

## Biomass Gasification And Pyrolysis Practical Design And Theory

*Engineering the physical, chemical, and energy properties of lignocellulosic biomass is important to produce high-quality consistent feedstocks with reduced variability for biofuels production. The emphasis of this book will be the beneficial impacts that mechanical, chemical, and thermal preprocessing methods can have on lignocellulosic biomass quality attributes or specifications for solid and liquid biofuels and biopower production technologies. "Preprocessing" refers to treatments that can occur at a distance from conversion and result in an intermediate with added value, with improved conversion performance and efficiency. This book explores the effects of mechanical, chemical, and thermal preprocessing methods on lignocellulosic biomass physical properties and chemical composition and their suitability for biofuels production. For example, biomass mechanical preprocessing methods like size reduction (which impacts its particle size and distribution) and densification (density and size and shape) are important for feedstocks to meet the quality requirements for both biochemical and thermochemical conversion methods like enzymatic conversion, gasification, and pyrolysis process. Thermal preprocessing methods like drying, deep drying, torrefaction, steam explosion, hydrothermal carbonization, and hydrothermal liquefaction effect feedstock's proximate, ultimate and energy property, making biomass suitable for both solid and liquid fuel production. Chemical preprocessing which includes washing, leaching, acid, alkali, and ammonia fiber explosion that can enable biochemical composition, such as modification of lignin and hemicellulose, and impacts the enzymatic conversion application for liquid fuels production. This book also explores the integration of these preprocessing technologies to achieve desired lignocellulosic biomass quality attributes for biofuels production.*

*Pyrolysis and Gasification of Biomass and Waste provides an authoritative review of thermal biomass conversion technologies and their implementation now and in the future. These proceedings include over 70 papers and case studies presented by leading experts from Europe and North America in Strasbourg in October 2002. Covering both technical issues and commercial opportunities, the papers include numerous diagrams, tables and figures presenting up-to-date details of how the latest pyrolysis and gasification technology is being put into practice. The meeting covered a wide range of raw materials and processes, addressing topics such as: small and large scale gasification; fast pyrolysis of biomass; liquefied wood fuel; full-scale application of sewage sludge pyrolysis; ammonia production and reduction; gasification of sorted MSW; green diesel; gas engines; gas cleaning and process design; technical and non-technical barriers to commercial exploitation. A key aim of the Strasbourg meeting was to create recommendations for strategies and policies in these areas, which the European Commission can use in its forward planning, especially with regard to sustainable energy supply, greenhouse gas mitigation and associated environmental issues. This book is an invaluable reference source for anyone concerned with these issues, and essential reading for researchers, engineers, waste managers and other professionals involved with the utilisation of green fuels and feedstocks, gasification and the contemporary biomass industry.*

*Most covered energy forms nowadays are gas in nature and electricity due to their environmental cleanliness and convenience. Recently, gasification market trend is starting to switch to low-grade feedstock such as biomass, wastes, and low-rank coal that are still not properly utilized. In this sense, the most promising area of development in gasification field lies in low-grade feedstock that should be converted to more user-friendly gas or electricity form in utilization. This book tried to shed light on the works on gasification from many parts of the world and thus can feel the technology status and the areas of interest regarding gasification for low-grade feedstock.*

*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.*

### Transformation of Biomass

#### Wood Gasifier Builder's Bible

#### Fuels and Chemicals from Biomass

#### Production of Hydrogen from Renewable Resources

#### Integrated Forest Biorefineries

#### Coal Gasification and Its Applications

In contrast to traditional combustion, gasification technologies offer the potential for converting coal and low or negative-value feedstocks, such as petroleum coke and various waste materials into usable energy sources or chemicals. With a growing number of companies operating and marketing systems based on gasification concepts worldwide, this b

