

## Microalgae Biotechnology And Microbiology

"Microalgae Biotechnology for Food, Health and High Value Products" presents the latest technological innovations in microalgae production, market status of algal biomass-based products, and future prospects for microalgal applications. It provides stimulating overviews from different perspectives of application that demonstrate how rapidly the commercial production of microalgae-based food, health and high value products is advancing. It also addresses a range of open questions and challenges in this field. The book highlights the latest advances of interest to those already working in the field, while providing a comprehensive overview for those readers just beginning to learn about the promise of microalgae as a sustainable source of both specialty and commercial products. It offers a valuable asset for commercial algae producers, algae product developers, scientific researchers and students who are dedicated to the advancement of microalgae biotechnology for applications in health, diet, nutrition, cosmetics, biomaterials etc.

Recent Developments in Applied Microbiology and Biochemistry, Vol. 2, provides a comprehensive treatment and understanding on application oriented microbial concepts, giving readers insights into recent developments in microbial biotechnology and medical, agricultural and environmental microbiology. Discusses microbial proteome analyses and their importance in medical microbiology Explores emerging trends in the prevention of current global health problems, such as cancer, obesity and immunity Shows recent approaches in the production of novel enzymes from environmental samples by enrichment culture and metagenomics approaches Guides readers through the status and recent developments in analytical methods for the detection of foodborne microorganisms

Microalgae are sunlight driven single-cell factories for protein, lipids, carbohydrates, pigments, vitamins and minerals, etc. Microalgae have long been used as health food and additives for human consumption, as well as animal feed in aquaculture.

Microalgae also prove to be beneficial to environmental cleanup such as bioremediation of industrial flue gases and waste water. Recently, owing to the demand of renewable energy, microalgal biofuels, biodiesel in particular, have attracted unprecedentedly interest. Also, microalgae emerge as promising hosts for the expression of recombinant proteins. Nevertheless, there are still tremendous challenges involved in the algae production pipeline such as strain improvement, mass cultivation, harvest and drying, biomass disruption, and recycling of water and nutrients, which have been impeding commercial application of microalgae in many different ways. The great opportunities lying ahead will be the innovations and breakthroughs occurred in microalgal biotechnology. This book brings together recent advances in microalgal biotechnology, dedicated to both the understanding of the fundamentals and development of industry-oriented technologies.

The term microalgae is often used in the algal research community to collectively describe microscopic algae and cyanobacteria. Research of microalgae has expanded enormously, namely because of their significant commercial potential. The thorough knowledge of the physiology of microalgae must precede any commercial exploitation. We have to understand the mechanisms underlying the physiological and biochemical processes in the algal cells. The book Microalgae - From Physiology to Application

covers major aspects of microalgae physiology and the possible applications in the sphere of biotechnology. This book gives a comprehensive overview of what is known about microalgae growth and production, secondary metabolites, and development of new species and products for commercialization. This volume should allow readers at all levels an entry into the exciting world of algal research.

Microalgal Biotechnology presents an authoritative and comprehensive overview of the microalgae-based processes and products. Divided into 10 discreet chapters, the book covers topics on applied technology of microalgae. Microalgal Biotechnology provides an insight into future developments in each field and extensive bibliography. It will be an essential resource for researchers and academic and industry professionals in the microalgae biotechnology field.

Algae are simple, primitive, heterogeneous, autotrophic, eukaryotic or prokaryotic organisms that lead a symbiotic, parasitic or free-living mode of life. Microalgae and macroalgae possess greater potential in various fields of application. Microalgae are ubiquitous and extremely diverse microorganisms which can accumulate toxic contaminants and heavy metals from wastewater, making them a superior candidate to become a powerful nanofactory. Algae have been discovered to reduce the presence of metal ions, and afterwards aid in the biosynthesis of nanoparticles. Since algae-mediated biogenic nanoparticles are eco-friendly, cost-effective, high-yielding, speedy and energy-efficient, a large number of studies have been published on them in the last few years. This book will be focused on recent progress on the utilization of algae for the synthesis of nanoparticles, their characterization and the possible mechanisms involved. This volume describes the synthesis of algal nanomaterials and its application in various fields for sustainable development. This book outlines the procedures to prepare phyconanomaterials, techniques to utilize the nanomaterials, and applications in agriculture, environment and medicine.

