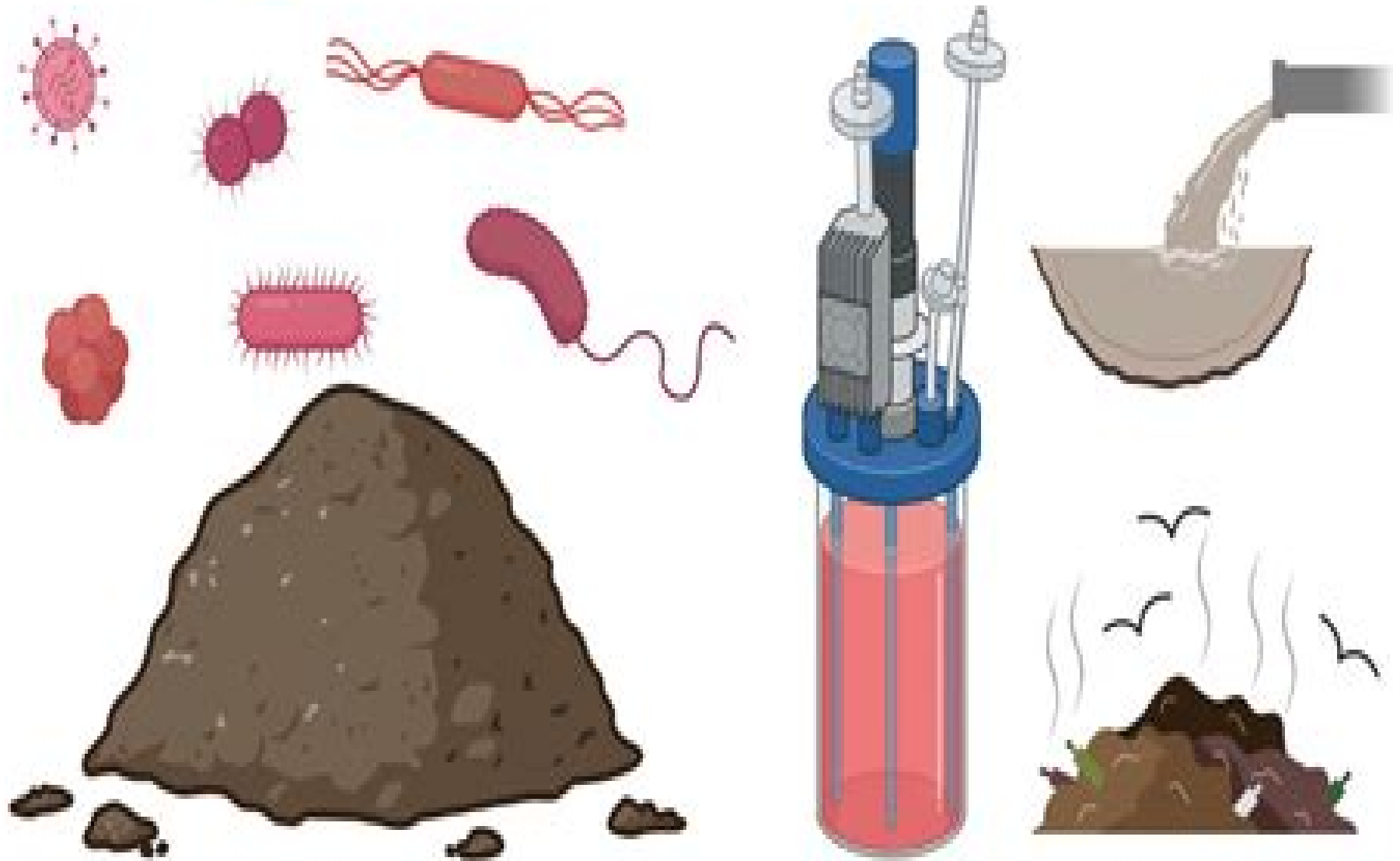


# Biodegradation vs. Bioremediation



# Microbial Biodegradation And Bioremediation

**Young-Cheol Chang**



## **Microbial Biodegradation And Bioremediation:**

**Microbial Biodegradation and Bioremediation** Surajit Das, 2014-07-01 Microbial Biodegradation and Bioremediation brings together experts in relevant fields to describe the successful application of microbes and their derivatives for bioremediation of potentially toxic and relatively novel compounds This single source reference encompasses all categories of pollutants and their applications in a convenient comprehensive package Our natural biodiversity and environment is in danger due to the release of continuously emerging potential pollutants by anthropogenic activities Though many attempts have been made to eradicate and remediate these noxious elements every day thousands of xenobiotics of relatively new entities emerge thus worsening the situation Primitive microorganisms are highly adaptable to toxic environments and can reduce the load of toxic elements by their successful transformation and remediation Describes many novel approaches of microbial bioremediation including genetic engineering metagenomics microbial fuel cell technology biosurfactants and biofilm based bioremediation Introduces relatively new hazardous elements and their bioremediation practices including oil spills military waste water greenhouse gases polythene wastes and more Provides the most advanced techniques in the field of bioremediation including insilico approach microbes as pollution indicators use of bioreactors techniques of pollution monitoring and more

**Biodegradation and Bioremediation** Ajay Singh, Owen P. Ward, 2013-03-09 In this volume experts from universities government labs and industry share their findings on the microbiological biochemical and molecular aspects of biodegradation and bioremediation The text covers numerous topics including bioavailability biodegradation of various pollutants microbial community dynamics properties and engineering of important biocatalysts and methods for monitoring bioremediation processes Microbial processes are environmentally compatible and can be integrated with non biological processes to detoxify degrade and immobilize environmental contaminants

*Microbial Biodegradation and Bioremediation* Surajit Das, Hirak Ranjan Dash, 2021-11-24 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

