

## Engineering Bacteria For Bioremediation Intech

Reviews of Environmental Contamination and Toxicology attempts to provide concise, critical reviews of timely advances, philosophy and significant areas of accomplished or needed endeavor in the total field of xenobiotics, in any segment of the environment, as well as toxicological implications.

This book covers the contemporary environmental issues faced by life on the planet and the role planetary microbiomes play in such issues. Providing insights on the net favorable and adverse effect of microbial processes, this volume covers both the spontaneous and anthropogenic events that impact climate change and life on the planet. The book describes the ecological significance of microbiomes associated with the kingdoms Plantae and Animalia with respect to climate change, natural and anthropogenic causes of climate change, microbial interactions in nature, planetary microbiomes and food security, climate change in relation to disease epidemiology and human health and engineering microorganisms to mitigate the consequences of climate change. The individual chapters in the intended book provide both theoretical and practical exposure to the current issues and future challenges of climate change in relation to the microbiomes. This collection should serve as ready reference to the researchers working in the area to reshape their future research in addressing the challenges of global climate change.

This book contains 20 chapters, which are divided into 5 sections. Section 1 covers different aspects of insecticide resistance of selected economically important plant insect pests, whereas section 2 includes chapters about the importance, development and insecticide resistance management in controlling malaria vectors. Section 3 is dedicated to some general questions in insecticide resistance, while the main topic of section 4 is biochemical approaches of insecticide resistance mechanisms. Section 5 covers ecologically acceptable approaches for overcoming insecticide resistance, such as the use of mycoinsecticides, and understanding the role of some plant chemical compounds, which are important in interactions between plants, their pests and biological control agents.

This book contains a collection of different research activities where several technologies have been applied to the optimization of biodegradation processes. The book has three main sections: A) Hydrocarbons biodegradation, B) Biodegradation and anaerobic digestion, and C) Biodegradation and sustainability.

Biofilms represent the natural living style of microbial communities and play a pivotal role in biogeochemical cycles and natural attenuation. Biofilms can be engineered for biodegradation and biotransformation of organic and inorganic contaminants, for both in situ bioremediation and ex situ treatment in bioreactors. This book focuses on microbial biofilms and their potential technological applications for sustainable development. It covers recent advances in biofilm technologies for contaminant remediation coupled to recovery of resources and serves as a complete reference on the science and technology behind biofilm mediated bioremediation and wastewater treatment.

Achieving environmental sustainability with rapid industrialization is currently a major global challenge. Industries are the key economic drivers, but are also the main polluters as untreated/partially treated effluents from industry are usually discharged into the aquatic environment or dumped. Industrial effluents often contain highly toxic and hazardous pollutants, which cause ecological damage and present health hazards to living beings. As such, there is a pressing need to find ecofriendly solutions to deal with industrial waste, and to develop sustainable methods for treating/detoxifying waste before it's released into the environment. As a low cost and eco-friendly clean technology, bioremediation can offer a sustainable alternative to conventional remediation technologies for the treatment and management of industrial wastes. This book (Volume II) describes the role of biological agents in the degradation and detoxification of organic and inorganic pollutants in industrial wastes, and presents recent bioremediation approaches for waste treatment and management, such as constructed wetlands, electro- bioremediation and nano-bioremediation, as well as microbial fuel cells. It appeals to students, researchers, scientists, industry professionals and experts in the field of microbiology, biotechnology, environmental sciences, eco-toxicology, environmental remediation and waste management and other relevant areas who are interested in biodegradation and bioremediation of industrial wastes for environmental safety.

Microbial Biodegradation and Bioremediation brings together experts in relevant fields to describe the successful application of microbes and their derivatives for bioremediation of potentially toxic and relatively novel compounds. This single-source reference encompasses all categories of pollutants and their applications in a convenient, comprehensive package. Our natural biodiversity and environment is in danger due to the release of continuously emerging potential pollutants by anthropogenic activities. Though many attempts have been made to eradicate and remediate these noxious elements, every day thousands of xenobiotics of relatively new entities emerge, thus worsening the situation. Primitive microorganisms are highly adaptable to toxic environments, and can reduce the load of toxic elements by their successful transformation and remediation. Describes many novel approaches of microbial bioremediation including genetic engineering, metagenomics, microbial fuel cell technology, biosurfactants and biofilm-based bioremediation Introduces relatively new hazardous elements and their bioremediation practices including oil spills, military waste water, greenhouse gases, polythene wastes, and more Provides the most advanced techniques in the field of bioremediation, including insilico approach, microbes as pollution indicators, use of bioreactors, techniques of pollution monitoring, and more

