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The text presents contemporary analytical techniques for the determination of heavy metals in air particles, water, soil and biological samples. It details experimental studies to reduce the occurrence of disease, remediate contaminated sites and establish acceptable range of oral intakes (AROI) guidelines.
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Wastewater Engineering: Advanced Wastewater Treatment Systems This text details the plant-assisted remediation method, "phytoremediation", which involves the interaction of plant roots and associated rhizospheric microorganisms for the remediation of soil contaminated with high levels of metals, pesticides, solvents, radionuclides, explosives, crude oil, organic compounds and various other contaminants. Each chapter highlights and compares the beneficial and economical alternatives of phytoremediation to currently practiced soil removal and burial practices. This book covers state of the art approaches in Phytoremediation written by leading and eminent scientists from around the globe. Phytoremediation: Management of Environmental Contaminants, Volume 1 supplies its readers with a multidisciplinary understanding in the principal and practical approaches of phytoremediation from laboratory research to field application.

Advances in Bioremediation and Phytoremediation for Sustainable Soil Management While most books examine only the classical aspects of hydrology, this three-volume set covers multiple aspects of hydrology, and includes contributions from experts from more than 30 countries. It examines new approaches, addresses growing concerns about hydrological and ecological connectivity, and considers the worldwide impact of climate change.

Phytoremediation: Role of Aquatic Plants in Environmental Clean-Up Removal of Emerging Contaminants from Wastewater through Bio-nanotechnology showcases profiles of the nonregulated contaminants termed as "emerging contaminants, which comprise industrial and household persistent toxic chemicals, pharmaceuticals and personal care products (PPCPs), pesticides, surfactants and surfactant residues, plasticizers and industrial additives, manufactured nanomaterials and nanoparticles, microplastics, etc. that are used extensively in everyday life. The occurrence of "emerging contaminants in wastewater, and their behavior during wastewater treatment and production of drinking water are key issues in the reuse and recycling of water resources. This book focuses on the exploitation of Nano-biotechnology inclusive of the state-of-the-art remediate strategies to degrade/detoxify/stabilize toxic and hazardous contaminants and restore contaminated sites, which is not as comprehensively discussed in the existing titles on similar topics available in the global market. In addition, it discusses the potential environmental and health hazards and ecotoxicity associated with the widespread distribution of emerging contaminants in the water bodies. It also considers the life cycle assessment (LCA) of emerging (micro)-pollutants with suitable case studies from various industrial sources. Provides natural and ecofriendly solutions to deal with the problem of pollution Details underlying mechanisms of nanotechnology-associated microbes for the removal of emerging contaminants Describes numerous successful field studies on the application of bio-nanotechnology for eco-restoration of contaminated sites Presents recent advances and challenges in bio-nanotechnology research and applications for sustainable development Provides authoritative
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Bioremediation: Applications for Environmental Protection and Management

This book details the plant-assisted remediation method, "phytoremediation", which involves the interaction of plant roots and associated rhizospheric microorganisms for the remediation of soil contaminated with high levels of metals, pesticides, solvents, radionuclides, explosives, crude oil, organic compounds and various other contaminants. Each chapter highlights and compares the beneficial and economical alternatives of phytoremediation to currently practiced soil removal and burial practices.

Heavy Metals In The Environment

This book provides useful information about bioremediation, phytoremediation, and mycoremediation of wastewater and some aspects of the chemical wastewater treatment processes, including ion exchange, neutralization, adsorption, and disinfection. Additionally, this book elucidates and illustrates the wastewater treatment plants in terms of plant sizing, plant layout, plant design, and plant location. Cutting-edge topics include wet air oxidation of aqueous wastes, biodegradation of nitroaromatic compounds, biological treatment of sanitary landfill leachate, bacterial strains for the bioremediation of radioactive contaminants, constructed wetlands, nanoremediation, and rainwater. As such, it is a valuable and practical resource for researchers, students, and managers in the fields of environmental science and engineering, as well as wastewater management, chemical engineering, and biotechnology.