Besides being one of the best Clean Coal Technologies, fluidized beds are also proving to be the most practical option for biomass conversion. Although the technology is well established, the field lacks a comprehensive guide to the design and operating principles of fluidized bed boilers and gasifiers. With more than 30 years of research and industrial experience, Prabir Basu answers this pressing need with Combustion and Gasification in Fluidized Beds. This book is a versatile resource that explains how fluidized bed equipment works and how to use the basic principles of thermodynamics and fluid mechanics in design while providing insight into planning new projects, troubleshooting existing equipment, and appreciating the capabilities and limitations of the process. From hydrodynamics to construction and maintenance, the author covers all of the essential information needed to understand, design, operate, and maintain a complete fluidized bed system. It is a must for clean coal technology as well as for biomass power generation. Beginning with a general introduction to fossil or biofuel conversion choices, the book surveys hydrodynamics, fundamentals of gasification, combustion of solid fuels, pollution aspects including climate change mitigation, heat transfer in fluidized beds, the design and operation of bubbling and circulating fluidized bed boilers, and various supporting components such as distributor grates, feeding systems, and gas-solid separators.

A joint effort of three continents, this book is about rational utilization of the fossil fuels for generation of heat or power. It provides a synthesis of two scientific traditions: the high-performance, but often proprietary, Western designs, and the elaborate national standards based on less advanced Eastern designs; it presents both in the same Western format. It is intended for engineers and advanced undergraduate and graduate students with an interest in steam power plants, burners, or furnaces. The text uses a format of practice based on theory: each chapter begins with an explanation of a process, with basic theory developed from first principles; then empirical relationships are presented and, finally, design methods are explained by worked out examples. It will thus provide researchers with a resource for applications of theory to practice. Plant operators will find solutions to and explanations of many of their daily operational problems. Designers will find this book ready with required data, design methods and equations. Finally, consultants will find it very useful for design evaluation.

Electric energy is arguably a key agent for our material prosperity. With the notable exception of photovoltaic generators, electric generators are exclusively used to produce electric energy from mechanical energy. More than 60% of all electric energy is used in electric motors for useful mechanical work in various industries. This book presents the modeling, performance, design, and control of reluctance synchronous and flux-modulation machines developed for higher efficiency and lower cost. It covers one- and three-phase reluctance synchronous motors in line-start applications and various reluctance flux-modulation motors in pulse width modulation converter-fed variable speed drives. "Reluctance motor drives start to find their rightful place in the adjustable speed motor drives. This is in part due to their lower cost, ease of cooling, higher fault tolerance, and suitability for use under harsh operating and ambient condition. The book by Prof. Boldea and Prof. Tutelea offers a physically insightful approach to electromechanical energy conversion in this family of electric machines. Authors provide an in-depth explanation of the electromagnetic performance, interdependence between control and magnetic design and fundamentals of design. I found this book to be a great resource for practicing engineers in industry and researchers in academia. There is an outstanding balance between the theoretical contents and engineering aspects of design and control throughout the manuscript which makes this book an excellent choice for a graduate course in academic institutions or series of short courses for practicing engineers in the industry. I would like to strongly recommend this book for researchers and practitioners in the area of electric machines." —Babak Fahimi, Distinguished Chair of Engineering at University of Texas at Dallas, USA Presents basic and up-to-date knowledge about the topologies, modeling, performance, design, and control of reluctance synchronous machines. Includes information on recently introduced reluctance flux-modulation electric machines (switched- flux, flux-reversal, Vernier, transverse flux, claw pole, magnetic-g geared dual-rotor, brushless doubly fed, etc.). Features numerous examples and case studies throughout. Provides a comprehensive overview of all reluctance electric machines.

