

# Emerging Technology For Bioremediation Of Metals

**Anju Malik, Mohd. Kashif Kidwai, Vinod  
Kumar Garg**



## **Emerging Technology For Bioremediation Of Metals:**

Emerging Technology for Bioremediation of Metals Battelle Memorial In, 1994-02-16 Bioremediation techniques for treating metals contaminated soil and water are in an emerging state of development Unlike organic compounds that can be broken down into harmless compounds such as CO<sub>2</sub> and water metals and their salts generally inhibit biological activity They must be converted into more complex states be sorbed or undergo valence state changes before biodegradation by activated sludge treatment or other complex reactions such as air stripping can occur This book introduces various treatment technologies and options for the bioremediation of metals The chapters written by researchers and practitioners from North America and Europe represent the most recent compilation of state of the art techniques and methods for metals biotreatment These topics and more are addressed

### **Emerging Technologies in Environmental Bioremediation**

Maulin P. Shah, Susana Rodriguez-Couto, S. Sevinc Sengor, 2020-04-18 Emerging Technologies in Environmental Bioremediation introduces emerging bioremediation technologies for the treatment and management of industrial wastes and other environmental pollutants for the sake of environmental sustainability Emerging bioremediation approaches such as nano bioremediation technology electro bioremediation technology microbial fuel cell technology Modified Ludzack Ettinger Process Modified Activated Sludge Process and phytotechnologies for the remediation of industrial wastes pollutants are discussed in a comprehensive manner not found in other books Furthermore the book includes updated information as well as future directions for research in the field of bioremediation of industrial wastes This book will be extremely useful to students researchers scientists and professionals in the field of microbiology and biotechnology Bio chemical engineers environmental researchers eco toxicology and many more Includes the recovery of resources from wastewater Describes the importance of microorganisms in environmental bioremediation technologies Points out the reuse of treated wastewater through emerging technologies Pays attention to the occurrence of novel micro pollutants Emphasizes the role of nanotechnology in pollutant bioremediation

*Emerging Technologies in Applied and Environmental Microbiology* Maulin P. Shah, B.R.M. Vyas, 2023-01-06 Emerging Technologies in Applied and Environmental Microbiology describes various problems and solutions that arise in applied and environmental microbiology using scientific technologies The book summarizes the main omic based methods currently used to characterize environmental microorganisms as well as approaches to analyzing and interpreting the bio information generated by experimentally based studies Sections explore the current understanding of bacterial signaling through examples of communication systems that include signaling in gram positive and gram negative bacteria along with discussions on how microorganisms interact with each other with other organisms and with the environment In addition this comprehensive resource highlights the importance of various emerging technologies for cleaning up pollution in the environment caused by human activities Final sections assess the potential application of several existing applied and environmental microbiological techniques and introduces new and emerging

technologies through applied aspects Describes various problems and solutions that arise in applied and environmental microbiology using scientific technologies Summarizes the main omics based methods currently used to characterize environmental microorganisms as well as approaches to analyzing and interpreting the bio information generated by experimentally based studies Explores the current understanding of bacterial signaling through examples of communication systems that include signaling in gram positive and gram negative bacteria Shows the presence of all kinds of microbes in the natural environment for the removal of organic pollutants through various emerging technologies Research Anthology on Emerging Techniques in Environmental Remediation Management Association, Information Resources,2021-11-26 As industry develops globally environmental pollution grows to be an increasingly serious problem with each passing year While there are many things that individuals on every level of power can do to mitigate the harm done to the environment environmental remediation is a step to take to save our soil and water resources As this problem is ongoing it is essential to be knowledgeable in the emerging techniques made within the field of environmental remediation The Research Anthology on Emerging Techniques in Environmental Remediation is a comprehensive resource on the emerging techniques and developments made within the field of environmental remediation With global contributing authors this book explores environmental remediation within diverse settings and international standards Covering topics such as pollution and contamination nanotechnology and agriculture this book is an essential reference for scientists chemists environmentalists government officials professors students researchers conservationists and academicians **Emerging Technologies in Wastewater Treatment** Maulin P. Shah,2023-03-20 Emerging technologies in wastewater treatment plant is an ecological profitable and natural technology designed to eliminate heavy metals radionuclides xenobiotic compounds organic waste pesticides etc from contaminated sites or industrial downloads through biological means Since this technology is used in conditions on site it does not physically disturb the site unlike conventional methods that is chemical or mechanical methods In this technology higher plants or microbes are used alone or in combination for the phytoextraction of heavy metals from sites contaminated with metals Through microbial interventions metals are immobilized or mobilized through redox conversions in contaminated sites If they are mobilized accumulating metal plants are placed to accumulate metals in their bodies Next metal loaded plants are collected and recycled to reduce the volume of waste and then disposed of as hazardous materials or used for the recovery of precious metals if possible In case of immobilization metals are no longer available to be toxic to organisms There are very few books published on the proposed theme A good number of books have been published on environmental bioremediation but the proposed book is a new and an innovative proposal specifically in wastewater treatment Looking into the importance of emerging technologies in wastewater treatment research the book will have a high and applicable value in industrial wastewater treatment research Features The book highlights the importance of emerging technologies in the wastewater treatment plant to clean up the environment from pollution caused by human

