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International Evaluation of In-situ Bioremediation of Contaminated Soil and Groundwater Sjeff J. J. M. Staps 1989

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

Soil and Groundwater Remediation Chunlong Zhang 2019-11-26 An introduction to the principles and practices of soil and groundwater remediation Soil and Groundwater Remediation offers a comprehensive and up-to-date review of the principles, practices, and concepts of sustainability of soil and groundwater remediation. The book starts with an overview of the importance of groundwater resource/quality, contaminant sources/types, and the scope of soil and groundwater remediation. It then provides the essential components of soil and groundwater remediation with easy-to-understand design equations/calculations and the practical applications. The book contains information on remediation basics such as subsurface chemical behaviors, soil and groundwater hydrology and characterization, regulations, cost analysis, and risk assessment. The author explores various conventional and innovative remediation technologies, including pump-and-treat, soil vapor extraction, bioremediation, incineration, thermally enhanced techniques, soil washing/flushing, and permeable reactive barriers. The book also examines the modeling of groundwater flow and contaminant transport in saturated and unsaturated zones. This important book: Presents the current challenges of remediation practices Includes up-to-date information about the low-cost, risk-based, sustainable remediation practices, as well as institutional control and management Offers a balanced mix of the principles, practices, and sustainable concepts in soil and groundwater remediation Contains learning objectives, discussions of key theories, and example problems Provides illustrative case studies and recent research when remediation techniques are introduced Written for undergraduate seniors and graduate students in natural resource, earth science, environmental science/engineering, and environmental management, Soil and Groundwater Remediation is an authoritative guide to the principles and components of soil and groundwater remediation that is filled with worked and practice problems.

Groundwater and Subsurface Remediation Helmut Kobus 1996 The complex topic of in-situ subsurface remediation technologies has been addressed at an international symposium at the Universitat Stuttgart on September 26 and 27, 1995, on the occasion of the inauguration of the research facility VEGAS (Versuchseinrichtung zur Grundwasser- und Altlastensanierung). The results are contained in this book with 22 contributions from leading experts in the field from Europe and North America. The book illustrates the role of large-scale experiments in groundwater and subsurface remediation research. The subtopics address the various links between conventional laboratory experiments, technology-scale experiments and field-site studies, showing the contribution of large-scale experiments to bridging the gap between small-scale investigations and large-scale field investigations (upscaling). The interdisciplinary nature of the problems requires a multidisciplinary approach. Therefore, the idea has been followed to bring together the various disciplines involved in the different aspects and facets of subsurface flow, transport and trans as hydraulics and hydrology, physics, formation, involving such diverse disciplines chemistry, microbiology, geology, industrial, chemical and hydraulic engineering, mathematics and hydroinformatics. The individual contributions from these diversified fields address the subject from different angles in an attempt to form a coherent picture of the various aspects of the complex problems of subsurface remediation. The focus is on research approaches and strategies with respect to the development of new and improved technologies and to the role of large-scale experiments in research and application.

Practical Design Calculations for Groundwater and Soil Remediation, Second Edition Jeff Kuo 2014-06-02 Includes Illustrative Applications of Practical Design Calculations Written in a straightforward style and user-friendly format, Practical Design Calculations for Groundwater and Soil Remediation, Second Edition highlights the essential concepts and important aspects of major design calculations used in soil and groundwater remediation. Drawing from the author's teaching and consulting experience, this text provides practical information that addresses the current needs of practicing engineers, scientists, and legal experts in the field. What's New in This Edition: This latest edition covers important aspects of major design calculations as well as practical and relevant working information for groundwater and soil remediation. Realistic examples are used liberally to illustrate the applications of the design calculations. Many examples are designed to assist the readers in building the right concepts. The text begins with an introductory chapter; it then illustrates the engineering calculations needed during site assessment and remedial investigation. It continues with a discussion on plume migration in soil and groundwater. It then covers the mass-balance concept, reaction kinetics, and types, configurations, and sizing of reactors. The author incorporates important design calculations for commonly used in situ and ex situ soil and groundwater remediation technologies, such as soil venting, air sparging, air stripping, bioremediation, and chemical oxidation, and off-gas treatment technologies. He also presents design calculations for capture zone and optimal well spacing. Includes both SI and US customary units, as well as unit conversions Presents examples that directly follow the design equations Provides discussion that assists engineers in building proper concepts Practical Design Calculations for Groundwater and Soil Remediation, Second Edition also serves as a reference or textbook for students dedicated to the study of site remediation.

