit Nagchaudhuri, 2020-01-29 This book presents a systems approach to bioenergy and provides a means to capture the complexity of bioenergy issues including both direct and indirect impacts across the energy economy The book addresses critical topics such as systems thinking sustainability biomass feedstocks of importance and relevance that are not competing with the food market anaerobic digestion and biogas biopower and bioheat and policies economy and rights to access to clean energy This is a contributed volume with each chapter written by relevant experts in the respective fields of research and teaching Each chapter includes a review with highlights of the key points critical thinking questions and a glossary This book can be used as a primary or secondary textbook in courses related to bioenergy and bioproducts and sustainable biofuels It is suitable for advanced undergraduate and graduate students Researchers professionals and policy makers will also be able to use this book for current reference materials

Biomass and Biofuels Shibu Jose, Thallada Bhaskar, 2015-04-22 The long held tenets of the energy sector are being rewritten in the twenty first century The rise of unconventional oil and gas and of renewables is transforming our economies and improving our understanding of the distribution of the world's energy resources and their impacts A complete knowledge of the dynamics underpinning energy markets is necessary for decision makers reconciling economic energy and environmental objectives Those that anticipate global energy developments successfully can derive an advantage while those that fail to do so risk making poor policy and investment decisions Focused on solving the key challenges impeding the realization of advanced cellulosic biofuels and bioproducts in rural areas Biomass and Biofuels Advanced Biorefineries for Sustainable Production and Distribution provides comprehensive information on sustainable production of biomass feedstock supply chain management of feedstocks to the biorefinery site advanced conversion processes and catalysts biocatalysts for production of fuels and chemicals using conventional and integrated technologies The book also presents detailed coverage of downstream processing and ecological considerations for refineries processing lignocellulosic and algal biomass resources Discussions of feedstock raw materials methods for biomass conversion and its effective integration to make biorefinery more sustainable economically environmentally and socially give you the tools to make informed decisions

Technologies for Converting Biomass to Useful Energy Erik Dahlquist, 2013-04-16 Officially the use of biomass for energy meets only 10 13% of the total global energy demand of 140 000 TWh per year Still thirty years ago the official figure was zero as only traded biomass was included While the actual production of biomass is in the range of 270 000 TWh per year most of this is not used for energy purposes and mostly it is not used very efficiently Therefore there is a need for new methods for converting biomass into refined products like chemicals fuels wood and paper products heat cooling and electric power Obviously some biomass is also used as food our primary life necessity The different types of conversion methods covered in this volume are biogas

production bio ethanol production torrefaction pyrolysis high temperature gasification and combustion This book covers the suitability of different methods for conversion of different types of biomass Different versions of the conversion methods are presented both existing methods and those being developed for the future System optimization using modeling methods and simulation are analyzed to determine advantages and disadvantages of different solutions Many international experts have contributed to provide an up to date view of the situation all over the world These global perspectives and the inclusion of so much expertise of distinguished international researchers and professionals make this book unique This book will prove useful and inspiring to professionals engineers researchers and students as well as to those working for different authorities and organizations

Biomass in Small-Scale Energy Applications Mateusz Szubel, Mariusz Filipowicz, 2019-10-08

Biomass in Small Scale Energy Applications Theory and Practice presents the current trends in the development of selected biomass based technologies for distributed energy generation It describes the methodology experimental results and computer simulations with a focus on pilot systems and devices crucial in multiple applications with related environmental economic issues It describes which stages of design development and application of advanced biomass based energy devices are critical in order for a given technology to be successful It includes both technical practical information and theoretical background related to combustion kinetics thermodynamics in energy systems and properties of selected types of biomass as well as case studies

Biomass as a Sustainable Energy Source for the Future Wiebren de Jong, J. Ruud van

Ommen, 2014-11-03 Focusing on the conversion of biomass into gas or liquid fuels the book covers physical pre treatment technologies thermal chemical and biochemical conversion technologies Details the latest biomass characterization techniques Explains the biochemical and thermochemical conversion processes Discusses the development of integrated biorefineries which are similar to petroleum refineries in concept covering such topics as reactor configurations and downstream processing Describes how to mitigate the environmental risks when using biomass as fuel Includes many problems small projects sample calculations and industrial application examples