• Presents low-cost treatment technologies for both solid waste and wastewater • Analyzes the efficiency and effectiveness of state-of-the-art technologies • Includes methods and case studies for practical application
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Environmental Risk Assessment of Soil Contamination Excessive levels of heavy metals can be introduced into the environment, for example, by industrial waste or fertilizers. Soil represents a major sink for heavy metals ions, which can then enter the food chain via plants or leaching into groundwater. In Heavy Metal Ions in the Environment, the author looks at where heavy metals ions come from, how they interact with the environment and how they can be removed from the environment – by a process known as remediation. This book serves as a valuable addition to an increasingly important field of study, which is, at present, served by a limited number of archival texts. Includes comprehensive coverage of heavy metal ions in the environment Is practical and easy to read Is suitable for students and researchers in environmental science and environmental or chemical engineering

Removal of Refractory Pollutants from Wastewater Treatment Plants A heavy backlog of gaseous, liquid, and solid pollution has resulted from a lack of development in pollution control. Because of this, a need for a collection of original research in water and wastewater treatment, industrial waste management, and soil and ground water pollution exists. Advanced Treatment Techniques for Industrial Wastewater is an innovative collection of research that covers the different aspects of environmental engineering in water and wastewater treatment processes as well as the different techniques and systems for pollution management. Highlighting a range of topics such as agriculture pollution, hazardous waste management, and sewage farming, this book is an important reference for environmental engineers, waste authorities, solid waste management companies, landfill operators, legislators, environmentalists, and academicians seeking research on waste management.

Physico-Chemical Wastewater Treatment and Resource Recovery This book will discuss the effective and sustainable technological approaches for remediation of contaminates via eco-friendly usage of microbes. The primary focus will be on the role of microbes, particularly bacteria and fungi, for the degradation and removal of various xenobiotic substances in the environment. The book will also emphasize molecular approaches and biosynthetic pathways of microbes, and
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The present book contains five chapters. First two chapters provide information about types of contaminants commonly reported in wastewaters and enlist some important and well-studied aquatic plant species known for their potential to remove various contaminants from wastewater. Subsequent chapters deal with mechanisms involved in contaminant removal by aquatic plant species, and also provide detailed information about role of aquatic plant species in wetlands. Potential of constructed wetlands in cleaning domestic and industrial wastewaters has also been discussed in detail. The strategy for enhancing phytoremediation capacity of plants by different means and effectiveness of phytoremediation technology in terms of monetary benefits has been discussed in last chapter. Last chapter also emphasizes the future aspects of this technology.

Plant Ecophysiology and Adaptation under Climate Change: Mechanisms and Perspectives II Scientific Essay from the year 2016 in the subject Geography / Earth Science - Physical Geography, Geomorphology, Environmental Studies, language: English, abstract: This text summarizes the role of phytoremediation in the remediation of industrial waste water since this waste water has become a threat to water quality. Several technologies are available to remediate water that is contaminated by industrial pollutant. However, many of these technologies are costly (e.g. excavation of contaminated material and chemical/physical treatment) or do not achieve a long-term nor aesthetic solution. Phytoremediation can provide a cost-effective, long-lasting and aesthetic solution for remediation of contaminated sites. In many cases, especially in tropical or subtropical areas,

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Invasive plants such as the water hyacinth (*Eichhornia crassipes*) and water lettuce (*P. stratiotes L.*) are used in these phytoremediation water systems. This is because, compared to native plants, these invasive plants show a much higher nutrient removal efficiency with their high nutrient uptake capacity, fast growth rate, and big biomass production. In the active growth season, for instance, water hyacinth plants can double in number and biomass in 6 to 15 days. This study shows the importance of phytoremediation in the phytoremediation of industrial waste.