Clean Soil and Safe Water Francesca F. Quercia 2011-11-17 This book addresses questions of relevance to governments and industry in many countries around the world, in particular concerning the link between contaminated-land-management programs and the protection of drinking water resources and the potential effects of climate changes on the availability of these same resources. On the "problem" side, it reports and analyzes methodologies and experiences in monitoring and characterization of drinking water resources (at basin, country and continental scales), pollution prevention, assessment of background quality and of impacts on safety and public health from land and water contamination and impacts of climate change. On the "solution" side, the book presents results from national cleanup programs, recent advances in research into groundwater and soil

remediation techniques, treatment technologies, research needs and information sources, land and wastewater management approaches aimed at the protection of drinking water.

Advances in Bioremediation of Wastewater and Polluted Soil Naofumi Shiomi 2015-09-09 The pollution of soil and groundwater by heavy metals and other chemicals is becoming a serious issue in many countries. However, the current bioremediation processes do not often achieve sufficient remediation, and more effective processes are desired. This book deals with advances in the bioremediation of polluted soil and groundwater. In the former chapters of this book, respected researchers in this field describe how the optimization of microorganisms, enzymes, absorbents, additives and injection procedures can help to realize excellent bioremediation. In the latter chapters, other researchers introduce bioremediation processes that have been performed in the field and novel bioremediation processes. Thus, the readers will be able to obtain new ideas about effective bioremediation as well as important information about recent advances in bioremediation.

Electrochemically Assisted Remediation of Contaminated Soils M. A. Rodrigo 2021-06-15 This book provides an overview of the current development status of remediation technologies involving electrochemical processes, which are used to clean up soils that are contaminated with different types of contaminants (organics, inorganics, metalloids and radioactive). Written by internationally recognized experts, it comprises 21 chapters describing the characteristics and theoretical foundations of various electrochemical applications of soil remediation. The book's opening section discusses the fundamental properties and characteristics of the soil, which are essential to understand the processes that can most effectively remove organic and inorganic compounds. This part also focuses on the primary processes that contribute to the application of electrochemically assisted remediation, hydrodynamic aspects and kinetics of contaminants in the soil. It also reviews the techniques that have been developed for the treatment of contaminated soils using electrochemistry, and discusses different strategies used to enhance performance, the type of electrode and electrolyte, and the most important operating conditions. In turn, the book's second part deals with practical applications of technologies related to the separation of pollutants from soil. Special emphasis is given to the characteristics of these technologies regarding transport of the contaminants and soil toxicity after treatment. The third part is dedicated to new technologies, including electrokinetic remediation and hybrid approaches, for the treatment of emerging contaminants by ex-situ and in-situ production of strong oxidant species used for soil remediation. It also discusses pre-pilot scale for soil treatment and the use of solar photovoltaic panels as an energy source for powering electrochemical systems, which can reduce both the investment and maintenance costs of electrochemically assisted processes.

Bioremediation of Contaminated Soils Donald L. Wise 2000-06-09 This volume focuses on innovative bioremediation techniques and applications for the cleanup of contaminated media and sites. It includes quantitative and design methods that elucidate the relationships among various operational parameters, and waste chemistry that defines the cost effectiveness of bioremediation projects. It also presents numerical models.

Handbook of Research on Microbial Remediation and Microbial Biotechnology for Sustainable Soil Malik, Junaid Ahmad 2021-06-11 The introduction of contaminants, due to rapid urbanization and anthropogenic activities into the environment, causes distress to the physio-chemical systems including living organisms, which possibly is threatening the dynamics of nature as well as the soil biology by producing certain xenobiotics. Hence, there is an immediate global demand for the diminution of such contaminants and xenobiotics that can otherwise adversely affect the living organisms. Some toxic xenobiotics include synthetic organochlorides such as PAHs and some fractions of crude oil and coal. Over time, microbial remediation processes have been accelerated to produce better, more eco-friendly, and more biodegradable solutions for complete dissemination of these xenobiotic compounds. The advancements in microbiology and biotechnology led to the launch of microbial biotechnology as a separate area of research and contributed dramatically to the development of areas like agriculture, environment, biopharmaceutics, fermented foods, and more. The Handbook of Research on Microbial Remediation and Microbial Biotechnology for Sustainable Soil provides a detailed comprehensive account for microbial treatment technologies, bioremediation strategies, biotechnology, and the important microbial species involved in remediation. The chapters focus on recent developments in microbial biotechnology in the areas of agriculture and environment and the physiology, biochemistry, and the mechanisms of remediation along with a future outlook. This book is ideal for scientists, biologists, academicians, students, and researchers in the fields of life sciences, microbiology, environmental science, environmental engineering, biotechnology, agriculture, and health sciences.

