



Microbial Degradation Processes in Radioactive Waste Repository and in Nuclear Fuel Storage Areas

Edited by

J. H. Wolfram, R. D. Rogers
and L. G. Gazso

NATO ASI Series

Microbial Processes In Radioactive Wast

Huangqi Zhang



Microbial Processes In Radioactive Wast:

Microbial Degradation Processes in Radioactive Waste Repository and in Nuclear Fuel Storage Areas J.H. Wolfram, Robin D. Rogers, Lajos G. Gázsó, 1997-03-31 Purpose of the Workshop In the spirit of enhancing developments in science and technology by facilitating international scientific cooperation the Science Committee of NATO is sponsoring AR W s in several selected priority areas The objective of this workshop was to discuss what microbial mediated problems have been experienced in the area of nuclear waste management and spent fuel storage Long term storage of high level wastes in repositories is just starting in some countries However low and medium level wastes have been stored for several decades In the area of spent fuel interim storage has been extended at many locations far beyond the intended time It was a priority of the workshop to examine and discuss what deleterious effects have been observed under these storage conditions or under conditions used in simulated trial tests for predicting material performance under the storage conditions For example one chronic problem that was discussed was possibility that microbial influenced corrosion MIC could be taking place in the wet storage of spent fuel thereby initiating or accelerating the process of corrosion Another discussion in the area of waste forms focused on the presence of biofilms which may be breaking down the structure of the waste form and thereby jeopardizing its integrity The meeting focused on discussing the observations and data collected relating to problems encountered in the storage of these types of wastes and sharing this information with others that have not monitored their facilities for similar problems

Microbial Processes in Radioactive Waste Disposal Karsten Pedersen, 2000 *The Microbiology of Nuclear Waste Disposal* Jonathan R. Lloyd, Andrea Cherkouk, 2020-10-22 The Microbiology of Nuclear Waste Disposal is a state of the art reference featuring contributions focusing on the impact of microbes on the safe long term disposal of nuclear waste This book is the first to cover this important emerging topic and is written for a wide audience encompassing regulators implementers academics and other stakeholders The book is also of interest to those working on the wider exploitation of the subsurface such as bioremediation carbon capture and storage geothermal energy and water quality Planning for suitable facilities in the U S Europe and Asia has been based mainly on knowledge from the geological and physical sciences However recent studies have shown that microbial life can proliferate in the inhospitable environments associated with radioactive waste disposal and can control the long term fate of nuclear materials This can have beneficial and damaging impacts which need to be quantified Encompasses expertise from both the bio and geo disciplines aiming to foster important collaborations across this disciplinary divide Includes reviews and research papers from leading groups in the field Provides helpful guidance in light of plans progressing worldwide for geological disposal facilities Includes timely research for planning and safety case development

Evaluation of Microbial Processes in Radioactive Waste Disposal, 1986 The approach taken was to ascertain the likelihood of microbes being present in the disposal trench Then the extent of general microbial activity was discussed in relation to the environmental conditions thought to exist within the disposal trench

Based on the composition of the waste the biochemical pathways and end products of probable importance were identified To encompass a range of outcomes two scenarios were considered one in which total containment was assumed and a second worst case scenario

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

Nuclear Waste Cleanup Technologies and Opportunities Robert Noyes, 2013-01-15 One of the largest most complicated and expensive environmental problems in the United States is the cleanup of nuclear wastes The US Department of Energy DOE has approximately 4 000 contaminated sites covering tens of thousands of acres and replete with contaminated hazardous or radioactive waste soil or structures In addition to high level waste it has more than 250 000 cubic meters of transuranic waste and millions of cubic meters of low level radio active waste In addition DOE is responsible for thousands of facilities awaiting decontamination decommissioning and dismantling DOE and its predecessors have been involved in the management of radioactive wastes since 1943 when such wastes were first generated in significant quantities as by products of nuclear weapons production Waste connected with DOE s nuclear weapons complex has been accumulating as a result of various operations spanning over five decades The cost estimates for nuclear waste cleanup in the United States have been rapidly rising It has recently been estimated to be in a range from 200 to 350 billion Costs could vary considerably based on future philosophies as to whether to isolate certain sites the iron fence philosophy or clean them up to a pristine condition the greenfields philosophy Funding will also be based on Congressional action that may reduce environmental cleanup based on budget considerations