Phytoremediation Major impacts of current and pre-regulatory mining activities on the environment include the generation of acid mine drainage (AMD) and metal(loid)-laden acid sulfate soils. Current remediation techniques are mostly cost prohibitive due to high energy, material, and labor requirement. This study investigated two complementary low-cost methods that harnessed the metal(loid)-removing and acid-neutralizing properties of drinking water treatment residuals (WTRs) and the uptake (phytoremediation) potential of vetiver (*Vetiviera zizanioides L.*) and pokeweed (*Phytolacca americana L.*) to attenuate and immobilize metal(loid)s from natural AMD and metal(loid)-contaminated soil. Metals were removed from AMD by using a reverse flow fluidized column filter and hydroponic phytoremediation with vetiver and pokeweed. Metals were immobilized in soil through the amendment with Fe and Ca-WTR complimented by the uptake and translocation of metals by vetiver and pokeweed. Experiments were performed under controlled greenhouse conditions as well as under natural Illinois environment in simulated field conditions. Furthermore, the integrated effects of WTR application and the growth of vetiver on soil erosion were also studied. Physicochemical analysis of AMD and soil samples from the Tab-Simco abandoned mine in the Illinois Coal Basin, U.S.A, showed significant concentrations of major metals and metalloids such as Fe, Al, Mn, Zn, Ni, Cu and As at acidic pH levels. The degree of soil contamination at the site was spatially variable with respect to the location of the main AMD seep. Physical, chemical, agronomic and mineralogical characterization of locally acquired water treatment residuals (WTR) showed that the silty and alkaline (pH ≈ 7.0-9.1) materials also contained significant amounts of plant required micronutrients. The presence of amorphous phases of mostly metal (oxy)hydroxides, alkalinity, and porosity of the WTRs suggested the potential to neutralize acidity and capability to remove metal(loid)s in contaminated soils and AMD. Recorded metal removal (%MR) rate by WTR was rapid in the first 80 min in a batch agitation study, except for Mn. Thus, high metal removal ranging from 99.8% to 84.9% at selectivity sequence of Al>Fe>Cu>Zn and Mn (9.6%) was obtained at equilibrium. The pH of the AMD was also increased from 2.6 to 6.7. Analysis of leachate samples from gravity-drained columns following simulated rain events in a greenhouse study showed reduced concentrations of Al, Fe, Mn, Zn, Cu, As and Pb at sustained neutral pH compared with unamended control columns during the 12 weeks study period. Metal immobilization in soil by the lower amendment rates of WTR was comparable to the higher application rates.
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Phytoremediation is an exciting, new technology that utilizes metal-accumulating plants to rid soil of heavy metals and radionuclides. Hyperaccumulation plants are an appealing and economical alternative to current methods of soil recovery. Phytoremediation of Contaminated Soil and Water is the most thorough literary examination of the subject available today. The successful implementation of phytoremediation depends on identifying plant material that is well adapted to specific toxic sites. Gentle remediation is then applied in situ, or at the contamination site. No soil excavation or transport is necessary. This severely contains the potential risk of the pollutants entering the food chain. And it’s cost-effective. The progress of modern man has created many sites contaminated with heavy metals. The effected land is toxic to plants and animals, which creates considerable public interest in remediation. But the commonly used remedies are ex situ, which poses an expensive dilemma and an even greater threat. Phytoremediation offers the prospect of a cheaper and healthier way to deal with this problem. Read Phytoremediation of Contaminated Soil and Water to learn just how far this burgeoning technology has developed.