Contaminants and the Soil Environment in the Australasia-Pacific Region R. Naidu 2012-12-06 The Australasia-Pacific Region supports approximately 50% of the world's population. The last half-century has witnessed a rapid increase in the regional population, agricultural productivity, industrial activities and trade within the region. Both the demand for increased food production and the desire to improve the economic conditions have affected regional environmental quality. This volume presents an overview of the fate of contaminants in the soil environment; current soil management factors used to control contaminant impacts, issues related to sludge and effluent disposals in the soil environment; legal, health and social impacts of contaminated land, remediation approaches and strategies to manage contaminated land, some of the problems associated with environmental degradation in the Australasia-Pacific Region and steps that we need to take to safeguard our environment.

In Situ Treatment Technology, Second Edition Evan K. Nyer 2000-12-28 Completely revised and updated, the second edition of the bestselling In Situ Treatment Technology adds three new chapters to provide the reader with an even more comprehensive reference source on remediation. This authoritative book goes beyond discussion of individual in situ technologies by providing an understanding of the geologic foundation, the strengths and limitations of each of the technologies, and the details necessary to implement them. It also integrates all chapters to show how these technologies fit together to make a particular remediation method simultaneously the best technical and the most cost-effective design. The latest updates from the EPA and DOD, as well the inclusion of new material, affords you the detailed knowledge necessary to design a full-scale treatment system. New in this edition are sections in three of the chapters that provide the specific calculations necessary to design an actual treatment system. In Situ Treatment Technology, Second Edition is a comprehensive reference source.

In Situ Chemical Oxidation for Groundwater Remediation Robert L. Siegrist 2011-02-26 This volume provides comprehensive up-to-date descriptions of the principles and practices of in situ chemical oxidation (ISCO) for groundwater remediation based on a decade of intensive research, development, and demonstrations, and lessons learned from commercial field applications.

In Situ Soil Remediation A.M. Otten 1997-09-30 In situ remediation techniques have experienced a boom over the last few years, thereby producing a wide range of valuable experiences. Their results have demonstrated that in situ techniques are a mature alternative to conventional remediation techniques. Irrespective of future policy developments, it is impossible to imagine future remediation practice without the use of in situ techniques. The book presents an overview of recent developments in the field of in situ soil remediation. The book is unique in that it is not a compilation of unrelated case studies. A conceptual approach has been chosen; remediation models described in this book are illustrated from a practical point of view. The authors present the Dutch way of treating contaminated land; The Netherlands is renowned for being at the forefront of remediation techniques as a result of the country's progressiveness and experience in this area.

The Handbook of Environmental Remediation Chaudhery Mustansar Hussain 2020 Environmental remediation technologies to control or prevent pollution from hazardous waste material is a growing research area in academia and industry, and is a matter of utmost concern to public health, to improve ecology and to facilitate the redevelopment of a contaminated site. Recently, in situ and ex situ remediation technologies have been developed to rectify the contaminated sites, utilizing various tools and devices through physical, chemical, biological, electrical, and thermal processes to restrain, remove, extract, and immobilize mechanisms to minimize the contamination effects. This handbook brings altogether classical and emerging techniques for hazardous wastes, municipal solid wastes and contaminated water sites, combining chemical, biological and engineering control methods to provide a one-stop reference. This handbook presents a comprehensive and thorough description of several remediation techniques for contaminated sites resulting from both natural processes and anthropogenic activities. Providing critical insights into a range of treatments from chemical oxidation, thermal treatment, air sparging, electrokinetic remediation, stabilization/solidification, permeable reactive barriers, thermal desorption and incineration, phytoremediation, biostimulation and bioaugmentation, bioventing and biosparging through ultrasound-assisted remediation methods, electrochemical remediation methods, and nanoremediation, this handbook provides the reader an inclusive and detailed overview and then discusses future research directions. Closing chapters on green sustainable remediation, economics, health and safety issues, and environmental regulations around site remediation will make this a must-have handbook for those working in the field.