The pollution of soil and groundwater by heavy metals and other chemicals is becoming a serious issue in many countries. However, the current bioremediation processes do not often achieve sufficient remediation, and more effective processes are desired. This book deals with advances in the bioremediation of polluted soil and groundwater. In the former chapters of this book, respected researchers in this field describe how the optimization of microorganisms, enzymes, absorbents, additives and injection procedures can help to realize excellent bioremediation. In the latter chapters, other researchers introduce bioremediation processes that have been performed in the field and novel bioremediation processes. Thus, the readers will be able to obtain new ideas about effective bioremediation as well as important information

about recent advances in bioremediation.

This book presents the select peer-reviewed proceedings of the International Conference on Advances in Bioprocess Engineering and Technology (ICABET 2020). The book covers all aspects of bioprocesses, especially related to fermentation technology, food technology, environmental biotechnology, and sustainable energy. Along with this primary theme, the focus is on recent advances in bioprocessing research such as biosensors, micro-reactors, novel separation techniques, bioprocess control, bio-safety, advanced techniques for waste to wealth generation, and nanobiotechnology. This contents are divided according to the major themes of the conference: (i) Fermentation Technology and Bioreactor, (ii) Food Pharmaceuticals and Health care, (iii) Environment and Agriculture, and (iv) Sustainable Energy. This book is intended to help students, researchers, and industry professionals acquire knowledge on innovative technologies and recent advancements in the field of bioprocess engineering and technology.

This book addresses waste generation problems from various sectors, including industries, agriculture, and household. It focuses on how modern biotechnological approaches could help manage waste in an eco-friendly manner and generate precious bioenergy. It discusses the inadequate waste management systems damaging the environment and its adverse impacts on climate change-related problems. This book covers all the essential information regarding various types of waste and their management. It is a comprehensive compilation for understanding the efficient generation of bioenergy. It is a relevant reading material (resource) for anyone who wishes to study waste management as Chemist, Biologist, Biotechnologist, Industrialist, Ecologist, Microbiologist, Economist, and all disciplines related to the environment.

Intensified agrarian and industrial activity has led to earth's soil and groundwater resources becoming polluted with hazardous materials. Bioremediation delivers a green technology using dynamics of living organisms, typically bacteria, fungi, microalgae and also plants to eliminate contaminants from ecosystem. This biological know-how is not only cost-effective compared to conventional physico-chemical approaches, but also very successful and is being employed in the field. This book focuses on important issues for several critical and common environmental pollutants, resulting in a compilation having recent updates on the bioremediation applications towards green and clean environment. This volume also describes updates on various novel approaches of bioremediation including nanotechnology, rhizomicrobiome technology, composting, metagenomics, and biosurfactants-based bioremediation. This volume is a resource for researchers, environmentalists, professionals and policy makers.

This book focuses on the toxicity of various organic and inorganic pollutants, their eco-toxicological effects and eco-friendly approaches for remediation of environmental pollutants. Extensive focus has been relied on the recent advances in ecofriendly approaches such as bioremediation and phytoremediation technologies, including the use of various group of microbes for remediation of environmental pollutants, etc. Researchers working in the field of bioremediation, phytoremediation, waste management and related fields will find this compilation most useful for further study to learn about the subject matter.

Healthy environment is important for any kind of biota on earth. It provides the basic elements of life such as clean water, fresh air, fertile soil and supports ecosystem of the food chain. Pollution drastically alters quality of the environment by changing the physico-chemical and biological aspects of these components. Accordingly, toxic metals, combustible and putrescible substances, hazardous wastes, explosives and petroleum products are all examples of inorganic and organic compounds that cause contaminations. Specifically, pollution of toxic and heavy metal in the environment is a growing problem worldwide, currently at an alarming rate. Toxic metals threaten the aquatic ecosystems, agriculture and ultimately human health. Traditional treatment techniques offer certain advantages such as rapid processing, ease of operation and control and flexibility. But, they could not maintain the quality of the environment due to the high operational costs of chemicals used, high energy consumption and handling costs for sludge disposal and overburden of chemical substances which irreversibly affect and destroy biodiversity, which ultimately render the soil useless as a medium for plant growth. Therefore, bioremediation and biotechnology, carried out by living assets to clean up, stabilize and restore contaminated ecosystems, have emerged as promising, environmental friendly and affordable approaches. Furthermore, the use of microbes, algae, transgenic plants and weeds adapted to stressful environments could be employed to enhance accumulation efficiency. Hence, sustainable and inexpensive processes are fast emerging as a viable alternative to conventional remediation methods, and will be most suitable for developing countries. In the current volume, we discuss pollution remediation challenges and how living organisms and the latest biotechnological techniques could be helpful in remediating the pollution in ecofriendly and sustainable ways.