This contributed volume presents the latest research and state-of-the-art approaches in the study of microalgae. It describes in detail technologies for the cultivation of marine, freshwater and extremophilic algae, as well as phototrophic biofilms, cyanobacterial mats and periphytons, including the media requirements and growth rates of different types of algae. The second part of the book is dedicated to the biotechnological applications of algal biomass and secondary metabolites produced by these organisms, and critically discusses topics such as algae-based biofuels and CO<sub>2</sub> sequestration. In addition, it reviews the prospects and challenges of algal bioremediation of domestic and industrial wastewaters, including the use of planktonic and self-immobilized algae systems in wastewater treatment, explaining their merits and drawbacks. Lastly, it highlights research methods and approaches related to the production of high-value products and bioactive compounds.

Algal and phycology-based approaches for wastewater treatment have recently gained interest. Phycology-Based Approaches for Wastewater Treatment and Resource Recovery highlights advanced algal-based technologies developed or being considered for wastewater treatment along with the opportunities that existing technologies can provide at an industrial scale. It covers recent findings on algal-based approaches for the removal of heavy metals, organic pollutants, and other toxicities from sewage and industrial effluents and supplies in-depth analysis on technologies such as biosorption and bioaccumulations. Advanced mathematical modeling approaches to understand

waste removal and resource recovery from wastewater are illustrated as well. The book: Provides exhaustive information on the use of algae for the simultaneous treatment and resource recovery of wastewater Discusses algae, microalgae, and cyanobacteria applications in detail Presents critical insight into limitations of the prevalent technologies Reviews methodology of advanced technologies Includes illustrations and interesting trivia boxes throughout the book This book is of interest to researchers, graduate students and professionals in phycology, microbiology, bioremediation, environmental sciences, biotechnology, wastewater treatment, resource recovery, and circular economy.

This Brief provides a concise review of the potential use of microalgae for biofuel production. The following topics are highlighted: the advantages of microalgae over conventional biofuel-producing crops; technological processes for energy production using microalgae; microalgal biomass production systems, production rates and costs; algae cultivation strategies and main culture parameters; biomass harvesting technologies and cell disruption; CO<sub>2</sub> sequestration; life cycle analysis; and algal biorefinery strategies. The conclusions section discusses the contribution of the technologies described to environmental sustainability and future prospects. This book provides in-depth information on basic and applied aspects of biofuels production from algae. It begins with an introduction to the topic, and follows with the basic scientific aspects of algal cultivation and its use for biofuels production, such as photo bioreactor engineering for microalgae production, open culture systems for biomass production and the economics of biomass production. It provides state-of-the-art information on synthetic biology approaches for algae suitable for biofuels production, followed by algal biomass harvesting, algal oils as fuels, biohydrogen production from algae, formation/production of co-products, and more. The book also covers topics such as metabolic engineering and molecular biology for algae for fuel production, life cycle assessment and scale-up and commercialization. It is highly useful and helps you to plan new research and design new economically viable processes for the production of clean fuels from algae. Covers in a comprehensive but concise way most of the algae biomass conversion technologies currently available Lists all the products produced from algae, i.e. biohydrogen, fuel oils, etc., their properties and potential uses Includes the economics of the various processes and the necessary steps for scaling them up

Fish and shrimp producing industries generate huge amounts of wastes in form of viscera, scales, waste water, etc. Applications of microorganisms and/or microbes based products have contributed significantly in solving many of these problems associated with aquaculture and waste management. This book addresses strategies for control of bacterial inf

This book addresses microalgae, which represent a very promising biomass resource for wastewater treatment and producing biofuels. Accordingly, microalgae are also an expanding sector in biofuels and wastewater treatment, as can be seen in several high-profile start-ups from around the globe, including Solix Biofuels, Craig Venter's Synthetic Genomics, PetroSun, Chevron Corporation, ENN Group etc. In addition, a number of recent studies and patent applications have confirmed the value of modern microalgae for biofuels production and wastewater treatment systems. However, substantial inconsistencies have been observed in terms of system boundaries, scope, the cultivation of microalgae and oil extraction systems, production costs and economic viability, cost-lowering components, etc. Moreover, the downstream technologies and core principles involved in liquid fuel extraction from microalgal cells are still in their early stages, and not always adequate for industrial production. Accordingly, multilateral co-operation between universities, research institutes, governments, stakeholders and researchers is called for in order to make microalgae biofuels economical. Responding to this challenge, the book begins with a general introduction to microalgae and

the algae industry, and subsequently discusses all major aspects of microalgal biotechnology, from strain isolation and robust strain development, to biofuel development, refinement and wastewater treatment.