#### Lignin

#### Combustion and Gasification in Fluidized Beds

#### Biomass Volume Estimation and Valorization for Energy

#### Biomass Gasification and Pyrolysis

#### Billion Dollar Burger

#### Gasification

The riveting story of the entrepreneurs and renegades fighting to bring lab-grown meat to the world. The trillion-dollar meat industry is one of our greatest environmental hazards: it pollutes more than all the world's fossil-fuel-powered cars. Global animal agriculture is responsible for deforestation, soil erosion, and more emissions than air travel, paper mills, and coal mining combined. It also, of course, depends on the slaughter of more than 60 billion animals per year, a number that is only increasing as the global appetite for meat swells. But a band of doctors, scientists, activists, and entrepreneurs have been racing to end animal agriculture as we know it, hoping to fulfill a dream of creating meat without ever having to kill an animal. In the laboratories of Silicon Valley companies, Dutch universities, and Israeli startups, visionaries are growing burgers and steaks from microscopic animal cells and inventing systems to do so at scale--allowing us to feed the world without slaughter and environmental devastation. Drawing from exclusive and unprecedented access to the main players, from polarizing activist-turned-tech CEO Josh Tetrick to lobbyists and regulators on both sides of the issue, Billion Dollar Burger follows the people fighting to upend our food system as they butt up against the entrenched interests fighting viciously to stop them. The stakes are monumentally high: cell-cultured meat is the best hope for sustainable food production, a key to fighting climate change, a gold mine for the companies that make it happen, and an existential threat for the farmers and meatpackers that make our meat today. Are we ready?

Biomass is the most widely used non-fossil fuel in the world. Biomass resources show a considerable potential in the long-term given the increasing proliferation of dedicated energy crops for biofuels. The second edition of Biomass Gasification and Pyrolysis is enhanced with new topics, such as torrefaction and cofiring, making it a versatile resource that not only explains the basic principles of energy conversion systems, but also provides valuable insight into the design of biomass conversion systems. This book will allow professionals, such as engineers, scientists, and operating personnel of biomass gasification, pyrolysis or torrefaction plants, to gain a better comprehension of the basics of biomass conversion. The author provides many worked out design problems, step-by-step design procedures and real data on commercially operating systems. With a dedicated focus on the design, analysis, and operational aspects of biomass gasification, pyrolysis, and torrefaction, Biomass Gasification, Pyrolysis and Torrefaction, Second Edition offers comprehensive coverage of biomass in its gas, liquid, and solid states in a single easy-to-access source. Contains new and updated step-by-step process flow diagrams, design data and conversion charts, and numerical examples with solutions includes chapters dedicated to evolving torrefaction technologies, practicing option of biomass cofiring, and biomass conversion economics Expanded coverage of syngas and other Fischer-Tropsch alternatives Spotlighted advanced processes such as supercritical water gasification and torrefaction of biomass. Provides available research results in an easy-to-use design methodology

This book documents the recent accomplishments of integrated forest biorefineries and their future in the pulp, paper, and fiber-processing industries.

This book addresses the science and technology of the gasification process and the production of electricity, synthetic fuels and other useful chemicals. Pursuing a holistic approach, it covers the fundamentals of gasification and its various applications. In addition to discussing recent advances and outlining future directions, it covers advanced topics such as underground coal gasification and chemical looping combustion, and describes the state-of-the-art experimental techniques, modeling and numerical simulations, environmentally friendly approaches, and technological challenges involved. Written in an easy-to-understand format with a comprehensive glossary and bibliography, the book offers an ideal reference guide to coal and biomass gasification for beginners, engineers and researchers involved in designing or operating gasification plants.

#### Reluctance Electric Machines

#### A Review of Combustion and Gasification Technologies

#### Fischer-Tropsch Synthesis, Catalysts, and Catalysis

#### Biomass Gasification Design Handbook

#### Practical Design and Theory

#### ICRABR 2016

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

This title presents the results from ThermalNet, which is the latest thermal biomass conversion network to be carried out on a European basis.

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

This book explores the use of biomass as an energy source and its application in energy conversion technologies. Focusing on the challenges of, and technologies related to, biomass conversion, the book is divided into three parts. The first part underlines the fundamental concepts that form the basis of biomass production, its feasibility valuation, and its potential utilization. This part does not focus on how biomass is produced, but also methods of assessment. The second part focuses on the clarification of central concepts of the biorefinery processes. After a preliminary introduction with industrial examples, common issues of biochemical reaction engineering applications are analysed in detail. The theory explained in this part demonstrates that the chemical kinetics are the core focus in modelling biological processes such as growth, decay, product formation and feedstock consumption. This part continues with the theory of biofuels production, including biogas, bioethanol, biodiesel and Fischer-Tropsch synthesis of hydrocarbons. The third part of this book gives detailed explanations of preliminary notions related to the theory of thermodynamics. This theory will assist the reader when taking into account the concepts treated in the previous two parts of the book. Several detailed derivations are given to give the reader a full understanding of the arguments at hand. This part also gives literature data on the main properties of some biomass feedstock. Fundamentals of Biofuels Engineering and Technology will be of interest not only to academics and researchers working in this field but also to graduate students and energy professionals seeking to expand their knowledge of this increasingly important area.