In Situ Bioremediation National Research Council 1993-02-01 In situ bioremediation "the use of microorganisms for on-site removal of contaminants" is potentially cheaper, faster, and safer than conventional cleanup methods. But in situ bioremediation is also clouded in uncertainty, controversy, and mistrust. This volume from the National Research Council provides direction for decisionmakers and offers detailed and readable explanations of: the processes involved in in situ bioremediation, circumstances in which it is best used, and methods of measurement, field testing, and modeling to evaluate the results of bioremediation projects.

Bioremediation experts representing academic research, field practice, regulation, and industry provide accessible information and case examples; they explore how in situ bioremediation works, how it has developed since its first commercial use in 1972, and what research and education efforts are recommended for the future. The volume includes a series of perspective papers. The book will be immediately useful to policymakers, regulators, bioremediation practitioners and purchasers, environmental groups, concerned citizens, faculty, and students.

Practical Techniques for Groundwater & Soil Remediation Evan K. Nyer 2019-08-13 **Practical Techniques for Groundwater and Soil Remediation** is a compilation of articles by the author that were printed in the National Ground Water Association (NGWA) magazine *Groundwater Monitoring Review*. The book provides valuable data, emphasizes the practical aspects of remediation, presents results from actual remediation programs, and helps readers prepare remediation strategies. The book also includes detailed technical data on treatment equipment performance and the costs associated with their design and operation. A unique feature of the book is that it also contains data from treatment systems that did not work. **Practical Techniques for Groundwater and Soil Remediation** is a "must have" source of invaluable data and tips that will be useful for all groundwater and soil remediation professionals.

Soil and Sediment Remediation Piet Lens 2005-09-30 **Soil and Sediment Remediation** discusses in detail a whole set of remediative technologies currently available to minimise their impact. Technologies for the treatment of soils and sediments in-situ (landfarming, bioscreens, bioventing, nutrient injection, phytoremediation) and ex-situ (landfarming, bio-heap treatment, soil suspension reactor) will be discussed. The microbiological, process technological and socio-economical aspects of these technologies will be addressed. Special attention will be given to novel biotechnological processes that utilise sulfur cycle conversions, e.g. sulfur and heavy metal removal from soils. Also the potential of phytoremediation will be highlighted. In addition, treatment schemes for the clean-up of polluted megasites, e.g. harbours and Manufactured Gaswork Plants (MGP), will be elaborated. The aim of **Soil and Sediment Remediation** is to introduce the reader in: the biogeochemical characteristics of soil and sediments- new techniques to study soil/sediment processes (molecular probes, microelectrodes, NMR) clean up technologies for soils polluted with organic (PAH, NAPL, solvents) or inorganic (heavy metals) pollutants- preventative and remediative strategies and technologies available in environmental engineering novel process applications and bioreactor designs for bioremediation the impact of soil pollution on society and its economic importance.

Soil and Groundwater Remediation Technologies Jörg Rinklebe 2020 This book offers various soil and water treatment technologies due to increasing global soil and water pollution. In many countries, the management of contaminated land has matured, and it is developing in many others. Topics covered include chemical and ecological risk assessment of contaminated sites; phytomanagement of contaminants; arsenic removal; selection and technology diffusion; technologies and socio-environmental management; post-remediation long-term management; soil and groundwater laws and regulations; and trace element regulation limits in soil. Future prospects of soil and groundwater remediation are critically discussed in this book. Hence, readers will learn to understand the future prospects of soil and groundwater contaminants and remediation measures. **Key Features:** Discusses conventional and novel aspects of soil and groundwater remediation technologies Includes new monitoring/sensing technologies for soil and groundwater pollution Features a case study of remediation of contaminated sites in the old, industrial, Ruhr area in Germany Highlights soil washing, soil flushing, and stabilization/solidification Presents information on emerging contaminants that exhibit new challenges This book is designed for undergraduate and graduate courses and can be used as a handbook for researchers, policy makers, and local governmental institutes. **Soil and Groundwater Remediation Technologies: A Practical Guide** is written by a team of leading global experts in the field.