Provide Information On The Application Of Cyanobacteria With Their Biotechnological Potential In The Present Scenario. Topics Covering Algal Cytology, Ecology, Marine, Agronomy, Environmental Impact On Marine Pollution, Biological Nitrogen Fixation, Phototaxis, Phycotoxins, Etc. Have Been Specially Included To Project Their Role In The Present Century. Information On Dinoflagellates, Diatoms And Ultrastructural Studies Have Also Been Included. It has become more evident that many microalgae respond very differently than land plants to diverse stimuli. Therefore, we cannot reduce microalgae biology to what we have learned from land plants biology. However, we are still at the beginning of a comprehensive understanding of microalgae biology. Microalgae have been posited several times as prime candidates for the development of sustainable energy platforms, making thus the in-depth understanding of their biological features an important objective. Thus, the knowledge related to the basics of microalgae biology must be acquired and shared rapidly, fostering the development of potential applications. Microalgae biology has been studied for more than forty years now and more intensely since the 1970's, when genetics and molecular biology approaches were integrated into the research programs. Recently, studies on the molecular physiology of microalgae have provided evidences on the particularities of these organisms, mainly in model species, such as *Chlamydomonas reinhardtii*. Of note, cellular responses in microalgae produce very interesting phenotypes, such as high lipid content in nitrogen deprived cells, increased protein content in cells under high CO<sub>2</sub> concentrations, the modification of flagella structure and motility in basal body mutant strains, the different ancient proteins that microalgae uses to dissipate the harmful excess of light energy, the hydrogen production in cells under sulfur deprivation, to mention just a few. Moreover, several research groups are using high-throughput and data-driven technologies, including "omics" approaches to investigate microalgae cellular responses at a system-wide level, revealing new features of microalgae biology, highlighting differences between microalgae and land plants. It has been amazing to observe the efforts towards the development and optimization of new technologies required for the proper study of microalgae, including methods that opened new paths to the investigation of important processes such as regulatory mechanisms, signaling crosstalk, chemotactic mechanisms, light responses, chloroplast controlled mechanisms, among others. This is an exciting moment in microalgae research when novel data are been produced and applied by research groups from different areas, such as bioprocesses and biotechnology. Moreover, there has been an increased amount of research groups focused in the study of microalgae as a sustainable source for bioremediation, synthesis of bioproducts and development of bioenergy. Innovative strategies are combining the knowledge of basic sciences on microalgae into their applied processes, resulting in the progression of many applications that hopefully, will achieve the necessary degree of optimization for economically feasible large-scale applications. Advances on the areas of basic microalgae biology and novelties on the essential cellular processes were revealed. Progress in the applied science showed the use of the basic science knowledge into fostering translational research, proposing novel strategies for a sustainable world scenario. In this present e-book, articles presented by research groups from different scientific areas showed, successfully, the increased development of the microalgae research. Herewith, you will find articles ranging from bioprospecting regional microalgae species, through advances in microalgae molecular physiology to the development of techniques for characterization of biomass and the use of biomass into agriculture and bioenergy production. This e-book is an excellent source of knowledge for those working with microalgae basic and applied sciences, and a great opportunity for researchers from both areas to have an overview of the amazing possibilities we have for building an environmentally sustainable future once the knowledge is

translated into novel applications.

The Pigments from Microalgae Handbook presents the current state of knowledge on pigment production using microalgae-based processes, and covers both the scientific fundamentals of this technology and its practical applications. It addresses biology, chemistry, biochemistry, analysis and engineering aspects, as well as applications of natural pigments in photosynthetic organisms. The book also describes the analytical procedures associated with the characterization of pigments and the engineering aspects of microalgal pigment production. It considers the three major classes of pigments (chlorophylls, carotenoids and phycobiliproteins) produced and surveys the main commercial applications of these chemicals. The book offers a valuable source of information for industrial researchers and practitioners in industrial biotechnology, as it covers various engineering aspects of microalgal pigment production, such as bioreactors and bioprocesses, industrial extraction processes, and the bioeconomy of production including life-cycle assessment. The book will also be of interest to undergraduate and graduate students of biochemistry, food chemistry, and industrial microbiology.

