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Biohydrogen Production: Fundamentals and Technology Advances covers the fundamentals of biohydrogen production technology, including microbiology, biochemistry, feedstock requirements, and molecular biology of the biological hydrogen production processes. It also gives insight into scale-up problems and limitations. In addition, the book discusses mathematical modeling of the various processes involved in biohydrogen production and the software required to model the processes. The book summarizes research advances that have been made in this field and discusses bottlenecks of the various processes, which presently limit the commercialization of this technology. The authors also focus on the process economy, policy, and environmental impact of this technology, since the future of biohydrogen production depends not only on research advances, but also on economic considerations (the cost of fossil fuels), social espousal, and the development of H₂ energy systems. The book describes the fundamentals of this technology interwoven with more advanced research findings. Further reading is suggested at the end of each chapter. Since the beauty of any innovation is its applicability, socioeconomic impact, and cost energy analysis, the book examines each of these points to give you a holistic picture of this technology. Illustrative diagrams, flow charts, and comprehensive tables detailing the scientific advancements provide an opportunity to understand the process comprehensively and meticulously. Written in a lucid style, the book supplies a complete knowledge bank about biohydrogen production processes.

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Biohydrogen Production and Hybrid Process Development: Energy and Resource Recovery from Food Waste explores the production of biohydrogen from food waste via anaerobic fermentation, focusing on effect factors, control methods and optimization. The book introduces food waste treatment and disposal technologies, including operational principles and process control. The authors discuss the use of aged refuse, the effect of several key factors on anaerobic gas production rate, process parameters optimization for enhancing biohydrogen yield, key factors in biohydrogen production from sewage sludge fermentation, and new developments in nutrition recovery from food waste. This book spans the entire production cycle, from waste recovery to its conversion processes, end-product, and by-product utilization, providing engineering researchers, PhD students, and industry practitioners in the field of biohydrogen production, biogas production, biomass conversion, and food waste management with a thorough background on the production of hydrogen via anaerobic fermentation. Covers the fundamentals and applications of the use of food waste for biohydrogen production through anaerobic digestion Explores core challenges of biohydrogen production operations, including details on process optimization and control, and multiple case studies grounded in current industrial practice Includes methodological perspectives comparing and contrasting approaches to biohydrogen production using anaerobic digestion

with optimization techniques for production efficiency

The book is organized in three parts. Part I shows how the catalytic and electrochemical principles involve hydrogen production technologies. Part II is devoted to biohydrogen production and introduces gasification and fast pyrolysis biomass, dark fermentation, microbial electrolysis and power production from algae. The last part of the book is concerned with the photo hydrogen generation technologies. Recent developments in the area of semiconductor-based nanomaterials, specifically semiconductor oxides, nitrides and metal-free semiconductors based nanomaterials for photocatalytic hydrogen production are extensively discussed in this part.

This book comprehensively introduces fundamentals and applications of fermentative hydrogen production from organic wastes, consisting of eight chapters, covering the microbiology, biochemistry and enzymology of hydrogen production, the enrichment of hydrogen-producing microorganisms, the pretreatment of various organic wastes for hydrogen production, the influence of different physicochemical factors on hydrogen production, the kinetic models and simulation of biological process of fermentative hydrogen production, the optimization of biological hydrogen production process and the fermentative hydrogen production from sewage sludge. The book summarizes the most recent advances that have been made in this field and discusses bottlenecks of further development. This book gives a holistic picture of this technology and details the knowledge through illustrative diagrams, flow charts, and comprehensive tables. It is intended for undergraduate and graduate students who are interested in bioenergy and wastes management, researchers exploring microbial fermentation process, and engineers working on system optimization or other bioenergy applications.