Bioremediation Technologies Robert L. Irvine 1998-01-08 **FROM THE INTRODUCTION** This three-volume series, **Bioremediation: Principles and Practice**, provides state of the art description of advances in pollution treatment and reduction using biological means; identify and address, at a fundamental level, broad scientific and technological areas that are unique to the subject or theme and that must be understood if advances are to be made; and provide a comprehensive overview of new developments at the regulatory, desk-top, bench-scale, pilot scale, and full-scale levels. The series covers all media-air, water, and soil/sediment-and blends the talents, knowledge, and know-how of academic, industrial, governmental, and international contributors. The series addresses the removal of both hazardous and nonhazardous contaminants from the liquid, solid, and gas phase using biological processes. This includes the biological treatment of wastes of municipal and industrial origin; bioremediation of leachates, soils, and sediments; and biofiltration for contaminated gases.

Biotechnology for the Environment: Soil Remediation Spiros Agathos 2002-11-30 At the dawn of the 21st century, biotechnology is emerging as a key enabling technology for sustainable environmental protection and stewardship. **Biotechnology for the Environment: Soil Remediation** offers a state-of-the-art account of environmental biotechnology both in emerging and in more mature technological applications of soil remediation and cleanup of contaminated sites. Harnessing the potential of microorganisms and plants as eco-efficient and robust cleanup agents in a variety of practical situations is not only possible but is becoming widespread practice. Chapters are featured on current experience and trends in bioremediation of contaminated soil, life cycle assessment software tools for remediation planning, ex situ cleanup technologies using slurry reactors, implementation of anaerobic and aerobic in situ processes including monitored natural attenuation, complementary technologies on pesticide immobilisation in soil or humification of nitroaromatics, and, finally, phytoremediation of recalcitrant organic compounds and heavy metals. For more information on **Strategy and Fundamentals**, see **Focus on Biotechnology Volume 3A**, and for more information on **Waste Water and Waste Gas Handling**, see **Focus on Biotechnology Volume 3C**.

Sustainable Remediation of Contaminated Soil and Groundwater Deyi Hou 2019-11-23 **Sustainable Remediation of Contaminated Soil and Groundwater: Materials, Processes, and Assessment** provides the remediation tools and techniques necessary for simultaneously saving time and money and maximizing environmental, social and economic benefits. The book integrates green materials, cleaner processes, and sustainability assessment methods for planning, designing and implementing a more effective remediation process for both soil and groundwater projects. With this book in hand, engineers will find a valuable guide to greener remediation materials that render smaller environmental footprint, cleaner processes that minimize secondary environmental impact, and sustainability assessment methods that can be used to guide the development of materials and processes. Addresses materials, processes, and assessment needs for implementing a successful sustainable remediation process Provides an integrated approach for the unitization of various green technologies, such as green materials, cleaner processes and sustainability assessment Includes case studies based on full-scale commercial soil and groundwater remediation projects

In Situ Bioremediation of Perchlorate in Groundwater Hans F. Stroo 2011-09-21 In the late 1970s and early 1980s, our nation began to grapple with the legacy of past disposal practices for toxic chemicals. With the passage in 1980 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, it became the law of the land to remediate these sites. The U. S. Department of Defense (DoD), the nation's largest industrial organization, also recognized that it too had a legacy of contaminated sites. Historic operations at Army, Navy, Air Force, and Marine Corps facilities, ranges, manufacturing sites, shipyards, and depots had resulted in widespread contamination of soil, groundwater, and sediment. While Superfund began in 1980 to focus on remediation of heavily contaminated sites largely abandoned or neglected by the private sector, the DoD had already initiated its Installation Restoration Program in the mid 1970s. In 1984, the DoD began the Defense Environmental Restoration Program (DERP) for contaminated site assessment and remediation. Two years later, the U. S. Congress codified the DERP and directed the Secretary of Defense to carry out a concurrent program of research, development, and demonstration of innovative remediation technologies. As chronicled in the 1994 National Research Council report, "Ranking Hazardous-Waste Sites for Remedial Action", our early estimates on the cost and suitability of existing technologies for cleaning up contaminated sites were wildly optimistic. Original estimates, in 1980, projected an average Superfund cleanup cost of a mere \$3.

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.

Evaluation of demonstrated and emerging technologies for the treatment of contaminated land and groundwater (phase III) 1998 special session treatment walls and permeable reactive barriers.