In this book, researchers and practitioners working in the field present the major promises of algae biotechnology and they critically discuss the challenges arising from applications. Based on this assessment, the authors explore the great scientific, industrial and economic potential opened up by algae biotechnology. The first part of the book presents recent developments in key enabling technologies, which are the driving force to unleash the enormous potential of algae biotechnology. The second part of the book focuses on how practical applications of algae biotechnology may provide new solutions to some of the grand challenges of the 21st century. Algae offer great potential to support the building of a bio-based economy and they can contribute new solutions to some of the grand challenges of the 21st century. Despite significant progress, algae biotechnology is yet far from fulfilling its potential. How to unleash this enormous potential is the challenge that the own field is facing. New cultivation technologies and bioprocess engineering allow for optimization of the operation strategy of state-of-the-art industrial-scale production systems and they reduce the production costs. Parallel to this, new molecular technologies for genetic and metabolic engineering of (micro)algae develop quickly. The optimization of existing biochemical pathways or the introduction of pathway components makes high-yield production of specific metabolites possible. Novel screening technologies including high-throughput technologies enables testing of extremely large numbers of samples and, thus, allow for large scale modelling of biomolecular processes, which would have not been possible in the past. Moreover, profitable production can demand for integrated biorefining, which combines consecutive processes and various feedstocks to produce both transportation fuel, electric energy and valuable chemicals. This book examines the utilization of algae for the development of useful products and processes with the emphasis towards green technologies and processes, and the requirements to make these viable. Serving as a complete reference guide to the production of biofuels and other value added products from micro and macro algae, it covers various aspects of algal biotechnology from the basics to large scale cultivation, harvesting and processing for a variety of products. It is authored and edited by respected world experts in the field of algal biotechnology and provides the most up to date and cutting edge information on developments in the field. Over the past decade there has been substantial focus and related literature on the application of algal biomass for the generation of novel processes and products. 'Algae Biotechnology: Products and Processes' encompasses a holistic approach to critically evaluating developments in the field of algal biotechnology whilst taking into account recent

advances and building on the body of knowledge. Aspects of the effects of harmful algae are also discussed, as well as the potential commercial application of algal biotechnology, the techno-economic feasibility of algal biodiesel production and the use of genetic and metabolic engineering for the improvement of yield. Other bioenergy sources such as alcohol fuels, aviation fuels, biohydrogen and biogas are also covered. This book is intended for postgraduates and researchers working in the biofuels and algal industry; it constitutes ideal reference material for both early stage and established researchers.

Microalgae are one of the most studied potential sources of biofuels and bioenergy. This book covers the key steps in the production of renewable biofuels from microalgae - strain selection, culture systems, inorganic carbon utilisation, lipid metabolism and quality, hydrogen production, genetic engineering, biomass harvesting, extraction. Greenhouse gas and techno-economic modelling are reviewed as is the 100 year history of microalgae as sources of biofuels and of commercial-scale microalgae culture. A summary of relevant basic standard methods used in the study of microalgae culture is provided. The book is intended for the expert and those starting work in the field.?

**Biomass, Biofuels and Biochemicals: Biofuels from Algae, Second Edition** provides information on strategies for commercial microalgae based biofuel production, including their cultivation, pre-treatment and conversion methods. The book discusses methods for producing microalgal biomass in large scale by outdoor culturing and outlines new technologies for their use. In addition, it explains how modern genetic engineering enables the generation of recombinant strains that generate higher quantities of feedstock. The complete utilization of microalgal biomass, which can also be obtained from valorizing nutrients from wastewater and industrial exhaust gases, can be efficiently converted to energy rich biofuels and high value pharmaceuticals in a well-defined biorefinery. Includes the current technologies for the cultivation and conversion of energy rich microalgal biomass into biofuels Provides information on all the conversion methods – biochemical and thermochemical conversions Covers other high value products from microalgae and less conventional applications, such as fine chemical production and aviation fuel generation Discusses the economics of microalgal biofuel production and how to accomplish cost competitive results