Soil Bioremediation Phytoremediation Technology for the Removal of Heavy Metals and Other Contaminants from Soil and Water focuses on the exploitation of plants and their associated microbes as a tool to degrade/detoxify/stabilize toxic and hazardous contaminants and restore the contaminated site. The book introduces various phytoremediation technologies using an array of plants and their associated microbes for environmental cleanup and sustainable development. The book mainly focuses on the remediation of toxic and hazardous contaminants in soil and water. It covers the use of plants such as vetiver and pokeweed for heavy metal removal from wastewater treatment systems. The developed integrated WTR fluidized column and phytoremediation technique with vetiver and pokeweed under hydroponic conditions sequentially removed significant quantities of most heavy metals from AMD. Thus, the overall findings showed that the locally collected WTRs—otherwise waste materials—showed high metal-removing and acidity-reducing capabilities in AMD and contaminated soil treatment applications. The similarity between the results obtained from the laboratory and simulated field study also showed that laboratory/greenhouse experiments may serve as reliable proxies for field responses in applications such as soil and water conservation in agricultural environments, remediation of abandoned mine lands, as well as wastewater treatment systems.
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environmental contaminants, their phytoremediation mechanisms and strategies, advances and challenges in the current scenario. This book is intended to appeal to students, researchers, scientists and a wide range of professionals responsible for regulating, monitoring and designing industrial waste facilities. Engineering consultants, industrial waste managers and purchasing department managers, government regulators, and graduate students will also find this book invaluable. Provides natural and eco-friendly solutions to deal with the problem of pollution Details underlying mechanisms of phytoremediation of organic and inorganic contaminants with enzymatic roles Describes numerous, successful field studies on the application of phytoremediation for eco-restoration of contaminated sites Presents recent advances and challenges in phytoremediation research and applications for sustainable development Provides authoritative contributions on the diverse aspects of phytoremediation by world leading experts

Cost Effective Technologies for Solid Waste and Wastewater Treatment

This text details the plant-assisted remediation method, “phytoremediation”, which involves the interaction of plant roots and associated rhizospheric microorganisms for the remediation of soil contaminated with high levels of metals, pesticides, solvents, radionuclides, explosives, crude oil, organic compounds and various other contaminants. Many chapters highlight and compare the efficiency and economic advantages of phytoremediation to currently practiced soil and water treatment practices. Volume 5 of Phytoremediation: Management of Environmental Contaminants provides the capstone of the series. Taken together, the five volumes provide a broad–based global synopsis of the current applications of phytoremediation using plants and the microbial communities associated with their roots to decontaminate terrestrial and aquatic ecosystems.

Handbook of Engineering Hydrology (Three-Volume Set)

Wastewater Treatment: Cutting-Edge Molecular Tools, Techniques and Applied Aspects reports new findings in existing molecular biology strategies, including their limitations, challenges and potential application to remove environmental pollutants through advancements made in cutting edge tools. In addition, the book introduces new trends and advances in environmental bioremediation with thorough discussions on recent developments in this field. Describes the application of different omics tools in wastewater treatment plants (WWTPs) Describes the role of microorganisms in WWTPs Points out the reuse of treated wastewater through emerging technologies Includes the recovery of resources from wastewater Emphasizes the need for the use of cutting-edge molecular tools

An Integration of Phycoremediation Processes in Wastewater Treatment Development in Wastewater Treatment Research and Processes

As the global population grows and many developing countries modernize, the importance of water supply and wastewater treatment becomes a much greater factor in the...
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Welfare of nations. Clearly, in today's world the competition for water resources coupled with the unfortunate commingling of wastewater discharges with freshwater supplies creates additional pressure on treatment systems. Recently, researchers focus on wastewater treatment by difference methods with minimal cost and maximum efficiency. This volume of the Wastewater Engineering: Advanced Wastewater Treatment Systems is a selection of topics related to physical-chemical and biological processes with an emphasis on their industrial applications. It gives an overview of various aspects in wastewater treatments methods including topics such as biological, bioremediation, electrochemical, membrane and physical-chemical applications. Experts in the area of environmental sciences from diverse institutions worldwide have contributed to this book, which should prove to be useful to students, teachers, and researchers in the disciplines of wastewater engineering, chemical engineering, environmental engineering, and biotechnology. We gratefully acknowledge the cooperation and support of all the contributing authors.

Phytoremediation This book discusses new and innovative trends and techniques in the removal of toxic and or refractory pollutants through various environmental biotechnological processes from wastewater, both at the laboratory and industrial scale. It focuses primarily on environmentally-friendly technologies which respect the principles of sustainable development, including the advanced trends in remediation through an approach of environmental biotechnological processes from either industrial or sewage wastewater. Features: Examines the fate and occurrence of refractory pollutants in wastewater treatment plants (WWTPs) and the potential approaches for their removal. Highlights advanced remediation procedures involving various microbiological and biochemical processes. Assesses and compares the potential application of numerous existing treatment techniques and introduces new, emerging technologies. Removal of Refractory Pollutants from Wastewater Treatment Plants is suitable for practicing engineers, researchers, water utility managers, and students who seek an excellent introduction and basic knowledge in the principles of environmental bioremediation technologies.