Geoenvironmental Engineering Hari D. Sharma 2004-05-20 Geoenvironmental Engineering covers the application of basic geological and hydrological science, including soil and rock mechanics and groundwater hydrology, to any number of different environmental problems. * Includes end-of-chapter summaries, design examples and worked-out numerical problems, and problem questions. * Offers thorough coverage of the role of geotechnical engineering in a wide variety of environmental issues. * Addresses such issues as remediation of in-situ hazardous waste, the monitoring and control of groundwater pollution, and the creation and management of landfills and other above-ground and in-situ waste containment systems.

Advances in Remediation Techniques for Polluted Soils and Groundwater Pankaj Kumar Gupta 2021-12-13 Advances in Remediation Techniques for Polluted Soils and Groundwater focuses on the thematic areas for assessment, mitigation, and management of polluted sites. This book covers advances in modelling approaches, including Machine Learning (ML)/ Artificial Intelligence (AI) applications; GIS and remote sensing; sensors; impacts of climate change on geogenic contaminants; and socio-economic impacts in the poor rural and urban areas, which are lacking in a more comprehensive manner in the previous titles. This book encompasses updated information as well as future directions for researchers working in the field of management and remediation of polluted sites. Introduces fate and transport of multi-pollutants under varying subsurface conditions Details underlying mechanisms of biodegradation and biotransformation of geogenic, industrial and emerging pollutants Presents recent advances and challenges in assessment, water quality modeling, uncertainty, and water supply management Provides authoritative contributions on the diverse aspects of management and remediation from leading experts around the world

In Situ Bioremediation of Perchlorate in Groundwater Hans F. Stroo 2008-12-02 In the late 1970s and early 1980s, our nation began to grapple with the legacy of past disposal practices for toxic chemicals. With the passage in 1980 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, it became the law of the land to remediate these sites. The U. S. Department of Defense (DoD), the nation's largest industrial organization, also recognized that it too had a legacy of contaminated sites. Historic operations at Army, Navy, Air Force, and Marine Corps facilities, ranges, manufacturing sites, shipyards, and depots had resulted in widespread contamination of soil, groundwater, and sediment. While Superfund began in 1980 to focus on remediation of heavily contaminated sites largely abandoned or neglected by the private sector, the DoD had already initiated its Installation Restoration Program in the mid 1970s. In 1984, the DoD began the Defense Environmental Restoration Program (DERP) for contaminated site assessment and remediation. Two years later, the U. S. Congress codified the DERP and directed the Secretary of Defense to carry out a concurrent program of research, development, and demonstration of innovative remediation technologies. As chronicled in the 1994 National Research Council report, "Ranking Hazardous-Waste Sites for Remedial Action", our early estimates on the cost and suitability of existing technologies for cleaning up contaminated sites were wildly optimistic. Original estimates, in 1980, projected an average Superfund cleanup cost of a mere \$3.

Remediation Engineering of Contaminated Soils Donald L. Wise 2000-07-25 "Offers thorough coverage of the remediation of soils contaminated by hazardous wastes, including materials, analytical techniques, cleanup design and methodology, characterization of geosystems, monitoring of contaminants in the subsurface, and waste containment. Cites specific case studies in hydrocarbon remediation that offer a concise overview of possible technological approaches."

Environmental Soil Remediation and Rehabilitation Eric D. van Hullebusch 2020-04-22 This book provides a comprehensive overview of innovative remediation techniques and strategies for soils contaminated by heavy metals or organic compounds (e.g. petroleum hydrocarbons, NAPLs and chlorinated organic compounds). It discusses various novel chemical remediation approaches (in-situ and ex-situ) used alone and in combination with physical and/or thermal treatment. Further, it addresses the recovery of NAPLs, reuse of leaching solutions, and in-situ chemical reduction and oxidation, and explores the chemical enhancement of physical NAPLs recovery from both practical and theoretical perspectives. Also presenting the state-of-the-art in waste-assisted bioremediation to improve soil quality and the remediation of petroleum hydrocarbons, the book is a valuable resource for students, researchers and R&D professionals in industry engaged in the treatment of contaminated soils.

