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MARINE BACTERIAL BIODIVERSITY OF WEST COASTLINE OF INDIA AT KARWAR

Abatement of Environmental Pollutants

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Isolation & Characterization of Biosurfactant Producing Bacteria

Advanced Bioremediation Technologies and Processes for the Treatment of Synthetic Organic Compounds (SOCs)

Soil Bioremediation

A Handbook of Environmental Toxicology

Advances in Biodegradation and Bioremediation of Industrial Waste

Rhizobiont in Bioremediation of Hazardous Waste

Microbes for Legume Improvement

In Situ Cultivation of Potential PAH Degrading Bacteria from Coastal Sediment

Mechanisms of Arsenic Toxicity and Tolerance in Plants

Bioresource Utilization and Management

Polar Microbiology

Metal Ions in Biology and Medicine

Electrochemically Active Microorganisms

Novel Approaches for Bioremediation of
Phytoremediation Microbial electrochemical systems (MESs, also known as bioelectrochemical systems (BESs) are promising technologies for energy and products recovery coupled with wastewater treatment, and have attracted increasing attention. Many studies have been conducted to expand the application of MESs for contaminants degradation and bioremediation, and increase the efficiency of electricity production by optimizing architectural structure of MESs, developing new electrode materials, etc. However, one of the big challenges for researchers to overcome, before MESs can be used commercially, is to improve the performance of the biofilm on electrodes so that ‘electron transfer’ can be enhanced. This would lead to greater production of electricity, energy or other products. Electrochemically active microorganisms (EAMs) are a group of microorganisms which are able to release electrons from inside their cells to an electrode or accept electrons from an electron donor. The way in which EAMs do this is called ‘extracellular electron transfer’ (EET). So far, two EET mechanisms have been identified: direct electron transfer from microorganisms physically attached to an electrode, and indirect electron transfer from microorganisms that are not physically attached to an electrode. 1) Direct electron transfer between microorganisms and electrode can occur in two ways: a) when there is physical contact between outer membrane structures of the microbial cell and the surface of the electrode, b) when electrons are transferred between the
microorganism and the electrode through tiny projections (called pili or nanowires) that extend from the outer membrane of the microorganism and attach themselves to the electrode. 2) Indirect transfer of electrons from the microorganisms to an electrode occurs via long-range electron shuttle compounds that may be naturally present (in wastewater, for example), or may be produced by the microorganisms themselves. The electrochemically active biofilm, which degrades contaminants and produces electricity in MESs, consists of diverse community of EAMs and other microorganisms. However, up to date only a few EAMs have been identified, and most studies on EET have focused on the two model species of Shewanella oneidensis and Geobacter sulfurreducens.

**Halophiles**

**Isolation of Hydrocarbonoclastic Bacteria and Assessment of Their Bioremediation Potential in the Treatment of Oil Contaminated Marine Environments**

**Bioremediation and Sustainable Technologies for Cleaner Environment** Microbial enzymes play a vital role in maintaining soil health and removing pollutants from contaminated land. Soil microflora is closely associated with maintaining soil fertility, and the use of chemical pesticides, fertilizers and other volatile sprays in agriculture threatens the health of the microbial population in the soil. Every single particle of healthy soil contains millions of bacteria, which interact with the nutrients available, sustaining the nutrient cycle and making this microflora an essential component of life on earth. How do microbes help in the nutrient cycle? Either by intracellular digestion of macromolecules and converting these into smaller units in their metabolic pathways, or by secreting enzymes into the extracellular environment to facilitate the conversion of complex macromolecules into micro-molecules that can be easily absorbed by other living species. To meet demands for energy and food for the growing global population, it is important to protect agricultural land from contamination and maintain its productivity. Heavy metal ions from contaminated land can enter crops, fish or...
aquatic organisms via contaminated water, and these are then taken up by the human body, where they can accumulate and alter the normal microflora. The microbiological component of the soil is a highly complex system and is still not fully understood. How do microbes survive in the changing physicochemical environment of soil? This book helps readers understand the mechanism, various routes of microbial soil remediation, the interactions of different genera, and how microbial enzymes support the sustainable restoration of healthy soil.