**Microbial Bioremediation & Biodegradation** Maulin P. Shah,2020-04-30 Microbial or biological degradation has long been the subject of active concern and the rapid expansion and growing sophistication of various industries in the last century has significantly increased the volume and complexity of toxic residues of wastes These can be remediated by plants and microbes either natural origin or adapted for a specific purpose in a process known as bioremediation The interest in microbial biodegradation of pollutants has intensified in recent years in an attempt to find sustainable ways to clean contaminated environments These bioremediation and biotransformation methods take advantage of the tremendous microbial catabolic diversity to degrade transform or accumulate a variety of compounds such as hydrocarbons polychlorinated biphenyls polaromatic hydrocarbons pharmaceutical substances radionuclides and metals Unlike conventional methods bioremediation does not physically disturb the site This book describes the basic principles of biodegradation and shows how these principles are related to bioremediation Authored by leading international environmental microbiologists it discusses topics such as aerobic biodegradation microbial degradation of pollutants and microbial community dynamics It provides valuable insights into how biodegradation processes work and can be utilised for pollution abatement and as such appeals to researchers and postgraduate students as well as experts in the field of bioremediation *Consequences of Microbial Interactions with Hydrocarbons, Oils, and Lipids: Biodegradation and Bioremediation* Robert J. Steffan,2019 In this book international experts discuss the state of the art in the biological degradation of hydrocarbons to meet remedial or disposal goals The work focuses on practical applications often on globally important scales including the remediation of some of the world s largest crude oil spills Other related chapters discuss important implications of microbial transformation of hydrocarbons including treatment of high fat processing wastes impacts of microbial biodegradation activity on industrial processes and the implications of microbial oil degradation in relation to modern oil extraction processes like hydraulic fracturing of shales and extraction of oil sands Microbial Bioremediation P RAJENDRAN,P GUNASEKARAN,2019-06-07 Bioremediation which is the use of living organisms such as plants Phytoremediation and microbes such as bacteria algae and fungi Microbial bioremediation or their systems to treat the contaminants is an efficient eco friendly and economical novel alternative to conventional treatment technologies This

book would serve to inculcate in the readers the present status feasibility and the significance of microbial bioremediation. The various aspects of bioremediation like biodegradation of contaminants and pollutants and bioconversion including the genetics of microbial degradation have been comprehensively discussed with precise diagrammatic representations which will make the reader appreciate the concepts without impediments.