Biomass Production and Efficient Utilization for Energy Generation N.S. Rathore, N.L. Panwar, 2021-11-29 The content of book includes all major aspects of biomass production and efficient utilization for energy generation Most of the information presented in this book reflects a basis to acquire the understanding of the proper utilization of biomass for heat and power generation In this book design criteria present state of art of technology and future perspective of clean energy are illustrated through graphs figures tables flowcharts equations etc to make the subject more clear and useful Note T F does not sell or distribute the hardback in India Pakistan Nepal Bhutan Bangladesh and Sri Lanka This title is co published with NIPA

Introduction to Biomass Energy Conversions Sergio Capareda, 2013-07-09 The potential that biomass energy has to supplement traditional fuels and reduce greenhouse gas emissions has put it front and center in the plan to replace fossil based fuels with renewable fuels While much has been written about biomass conversions no single textbook contains all the information needed to teach a biomass

conversion course until Biomass as Energy Source Erik Dahlquist, 2013-03-25 Global energy use is approximately 140 000 TWh per year Interestingly biomass production amounts to approximately 270 000 TWh per year or roughly twice as much whereas the official figure of biomass use for energy applications is 10 13% of the global energy use This shows that biomass is not a marginal energy resource but more than capable of meeting all our energy and food needs provided it is used efficiently The use of food in generating energy has been extensively debated but there is actually no need for it given the comprehensive resources available from agriculture and forestry waste This book discusses the biomass resources available and aspects like efficient energy use One way of using energy efficiently is to use waste biomass or cellulosic materials in biorefineries where production of fibers and products from fibers is combined with production of most chemicals we need in our daily life Such products include clothes soap perfume medicines etc Conventional pulp and paper applications bio fuel for vehicles and even fuel for aviation as well as heat and power production are covered The problem with biomass is not availability but the difficulty to use the resources efficiently without harming the long term productivity This book covers all types of resources on a global scale making it unique Many researchers from all over the world have contributed to give a good coverage of all the different international perspectives This book will provide facts and inspiration to professionals engineers researchers and students as well as to those working for various authorities and organizations *Modeling Energetic Efficiency of Biofuels Production* Andrzej Wasiak, 2018-09-19 This book focuses on how the energetic efficiency of biofuel production systems can be modeled It provides engineers and economists with an essential grasp of biofuel production systems performance as it includes results of mathematical modeling and computer simulations concerning the performance of real world biofuel production systems The book also indicates the limitations on biofuel production s ability to ensure sustainability and the energetic self sufficiency of agriculture helping politicians and other decision makers to choose between various legal and economic options Sustainable Approaches for Biofuels Production Technologies Neha Srivastava, Manish Srivastava, P.K. Mishra, S.N. Upadhyay, Pramod W. Ramteke, Vijaj Kumar Gupta, 2018-07-19 This volume focuses on technological advances relevant to establishing biofuels as a viable alternative to fossil fuels by overcoming current limitations The progressive depletion of fossil fuels due to their large scale utilization and their environmental consequences notably global warming increase the need for sustainable and cleaner energy options Renewable biofuels like biohydrogen biomethane biogas ethanol and butenol represent attractive energy sources to meet the growing global demand thanks to sustainable and cost efficient production approaches based on cellulosic biomass Currently the commercialization of these technologies is hindered by technical and economic limitations such as biomass complexity and pre treatment enzyme hydrolysis production efficiency as well as storage and cost As such this book presents economically viable and sustainable approaches to improve existing biofuel technologies and appeals to anyone with an interest in biofuels as renewable energy options and their practical implementation *Biomass Energy Explained* Yves Earhart, AI, 2025-02-28

Biomass Energy Explained explores the potential of biomass energy as a renewable resource in our global energy transition. It examines how organic materials can be converted into power, addressing the critical need for sustainable energy sources. The book highlights the environmental implications, including the potential to reduce reliance on fossil fuels and promote energy security. Did you know that biomass has been used as a primary energy source since the days of wood-burning stoves? Or that biomass can contribute to a circular economy by reducing waste? The book begins by outlining the types of biomass resources, such as agricultural residues and energy crops, before dedicating chapters to conversion technologies like gasification and anaerobic digestion. It analyzes each technology's efficiency and environmental footprint, culminating in a comprehensive look at sustainability considerations. Biomass Energy Explained uniquely focuses on integrating biomass with other renewable sources, providing a balanced perspective for policymakers, researchers, and anyone interested in sustainable development.

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