#### Circulating Fluidized Bed Boilers

#### A Primer for Engineers and Scientists

#### Emerging Areas in Bioengineering

#### Biomass Preprocessing and Pretreatments for Production of Biofuels

#### Biomass Gasification, Pyrolysis and Torrefaction

#### Thermal Biomass Conversion

This book provides general information and data on one of the most promising renewable energy sources: biomass for its thermochemical conversion. During the last few years, there has been increasing focus on developing the processes and technologies for the conversion of biomass to liquid and gaseous fuels and chemicals, in particular to develop low-cost technologies. This book provides data-based scientific information on the most advanced and innovative processing of biomass as well as the process development elements on thermochemical processing of biomass for the production of biofuels and bio-products on (biomass-based biorefinery). The conversion of biomass to biofuels and other value-added products on the principle biorefinery offers potential from technological perspectives as alternate energy. The book covers intensive R&D and technological developments done during the last few years in the area of renewable energy utilizing biomass as feedstock and will be highly beneficial for the researchers, scientists and engineers working in the area of biomass-biofuels- biorefinery. Provides the most advanced and innovative thermochemical conversion technology for biomass Provides information on large scales such as thermochemical biorefinery Useful for researchers intending to study scale up Serves as both a textbook for graduate students and a reference book for researchers Provides information on integration of process and technology on thermochemical conversion of biomass

This book has been overshadowed by other, more widely-publicized renewable energy technologies such as wind, solar and hydro, and still retains an outmoded image in comparison to its apparently more attractive cousins. The potential for biomass to act as a store of solar energy, and yet to be converted efficiently when required into heat, power, transport fuels and even substitutes for plastics and petrochemicals, is not widely appreciated. The increasing abundance of well-designed, successful bioenergy projects around the world is creating new interest in this renewable, sustainable and low-emission-producing source of energy. The Brilliance of Bioenergy covers all the main resources and technologies, principles, practice, social and environmental issues as well as the economics involved. The book also presents valuable, practical experiences - both 'how to' and 'how not to' - in the form of case studies of both small and large scale projects in both developed and developing countries. The Brilliance of Bioenergy is for those wishing to learn more about biomass, the technologies and the business potential. It will be welcomed by all involved in biomass production, bioenergy utilization, planning and development, and in renewable energies in general, as well as students, academics and researchers in the subject.

With petroleum prices spiralling upward, making synthetic fuels-or "synfuels"-from coal, natural gas, and biomass has become more economically competitive. Advanced energy companies now focus exclusively on alternative fuels, and many oil companies have programs dedicated to developing synthetic fuels. The Fischer-Tropsch process, which uses a catalyst to convert coal, natural gas, or biomass into liquid hydrocarbons, has long been used to produce synthetic fuels. It is now being used to produce synthetic fuels that can be used in internal combustion engines.

Although there were many books and papers that deal with gasification, there has been only a few practical book explaining the technology in actual application and the market situation in reality. Gasification is a key technology in converting coal, biomass, and wastes to useful high-value products. Until renewable energy can provide affordable energy hopefully by the year 2030, gasification can bridge the transition period by providing the clean liquid fuels, gas, and chemicals from the low grade feedstock. Gasification still needs many upgrades and technology breakthroughs. It remains in the niche market, not fully competitive in the major market of electricity generation, chemicals, and liquid fuels that are supplied from relatively cheap fossil fuels. The book provides the practical information for researchers and graduate students who want to review the current situation, to upgrade, and to bring in a new idea to the conventional gasification technologies.