**Microbial Biodegradation** Eduardo Díaz, 2008. In this timely book expert international authors critically review all of the most important topics in this exciting field. This book is unique in that it is the first to review the area from a molecular biology and genomics perspective. Topics covered include aerobic and anaerobic biodegradation of aromatic compounds, molecular detection methods e.g. microautoradiography, mRNA analyses etc., genome based predictive modeling, elucidation of regulatory networks, bioavailability, chemotaxis and transport issues, functional genomic analyses, natural attenuation, community fingerprinting and metagenomics, biotreatment and biocatalysts engineering. The book will be essential reading for microbial degradation and bioremediation scientists and of general interest for microbiologists working in field of environmental microbiology.

**Recent Advances in Microbial Degradation** . Inamuddin, Mohd Imran Ahamed, Ram Prasad, 2021-07-07. Microbes play a major role in the degradation of various pollutants. Therefore microbes find potential application in the area of energy and environmental technology. The book provides in depth literature on the topics of environmental and industrial importance. It is compiled to explore the application of microbe used in the degradation of aflatoxin, polymers, biomass into fuel, disinfectants, food products, xenobiotic compounds, lipids, steroids, organic pollutants, proteins, oil waste and wastewater pollutants. This book will be of interest to teachers, researchers, scientists and capacity builders. Also the book serves as additional reading material for undergraduate and graduate students of microbiology and environmental sciences. National and international remediation and restoration scientists, policymakers will also find this to be a useful read.

*Bioremediation* Katherine H. Baker, Diane S. Herson, 1994. Bioremediation, one of the hottest technologies of the decade, is the use of microorganisms in reducing, controlling and rectifying the effects of chemical pollutants. Written by two leaders at the Environmental Microbiology Association, this book offers an overview of the major classes of pollutants and the bioremediation of various environments. Also relates this scientific information to real problems using case studies. Includes illustrations and an index.

**Microbial Bioremediation** Rouf Ahmad Bhat, Monica Butnariu, Gowhar Hamid Dar, Khalid Rehman Hakeem, 2022-12-10. Microbial bioremediation and biodegradation in environmental monitoring offers an environmentally friendly approach for the monitoring and effective removal of contaminants. Various aspects of microbial mediated bioremediation take advantage of the microorganisms ability to transform noxious compounds into utilizable intermediates and value added products. Different microbial metabolites such as enzymes, biosurfactants, emulsifiers, organic acids and solvents play significant roles in the decontamination of radioactive and heavy metals, chemical pesticides and organic contaminants such as dyes and hydrocarbons in environmentally safe manners. Recent advancements in biochemical engineering, OMICS and genetic modification and synthetic biology pave ways

for identifying indicator microbial strains mechanisms of remediation and the development of tailor made microbe metabolites for future applications Microbial biotechnology in environmental monitoring and bioremediation thus represent a new way to rehabilitate and reconstruct damaged ecosystems This work summarizes the latest research in the field of environmental bioremediation and offers fascinating insights on the behaviours of these unique microorganisms It also presents exciting new perspectives for the application of microbes in environmental protection It is suitable for students scholars researchers and organizations involved in environmental protection