Bioremediation Potential of Metal Resistant Bacteria Isolated from Abandoned Gold Mine Tailings This book reviews principles, techniques and applications of metal, metal oxides, metal sulfides and metal-organic frameworks for removal and degradation of pollutants. Natural materials are often much more advanced than synthetic materials in terms of circularity and are functional, often biodegradable, recyclable and generate little waste. They are, therefore, a source of inspiration of new synthetic materials. In particular, recent research has focused on various types of functional materials such as organic, inorganic, nanostructured and composites for the remediation of environmental pollution.

Arsenic Research and Global Sustainability Microbial Biodegradation and Bioremediation: Techniques and Case Studies for Environmental Pollution, Second Edition describes the successful application of microbes and their derivatives for bioremediation of potentially toxic and relatively novel compounds in the environment. 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, thousands of xenobiotics of relatively new entities emerge every day, 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. This completely updated new edition presents many new technologies and techniques and includes theoretical context and
case studies in every chapter. Microbial Biodegradation and Bioremediation: Techniques and Case Studies for Environmental Pollution, Second Edition serves as a single-source reference and encompasses all categories of pollutants and their applications in a convenient, comprehensive format for researchers in environmental science and engineering, pollution, environmental microbiology, and biotechnology. 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 Completely updated and expanded to include topics and techniques such as genetically engineered bacteria, environmental health, nanoremediation, heavy metals, contaminant transport, and in situ and ex situ methods Includes theoretical context and case studies within each chapter

Phytoremediation

Microbial Biotechnology 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 present gene and protein expression studies for bio-deterioration techniques. New innovative and sophisticated green technologies for waste minimization and waste control will be presented, as well as the potential of microbes for various techniques of bioremediation, including bio-sorption, bio-augmentation, bio-stimulation, to clean contaminated environments.
Characterization and Evaluation of Biodegradation Potential of Pentachlorophenol-metabolizing Bacteria Isolated from a Contaminated Shallow Aquifer at a Former Wood Treatment Facility

Pollution is one of the most serious issues facing mankind and other life forms on earth. Environmental pollution leads to the degradation of ecosystems, loss of services, economic losses, and various other problems. The eco-friendliest approach to rejuvenating polluted ecosystems is with the help of microorganism-based bioremediation. Microorganisms are characterized by great biodiversity, genetic and metabolic machinery, and by their ability to survive, even in extremely polluted environments. As such, they are and will remain the most important tools for restoring polluted ecosystems / habitats. This three-volume book sheds light on the utilization of microorganisms and the latest technologies for cleaning up polluted sites. It also discusses the remediation or degradation of various important pollutants such as pesticides, wastewater, plastics, PAHs, oil spills etc. The book also explains the latest technologies used for the degradation of pollutants in several niche ecosystems. Given its scope, the book will be of interest to teachers, researchers, bioremediation scientists, capacity builders and policymakers. It also offers valuable additional reading material for undergraduate and graduate students of microbiology, ecology, soil science, and the environmental sciences.

Nanobiotechnology

Nanobiotechnology: Microbes and Plant Assisted Synthesis of Nanoparticles, Mechanisms and Applications covers in detail the green synthesis of nanostructures of tailor-made size, shape and physico-chemical and opto-electronic properties. The rationale behind the selection of bacteria, cyanobacteria, algae, fungi, virus and medicinal plants for the synthesis of biologically active exotic nanoparticles for biomedical applications is also part of this book. It also explores metal recovery, bioconversion, detoxification and removal of heavy metals using nanobiotechnology and discusses the potential of nanobiotechnology to address environmental pollution and toxicity. The book further covers the economic and commercial aspects of
such green nanobiotechnology initiatives, its current status in intellectual property rights like patents filed so far globally, technology transfers, and market potential. This information enables one to decipher the scope of biogenic nanoparticles and its prospects. Provides an overview on the general and applied aspects on nanotechnology. Gives the scope of exploring bacteria, fungi, algae, virus and medicinal plants for the synthesis of exotic nanoparticles. Furnishes a comprehensive report on the underlying molecular mechanisms behind the biosynthesis of nanoparticles. Outlines sustainable alternative strategies of bioremediation of heavy metals, metal recovery, detoxification and bioconversion using nanobiotechnology. Explores the promises of patenting, technology transfer and commercialization potential of biogenic nanoparticles.