**Algal Green Chemistry: Recent Progress in Biotechnology** presents emerging information on green algal technology for the production of diverse chemicals, metabolites, and other products of commercial value. This book describes and emphasizes the emerging information on green algal technology, with a special emphasis on the production of diverse chemicals, metabolites, and products from algae and cyanobacteria. Topics featured in the book are exceedingly valuable for researchers and scientists in the field of algal green chemistry, with many not covered in current academic studies. It is a unique source of information for

scientists, researchers, and biotechnologists who are looking for the development of new technologies in bioremediation, eco-friendly and alternative biofuels, biofertilizers, biogenic biocides, bioplastics, cosmeceuticals, sunscreens, antibiotics, anti-aging, and an array of other biotechnologically important chemicals for human life and their contiguous environment. This book is a great asset for students, researchers, and biotechnologists. Discusses high-value chemicals from algae and their industrial applications Explores the potential of algae as a renewable source of bioenergy and biofuels Considers the potential of algae as feed and super-food Presents the role of triggers and cues to algal metabolic pathways Includes developments in the use of algae as bio-filters

The Handbook of Microalgae-based Processes and Products provides a complete overview of all aspects involved in the production and utilization of microalgae resources at commercial scale. Divided into four parts (fundamentals, microalgae-based processes, microalgae-based products, and engineering approaches applied to microalgal processes and products), the book explores the microbiology and metabolic aspects of microalgae, microalgal production systems, wastewater treatment based in microalgae, CO<sub>2</sub> capture using microalgae, microalgae harvesting techniques, and extraction and purification of biomolecules from microalgae. It covers the largest number of microalgal products of commercial relevance, including biogas, biodiesel, bioethanol, biohydrogen, single-cell protein, single-cell oil, biofertilizers, pigments, polyunsaturated fatty acids, bioactive proteins, peptides and amino acids, bioactive polysaccharides, sterols, bioplastics, UV-screening compounds, and volatile organic compounds. Moreover, it presents and discusses the available engineering tools applied to microalgae biotechnology, such as process integration, process intensification, and techno-economic analysis applied to microalgal processes and products, microalgal biorefineries, life cycle assessment, and exergy analysis of microalgae-based processes and products. The coverage of a broad range of potential microalgae processes and products in a single volume makes this handbook an indispensable reference for engineering researchers in academia and industry in the fields of bioenergy, sustainable development, and high-value compounds from biomass, as well as graduate students exploring those areas. Engineering professionals in bio-based industries will also find valuable information here when planning or implementing the use of microalgal technologies. Covers theoretical background information and results of recent research. Discusses all commercially relevant microalgae-based processes and products. Explores the main emerging engineering tools applied to microalgae processes, including techno-economic analysis, process integration, process intensification, life cycle assessment, and exergy analyses.

Biotechnology: Prospects and Applications covers the review of recent developments in biotechnology and international authorship presents global issues that help in our understanding of the role of biotechnology in solving important scientific and societal problems for the benefit of mankind and

environment. A balanced coverage of basic molecular biology and practical applications, relevant examples, colored illustrations, and contemporary applications of biotechnology provide students and researchers with the tools and basic knowledge of biotechnology. In our effort to introduce students and researchers to cutting edge techniques and applications of biotechnology, we dedicated specific chapters to such emerging areas of biotechnology as Emerging Dynamics of Brassinosteroids Research, Third generation green energy, Bioremediation, Metal Organic Frameworks: New smart materials for biological application, Bioherbicides, Biosensors, Fetal Mesenchymal Stem Cells and Animal forensics. Biotechnology: Prospects and Applications will be highly useful for students, teachers and researchers in all disciplines of life sciences, agricultural sciences, medicine, and biotechnology in universities, research stations and biotechnology companies. The book features broader aspects of the role of biotechnology in human endeavor. It also presents an overview of prospects and applications while emphasizing modern, cutting-edge, and emerging areas of biotechnology. Further, it provides the readers with a comprehensive knowledge of topics in food and agricultural biotechnology, microbial biotechnology, environmental biotechnology and animal biotechnology. The chapters have been written with special reference to the latest developments in above broader areas of biotechnology that impact the biotechnology industry. A list of references at the end of each chapter is provided for the readers to learn more about a particular topic. Typically, these references include basic research, research papers, review articles and articles from the popular literature.