#### Theory to Practice

#### Recent Advances and Future Challenges

#### Trends and Applications

#### Advances and Applications

#### Technologies for Converting Biomass to Useful Energy

#### Design and Control

*While energy is essential for development, standard fossil fuels are often in short supply in countries where it is needed most. However, alternative fuel resources abound in the form of agricultural and municipal waste or "biomass." This report reviews the state of the art of biomass combustion and gasification systems, including their advantages and disadvantages. It also encourages investment in use of these technologies to enable developing countries to better exploit their biomass resources and help close the gap between their energy needs and their energy supply.*

*This book discusses latest advances in the area of bioenergy, including algal biomass, biodiesel, bioethanol, biomethanation, pyrolysis, biomass gasification, biomass cook stoves and integrated processes. The volume comprises select proceedings of ICRABR-2016. The contents include cutting-edge research vital to R&D organizations, academics and the industry to promote and document the recent developments in the area of bioenergy for all types of stakeholders. The book highlights the need for biofuels and their market, the barriers and challenges faced by biofuels and bioenergy, and future strategies required to foster new ideas for research, collaboration, and commercialization of bioenergy. It addresses various topics, such as biomass and energy management; thermochemical conversion processes; biochemical conversion processes; catalytic conversion processes; electrochemical processes; waste treatment to harvest energy; and integrated processes. It will prove a valuable resource for students, researchers, professionals and policymakers in the field of biofuels and bioenergy.*

*Lignin Trends and Applications consists of 11 chapters related to the lignin structure, modification, depolymerization, degradation processes, computational modeling, and applications. This is a useful book for readers from diverse areas, such as physics, chemistry, biology, materials science, and engineering. It is expected that this book may expand the reader's knowledge about this complex natural polymer.*

#### Biomass Gasification and PyrolysisPractical Design and TheoryAcademic Press

#### Handbook of Biomass Downdraft Gasifier Engine Systems

#### Recent Advances in Thermochemical Conversion of Biomass

#### Gasifiers

#### Biomass in Small-Scale Energy Applications

#### Thermochemical Processing of Biomass

#### Inside Big Tech's Race for the Future of Food

Gasification is a process that if properly utilized can transform the world in which we live. Comprehensive in its coverage, this second edition continues the tradition of the first by providing engineers and scientists with an up-to-date overview of commercial processes and applications relevant to today's demands. Gasification, 2nd edition is expanded and provides more detail on the integration issues for current generation, state-of-the-art Integrated Gasification Combined Cycles (IGCC), CO2 capture in the IGCC context addressing the issues of pre-investment and retrofitting as well as defining what the term "CO2 capture ready" might mean in practice; issues of plant reliability, availability and maintainability (RAM) including as evaluation of feedback from existing plants; implementation of fuel cell technology in IGCC concepts. All statistics, processes and projects, including descriptions of a number of processes not covered in the previous edition. "Up-to-date overview of commercial processes" Covers applications relevant to today's demands "Addresses the issues of pre-investment and retrofitting" Provides more detail on the integration issues for Integrated Gasification Combined Cycles from 40 expert authors, this is an extensive overview of all important research topics in the field of bioengineering, including metabolic engineering, biotransformations and biomedical applications. Alongside several chapters dealing with biotransformations and biocatalysis, a whole section is devoted to biofuels and the utilization of biomass. Current perspectives on synthetic biology and metabolic engineering approaches are presented, involving such example organisms as Escherichia coli and Corynebacterium glutamicum, while a further section covers topics in biomedical engineering including drug delivery systems and bipharmaceuticals. The book concludes with chapters on computer-aided bioprocess engineering and systems biology. This is a part of the Advanced Biotechnology book series, covering all pertinent aspects of the field with each volume prepared by eminent scientists who are experts on the topic in question. Invaluable reading for biotechnologists and bioengineers, as well as those working in the chemical and pharmaceutical industries.