Microbial Rejuvenation of Polluted Environment This book presents a broad compendium of biodegradation research and discussions on the most up-to-date bioremediation strategies. The most relevant microbiological, biochemical and genetic concepts are presented alongside the fundamentals of bioremediation. The topics include: a wide variety of contaminant impacts evaluation, key methodologies required to measure biodegradation and propose new bioremediation protocols, as well as the handling of microbial communities related to such processes. The selected collaborating authors are renowned for their microbiology expertise and will provide an in-depth reference for students and specialists. The contents provide a valuable source of information for researchers, professionals, and policy makers alike.

Metal, Metal-Oxides and Metal-Organic Frameworks for Environmental Remediation

MARINE BACTERIAL BIODIVERSITY OF WEST COASTLINE OF INDIA AT KARWAR Dr. Datta Madamwar holds a provisional patent related to the theme of this Research Topic. All other Topic Editors declare no competing interests with regards to the Research Topic subject.
Abatement of Environmental Pollutants This book describes many novel approaches of microbial bioremediation including conventional and modern approaches, metagenomics, biosurfactants and nano-based bioremediation. Also presents up-to-date knowledge about biodegradation of solid and liquid contaminants in the rhizospheric zone by plant (rhizo)-microbiome interface. It also illustrates communication pathways based on evolving methodologies, bioinformatic tools which provides insights into the functional dynamics of bioremediation process by the host-microbiome interface. The different chapters explain the mechanism and outcomes during the process of bioremediation. The book broadly depicts the following: Advances in bioremediation through nanoremediation, rhizo-remediation, bioremediation of different ecosystems like polluted waters, industrial effluents, bioremediation of metal and organic pollutants, toxic dyes etc. The book is very useful for researchers and students in the fields of applied and environmental microbiology. It is also meant for industry experts and professionals working in the field of bioremediation and waste management.

Microbial Biodegradation and Bioremediation Written by an international team of authors from a range of educational, medical and research establishments, this book is an essential reference for advanced students and researchers in the areas of environmental sciences, ecology, agriculture, environmental health and medicine, in addition to industry and government personnel responsible for environmental regulations and directives. A Handbook of Environmental Toxicology focuses on two key aspects: human disorders and ecotoxicology as affected by major toxins originating from biological sources and pollutants, as well as radiation generated spontaneously or as a result of anthropogenic activity. A diverse array of these potentially harmful agents regularly appear in the atmosphere, soil, water and food, compromising both human health and biodiversity in natural and managed ecosystems.

Arsenic Toxicity: Challenges and Solutions
Isolated From Seria Crude Oil Terminal (SCOT) plant in Brunei Darussalam using selective enrichment technique. All isolates were cultivated in liquid media with crude oil as the sole carbon and energy source. The nucleotide sequences of the 16S rRNA gene of these bacteria were determined. Based on biochemical and molecular characterization performed, the identities of the bacteria capable of degrading hydrocarbons belong to the genus Bacillus, Brevibacillus, Pseudomonas, Agrobacterium and Stenotrophomonas. All these isolates were assessed for their resistance against antibiotics like gentamicin, cephalexin, tetracycline, penicillin, erythromycin and vancomycin by means of the Kirby-Bauer disk diffusion method.

Soil Bioremediation Arsenic is likely the most talked-about metalloid in the modern world because of its toxic effects on both animal and plants. Further, arsenic pollution is now producing negative impacts on food security, especially in many south Asian countries. Since plants are a major food source, their adaptation to As-rich environments is essential, as is being informed about recent findings on multifarious aspects of the mechanisms of arsenic toxicity and tolerance in plants. Although numerous research works and review articles have been published in journals, annual reviews and as book chapters, to date there has been no comprehensive book on this topic. This book contains 19 informative chapters on arsenic chemistry, plant uptake, toxicity and tolerance mechanisms, as well as approaches to mitigation. Readers will be introduced to the latest findings on plant responses to arsenic toxicity, various tolerance mechanisms, and remediation techniques. As such, the book offers a timely and valuable resource for a broad audience, including plant scientists, soil scientists, environmental scientists, agronomists, botanists and molecular biologists.