Microalgae are microscopic algae, typically found in freshwater and marine systems. Microalgae, capable of performing photosynthesis, are important for life on earth; they produce approximately half of the atmospheric oxygen and use simultaneously the greenhouse gas carbon dioxide to grow photoautotrophically. The biodiversity of microalgae is enormous and they represent an almost untapped resource. In this book, the authors present current research in the study of microalgae, including microalgal biotechnological applications in nutrition, health and the environment; using microalgae biomass for biodiesel and biofuel production and microalgae for aquaculture.

"In view of tremendous development in the area of biotechnology, algal biotechnology is a fascinating field that has attracted many researchers in the past two decades. Considering its potential and future applications for human well-being, studies related to basics and applied aspects of commercially important microalgae need to be focused. Keeping this in mind, comprehensive details starting from culture collection to metabolite production in microalgae need to be addressed and hence, our book "Applied Algal Biotechnology" will definitely provide valuable information and exciting results-based techniques that will easily guide young researchers, PhD scholars and also UG and PG students. In the present research scenario, every plant sciences laboratories has a separate unit for microalgal biotechnology to better understand the basic

concepts that make microalgae an alternate model system that can compete with *Arabidopsis thaliana*. The strategies starting from isolation, identification, medium preparation, culturing condition, metabolite production, novel gene isolation and its expression pattern under the influence of different biotic and abiotic stress condition, genetic transformation in homologous/heterologous host etc., are very much essential for the fruitful execution of research"--

Handbook of Algal Science, Microbiology, Technology and Medicine provides a concise introduction to the science, biology, technology and medical use of algae that is structured on the major research fronts of the last four decades, such as algal structures and properties, algal biomedicine, algal genomics, algal toxicology, and algal bioremediation, algal photosystems, algal ecology, algal bioenergy and biofuels. It also covers algal production for biomedicine, algal biomaterials, and algal medicinal foods within these primary sections. All chapters are authored by the leading researchers in their respective research fields. Our society currently faces insurmountable challenges in the areas of biomedicine and energy in the face of increasing global population and diminishing natural resources as well as the growing environmental and economic concerns, such as global warming, greenhouse gas emissions and climate change. Algae offer a way to deal with these challenges and concerns for both sustainable and environment friendly bioenergy production and in biomedicine through the development of crucial biotechnology. Provides an essential interdisciplinary introduction and handbook for all the stakeholders engaged in science, technology and medicine of algae Covers the major research streams of the last four decades, ranging from algal structures, to algal biomedicine and algal bioremediation Fills a significant market opening for an interdisciplinary handbook on algal science, technology and medicine

Microalgae Biotechnology and Microbiology Cambridge University Press

Biotechnology for Biofuel Production and Optimization is the compilation of current research findings that cover the entire process of biofuels production from manipulation of genes and pathways to organisms and renewable feedstocks for efficient biofuel production as well as different cultivation techniques and process scale-up considerations. This book captures recent breakthroughs in the interdisciplinary areas of systems and synthetic biology, metabolic engineering, and bioprocess engineering for renewable, cleaner sources of energy. Describes state-of-the-art engineering of metabolic pathways for the production of a variety of fuel molecules Discusses recent advances in synthetic biology and metabolic engineering for rational design, construction, evaluation of novel pathways and cell chassis Covers genome engineering technologies to address complex biofuel-tolerant phenotypes for enhanced biofuel production in engineered chassis Presents the use of novel microorganisms and expanded substrate utilization strategies for production of targeted fuel molecules Explores biohybrid methods for harvesting bioenergy Discusses bioreactor design and optimization of scale-up

Antenna Mutants, Domestication, by Roberto Bassi Heterotrophic Cultivation, by William McCaffrey Chlorella for industrial applications: Advances and prospective, by Feng Chen Carotinoide, by Carola Griebel Engineering the algal chloroplast for synthesis of therapeutic proteins, by Saul Purton Design Concepts and recent developments of photobioreactors, by Clemens Posten Efficiency of flat plate reactors, by Mario Tredici Measuring modelling and control, by Olivier Bernard Microalgae in Life Support Systems, by Klaus Slenzka Heterotrophic oil production, by Makato Watanabe