Skyrocketing energy costs have spurred renewed interest in coal gasification. Currently available information on this subject needs to be updated, however, and focused on specific coals and end products. For example, carbon capture and sequestration, previously given little attention, now has a prominent role in coal conversion processes. This book approaches coal gasification and related technologies from a process engineering point of view, with topics chosen to aid the process engineer who is interested in a complete, coal-to-products system. It provides a perspective for engineers and scientists who analyze and improve components of coal conversion processes. The first topic describes the nature and availability of coal. Next, the fundamentals of gasification are described, followed by a description of gasification technologies and gas cleaning processes. The conversion of syngas to electricity, fuels and chemicals is then discussed. Finally, process economics are covered. Emphasis is given to the selection of gasification technology based on the type of coal fed to the gasifier and desired end product: E.g., lower temperature gasifiers produce substantial quantities of methane, which is undesirable in an ammonia synthesis feed. This book also reviews gasification kinetics which is informed by recent papers and process design studies by the US Department of Energy and other groups, and also largely ignored by other gasification books. 1 Approaches coal gasification and related technologies from a process engineering point of view, providing a perspective for engineers and scientists who analyze and improve components of coal conversion processes 2 Describes the fundamentals of gasification, gasification technologies, and gas cleaning processes 3 Emphasizes the importance of the coal types fed to the gasifier and desired end products 4 Covers gasification kinetics, which was largely ignored by other gasification books Provides a perspective for engineers and scientists who analyze and improve components of the coal conversion processes Describes the fundamentals of gasification, gasification technologies, and gas cleaning processes Covers gasification kinetics, which was largely ignored by other gasification books

NEW 3rd Edition! 2 BOOK SET Got wood? Transform your tree branches and scrap lumber into wood gas in just minutes. Make fuel and power when others can't, so you can: Run generators Fuel older vehicles & gas tractors Heat greenhouses Pump well water Fire up kilns & forges Make activated charcoal for water purification Go off grid and shelter in! Not all gasifiers are created equally Build a high quality wood gasifier the first time. Professional grade plans from an industry expert, reworked in commonly available materials for the home fabricator and DIY'er: 500 + photos Step-by-step construction plans Parts list Hearth sizing chart (critical) Engineering diagrams & budgets Engine selection Bonus Electronic Carburetor book Woodgas wisdom Fuel is freedom The Wood Gasifier Builder's Bible is a complete set of construction plans to build a wood gasifier with step by step schematics and hundreds of pictures, part lists, budgets, material selection and much more. With a wood gasifier you hold the keys to modern civilization. Secure your homestead & rest in peace no matter what the future holds. Get back to basics and ride out the storm or start a home based business fabricating "free energy" tools for your friends and neighbors. Specifications Perfect for 500 cc - 5 liter spark ignited gasoline engines. 2.5 tps per kilowatt/hr @ 3600 rpm. Runs on wood chunks. Use a bandsaw/mach to make wood chunks. Does NOT run on wood pellets.

#### Coal and Biomass Gasification

#### Theory and Practice

#### Handbook biomass gasification

#### Pyrolysis, Theory and Industrial Practice

#### Gasification Technologies

#### Pyrolysis and Gasification of Biomass and Waste

Written for a wide variety of biotechnologists, this book provides a major review of the state-of-the-art in bioethanol production technologies, enzymatic biomass conversion, and biodiesel. It also provides a detailed explanation of a breakthrough in photosynthetic water splitting which could result in a doubling of the efficiency of solar energy conversion by green plants. The book covers production of lactic acid, succinic acid, 1,3-propanediol, 2,3-butanediol, and polyhydroxybutyrate and xylitol. It also includes a chapter on synthesis-gas fermentation.