Biodegradation, Pollutants and Bioremediation Principles Cost-Effective Technologies for Solid Waste and Wastewater Treatment synthesizes methods, case studies, and analyses of various state-
of-the-art techniques for removing contaminants from wastewater, solid waste, or sewage and converting or reusing the waste with minimum impact on the environment. Focusing on innovative treatment strategies, as well as recent modifications to conventional processes, the book covers methods for a complex variety of emerging pollutants including organic matter, chemicals, and micropollutants resulting from developmental and industrial activities. Serving as a practical guide to state-of-the-art methods, Cost-Effective Technologies for Solid Waste and Wastewater Treatment also delivers foundational information on the practical design of treatment and reuse systems and explains the treatments in terms of scale, efficiency, and effectiveness. It focuses on cost-effective technologies that are particularly applicable to environmental clean-up, such as bioaugmentation and biostimulation of plastics, activated carbon, phytoremediation, crude oil pollution stress, adsorbents, contaminants of emerging concern, anaerobic digestion, in situ chemical oxidation (ISCO), biosorption, bioremediation, 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

Microbes and Enzymes in Soil Health and Bioremediation Addresses a Global Challenge to Sustainable Development Advances in Biodegradation and Bioremediation of Industrial Waste examines and compiles the latest information on the industrial waste biodegradation process and provides a comprehensive review. Dedicated to reducing pollutants generated by agriculturally contaminated soil, and plastic waste from various industries, this text is a book that begs the question: Is a pollution-free environment possible? The book combines with current available data with the expert knowledge of specialists from around
the world to evaluate various aspects of environmental microbiology and biotechnology. It emphasizes the role of different bioreactors for the treatment of complex industrial waste and provides specific chapters on bioreactors and membrane process integrated with biodegradation process. It also places special emphasis on phytoremediation and the role of wetland plant rhizosphere bacterial ecology and the bioremediation of complex industrial wastewater. The authors address the microbiological, biochemical, and molecular aspects of biodegradation and bioremediation which cover numerous topics, including microbial genomics and proteomics for the bioremediation of industrial waste. This text contains 14 chapters and covers: Bioprocess engineering and mathematical modelling with a focus on environmental engineering The roles of siderophores and the rhizosphere bacterial community for phytoremediation of heavy metals Current advances in phytoremediation, especially as it relates to the mechanism of phytoremediation of soil polluted with heavy metals Microbial degradation of aromatic compounds and pesticides: Challenges and solution Bioremediation of hydrocarbon contaminated wastewater of refinery plants The role of biosurfactants for bioremediation and biodegradation of various pollutants discharged from industrial waste as they are tools of biotechnology The role of potential microbial enzymatic processes for bioremediation of industrial waste The latest knowledge regarding the biodegradation of tannery and textile waste A resource for students interested in the field of environment, microbiology, industrial engineering, biotechnology, botany, and agricultural sciences, Advances in Biodegradation and Bioremediation of Industrial Waste provides recent knowledge and approaches on the bioremediation of complex industrial waste.

Rhizomicrobiome Dynamics in Bioremediation Biosurfactants are amphiphilic compounds i.e., they contain both hydrophilic and hydrophobic moieties which partitions preferentially at the interfaces such as liquid/liquid, gas/liquid or solid/liquid interfaces. This facilitates properties like emulsification, foaming, detergency and dispersing. Their low toxicity and eco-friendly nature and the
wide range of potential Industrial applications in bioremediation, health care, food processing and oil industries makes them a highly useful group of chemical surfactants with respect to their biocompatibility, lower toxicity, higher biodegradability, higher stability, extreme stability in extreme temperature and pH with advent of time this attribute is contributing its higher demand in the field of biotechnology. This study focus on the screening production, extraction and purification of biosurfactant from bacteria isolated from petrochemical wastes and marine water and their chemical characteristics were elucidated. The antimicrobial activity of these biosurfactant was studied and their effect on lead remediation was also deliberated.