Introduction to Petroleum Biotechnology introduces the petroleum engineer to biotechnology, bringing together the various biotechnology methods that are applied to recovery, refining and remediation in the uses of petroleum and petroleum products. A significant amount of petroleum is undiscoverable in reservoirs today using conventional and secondary methods. This reference explains how microbial enhanced oil recovery is aiding to produce more economical and environmentally-friendly metabolic events that lead to improved oil recovery.

Meanwhile, in the downstream side of the industry, petroleum refining operators are facing the highest levels of environmental regulations while struggling to process more of the heavier crude oils since conventional physical and chemical refining techniques may not be applicable to heavier crudes. This reference proposes to the engineer and refining manager the concepts of bio-refining applications to not only render heavier crudes as lighter crudes through microbial degradation, but also through biodenitrogenation, biodemetalization and biodesulfurization, making more petroleum derivatives purified and upgraded without the release of more pollutants. Equipped for both upstream and downstream to learn the basics, this book is a necessary primer for today's petroleum engineer. Presents the fundamentals behind petroleum biotechnology for both upstream and downstream oil and gas operations Provides the latest technology in reservoir recovery using microbial enhanced oil recovery methods Helps readers gain insight into the current and future application of using biotechnology as a refining and fuel blending method for heavy oil and tar sands

Handbook of Bioremediation: Physiological, Molecular and Biotechnological Interventions discusses the mechanisms of responding to inorganic and organic pollutants in the environment using different approaches of phytoremediation and bioremediation. Part One focuses specifically on inorganic pollutants and the use of techniques such as metallothionein-assisted remediation, phytoextraction and genetic manipulation. Part Two covers organic pollutants and consider topics such as plant enzymes, antioxidant defense systems and the remediation mechanisms of different plant species. This comprehensive volume is a must-read for researchers interested in plant science, agriculture, soil science and environmental science. The techniques covered in this book will ensure scientists have the knowledge to practice effective bioremediation techniques themselves.

Provides a comprehensive review of the latest advances in bioremediation of organic and inorganic pollutants Discusses a range of different phytoremediation techniques Evaluates the role of genomics and bioinformatics within bioremediation

The rapid progression of technology has significantly impacted population growth, urbanization, and industrialization in modern society. These developments, while positive on the surface, have created critical environmental problems in recent years. The Handbook of Research on Inventive Bioremediation Techniques is a comprehensive reference source for the latest scholarly information on optimizing bioremediation technologies and methods to control pollution and enhance sustainability and conservation initiatives for the environment. Highlighting pivotal research perspectives on topics such as biodegradation, microbial tools, and green technology, this publication is ideally designed for academics, professionals, graduate students, and practitioners

interested in emerging techniques for environmental decontamination.

Biotechnology and Bioengineering presents the most up-to-date research on biobased technologies. It is designed to help scientists and researchers deepen their knowledge in this critical knowledge field. This solid resource brings together multidisciplinary research, development, and innovation for a wide study of Biotechnology and Bioengineering.

This edited volume focuses on comprehensive state-of-the-art information about the practical aspects of cultivation, harvesting, biomass processing and biofuel production from algae. Chapters cover topics such as synthetic ecological engineering approaches towards sustainable production of biofuel feedstock, and algal biofuel production processes using wastewater. Readers will also discover more about the role of biotechnological engineering in improving ecophysiology, biomass and lipid yields. Particular attention is given to opportunities of commercialization of algal biofuels that provides a realistic assessment of various techno-economical aspects of pilot scale algal biofuel production. The authors also explore the pre-treatment of biomass, catalytic conversion of algal lipids and hydrothermal liquefaction with the biorefinery approach in detail. In a nut shell, this volume will provide a wealth of information based on a realistic evaluation of contemporary developments in algal biofuel research with an emphasis on pilot scale studies. Researchers studying and working in the areas of environmental science, biotechnology, genetic engineering and biochemistry will find this work instructive and informative.