Soil and Groundwater Remediation Technologies Yong Sik Ok 2020-03-23 This book offers various soil and water treatment technologies due to increasing global soil and water pollution. In many countries, the management of contaminated land has matured, and it is developing in many others. Topics covered include chemical and ecological risk assessment of contaminated sites; phytomanagement of contaminants; arsenic removal; selection and technology diffusion; technologies and socio-environmental management; post-remediation long-term management; soil and groundwater laws and regulations; and trace element regulation limits in soil. Future prospects of soil and groundwater remediation are critically discussed in this book. Hence, readers will learn to understand the future prospects of soil and groundwater contaminants and remediation measures. Key Features: Discusses conventional and novel aspects of soil and groundwater remediation technologies Includes new monitoring/sensing technologies for soil and groundwater pollution Features a case study of remediation of contaminated sites in the old, industrial, Ruhr area in Germany Highlights soil washing, soil flushing, and stabilization/solidification Presents information on emerging contaminants that exhibit new challenges This book is designed for undergraduate and graduate courses and can be used as a handbook for researchers, policy makers, and local governmental institutes. Soil and Groundwater Remediation Technologies: A Practical Guide is written by a team of leading global experts in the field.

Biotechnology for Environmental Protection Rangabhashyam Selvasembian 2022-10-28 This book covers broader application of biotechnology for the protection of environment through different bioremediation and biodegradation techniques developed for removal of environmental contaminants including the recently discovered contaminants. The book offers a comprehensive overview of environmental pollutants including their fate, behavior, environmental and associated health risks. It is useful reading material for postgraduate and graduate students of environmental biotechnology, environmental microbiology and ecology. Young researchers also find the chapters useful understanding the latest developments.

Bioelectrochemical Systems Korneel Rabaey 2009-12-01 In the context of wastewater treatment, Bioelectrochemical Systems (BESs) have gained considerable interest in the past few years, and several BES processes are on the brink of application to this area. This book, written by a large number of world experts in the different sub-topics, describes the different aspects and processes relevant to their development. Bioelectrochemical Systems (BESs) use micro-organisms to catalyze an oxidation and/or reduction reaction at an anodic and cathodic electrode respectively. Briefly, at an anode oxidation of organic and inorganic electron donors can occur. Prime examples of such electron donors are waste organics and sulfides. At the cathode, an electron acceptor such as oxygen or nitrate can be reduced. The anode and the cathode are connected through an electrical circuit. If electrical power is harvested from this circuit, the system is called a Microbial Fuel Cell; if electrical power is invested, the system is called a Microbial Electrolysis Cell. The overall framework of bio-energy and bio-fuels is discussed. A number of chapters discuss the basics – microbiology, microbial ecology, electrochemistry, technology and materials development. The book continues by highlighting the plurality of processes based on BES technology already in existence, going from wastewater based reactors to sediment based bio-batteries. The integration of BESs into existing water or process lines is discussed. Finally, an outlook is provided of how BES will fit within the emerging biorefinery area.

Environmental Microbiology Ian L. Pepper 2011-10-13 For microbiology and environmental microbiology courses, this leading textbook builds on the academic success of the previous edition by including a comprehensive and up-to-date discussion of environmental microbiology as a discipline that has grown in scope and interest in recent years. From environmental science and microbial ecology to topics in molecular genetics, this edition relates environmental microbiology to the work of a variety of life science, ecology, and environmental science investigators. The authors and editors have taken the care to highlight links between environmental microbiology and topics important to our changing world such as bioterrorism and national security with sections on practical issues such as bioremediation, waterborne pathogens, microbial risk assessment, and environmental biotechnology. WHY ADOPT THIS EDITION? New chapters on: Urban Environmental Microbiology Bacterial Communities in Natural Ecosystems Global Change and Microbial Infectious Disease Microorganisms and Bioterrorism Extreme Environments (emphasizing the ecology of these environments) Aquatic Environments (now devoted to its own chapter- was combined with Extreme Environments) Updates to Methodologies: Nucleic Acid -Based Methods: microarrays, phyloarrays, real-time PCR, metagenomics, and comparative genomics Physiological Methods: stable isotope fingerprinting and functional genomics and proteomics-based approaches Microscopic Techniques:

FISH (fluorescent in situ hybridization) and atomic force microscopy Cultural Methods: new approaches to enhanced cultivation of environmental bacteria Environmental Sample Collection and Processing: added section on air sampling

Remediation Technologies for Soils and Groundwater Alok Bhandari 2007 This report provides a comprehensive and thorough overview of conventional engineered processes and technologies used for the remediation of contaminated sites.