Isolation & Characterization of Biosurfactant Producing Bacteria
This book will discuss the effective and sustainable technological approaches for remediation of contaminants 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 present gene and protein expression studies for bio-deterioration techniques. New innovative and sophisticated green technologies for waste minimization and waste control will be presented, as well as the potential of microbes for various techniques of bioremediation, including bio-sorption, bio-augmentation, bio-stimulation, to clean contaminated environments.

Advanced Bioremediation Technologies and Processes for the Treatment of Synthetic Organic Compounds (SOCs) Around the World, metal pollution is a major problem. Conventional practices of toxic metal removal can be ineffective and/or expensive, delaying and exacerbating the crisis. Those communities dealing with contamination must be aware of the fundamentals advances of microbe-mediated metal removal practices because these methods can be easily used and require less remedial intervention. This book describes innovations and efficient applications for metal
bioremediation for environments polluted by metal contaminants.

Soil Bioremediation Abatement of Environmental Pollutants: Trends and Strategies addresses new technologies and provides strategies for environmental scientists, microbiologists and biotechnologists to help solve problems associated with the treatment of industrial wastewater. The book helps readers solve pollution challenges using microorganisms in bioremediation technologies, including discussions on global technologies that have been adopted for the treatment of industrial wastewater and sections on the lack of proper management. Moreover, limited space, more stringent waste disposal regulations and public consciousness have made the present techniques expensive and impractical. Therefore, there is an urgent need to develop sustainable management technologies for industries and municipalities. To remove the damaging effect of organic pollutants on the environment, various new technologies for their degradation have been recently discovered. Covers bioremediation of petrochemical pollutants, such as Benzene, Toluene, Xylene, Ethyl Benzene, and phenolic compound Includes discussions on genetic engineering microbes and their potential in pollution abatement Contains information on plant growth promoting bacteria and their role in environment management

A Handbook of Environmental Toxicology Human actions across the past few centuries have led to a depletion of the world's natural energy sources, as well as large scale environmental degradation. In the context of these current global issues, this book covers the latest research on the application and use of microbes in topical areas such as bioremediation and biofuels. With chapters covering environmental clean-up, microbial fuel cells and biohydrogen, it provides a comprehensive discussion of the latest developments in the field of microbe utilization.

Advances in Biodegradation and Bioremediation of Industrial Waste Arsenic (As) is a widely distributed element in the environment having no known useful physiological function in
plants or animals. Historically, this metalloid has been known to be used widely as a poison. Effects of arsenic have come to light in the past few decades due to its increasing contamination in several parts of the world, with the worst situation being in Bangladesh and West Bengal in India. This edited volume brings together diverse group of environmental science, sustainability and health researchers to address the challenges posed by global mass poisoning caused by arsenic water contamination. The book covers sources of arsenic contamination, and its impact on human health and on prospective remediation both by bioremediation and phytoremediation. Applications of advance techniques such as genetic engineering and nanotechnology are also discussed to resolve the issue of arsenic contamination in ground water and river basins. The book sheds light on this global environmental issue, and proposes solutions to remove contamination through a multi-disciplinary lens and case studies from Bangladesh and India. The book may serve as a reference to environment and sustainability researchers, students and policy makers. It delivers an outline to graduate, undergraduate students and researchers, as well as academicians who are working on arsenic toxicity with respect to remediation and health issues.

Rhizobiont in Bioremediation of Hazardous Waste This book presents in-depth insights into strategies involving plant growth-promoting rhizobacteria (PGPR), including symbiotic/asymbiotic nitrogen fixers and associative/endophyte bacteria, phosphate-solubilizing microbes, as well as arbuscular mycorrhizal fungi and their active biomolecules in legume production. It also examines the latest research findings on the taxonomic status of rhizobia and signal molecules affecting rhizobia-legume symbiosis to improve readers’ understanding of the cultivation of legumes in conventional and derelict soil. The agronomically important microflora broadly discussed have offered solutions to some of the problems associated with expensive fertilizers used in many production systems. This second edition provides an overview of metal toxicity to legumes and presents strategies for the abatement of metal toxicity to legumes. Aimed at professionals, practitioners,
researchers and graduate students in microbiology, crop sciences, soil microbiology, biotechnology and environmental microbiology, the book focuses on the basic concepts and practical aspects of useful soil microbiota in legume production.