activities It assesses the potential application of several existing bioremediation techniques and introduces new emerging technologies It is an updated vision of the existing emerging technologies in environmental bioremediation strategies with their limitations and challenges and their potential application to remove environmental pollutants It also introduces the new trends and advances in environmental bioremediation with a thorough discussion of recent developments in this field Highlights the importance of bioremediation to deal with the ever increasing number of environmental pollutants

**Emerging Eco-friendly Green Technologies for Wastewater Treatment** Ram Naresh Bharagava,2020-03-04 As we know rapid industrialization is a serious concern in the context of a healthy environment and public health due to the generation of huge volumes of toxic wastewater Although various physico chemical and biological approaches are available for the treatment of this wastewater many of them are not effective Now there a number of emerging ecofriendly cost effective approaches utilizing microorganisms bacterial fungi algae green plants or their enzymes and constructed wetland treatment systems in the treatment of wastewaters containing pollutants such as endocrine disrupting chemicals toxic metals pesticides dyes petroleum hydrocarbons and phenolic compounds This book provides a much needed comprehensive overview of the various types of wastewater and their ecotoxicological effects on the environment humans animals and plants as well as various emerging and eco friendly approaches for their treatment It provides insights into the ecological problems and challenges in the treatment and management of wastewaters generated by various sources

**Genomics Approach to Bioremediation** Vineet Kumar,Muhammad Bilal,Luiz Fernando Romanholo Ferreira,Hafiz M. N. Iqbal,2023-02-14 Genomics Approach to Bioremediation Provides insights into the various aspects of microbial genomics and biotechnology for environmental cleanup In recent years the application of genomics to biodegradation and bioremediation research has led to a better understanding of the metabolic capabilities of microorganisms their interactions with hazardous and toxic chemical compounds and their adaptability to changing environmental conditions Genomics Approach to Bioremediation Principles Tools and Emerging Technologies provides comprehensive and up to date information on cutting edge technologies and approaches in bioremediation and biodegradation of environmental pollutants Edited by prominent researchers in the field this authoritative reference examines advanced genomics technologies next generation sequencing NGS and state of the art bioinformatics tools while offering valuable insights into the unique functional attributes of different microbial communities and their impact on the removal of chemical contaminants Each chapter includes numerous high quality illustrations detailed tables extensive references and step by step descriptions of various microbial metabolic pathways of degradation and biotransformation of environments containing various inorganic metallic organometallic and organic hydrocarbon contaminants Describes methodologies and underlying theory for the remediation detoxification and degradation of contaminated environments Covers new genomics technologies that address nutrient removal resource recovery and other major trends in environmental cleanup Highlights recent advances in microbial biotechnological approaches including the

latest description of the relationship between microbes and the environment focusing on their impact on ecosystem services Offers perspectives on energy saving production sustainability and community involvement Discusses current challenges and future directions in the field of bioremediation Genomics Approach to Bioremediation Principles Tools and Emerging Technologies is an essential resource for biochemical and environmental engineers environmental microbiologists academic researchers process and treatment plant managers policymakers and industry professionals working in the areas of microbial degradation bioremediation and phytoremediation

**Bioremediation of Toxic Metal(loid)s** Anju Malik, Mohd. Kashif Kidwai, Vinod Kumar Garg, 2022-11-30 The book Bioremediation of Toxic Metal(loid)s describes the state of the art and potential of emerging technologies on bioremediation of toxic metal(loid)s It has a compilation of the available comprehensive knowledge of the fundamentals and advancements in the field of bioremediation of toxic metal(loid)s The mechanisms applications and current advancements of various bioremediation strategies used for metal(loid)s have been described in 21 chapters contributed by leading experts from different institutes universities and research laboratories from various countries across the globe including Argentina Canada Chile Colombia France India Japan Republic of Korea the United Kingdom and the United States of America This book offers a bird's eye view on various bioremediation technologies based on a variety of biological agents viz plants bacteria algae fungi etc used for environmental clean up of toxic metal(loid)s