Handbook of Research on Microbial Tools for Environmental Waste Management

This book discusses new and innovative trends and techniques in the removal of toxic and or refractory pollutants through various environmental biotechnological processes from wastewater, both at the laboratory and industrial scale. It focuses primarily on environmentally-friendly technologies which respect the principles of sustainable development, including the advanced trends in remediation through an approach of environmental biotechnological processes from either industrial or sewage wastewater. Features: Examines the fate and occurrence of refractory pollutants in wastewater treatment plants (WWTPs) and the potential approaches for their removal. Highlights advanced remediation procedures involving various microbiological and biochemical processes. Assesses and compares the potential application of numerous existing treatment techniques and introduces new, emerging technologies.
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Technologies and introduces new, emerging technologies. Removal of Refractory Pollutants from Wastewater Treatment Plants is suitable for practicing engineers, researchers, water utility managers, and students who seek an excellent introduction and basic knowledge in the principles of environmental bioremediation technologies.

Recent Advancements in Bioremediation of Metal Contaminants

Rapid industrialization is a serious concern in the context of a healthy environment. With the growth in the number of industries, the waste generated is also growing exponentially. The various chemical processes operating in the manufacturing industry generate a large number of by-products, which are largely harmful and toxic pollutants and are generally discharged into the natural water bodies. Once the pollutants enter the environment, they are taken up by different life forms, and because of bio-magnification, they affect the entire food chain and have severe adverse effects on all life forms, including on human health. Although, various physico-chemical and biological approaches are available for the removal of toxic pollutants, unfortunately these are often ineffective and traditional clean up practices are inefficient. Biological approaches utilizing microorganisms (bacterial/fungi/algae), green plants or their enzymes to degrade or detoxify environmental pollutants such as endocrine disruptors, toxic metals, pesticides, dyes, petroleum hydrocarbons and phenolic compounds, offer eco-friendly approaches. Such eco-friendly approaches are often more effective than traditional practices, and are safe for both industry workers as well as environment. This book provides a comprehensive overview of various toxic environmental pollutants from a variety natural and anthropogenic sources, their toxicological effects on the environment, humans, animals and plants as well as their biodegradation and bioremediation using emerging and eco-friendly approaches (e.g. Anammox technology, advanced oxidation processes, membrane bioreactors, membrane processes, GMOs), microbial degradation (e.g. bacteria, fungi, algae), phytoremediation, biotechnology and nanobiotechnology. Offering fundamental and advanced information on environmental problems, challenges and bioremediation approaches used for the remediation of contaminated sites, it is a valuable resource for students, scientists and researchers engaged in microbiology, biotechnology and environmental sciences.

Emerging and Eco-Friendly Approaches for Waste Management

New Trends in Removal of Heavy Metals from Industrial Wastewater covers the applicable technologies relating to the removal of heavy metals from wastewater and new and emerging trends in the field, both at the laboratory and industrial scale. Sections explore new environmentally friendly technologies, the principles of sustainable development, the main factors contributing to heavy metal removal from wastewater, methods and procedures, materials (especially low-cost materials originated from industrial and agricultural waste), management of wastewater containing heavy metals and wastewater valorization, recycling, environmental impact, and wastewater policies for post heavy metal removal.
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This book is an advanced and updated vision of existing heavy metal removal technologies with their limitations and challenges and their potential application to remove heavy metals/environmental pollutants through advancements in bioremediation. Finally, sections also cover new trends and advances in environmental bioremediation with recent developments in this field by an application of chemical/biochemical and environmental biotechnology. Outlines the fate and occurrence of heavy metals in Wastewater Treatment Plants (WWTPs) and potential approaches for their removal Describes the techniques currently available for removing heavy metals from wastewater Discusses the emerging technologies in heavy metal removal Covers biological treatments to remove heavy metals Includes the valorization of heavy metal containing wastewater