Microbes for Legume Improvement This book offers insights into the current focus and recent advances in bioremediation and green technology applications for waste minimization and pollution control. Increasing urbanization has an impact on the environment, agriculture and industry, exacerbating the pollution problem and creating an urgent need for sustainable and green eco-friendly remediation technology. Currently, there is heightened interest in environmental research, especially in the area of pollution remediation and waste conversion, and alternative, eco-friendly methods involving better usage of agricultural residues as economically viable substrates for environmental cleanup are still required. The book offers researchers and scholars inspiration, and suggests directions for specific waste management and pollution control. The research presented makes a valuable contribution toward a sustainable and eco-friendly societal environment.

In Situ Cultivation of Potential PAH Degrading Bacteria from Coastal Sediment The need for exploration, conservation, and sustainable utilization of bioresources is undeniable for the survival and growth of mankind. This new book throws light on new and recent research on and development of effective strategies for sustainable utilization of bioresources using modern tools and techniques to help meet this challenge. This volume addresses the utilization of bioresources in therapeutics, in biofuel, in agriculture, and in environmental protection. Beginning with the diverse potential applications of bioresources in food, medicine, and cosmetics, the volume goes on to address the various different underutilized bioresources and their sustainable uses. It discusses important advances in biofuel and patents that highlight recent developments that address the energy crises and the continuously fluctuating cost of petroleum. It explores new renewable energy sources from bioresources and their sustainable utilization in the
bioenergy and biofuel industry. Several chapters focus on the sustainable utilization of bioresources in the agricultural sector. The volume considers that developing countries have huge agricultural resources that could be employed for production of value-added byproducts for the sustainable development of a bio-based economy. The book discusses efficient use of underexploited natural bioresources, new chemical approaches for the generation of novel biochemicals, and the applications of genetics approaches for bioresource conservation and production of value-added products. Further, strategies for the production of biopesticides utilizing bioresources are also discussed.

Mechanisms of Arsenic Toxicity and Tolerance in Plants
Publisher’s note: This is a 2nd edition due to an article retraction.

Bioresource Utilization and Management Oil spills can introduce potentially carcinogenic pollutants, such as polycyclic aromatic hydrocarbons (PAHs), into coastal environments. Bioremediation uses the natural microorganisms in the environment to remove these pollutants. Traditional studies of these organisms are limited in the types of bacteria isolated due to the limitations of traditional culturing methods. In this study, diffusion chambers were used to culture and isolate potential PAH degrading bacteria from the coastal sediment obtained from the Chandeleur Islands. The diffusion chambers trapped bacteria in agar that contained 1 ppm benzo[a]pyrene. The bacteria were isolated from the diffusion chambers, and the 16S rRNA gene was sequenced to identify the bacteria. Seven unique bacteria isolates were obtained and were found to be genetically similar to bacteria from the Bacteroidetes and Alphaproteobacteria phyla. It was concluded that the diffusion chamber approach provided an environment that promoted the growth of potential PAH degrading bacteria. Exploration in the use of diffusion chambers should continue in research of PAH biodegradation and the uncultivability of microorganisms.

Polar Microbiology Phytoremediation: Biotechnological Strategies for Promoting Invigorating Environons focuses on phytoremediation’s
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history, present and future potential, discussing mechanisms of remediation, different types of pollutant and polluted environs, cell signaling, biotechnology, and molecular biology, including site-directed DNA and the omics related to plant sciences. Sections focus on phytoremediation as an economically feasible and environmentally safe strategy, including its mechanisms from macroscopic to microscopic level, strategies of assisted phytoremediation, the role of omics on innovations on the field, the development of genetically modified plants (GMPs) to deal with pollutants, the future prospects of targeted genetic engineering in phytoremediation and remediation advantages and disadvantages. Other sections in the book explore the phytoremediation of specific environs (water and soil) and specific contaminants that are of major worldwide concern. Presents phytoremediation mechanisms at a microscopic level (molecular mechanisms) Covers remediation in different environs and in different kinds of pollutants Conveys the economic aspects relating to phytoremediation