**Technology Profiles**, 1992

**Removal of Emerging Contaminants Through Microbial Processes** Maulin P Shah, 2020-10-14 The abundance of organic pollutants found in wastewater affect urban surface waters Traditional wastewater management technologies focus on the removal of suspended solids nutrients and bacteria however new pollutants such as synthetic or naturally occurring chemicals are often not monitored in the environment despite having the potential to enter the environment and cause adverse ecological and human health effects Collectively referred to as emerging contaminants they are mostly derived from domestic activities and occur in trace concentrations ranging from pico to micrograms per liter Environmental contaminants are resistant to conventional wastewater treatment processes and most of them remain unaffected causing contamination of receiving water This in turn leads to the need for advanced wastewater treatment processes capable of removing environmental contaminants to ensure safe fresh water sources This book provides an up to date overview of the current bioremediation strategies including their limitations challenges and their potential application to remove environmental pollutants It also introduces the latest trends and advances in environmental bioremediation and presents the state of the art in biological and chemical wastewater treatment processes As such it will appeal to researchers and policy makers as well as undergraduate and graduate environmental sciences students

**The Future of Effluent Treatment Plants** Maulin P. Shah, Susana Rodriguez-Couto, Kavita Mehta, 2021-05-24 The Future of Effluent Treatment Plants Biological Treatment Systems is an advanced and updated version of existing biological technologies that includes their limitations challenges and potential application to remove chemical oxygen demand COD

refractory chemical oxygen demand biochemical oxygen demand BOD color removal and environmental pollutants through advancements in microbial bioremediation The book introduces new trends and advances in environmental bioremediation with thorough discussions of recent developments In addition it illustrates that the application of these new emerging innovative technologies can lead to energy savings and resource recovery The importance of respiration nitrogen mineralization nitrification denitrification and biological phosphorus removal processes in the development of a fruitful and applicable solution for the removal of toxic pollutants from wastewater treatment plants is highlighted Equally important is the knowledge and theoretical modeling of water movement through wastewater ecosystems Finally emphasis is given to the function of constructed wetlands and activated sludge processes Considers different types of industrial wastewater Focuses on biological wastewater treatments Introduces new trends in bioremediation Addresses the future of WWTPs

**International Land Reclamation and Mine Drainage Conference and Third International Conference on the Abatement of Acidic Drainage: Mine drainage**, 1994 **The Superfund Innovative Technology Evaluation Program** Superfund Innovative Technology Evaluation Program (U.S.), 1993-06 Profiles 156 demonstration emerging and monitoring and measurement technologies being evaluated under the SITE Program **Microbes Based Approaches for the Management of Hazardous Contaminants** Ajay Kumar, Livleen Shukla, Joginder Singh, Luiz Fernando Romanholo Ferreira, 2024-07-08 Learn the various microbiological aspects one deals with in environment management and the remediation of toxic contaminants in the environment In recent years the accumulation of hazardous contaminants has caused a broad based deterioration in global environmental quality These have had wide ranging negative social impacts affecting climate soil and water ecosystems and more As traditional methods of contaminant mitigation have proven inadequate to the task microbial based remediation offers the clearest most environmentally friendly path forward for this crucial aspect of global environmental stewardship **Microbes Based Approaches for the Management of Hazardous Contaminants** offers comprehensive coverage of novel and indigenous microbes and their applications in contaminant mitigation Surveying all the major microbial products and methods for degrading and remediating hazardous pollutants it offers a key tool in the fight against global environmental degradation The result is a cutting edge introduction to an essential subject **Microbes Based Approaches for the Management of Hazardous Contaminants** will also find Current and future approaches to microbial degradation Detailed discussion of biofilms exopolysaccharides enzymes metabolites and many more Coverage of metabolic engineering as an alternative strategy **Microbes Based Approaches for the Management of Hazardous Contaminants** is ideal for those working in the field for the application of microbes in the remediation of hazardous pollutants and environment management particularly those interested in environmental sciences microbiology and microbial technology environmental biotechnology and molecular biology **New Trends in Removal of Heavy Metals from Industrial Wastewater** Maulin P. Shah, Susana Rodriguez-Couto, Vineet Kumar, 2021-04-23 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 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

Adaptive Soil Management : From Theory to Practices Amitava Rakshit,Purushothaman Chirakuzhyil Abhilash,Harikesh Bahadur Singh,Subhadip Ghosh,2017-03-15 The book focuses in detail on learning and adapting through partnerships between managers scientists and other stakeholders who learn together how to create and maintain sustainable resource systems As natural areas shrink and fragment our ability to sustain economic growth and safeguard biological diversity and ecological integrity is increasingly being put to the test In attempting to meet this unprecedented challenge adaptive management is becoming a viable alternative for broader application Adaptive management is an iterative decision making process which is both operationally and conceptually simple and which incorporates users to acknowledge and account for uncertainty and sustain an operating environment that promotes its reduction through careful planning evaluation and learning until the desired results are achieved This multifaceted approach requires clearly defined management objectives to guide decisions about what actions to take and explicit assumptions about expected outcomes to compare against actual outcomes In this edited book we address the issue by pursuing a holistic and systematic approach that utilizes natural resources to reap sustainable environmental economic and social benefits for adaptive management helping to ensure that relationships between land water and plants are managed in ways that mimic nature