In Situ Bioremediation Bruce E. Rittmann 1994-12-31 This critical review of the status of in situ bioremediation, which is used to clean up contaminated groundwater aquifers and surface soils, has been organized according to possibilities and restrictions. Possibilities are based on present knowledge and indicate that in situ bioremediation can achieve decontamination of aquifers and soils. Restrictions encompass the scientific, engineering, legal, and other questions that stand in the way of successful development and application of in situ bioremediation. Although much has been written about bioremediation, this critical review is unique because it is comprehensive, critical, and integrated. This situation was no accident; the organization of the authorship team and the report's contents were designed to achieve each of the three attributes. Combining a good plan, outstanding individuals contributing, and an incredible amount of work, they created a critical review that defines the technical and non-technical issues that will determine how much of an impact in situ bioremediation makes on solving the world's challenges for cleanup of our legacy of improperly disposed of materials. Readers of this review will find the issues identified and connected. They will have a solid foundation for research, application, or evaluation of in situ bioremediation in the future.

Advanced Groundwater Remediation Franz-Georg Simon 2002 This book presents a concise summary of advanced groundwater treatment methods, especially 'pump-and-treat' and 'permeable reactive barriers'. The topics include heavy metal removal, with special emphasis on uranium, and sorption, one of the basic mechanisms in groundwater remediation.

Soil Bioremediation Javid A. Parray 2021-03-22 SOIL BIOREMEDIATION A practical guide to the environmentally sustainable bioremediation of soil Soil Bioremediation: An Approach Towards Sustainable Technology provides the first comprehensive discussion of sustainable and effective techniques for soil bioremediation involving microbes. Presenting established and updated research on emerging trends in bioremediation, this book provides contributions from both experimental and numerical researchers who provide reports on significant field trials. Soil Bioremediation instructs the reader on several different environmentally friendly bioremediation techniques, including: Bio-sorption Bio-augmentation Bio-stimulation Emphasizing molecular approaches and biosynthetic pathways of microbes, this one-of-a-kind reference focuses heavily on the role of microbes in the degradation and removal of xenobiotic substances from the environment and presents a unique management and conservation perspective in the field of environmental microbiology. Soil Bioremediation is perfect for undergraduate students in the fields of environmental science, microbiology, limnology, freshwater ecology and microbial biotechnology. It is also invaluable for researchers and scientists working in the areas of environmental science, environmental microbiology, and waste management.

Hazardous Materials and Hazardous Waste Management Gayle Woodside 1999-03-25 The most comprehensive and convenient guide to date on the management, storage, and disposal of hazardous materials and waste. For the professional faced with making sense of the reams of governmental regulations surrounding waste handling and disposal from the EPA, OSHA, and the Nuclear Regulatory Commission, untangling the legal jargon can be as challenging as managing these materials and wastes. Explaining how these complex regulations interrelate and when they apply, the first edition of Hazardous Materials and Hazardous Waste Management became an instant reference staple-offering practical, comprehensive guidance on current definitions of hazardous wastes and materials as well as their use, management, treatment, storage, and disposal. Extensively revised and expanded with many new topics, this new Second Edition now covers additional areas such as water quality management, pollution prevention, process safety management, and transportation of hazardous materials and waste. Retaining its predecessor's practical topical range, this edition is invaluable for the chemical and environmental engineer as well as the hazardous materials technician, with essential information on: Hazardous materials management in the workplace, from personal monitoring and protection to safety and administration. Treatment and disposal technologies. Environmental contamination assessment and management, including groundwater and soil, air quality, water quality, and pollution prevention. Process safety management, hazard assessment, emergency response, and incident handling. The first book to provide coherent treatment of both hazardous materials and waste management in one volume, the Second Edition of Hazardous Materials and Hazardous Waste Management secures this reference's well-earned position in the professional's library as a source of solid, timely technical information.

Environmental Biotechnology Hans-Joachim Jördening 2006-03-06 A deeper insight into the complex processes involved in this field, covering the biological, chemical and engineering fundamentals needed to further develop effective methodologies. The book devotes detailed chapters to each of the four main areas of environmental biotechnology -- wastewater treatment, soil treatment, solid waste treatment, and waste gas treatment -- dealing with both the microbiological and process engineering aspects. The result is the combined knowledge contained in the extremely successful volumes 11a through 11c of the "Biotechnology" series in a handy and compact form.