Metal Ions in Biology and Medicine

Electrochemically Active Microorganisms Pollution has accompanied polar exploration since Captain John Davis’ arrival on the Antarctic continent in 1821 and has become an unavoidable consequence of oil spills in our polar regions. Fortunately, many of the organisms indigenous to Polar ecosystems have the ability to degrade pollutants. It is this metabolic capacity that forms the basis for bioremediation as a potential treatment for the hydrocarbons that contaminate the pristine polar environments. The only book to cover the breadth of microbial ecology and diversity in polar regions with an emphasis on bioremediation, Polar Microbiology: The Ecology, Biodiversity, and Bioremediation Potential of Microorganisms in Extremely Cold Environments examines the diversity of polar microorganisms and their ability to degrade petroleum hydrocarbon contaminants in polar terrestrial and aquatic environments. Providing a unique perspective of these microorganisms in extremely cold temperatures, the book focuses on their taxonomy, physiology, biochemistry, population structure,
bioremediation potential, and potential for biotechnology applications. Leading investigators in the field provide complete coverage of the microbiology relevant to the study of biodiversity and biodegradation of pollutants in the Arctic and Antarctic, including: Microbial extremophiles living in cold and subzero temperature environments Genetics and physiology of cold adaptation of microorganisms Biodegradative microbial consortia in a defined closed environment Molecular characterization of biodegradative microbial populations Molecular approaches to assess biodegradation of petroleum hydrocarbons Environmental impact of hydrocarbon contamination Microbial biodiversity across Antarctic deserts By bringing together the current state of scientific knowledge and research on microbial community structures in extremely cold temperatures, this thought provoking resource is the ideal starting point for the research that must be done if we are to effectively reduce human’s eco-footprint on our polar regions.

Novel Approaches for Bioremediation of Organic Pollution The world of halophiles is quite diverse and their representatives in three domains of life i.e. archaea, bacteria and eukarya. They are found all over the small subunit rRNA based tree of life and these micro-organisms are adapted to salt concentration up to saturation hence able to grow at >300g/l NaCl concentration. Their metabolic diversity is high as well encompassing oxygenic and anoxygenic phototrophs, aerobic heterotrophs, denitrifiers, sulphate reducers, fermenters and methanogens. The proteins of halophiles are magnificently engineered to function in a milieu containing 2-5M salt that encodes genes represent a valuable repository and resource for reconstruction and visualizing processes of habitat selection and adaptive evolution. Search for new enzymes endowed with novel activities and enhanced stability continues to be desirable purpose for important commercial production of biotechnological significance. These poly extremophiles proved excellent source of enzymes and metabolites possessing inherent ability to function in extreme conditions of high salt, alkaline pH and facilitating catalysis for industrial application in food processing, industrial bioconversion, bioremediation etc. In fact, it has just
begun to realize the great potential and true extent of diversity and suitable applications if explored judiciously. This book highlights current applications and research on halophiles to provide a timely overview. Chapters are written by expert authors from around the world and include topics of varied importance which include their role to play in enzyme production, restoration of soil fertility and plant growth, antimicrobial and biocatalytic potential, biomolecules in nanotechnology and aspects of quorum sensing. The book is divided into three sections, dealing with biodiversity, biotechnology and sustainable exploitation of halophiles. This major new work represents a valuable source of information to all those scientists interested in microorganisms in general and extremophiles in particular with respect to their innovative products and applications.