**Microbes and Microbial Biotechnology for Green Remediation** Junaid Ahmad Malik, 2022-06-14 Microbes and Microbial Biotechnology for Green Remediation provides a comprehensive account of sustainable microbial treatment technologies The research presented highlights the significantly important microbial species involved in remediation the mechanisms of remediation by various microbes and suggestions for future improvement of bioremediation technology The introduction of contaminants due to rapid urbanization and anthropogenic activities into the environment causes unsteadiness and distress to the physicochemical systems including living organisms Hence there is an immediate global demand for the diminution of such contaminants and xenobiotics which can otherwise adversely affect the living organisms Over time microbial remediation processes have been accelerated to produce better eco friendlier and more biodegradable products for complete dissemination of these xenobiotic compounds The advancements in microbiology and biotechnology lead to the launch of microbial biotechnology as a separate area of research and contributed dramatically to the development of the areas such as agriculture environment biopharmaceutics and fermented foods Microbes stand as an imperative efficient green and economical alternative to conventional treatment technologies The proposed book provides cost effective and sustainable alternatives This book serves as a reference for graduate and postgraduate students in environmental biotechnology and microbiology as well as researchers and scientists working in the laboratories and industries involved in research related to microbiology environmental biotechnology and allied research Discusses important microbial activities such as biofertilizer biocontrol biosorption biochar biofilm biodegradation bioremediation bioclogging and quorum sensing Covers all the advanced microbial bioremediation techniques which are finding their way from the laboratory to the field for revival of the degraded agro ecosystems Examines the role of bacteria fungi microalgae *Bacillus* sp *Prosopis juliflora* *Deinococcus radiodurans* *Pseudomonas methanotrophs* siderophores and PGPRs as the biocontrol and green remediator agents for soil sustainability

***Microbial Degradation of Xenobiotics*** Shree Nath Singh, 2011-10-07 Our interest in the microbial biodegradation of xenobiotics has increased many folds in recent years to find out sustainable ways for environmental cleanup Bioremediation and biotransformation processes harness the naturally occurring ability of microbes to degrade transform or accumulate a wide range of organic pollutants Major methodological breakthroughs in recent years through detailed genomic metagenomic proteomic bioinformatic and other high throughput analyses of environmentally relevant microorganisms have provided us unprecedented insights into key

biodegradative pathways and the ability of organisms to adapt to changing environmental conditions The degradation of a wide spectrum of organic pollutants and wastes discharged into the environment by anthropogenic activities is an emerging need today to promote sustainable development of our society with low environmental impact Microbial processes play a major role in the removal of recalcitrant compounds taking advantage of the astonishing catabolic versatility of microorganisms to degrade or transform such compounds New breakthroughs in sequencing genomics proteomics bioinformatics and imaging are generating vital information which opens a new era providing new insights of metabolic and regulatory networks as well as clues to the evolution of degradation pathways and to the molecular adaptation strategies to changing environmental conditions Functional genomic and metagenomic approaches are increasing our understanding of the relative importance of different pathways and regulatory networks to carbon flux in particular environments and for particular compounds New approaches will certainly accelerate the development of bioremediation technologies and biotransformation processes in coming years for natural attenuation of contaminated environments

*Bioremediation for Environmental Sustainability* Gaurav Saxena, Vineet Kumar, Maulin P. Shah, 2020-10-13

*Bioremediation for Environmental Sustainability* Toxicity Mechanisms of Contaminants Degradation Detoxification and Challenges introduces pollution and toxicity profiles of various organic and inorganic contaminants including mechanisms of toxicity degradation and detoxification by microbes and plants and their bioremediation approaches for environmental sustainability The book also covers many advanced technologies in the field of bioremediation and phytoremediation including electro bioremediation microbial fuel cells nano bioremediation constructed wetlands phytotechnologies and many more which are lacking in other competitive titles existing in the market The book includes updated information as well as future directions for research in the field of bioremediation of industrial wastes This book is a reference for students researchers scientists and professionals in the fields of microbiology biotechnology environmental sciences eco toxicology environmental remediation and waste management especially those who aspire to work on the biodegradation and bioremediation of industrial wastes and environmental pollutants for environmental sustainability Environmental safety and sustainability with rapid industrialization is one of the major challenges worldwide Industries are the key drivers in the world economy but these are also the major polluters due to discharge of potentially toxic and hazardous wastes containing various organic and inorganic pollutants which cause environmental pollution and severe toxic effects in living beings Introduces pollution and toxicity profiles of environmental contaminants and industrial wastes including oil refinery wastewater distillery wastewater tannery wastewater textile wastewater mine tailing wastes plastic wastes and more Describes underlying mechanisms of degradation and detoxification of emerging organic and inorganic contaminants with enzymatic roles Focuses on recent advances and challenges in bioremediation and phytoremediation including microbial enzymes biosurfactants microalgae biofilm archaea genetically engineered organisms and more Describes how microbes and plants can be successfully applied for the

remediation of potentially toxic industrial wastes and chemical pollutants to protect the environment and public health