**Transgenic Plant Technology for Remediation of Toxic Metals and Metalloids** M.N.V. Prasad,2018-11-20 Transgenic Plant Technology for Remediation of Toxic Metals and Metalloids covers all the technical aspects of gene transfer from molecular methods to field performance using a wide range of plants and diverse abiotic stress factors It describes methodologies that are well established as a key resource for researchers as well as a tool for training technicians and students This book is an essential reference for those in the plant sciences forestry agriculture



microbiology environmental biology and plant biotechnology and those using transgenic plant models in such areas as molecular and cell biology developmental biology stress physiology and phytoremediation Provides in depth coverage of transgenic plant technology for environmental problems Discusses background and an introduction to techniques and salient protocols using specific plants systems Includes emerging strategies for application of transgenic plans in remediation

**Microbial Ecology of Wastewater Treatment Plants** Maulin P. Shah,Susana Rodriguez-Couto,2021-05-15 Microbial Ecology of Wastewater Treatment Plants presents different methods and techniques used in microbial ecology to study the interactions and evolution of microbial populations in WWTPs particularly the new molecular tools developed in the last decades These molecular biology based methods e g studies of DNA RNA and proteins provide a high resolution of information compared to traditional ways of studying microbial wastewater populations such as microscopic examination and culture based methods In addition this book addresses the ability of microorganisms to degrade environmental pollutants Describes application of different Omics tools in Wastewater treatment plants WWTPs Demonstrates the role of microorganisms in WWTPs Includes discussions on the microbial ecology of WWTPs Covers the microbial diversity of activated sludge Emphasizes cutting edge molecular tools [An Innovative Role of Biofiltration in Wastewater Treatment Plants \(WWTPs\)](#) Maulin P. Shah,Susana Rodriguez-Couto,Jayanta Kumar Biswas,2021-12-01 Many physico chemical and operational factors influence the performance treatment costs and long term stability of biofilters for the treatment of wastewater An Innovative Role of Biofiltration in Wastewater Treatment Plants focuses on identifying the factors that affect biofiltration such as the hydraulic retention time of the biofiltration system the type and characteristics of the filter and the attached biomass explains their influence and provides guidelines on how to control these factors to optimize better operation with respect to pollutant control present in wastewater treatment plants WWTPs The fundamental basis of treatment in biofilters is the action of pollutant degrading microorganisms and consequently the book also discusses in depth about the microbial ecology of biofiltration In addition it explores the applications of biofiltration including the removal of emerging pollutants Describes the microbial ecology of biofiltration Includes modeling of biofiltration Describes the designing of biofilters start up and monitoring Discusses the mechanism of biofiltration Describes the controlling and operational factors of biofiltration [Innovations in Environmental Biotechnology](#) Sudipti Arora,Ashwani Kumar,Shinjiro Ogita,Yuan- Yeu Yau,2022-05-16 The book has 2 sections Section A focuses on Environmental Sustainability and Green Technology and Section B covers Emerging Technologies in Environmental Biotechnology The book introduces Environmental biotechnology as a tool to progress towards sustainable development goals and covers green technologies such as Bio plastics Third generation hybrid technology for algal biomass production wastewater treatment and greenhouse gas mitigation Green vaccination Bio fuels Microbial enzymes Bioelectrical systems eco friendly handmade paper production nature based sanitation solutions and greener ways to tackle air pollution along with the application of GIS to monitor

manage COVID-19 pandemic The Section B covers emerging innovative technologies such as vermifiltration Small scale PVA gel based innovative solution for wastewater treatment Cyclic technology based sequencing batch reactors SBR and role of Role of Bio selectors in Performing Simultaneous Nitrification and Denitrification in SBR s It holistically covers essential information on Enzymatic Biotransformation and Biopolymer based nanocomposites for dye waste treatment Arbuscular Mycorrhizal Fungi assisted Bioremediation of heavy metals Coir Retting and Duckweeds The Tiny Creatures for Resolving the Major Environmental Issues It is a promising book for researchers academicians teachers students industrial enterprises policy makers public health officials and general users The book is closely aligned to curricula of post graduate courses in biotechnology microbiology environmental biotechnology and environmental science

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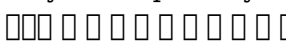
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