Smart Bioremediation Technologies: Microbial Enzymes provides insights into the complex behavior of enzymes and identifies metabolites and their degradation pathways. It will help readers work towards solutions for sustainable medicine and environmental pollution. The book highlights the microbial enzymes that have replaced many plant and animal enzymes, also presenting their applications in varying industries, including pharmaceuticals, genetic engineering, biofuels, diagnostics and therapy. In addition, new methods, including genomics and metagenomics, are being employed for the discovery of new enzymes from microbes. This book brings all of these topics together, representing the first resource on how to solve problems in bioremediation. Provides the most novel approaches in enzyme studies Gives insights in real-time enzymology that are correlated with bioremediation Serves as a valuable resource on the use of genomes, transcriptomes and proteomes with bioremediation Refers to enzymes as diagnostic tools

Environmental Engineering provides a profound introduction to Ecology, Chemistry, Microbiology, Geology and Hydrology engineering. The authors explain transport phenomena, air pollution control, waste water management and soil treatment to address the issue of energy preservation, production asset and control of waste from human and animal activities. Modeling of environmental processes and risk assessment conclude the interdisciplinary approach.

An authoritative overview of the ecological activities of microbes in the biosphere Environmental Microbiology and Microbial Ecology presents a broad overview of microbial activity and microbes' interactions with their environments and communities. Adopting an integrative approach, this text covers both conventional ecological issues as well as cross-disciplinary investigations that combine facets of microbiology, ecology, environmental science and engineering, molecular biology, and biochemistry. Focusing primarily on single-cell forms of prokaryotes — and cellular forms of algae, fungi, and protozoans — this book enables readers to gain insight into the fundamental methodologies for the characterization of microorganisms in the biosphere. The authors draw from decades of experience to examine the environmental processes mediated by microorganisms and explore the interactions between microorganisms and higher life forms. Highly relevant to modern readers, this book examines topics including the ecology of microorganisms in engineered environments, microbial phylogeny and interactions, microbial processes in relation to environmental pollution, and many more. Now in its second edition, this book features updated references and major revisions to chapters on assessing microbial communities, community relationships, and their global impact. New content such as effective public communication of research findings and advice on scientific article review equips readers with practical real-world skills. Explores the activities of microorganisms in specific environments with case studies and actual research data Highlights how prominent microbial biologists address significant microbial ecology issues Offers guidance on scientific communication, including scientific presentations and grant preparation Includes plentiful illustrations and examples of microbial interactions, community structures, and human-bacterial connections Provides chapter summaries, review questions, selected reading lists, a complete glossary, and critical thinking exercises Environmental Microbiology and Microbial Ecology is an ideal textbook for graduate and advanced undergraduate courses in biology, microbiology, ecology, and environmental science, while also serving as a current and informative reference for microbiologists, cell and molecular biologists, ecologists, and environmental professionals.

Today, microbiology is a rapidly growing discipline in the life sciences, and the technologies are evolving on a virtually daily basis. Next-generation sequencing technologies have revolutionized microbial analysis, and can help us understand the biology and genomic diversity of various bacterial species with significant impacts on agro-ecosystems. In addition, advances in molecular biology and microbiology techniques hold the potential to improve the productivity and sustainability of agriculture and forestry. This new volume addresses the role of microbial genomics in understanding the living systems that exist in the soil and their interactions with plants, an aspect that is also important for crop improvement. The topics covered focus on a deeper and clearer understanding of how microbes cause diseases, the genome-based development of novel antibacterial agents and vaccines, and the role of microbial genomics in crop improvement and agroforestry. Given its scope, the book offers a valuable resource for researchers and students of agriculture and infectious biology.

Bioremediation of Pollutants: From Genetic Engineering to Genome Engineering provides insights into genetic and genome engineering strategies in bioremediation, covering a wide range of microorganisms that are key to the removal of pollutants. The book includes discussions on root engineering, transgenic plants, metagenomics, bioreactors, molecular biology tools, genome editing, synthetic biology, microbial indicators, biosurfactants, biofilms, genetically modified organisms, and engineered fungi and bacteria. Presented by top experts in the field, this resource captures the essence and diversity of bioremediation methodologies in a single source. Students and beginners in environmental science, researchers, soil scientists, genetic and genome engineers, stakeholders and policymakers interested in improving this rapidly growing area of research will find this resource extremely useful. Draws together research from eminent scientists from across the globe in the areas of phytoremediation and microbial remediation Includes case studies of engineered bacterial remediation Covers the genome editing CRISPR-Cas9 system that has been less explored in plants and microorganisms