Handbook of Metal-Microbe Interactions and Bioremediation The Congress "Arsenic in the Environment" offers an international, multi- and interdisciplinary discussion platform for research and innovation aimed towards a holistic solution to the problem posed by the environmental toxin arsenic, with considerable societal impact. The congress has focused on cutting edge and breakthrough research in physical, chemical, toxicological, medical, agricultural and other specific issues on arsenic across a broader environmental realm. The Congress "Arsenic in the Environment" was first organized in Mexico City (As2006) followed by As2008 in Valencia, Spain, As2010 in Tainan, Taiwan, As2012 in Cairns, Australia and As2014 in Buenos Aires, Argentina. The 6th International Congress As2016 was held June 19-23, 2016 in Stockholm, Sweden and was entitled Arsenic Research and Global Sustainability. The Congress addressed the broader context of arsenic research along the following themes: Theme 1: Arsenic in Environmental Matrices and Interactions (Air, Water, Soil and Biological Matrices) Theme 2: Arsenic in Food Chain Theme 3: Arsenic and Health Theme 4: Clean Water Technology for Control of Arsenic Theme 5: Societal issues, Policy Studies, Mitigation and Management Long term exposure to low-to-medium levels of arsenic via contaminated food and drinking water can have a
serious impact on human health and globally, more than 100 million people are at risk. Since the end of the 20th century, arsenic in drinking water (mainly groundwater) has emerged as a global health concern. In the past decade, the presence of arsenic in plant foods – especially rice – has gained increasing attention. In the Nordic countries in particular, the use of water-soluble inorganic arsenic chemicals (e.g. chromated copper arsenate, CCA) as wood preservatives and the mining of sulfidic ores have been flagged as health concern. The issue has been accentuated by discoveries of naturally occurring arsenic in groundwater, primarily in the private wells, in parts of the Fennoscandian Shield and in sedimentary formations, with potentially detrimental effects on public health. Sweden has been at the forefront of research on the health effects of arsenic, technological solutions for arsenic removal, and sustainable mitigation measures for developing countries. Hosting this Congress in Sweden was also relevant because historically Sweden has been one of the leading producer of As2O3 and its emission from the smelting industries in northern Sweden and has successfully implemented actions to reduce the industrial emissions of arsenic as well as minimizing the use of materials and products containing arsenic in since 1977. The Congress has gathered professionals involved in different segments of interdisciplinary research in an open forum, and strengthened relations between academia, industry, research laboratories, government agencies and the private sector to share an optimal atmosphere for exchange of knowledge, discoveries and discussions about the problem of arsenic in the environment and catalyze the knowledge generation and innovations at a policy context to achieve the goals for post 2015 Sustainable Development.

Influence of Soils, Plants and Microorganisms in Bioremediation of Petroleum-contaminated Soils Proceedings of the 42nd OHOLE Conference held in Eilat, Israel, May 3-7, 1998

Isolation and molecular characterization of Glyphosate resistant bacteria from agricultural soils in Kerala Scientific Study from the
year 2016 in the subject Agrarian Studies, grade: 1.5, Mar Augustinose College, language: English, abstract: Glyphosate (N-phosphonomethylglycine) is a herbicide that is used worldwide. Its common trade name is Roundup. Its non-targeted species action makes it most popular herbicide. It was developed by Monsanto company. The primary target for glyphosate is the enzyme EPSPS (5-enolpyruvoylshikimate 3-phosphate synthase). When glyphosate binds to EPSPS it forms a very stable complex that essentially permanently disables the enzyme and hence affect the metabolic activity of the plant and results in its death. Finding Glyphosate degrading microorganisms from soil is an interesting topic since glyphosate is non-targeted in its toxicity. Microorganisms were isolated from soil samples, which were then identified by molecular method. Isolation of DNA, its amplification using 16s rRNA gene and its sequencing are the major steps involved. Bioinformatics tool helps to identify the microorganisms. Two microorganisms identified are Pseudomonas sp. and Achromobacter sp. In the phylogenetic analysis also the two organisms are grouped as separate clads. In these, strain 1 showed highest growth in the Glyphosate containing medium than strain 2. These results show that the bacterial strain may possess potential to be used in bioremediation of glyphosate-contaminated environments.

Identification and Characterization of Total Petroleum Hydrocarbon-degrading Bacteria Isolated from Inoculum Tanks and Their Potential in Bioremediation 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.

Recent Advances in Bioremediation/biodegradation by Extreme Microorganisms, 2nd Edition 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.

Cost Effective Technologies for Solid Waste and Wastewater Treatment Proceedings of the Seventh International Symposium on Metal Ions in Biology & Medicine held in Saint Petersburg State University, Saint Petersburg, Russia, on 5-9 May 2002.

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