This book provides in-depth information on basic and applied aspects of biohydrogen production. It begins with an introduction to the topic, and follows with the basic scientific aspects of biohydrogen production, such as the enzyme involved in biohydrogen production, the microorganisms and metabolic engineering information. It then provides state-of-art information on various aspects of biohydrogen production methods such as from solid wastes, from industrial effluents, thermo-chemical route for biohydrogen production, etc. It also includes information on engineering aspects such as the design of bioreactors for biohydrogen production and scale-up issues. Finally, it touches on the issues of hydrogen economy and commercialization. The book introduces you to all aspects of biohydrogen research, helping you understand the various issues involved and plan your own research based on recent findings and commercial needs. Provides information on the most advanced and innovative biohydrogen technologies, including fermentation and metabolic processes Provides examples on large-scale and commercial applications of biohydrogen processes and explains the steps necessary for scaling-up Explains the chemistry/theory of the processes involved and provides information on integration of the various processes and technologies on biohydrogen Guides through the process design, reactors and materials selection Devotes a whole chapter on the economical aspects of the processes and their commercialization

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Nanobiotechnology for Sustainable Bioenergy and Biofuel Production provides insights into the most recent innovations, trends, concerns and challenges in the production of biofuels. This book highlights a number of key research topics and practical applications of modern nanomaterials and nanocomposite-driven enzyme biotechnology for biofuels production, including the advances in the nanoscaffolds design (nanomaterials support) for immobilizing bioenergy producing enzymes (nanobiocatalyst system), the recent trends in biomass processing (untreated/treated agriculture and food waste, grasses, algal, etc.) using advanced nanobiocatalysts for biofuels production and the scale-up study of bioenergy production using nanomaterials immobilized enzymes and biofuel harvesting using nanomaterials. At the outset of new nanobiotechnology applications in biofuel production, there is a need for a new resource in the bioenergy field. This book delivers an overview of the contributions of biofuel production and the most up-to-date advances in nanobiotechnology to a diverse audience ranging from post-graduate students to researchers in biochemical engineering, biotechnology, bioremediation and environmental studies and pharmaceutical professionals. Key Features • Outlines the most recent nanobiotechnological advances in biofuels and bioenergy for biofuels productions • Covers biodiesel, bioethanol, biomethane, biohydrogen, biorefineries and biofuel harvesting using nanomaterials • Explains the scale-up nanobiotechnological study of biofuel production at the bioreactor level

This book is a novel attempt at describing the fundamental aspects of and advancements in the field of

biohythane production. The comprehensive collection of chapters is based on the fundamentals of heterotrophic hydrogen production and consequent methane production technologies. Emphasis is on the integration of two stages of a hybrid system for maximum gaseous energy generation from organic wastes, thus making the overall process economically viable. Readers get insight into the technological advancements made in the field of biohydrogen and biomethane production and the challenges involved in integrating these two technologies. The book also includes details of the microbiological, biochemical, and bioprocess aspects related to biohythane production, in addition to the applicability of this process, its socioeconomic concerns, and cost energy analysis, supplemented with illustrative diagrams, flowcharts, and comprehensive tables. It will be an ideal vade mecum for advanced undergraduate- and graduate-level students of biotechnology, microbiology, biochemical engineering, chemical engineering, and energy engineering; teachers and researchers in bioenergy, the environment, and biofuel production; and policy makers.

A text to the advances and development of novel technologies in the production of high-value products from economically viable raw materials Lignocellulosic Biorefining Technologies is an essential guide to the most recent advances and developments of novel technologies in the production of various high-value products from economically viable raw materials. Written by a team of experts on the topic, the book covers important topics specifically on production of economical and sustainable products such as various biofuels, organic acids, enzymes, biopigments, biosurfactants, etc. The book highlights the important aspects of lignocellulosic biorefining including structure, function, and chemical composition of the plant cell wall and reviews the details about the various components present in the lignocellulosic biomass and their characterizations. The authors explore the various approaches available for processing lignocellulosic biomass into second generation sugars and focus on the possibilities of utilization of lignocellulosic feedstocks for the production of biofuels and biochemicals. Each chapter includes a range of clear, informative tables and figures, and contains relevant references of published articles. This important text: Provides cutting-edge information on the recent developments in lignocellulose biorefinery Reviews production of various economically important and sustainable products, such as biofuels, organic acids, biopigments, and biosurfactants Highlights several broad-ranging areas of recent advances in the utilization of a variety of lignocellulosic feedstocks Provides a valuable, authoritative reference for anyone interested in the topic Written for post-graduate students and researchers in disciplines such as biotechnology, bioengineering, forestry, agriculture, and chemical industry, Lignocellulosic Biorefining Technologies is an authoritative and updated guide to the knowledge about various biorefining technologies.

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