Algae - Organisms for Imminent Biotechnology will be useful source of information on basic and applied aspects of algae for post graduate students, researchers, scientists, agriculturists, and decision makers. The book comprises a total of 12 chapters covering various aspects of algae particularly on microalgal biotechnology, bloom dynamics, photobioreactor design and operation of microalgal mass cultivation, algae used as indicator of water quality, microalgal biosensors for ecological monitoring in aquatic environment, carbon capture and storage by microalgae to enhancing CO<sub>2</sub> removal, synthesis and biotechnological potentials of algal nanoparticles, biofilms, silica-based nanovectors, challenges and opportunities in marine algae, and genetic identification and mass propagation of economically important seaweeds and seaweeds as source of new bioactive prototypes.

The author presents a state-of-the-art account of research in algal production and utilization. Dr Becker provides a compilation of the different methods employed worldwide for the artificial cultivation of different microalgae, including recipes for culture media, description of outdoor and indoor cultivation systems as well as harvesting and procesing methods. The book will be essential reading for advanced undergraduates, postgraduates and researchers in the field.

This volume explores and explains the vast uses and benefits of algae as food, feed, and fuel. It covers the most advanced applications of algae in the food and feed industries and for environmental sustainability. With chapters written by experts and which were extensively reviewed by many well-known subject experts and professionals, Phycobiotechnology: Biodiversity and Biotechnology of Algae and Algal Products for Food, Feed, and Fuel provides an abundance of valuable information. Algae are a genetically diverse group of organisms with a wide range of physiological and biochemical characteristics that have unique capabilities in the fields of agriculture, pharmaceuticals, industry, and environment. Algae hold the potential to become the planet's next major source of energy and a vital part of the solution for climate change and dependence on fossil fuels. Many varieties of algae are also known to be an abundant source of vitamins, minerals, and other nutrients that can boost the human immune system. An Integration of Phycoremediation Processes in Wastewater Treatment reviews the potential of microalgae to treat wastewater containing highly recalcitrant compounds whose degradation is not achieved by the conventional existing treatments. In addition, the book describes how the microalgae collected after

wastewater treatment can be used for obtaining added-value products, hence closing the loop and contributing to a circular economy. Finally, the technoeconomical aspects of this green technology are addressed, along with the design and development of photobioreactors, genetic aspects, metagenomics and metabolomics. Deals with emerging aspects of algal research, with a special reference to phycoremediation Covers diversity, mutations, genomics, metagenomics, eco-physiology, culturing, microalgae for food and feed, biofuel production, harvesting of microalgae, separation and purification of biochemicals Describes the techno-economical assessment, microalgal biotechnology and algal-bacterial systems for wastewater treatment Presents complex issues associated with cutting-edge biotechnological tools and techniques like next-generation sequencing methods, metabolomics and bioreactor design and development

Handbook of Microalgal Culture is truly a landmark publication, drawing on some 50 years of worldwide experience in microalgal mass culture. This important book comprises comprehensive reviews of the current available information on microalgal culture, written by 40 contributing authors from around the globe. The book is divided into four parts, with Part I detailing biological and environmental aspects of microalgae with reference to microalgal biotechnology and Part II looking in depth at major theories and techniques of mass cultivation. Part III comprises chapters on the economic applications of microalgae, including coverage of industrial production, the use of microalgae in human and animal nutrition and in aquaculture, in nitrogen fixation, hydrogen and methane production, and in bioremediation of polluted water. Finally, Part IV looks at new frontiers and includes chapters on genetic engineering, microalgae as platforms for recombinant proteins, bioactive chemicals, heterotrophic production, microalgae as gene-delivery systems for expressing mosquito-cidal toxins and the enhancement of marine productivity for climate stabilization and food security. Handbook of Microalgal Culture is an essential purchase for all phycologists and also those researching aquatic systems, aquaculture and plant sciences. There is also much of great use to researchers and those involved in product formulation within pharmaceutical, nutrition and food companies. Libraries in all universities and research establishments teaching and researching in chemistry, biological and pharmaceutical sciences, food sciences and nutrition, and aquaculture will need copies of this book on their shelves. Amos Richmond is at the Blaustein Institute for Desert Research, Ben-Gurion University of the Negev, Israel. Cultured Microalgae for the Food Industry: Current and Potential Applications is a comprehensive reference that addresses the current applications and potential uses of microalgae and microalgae-derived compounds in the food industry. The book explores the different steps of the subject, from strain selection and cultivation steps, to the assessment of the public perception of microalgae consumption and the gastronomical potential of this innovative resource. Readers will find coverage of microalgae biology, common and uncommon algae species, cultivation strategies for food applications, novel extraction techniques, safety issues, regulatory issues, and current market opportunities and challenges. This title also explores the gastronomic potential of microalgae and reviews current commercialized products along with consumer attitudes surrounding microalgae. Covering relevant, up-to-date research as assembled by a group of contributors who are experts in their respective fields, the book is an essential reading for advanced undergraduates, postgraduates, and researchers in the microbiology, biotechnology, food science and technology fields. Thoroughly explores the optimization, cultivation and extraction processes for increased bioactive compound yields Includes industrial functionality, bio-accessibility and