The Role of Phytoremediation in Remediation of Industrial Waste

Phytoremediation Technology for the Removal of Heavy Metals and Other Contaminants from Soil and Water The book on Physico-Chemical Treatment of Wastewater and Resource Recovery provides an efficient and low-cost solution for remediation of wastewater. This book focuses on physico-chemical treatment via advanced oxidation process, adsorption, its management and recovery of valuable chemicals. It discusses treatment and recovery process for the range of pollutants including BTX, PCB, PCDDs, proteins, phenols, antibiotics, complex organic compounds and metals. The occurrence of persistent pollutants poses deleterious effects on human and environmental health. Simple solutions for recovery of valuable chemicals and water during physico-chemical treatment of wastewater are discussed extensively. This book provides necessary knowledge and experimental studies on emerging physico-chemical processes for reducing water pollution and resource recovery.

Phytoremediation Pollution and ways to combat it have become topics of great concern for researchers. One of the most important dimensions of this global crisis is wastewater, which can often become contaminated with heavy metals such as lead, mercury, and arsenic, which are released from different industrial wastes, mines, and agricultural runoff. Bioremediation of such heavy metals has been extensively studied using different groups of bacteria, fungi, and algae, and has been considered as a safer, eco-friendly, and cost-effective option for mitigation of contaminated wasteland. The toxicity of water impacts all of society, and so it is of great importance that we understand the better, cleaner, and more efficient ways of treating water. Recent Advancements in Bioremediation of Metal Contaminants is a pivotal reference source that explores bioremediation of pollutants from industrial wastes and examines the role of diverse forms of microbes in bioremediation of wastewater. Covering a broad range of topics including microorganism tolerance, phytoremediation, and fungi, the role of different extremophiles and biofilms in bioremediation are also discussed. This book is ideally designed for environmentalists, engineers, policymakers, and researchers.
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Academics, researchers, and students in the fields of microbiology, toxicology, environmental chemistry, and soil and water science.

Ecological Assessment of Wastewater Treatment Technologies

This book examines bioremediation technologies as a tool for environmental protection and management. It provides global perspectives on recent advances in the bioremediation of various environmental pollutants. Topics covered include comparative analysis of bio-gas electrification from anaerobic digesters, mathematical modeling in bioremediation, the evaluation of next-generation sequencing technologies for environmental monitoring in wastewater abatement; and the impact of diverse wastewater remediation techniques such as the use of nanofibers, microbes and genetically modified organisms; bioelectrochemical treatment; phytoremediation; and biosorption strategies. The book is targeted at scientists and researchers working in the field of bioremediation.

SOUVENIR of 4th International Science Congress

This two-volume work presents comprehensive, accurate information on the present status and contemporary development in phycoremediation of various types of domestic and industrial wastewaters. The volume covers a mechanistic understanding of microalgae based treatment of wastewaters, including current challenges in the treatment of various organic and inorganic pollutants, and future opportunities of bioremediation of wastewater and industrial effluents on an algal platform. The editors compile the work of authors from around the globe, providing insight on key issues and state-of-the-art developments in algal bioremediation that is missing from the currently available body of literature. The volume hopes to serve as a much needed resource for professors, researchers and scientists interested in microalgae applications for wastewater treatment. Volume 1 focuses on the different aspects of domestic and industrial wastewater treatment by microalgae. The case studies include examples such as genetic technologies as well as the development and efficient use of designer consortia for enhanced utilization of microalgae. This volume provides thorough and comprehensive information on removal of persistent and highly toxic contaminants such as heavy metals, organic pesticides, polyaromatic hydrocarbons, endocrine disruptors, pharmaceutical compounds, and dyes from wastewater by microalgae, diatoms, and blue-green algae. Design considerations for algal ponds and efficient use of photobioreactors and HRAPs for wastewater treatment are some other highlights. This volume addresses the applications, potentials, and future opportunities for these various considerations in water pollution mitigation using algal technologies.