This book offers comprehensive coverage of the design, analysis, and operational aspects of biomass gasification, the key technology enabling the production of biofuels from all viable sources--some examples being sugar cane and switchgrass. This versatile resource not only explains the basic principles of energy conversion systems, but also provides valuable insight into the design of biomass gasifiers. The author provides many worked out design problems, step-by-step design procedures and real data on commercially operating systems. After fossil fuels, biomass is the most widely used fuel in the world. Biomass resources show a considerable potential in the long term if residues are properly handled and dedicated energy crops are grown. Includes step-by-step design procedures and case studies for Biomass Gasification Provides worked process flow diagrams for gasifier design. Covers integration with other technologies (e.g. gas turbine, engine, fuel cells)

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

· Explains operation and scientific fundamentals of circulating fluidized bed (CFB) boilers · Outlines practical issues in industrial use · Teaches how to optimize design for maximum reliability and efficiency · Discusses operating and maintenance issues and how to troubleshoot them This book provides practicing engineers and students with insight into the design and operation of circulating fluidized bed (CFB) boilers through a combination of theoretical concepts and practical experience. An emphasis on combustion, hydrodynamics, heat transfer, and material issues illustrates these concepts with numerous examples from actual operating plants. The relevance of design and feed-stock parameters to the operation of a CFB boiler are also examined, along with their impacts on designs of mechanical components, including cyclones, air distributor grids, and solid recycle systems. This versatile resource explains how fluidized bed equipment works and how the basic principles of thermodynamics and fluid mechanics influence design, while providing insight into planning new projects, troubleshooting existing equipment, and appreciating the capabilities and limitations of the process. From hydrodynamics to construction and maintenance, the author covers all of the essential information needed to understand, design, operate, and maintain a complete fluidized bed system. It is a must for clean coal technology as well as for biomass power generation.

#### Fundamentals of Biofuels Engineering and Technology

#### Off Grid Fuel for the Prepared Homestead: Wood Gas in Minutes

#### Fuel for Siege Economies

#### Mechanical, Chemical and Thermal Methods

#### In Business and In Practice

This book provides state-of-the-art reviews, current research and prospects of producing hydrogen using bio, thermal and electrochemical methods and covers hydrogen separation, storage and applications. Hydrogen produced from biomass offers a clean and renewable energy source and a promising energy carrier that will supplement or replace fossil fuels in the future. The book is intended as a reference work for researchers, academics and industrialists working in the chemical and biological sciences, engineering, renewable resources and sustainability. Readers will find a wealth of information in the text that is both useful for the practical development of hydrogen systems and essential for assessing hydrogen production by bioelectrochemical,

electrochemical, fermentation, gasification, pyrolysis and solar means, applied to many forms of biomass. Dr. Zhen Fang is Professor in Bioenergy, Leader and founder of biomass group, Chinese Academy of Sciences, Xishuiyonganna Tropical Botanical Garden and is also adjunct Professor of Life Sciences, University of Science and Technology of China. Dr. Richard L. Smith, Jr. is Professor of Chemical Engineering, Graduate School of Environmental Studies, Research Center of Supercritical Fluid Technology, Tohoku University, Japan. Dr. Xinshu Qi is Professor of Environmental Science, Nankai University, China.

Biomass is a key resource for meeting the energy and material demands of mankind in the future. As a result, businesses and technologies are developing around biomass processing and its applications. Transformation of Biomass: Theory to Practice explores the modern applications of biomass and bio-based residues for the generation of energy, heat and chemical products. The first chapter presents readers with a broad overview of biomass and its composition, conversion routes and products. The following chapters deal with specific technologies, including anaerobic digestion, pyrolysis and gasification, as well as hydrothermal and supercritical conversion. Each chapter details current practices, recent developments, business case models and comprehensive analysis of the problems associated with each approach, and how to optimize them. Topics covered include: Anaerobic digestion Reactor design Pyrolysis Catalysis in biomass transformation Engines for combined heat and power Influence of feedstocks on performance and products Bio-hydrogen from biomass Analysis of bio-oils Numerical simulation and formal kinetic parameters evaluation Business case development This textbook will provide students, researchers and industry professionals with a practical and accessible guide to the essential skills required to advance in the field of bioenergy.

#### The Brilliance of Bioenergy

#### Gasification for Low-grade Feedstock

#### Boilers and Burners

#### Conference Proceedings of the Second International Conference on Recent Advances in Bioenergy Research

#### Pyrolysis and Gasification

#### Gasification for Practical Applications