**Advances in Biodegradation and Bioremediation of Industrial Waste** Ram Chandra, 2020-06-30 This book reviews pollutants generated by agriculturally contaminated soil and plastic waste from a variety of industries The author details rhizobacteria describes the latest knowledge regarding the biodegradation of tannery and textile waste and reviews the role of microbes in plastic degradation bioremediation and recycling of urban waste Environmental Biotechnology Jeyabalan Sangeetha, Devarajan Thangadurai, Muniswamy David, Mohd Azmuddin Abdullah, 2016-10-14 With focus on the practical use of modern biotechnology for environmental sustainability this book provides a thoughtful overview of molecular aspects of environmental studies to create a new awareness of fundamental biological processes and sustainable ecological concerns It covers the latest research by prominent scientists in modern biology and delineates recent and prospective applications in the sub areas of environmental biotechnology with special focus on the biodegradation of toxic pollutants bioremediation of contaminated environments and bioconversion of organic wastes toward a green economy and sustainable future

**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

Microbial Biodegradation of Xenobiotic Compounds Young-Cheol Chang, 2019-01-30 Microbial Biodegradation of Xenobiotic Compounds examines and collects the recent information on the bioremediation technologies around the world This book focuses on methods to decrease pollutants created by anthropogenic activities industrial activities and agricultural activities This book answers some of the questions about how to reduce contaminants And whether there is a possibility of converting these pollutants in to useful energy by advanced biotechnological methods The book combines present obtainable data with the expert knowledge of researchers from all over the world covering different aspects of environmental biotechnology and microbiology It covers basic concepts of bioremediation and various methods involved in the



bioremediation process and provides specific chapters on the role of different genes and enzymes involved in microbial bioremediation process. It also gives special attention to heavy metal bioremediation by microalgae and the mechanisms involved during the degradation process. Recent innovative technologies about converting toxic pollutants into useful energy like bioplastics and electricity are also discussed by specialist authors. Various chapters address the bioremediation of pesticides in soil using microbial metabolites and molecular aspects of biodegradation which cover topics including identification of novel genes through the metagenomic approach and bioremediation using fungal laccase enzymes.

*Biodegradation, Pollutants and Bioremediation Principles* Ederio Dino Bidoia, Renato Nallin Montagnolli, 2021-04-20. 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.

**Practical Environmental Bioremediation** R. Barry King, John K. Sheldon, Gilbert M. Long, 1997-12-29. Bioremediation or enhanced microbiological treatment of environments contaminated with a variety of organic and inorganic compounds is one of the most effective innovative technologies to come around this century. *Practical Environmental Bioremediation: The Field Guide* presents updated material, case histories and many instructive illustrations to reflect the evolving image of this fast emerging industry. Bioremediation technology has witnessed great strides towards simplifying treatability formats, finding new approaches to field application, more potent nutrient formulations, monitoring protocols and the resulting general improvement in results. This new guide condenses all current available knowledge and presents necessary technical aspects and concepts in language that can be readily comprehended by the technical student, experienced scientist or engineer, the aspiring newcomer or anyone else interested in this exciting natural cleanup technique.

Bioremediation Ronald L. Crawford, 1996-11-21. Increased industrial and agricultural activity this century has led to vast quantities of the earth's soil and groundwater resources becoming contaminated with hazardous chemicals. Bioremediation provides a technology based on the use of living organisms, usually bacteria and fungi, to remove pollutants from soil and water preferably in situ. This approach which is potentially more cost effective than traditional techniques such as incineration of soils and carbon filtration of water requires an understanding of how organisms transform chemicals, how they survive in polluted environments and how they should be employed in the field. This book examines these issues for many of the most serious and common environmental contaminants, resulting in a volume which presents the most recent position on the application of bioremediation to the cleanup of polluted soil and water.

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