Green Materials for Wastewater Treatment

Phytoremediation: Methods and Reviews presents the most innovative recent methodological developments in phytoremediation research, and outlines a variety of the contexts in which phytoremediation has begun to be applied. A significant portion of this volume is devoted to groundbreaking methods for the production of plants that are able to
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Phytoremediation techniques are an essential approach in wastewater treatment for degrade, take up, or tolerate the effects of pollutants. Phytoremediation: Methods and Reviews adopts a multidisciplinary approach to the examination of principles and practices of phytoremediation, from molecular manipulation to field application. Parts I and II discuss detailed protocols for achieving several different goals of phytoremediation, including enhancing contaminant degradation, uptake, and tolerance by plants; exploiting plant diversity for phytoremediation; modifying contaminant availability; and experimentally analyzing phytoremediation potential. Parts III and IV examine a variety of progressive techniques for phytoremediation and explore their implementation and success on a global scale. This cutting-edge volume highlights the myriad of contexts in which phytoremediation can be applied, and energizes new research by describing ways in which barriers to success have been recently overcome.

Wastewater Treatment Engineering Soil is an irreplaceable resource that sustains life on the planet, challenged by food and energy demands of an increasing population. Therefore, soil contamination constitutes a critical issue to be addressed if we are to secure the life quality of present and future generations. Integrated efforts from researchers and policy makers are required to develop sound risk assessment procedures, remediation strategies and sustainable soil management policies. Environmental Risk Assessment of Soil Contamination provides a wide depiction of current research in soil contamination and risk assessment, encompassing reviews and case studies on soil pollution by heavy metals and organic pollutants. The book introduces several innovative approaches for soil remediation and risk assessment, including advances in phytoremediation and implementation of metabolomics in soil sciences.

Phytoremediation of Contaminated Soil and Water Water is 'elixir of life' and one of the most integral components of the environment. However, in recent years the quality of natural water has been altered seriously, mainly due to human interferences in natural processes. Recycling and reuse of wastewater is a promising technique to reduce the pollution load on surface water bodies. Phytoremediation is a cost effective, environment friendly, aesthetically pleasing and most suitable approach for the appropriate treatment of wastewater. This book demonstrated a reduction in heavy metals and organic contents by using...
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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

Advanced Treatment Techniques for Industrial Wastewater The remediation of environmental pollutants has become a relevant topic within the field of waste management. Advances in biological approaches are a potential tool for contamination and pollution control. The Handbook of Research on Microbial Tools for Environmental Waste Management is a critical scholarly resource that explores the advanced biological approaches that are used as remediation for pollution cleanup processes. Featuring coverage on a broad range of topics such as biodegradation, microbial dehalogenation, and pollution controlling treatments, this book is geared towards environmental scientists, biologists, policy makers, graduate students, and scholars seeking current research on environmental engineering and green technologies.

Introduction to Phytoremediation Contamination of Water: Health Risk Assessment and Treatment Strategies takes an interconnected look at various pollutants, sources of contamination, the effects of contamination on aquatic ecosystems and human health, and potential mitigation strategies. The book begins by examining the sources of potential contamination, including the current scenario of dyes, heavy metals, pesticides and oils contamination as well as regions impacted due to industrialization, mining or urbanization. It then analyzes various methods of water contamination, assesses health risk and adverse effects on those impacted, and concludes with an exploration of efficient, low-cost treatment technologies that remove toxic pollutants from the water. This book incorporates both theoretical and practical information that will be useful for researchers, professors, graduate students and professionals working on water contamination, environmental and health impacts, and the management and treatment of water resources. Provides practical case studies of various types of contamination and sources in different regions Offers an overview of inorganic and organic contaminants and their impact on human health Evaluates several low-cost, efficient and effective water treatment technologies to remove toxins from water and minimize risk

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This book presents advanced techniques for wastewater treatment and the chapters review the environmental impact of water pollution, the analysis of water quality, and technologies for the preservation of water resources. Also outlined in this volume is the bioremediation of heavy metals, dyes, bisphenols, phthalates, cyanobacteria in contaminated water and wastewater. Another focus of this book is the use of natural remediation techniques such as bacterial biofilms and enzymes.

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