This book presents new insights into the development of different aspects of petroleum science and engineering. The book contains 19 chapters divided into two main sections: (i) Exploration and Production and (ii) Environmental Solutions. There are 11 chapters in the first section, and the focus is on the topics related to exploration and production of oil and gas, such as characterization of petroleum source rocks, drilling technology, characterization of reservoir fluids, and enhanced oil recovery. In the second section, the special emphasis is on waste technologies and environmental cleanup in the downstream sector. The book written by numerous prominent scholars clearly shows the necessity of the multidisciplinary approach to sustainable development in the petroleum industry and stresses the most updated topics

such as EOR and environmental cleanup of fossil fuel wastes.

**Green Sustainable Process for Chemical and Environmental Engineering and Science: Biosurfactants for the Bioremediation of Polluted Environments** explores the use of biosurfactants in remediation initiatives, reviewing knowledge surrounding the creation and application of biosurfactants for addressing issues related to the release of toxic substances in ecosystems. Sections cover their production, assessment and optimization for bioremediation, varied pollutant degradation applications, and a range of contaminants and ecological sites. As awareness and efforts to develop greener products and processes continues to grow, biosurfactants are garnering more attention for the potential roles they can play in reducing the use and production of more toxic products. Drawing on the knowledge of its expert team of global contributors, this book provides useful insights for all those currently or potentially interested in developing or applying biosurfactants in their own work. Provides an accessible introduction to biosurfactant chemistry Highlights the optimization, modeling, prediction and kinetics of key factors supporting biosurfactant-enhanced biodegradation processes Explores a wide range of biosurfactant applications for remediation and degradation of pollutants

**New and Future Developments in Microbial Biotechnology and Bioengineering: Trends of Microbial Biotechnology for Sustainable Agriculture and Biomedicine Systems: Perspectives for Human Health** discusses how microbial biotechnology helps us understand new strategies to reduce pathogens and drug resistance through microbial biotechnology. The most commonly used probiotic bacteria are *Lactobacillus* and *Bifidobacterium*. Therefore, the probiotic strains exhibit powerful anti-inflammatory, antiallergic and other important properties. This new book provides an indispensable reference source for engineers/bioengineers, biochemists, biotechnologists, microbiologists, pharmacologists, and researchers who want to know about the unique properties of this microbe and explore its sustainable biomedicine future applications. Introduces the principles of microbial biotechnology and its application for sustainable biomedicine system Explores various microbes and their beneficial application for biofortification of crops for micronutrients Explains the potentials and significance of probiotics, prebiotics and synbiotics in health and disease Includes current applications of beneficial microbes as Functional Food Products of Pharmaceutical Importance

This volume provides an overview of recent trends in bioremediation techniques. Gathering contributions by a multi-disciplinary team of authors, it reviews the available methodologies for the remediation of various types of waste, e.g. e-waste, wastewater, municipal solid waste and algal blooms. Bioprocessing techniques are not only used for environmental cleanup but also for the production of valuable added products from waste biomass. Accordingly, this book provides the reader with an update on current valorization techniques for biofuels, algal biorefineries, and the hydrothermal conversion of biomass. Given its interdisciplinary scope, the book offers a valuable asset for students, researchers and engineers working in biotechnology, environmental engineering, wastewater management, chemical engineering and related areas.

This book focuses on the application of microbes in all fields of biology. There is an urgent need to understand and explore new microbes, their biological activities, genetic makeup and further opportunities for utilizing them. The book is divided into sections, highlighting the application of microbes in agriculture, nanotechnology, genetic engineering, bioremediation, industry, medicine and forensic sciences, and describing potential future advances in these fields. It also explores the potential role of microbes in space and how they might support life on a different planet.