the bioavailability of the main compounds obtained from microalgae Presents novel trends and the gastronomic potential of microalgae utilization in the food industry

A keystone reference that presents both up-to-date research and the far-reaching applications of marine biotechnology Featuring contributions from 100 international experts in the field, this five-volume encyclopedia provides comprehensive coverage of topics in marine biotechnology. It starts with the history of the field and delivers a complete overview of marine biotechnology. It then offers information on marine organisms, bioprocess techniques, marine natural products, biomaterials, bioenergy, and algal biotechnology. The encyclopedia also covers marine food and biotechnology applications in areas such as pharmaceuticals, cosmeceuticals, and nutraceuticals. Each topic in Encyclopedia of Marine Biotechnology is followed by 10-30 subtopics. The reference looks at algae cosmetics, drugs, and fertilizers; biodiversity; chitins and chitosans; aeropylsinin-1, toluquinol, astaxanthin, and fucoxanthin; and algal and fish genomics. It examines neuro-protective compounds from marine microorganisms; potential uses and medical management of neurotoxic phycotoxins; and the role of metagenomics in exploring marine microbiomes. Other sections fully explore marine microbiology, pharmaceutical development, seafood science, and the new biotechnology tools that are being used in the field today. One of the first encyclopedic books to cater to experts in marine biotechnology Brings together a diverse range of research on marine biotechnology to bridge the gap between scientific research and the industrial arena Offers clear explanations accompanied by color illustrations of the techniques and applications discussed Contains studies of the applications of marine biotechnology in the field of biomedical sciences Edited by an experienced author with contributions from internationally recognized experts from around the globe Encyclopedia of Marine Biotechnology is a must-have resource for researchers, scientists, and marine biologists in the industry, as well as for students at the postgraduate and graduate level. It will also benefit companies focusing on marine biotechnology, pharmaceutical and biotechnology, and bioenergy.

With the high interest in renewable resources, the field of algal biotechnology has undergone a huge leap in importance. This book treats the biological fundamentals of microalgal biotechnology in physiology and molecular biology. It provides an overview of applications and products as well as a survey of the state-of-the-art in process engineering of algae cultivation. So this book will be of interest to active people in the area of sustainable production of high value products or mass production of food and fuel for the future.

This excellent book covers wide-ranging topics in interdisciplinary microbiology, addressing various research aspects and highlighting advanced discoveries and innovations. It presents the fascinating topic of modern biotechnology, including agricultural microbiology, microalgae biotechnology, bio-energy, bioinformatics and metagenomics, environmental microbiology, enzyme technology and marine biology. It presents the most up-to-date areas of microbiology with an emphasis on shedding light on biotechnological advancements and integrating these interdisciplinary microbiology research topics into other biotechnology sub-disciplines. The book raises awareness of the industrial relevance of microbiology, which is key component of this unique collection. The topics include production of antioxidant-glutathione, enzyme-engineering methods, probiotic microbiology and features of microbial xylanases. It also covers some other remarkable aspects of microbiology, like potential health hazards in recreational water and fullerene nanocomposites, which are vital for biotechnological interventions. This book will be valuable resource for senior undergraduate and graduate students, researchers and other interested professionals or groups working in the interdisciplinary areas of microbiology and biotechnology.

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