Bioremediation refers to the clean-up of pollution in soil, groundwater, surface water, and air using typically microbiological processes. It uses naturally occurring bacteria and fungi or plants to degrade, transform or detoxify hazardous substances to human health or the environment. For bioremediation to be effective, microorganisms must enzymatically attack the pollutants and convert them to harmless products. As bioremediation can be effective only where environmental conditions permit microbial growth and action, its application often involves the management of ecological factors to allow microbial growth and degradation to continue at a faster rate. Like other technologies, bioremediation has its limitations. Some contaminants, such as chlorinated organic or high aromatic hydrocarbons, are resistant to microbial attack. They are degraded either gradually or not at all, hence, it is not easy to envisage the rates of clean-up for bioremediation implementation. Bioremediation represents a field of great expansion due to the important development of new technologies. Among them, several decades on metagenomics expansion has led to the detection of autochthonous microbiota that plays a key role during transformation. Transcriptomic guides us to know the expression of key genes and proteomics allow the characterization of proteins that conduct specific reactions. In this book we show specific technologies applied in bioremediation of main interest for research in the field, with special attention on fungi, which have been poorly studied microorganisms. Finally, new approaches in the field, such as CRISPR-CAS9, are also discussed. Lastly, it introduces management strategies, such as bioremediation application for managing affected environment and bioremediation approaches. Examples of successful bioremediation applications are illustrated in radionuclide entrapment and retardation, soil stabilization and remediation of polycyclic aromatic hydrocarbons, phenols, plastics or fluorinated compounds. Other emerging bioremediation methods include electro bioremediation, microbe-availed phytoremediation, genetic recombinant technologies in enhancing plants in accumulation of inorganic metals, and metalloids as well as degradation of organic pollutants, protein-metabolic engineering to increase bioremediation efficiency, including nanotechnology applications are also discussed.

**Engineering Bacteria for Bioremediation Handbook of Research on Inventive Bioremediation Techniques**IGI Global

**Bio-based Materials and Biotechnologies for Eco-efficient Construction** fills a gap in the published literature, discussing bio-based materials and biotechnologies that are crucial for a more sustainable construction industry. With comprehensive coverage and contributions from leading experts in the field, the book includes sections on Bio-based materials and biotechnologies for infrastructure applications, Bio-based materials and biotechnologies for building energy efficiency, and other applications, such as using biotechnology to reduce indoor air pollution, for water treatment, and in soil decontamination. The book will be an essential reference resource for academic researchers, civil engineers, contractors working in construction works, postgraduate students and other professionals. Focuses on sustainability and green concepts in construction Discusses recent trends on bio-based materials and biotechnologies for eco-efficient construction Covers many important aspects, including infrastructure applications, energy efficiency for building construction, and air, water and soil related problems **Environmental Biotechnology: A Biosystems Approach, Second Edition** presents valuable information on how biotechnology has acted as a vital buffer among people, pollution, and the environment. It answers the most important questions on the topic, including how, and why, a knowledge and understanding of the physical, chemical, and biological principles of the environment must be achieved in order to develop biotechnology applications. Most texts address either the applications or the implications of biotechnology. This book addresses both. The applications include biological treatment and other environmental engineering processes. The risks posed by biotechnologies are evaluated from both evidence-based and precautionary perspectives. Using a systems biology approach, the book provides a context for researchers and practitioners in environmental science that complements guidebooks on the necessary specifications and criteria for a wide range of environmental designs and applications. Users will find crucial information on the topics scientific researchers must evaluate in order to develop further technologies. Provides a systems approach to biotechnologies which includes the physical, biological, and chemical processes in context Presents relevant case studies on cutting-edge technologies, such as nanobiotechnologies and green engineering Addresses both the applications and implications of biotechnologies by following the lifecycle of a variety of established and developing biotechnologies Includes crucial information on the topics scientific researchers must evaluate in order to develop further technologies In recent years, there have been significant advances in the techniques of sampling and analysis, which has allowed the more accurate

recording of environmental levels of many substances present in the environment. At the same time, processes for the remediation of contaminated matrices have evolved, through the application and/or combination of biological, physical, and chemical procedures. The purpose of this book is to present new studies aimed at determining levels of environmental pollution in various parts of the world. It also shows new alternatives for the remediation of contaminated matrices.

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 book provides state of the art description of various approaches, techniques and some basic fundamentals of bioremediation to manage a variety of organic and inorganic wastes and pollutants present in our environment. A comprehensive overview of recent advances and new development in the field of bioremediation research are provided within relevant theoretical framework to improve our understanding for the cleaning up of polluted water and contaminated land. The book is easy to read and language can be readily comprehended by aspiring newcomer, students, researchers and anyone else interested in this field. Renowned scientists around the world working on the above topics have contributed chapters. In this edited book, we have addressed the scope of the inexpensive and energy neutral bioremediation technologies. The scope of the book extends to environmental/agricultural scientists, students, consultants, site owners, industrial stakeholders, regulators and policy makers.

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