Their World: A Diversity of Microbial Environments Christon J. Hurst, 2016-05-02 This volume summarizes recent advances in environmental microbiology by providing fascinating insights into the diversity of microbial life that exists on our planet The first two chapters present theoretical perspectives that help to consolidate our understanding of evolution as an

adaptive process by which the niche and habitat of each species develop in a manner that interconnects individual components of an ecosystem. This results in communities that function by simultaneously coordinating their metabolic and physiologic actions. The third contribution addresses the fossil record of microorganisms and the subsequent chapters then introduce the microbial life that currently exists in various terrestrial and aquatic ecosystems. Coverage of the geosphere addresses endolithic organisms' life in caves and the deep continental biosphere, including how subsurface microbial life may impact spent nuclear fuel repositories. The discussion of the hydrosphere includes hypersaline environments and arctic food chains. By better understanding examples from the micro biosphere, we can elucidate the many ways in which the niches of different species, both large and small, interconnect within the overlapping habitats of this world, which is governed by its microorganisms.

Soil Reclamation Processes: Microbiological Analyses and Applications Robert L. Tate, Donald A. Klein, 2020-08-18. This book provides an assessment of the understanding of soil microbiology and biochemistry as part of reclamation processes. It attempts to assemble more specialized literature on reclamation where application of microbiological concepts has provided the understanding of the process.

Clays in Natural and Engineered Barriers for Radioactive Waste Confinement S. Norris, J. Bruno, M. Cathelineau, P. Delage, C. Fairhurst, E.C. Gaucher, E.H. Höhn, A. Kalinichev, P. Lalioux, P. Sellin, 2014-10-24. This Special Publication contains 43 scientific studies presented at the 5th conference on Clays in natural and engineered barriers for radioactive waste confinement held in Montpellier, France, in 2012. The conference and this resulting volume cover all the aspects of clay characterization and behaviour considered at various temporal and spatial scales relevant to the confinement of radionuclides in clay, from basic phenomenological process descriptions to the global understanding of performance and safety at repository and geological scales. Special emphasis has been given to the modelling of processes occurring at the mineralogical level within the clay barriers. The papers in this Special Publication consider research into argillaceous media under the following topic areas: large scale geological characterization, clay based concept, large scale experiments, hydrodynamical modelling, geochemistry, geomechanics, mass transfer, gas transfer, mass transfer mechanisms. The collection of different topics presented in this Special Publication demonstrates the diversity of geological repository research.

Radioactive Waste Management, 1981 Environmental Mineralogy II D.J. Vaughan, R.A. Wogelius, 2013-02-06. In a sense, all mineralogy is environmental mineralogy. However, the term environmental has come to be employed particularly in combination with terms such as science issue or problem to refer to those systems at or near the surface of the Earth where the geosphere comes into contact with the hydrosphere, atmosphere, and biosphere. This is, of course, the environment upon which the human race depends for survival, and hence is now sometimes referred to as the critical zone. Those systems containing minerals that constitute the most important or key environments are considered here: soils, modern sediments, atmospheric aerosols, and the interior or exterior parts of certain micro and macro organisms. Particularly important are the roles that minerals play in processes that act over time to control

or influence the environment at various scales of observation Both pure systems and those contaminated as a result of human activity are considered The objectives for this volume are to help to define the subject of environmental mineralogy and to provide an initial source of information both for mineralogists and other scientists who wish to understand or work in this field It was hoped that it might also provide a text for use by those teaching courses in the subject at advanced

undergraduate or graduate student level **Biotechnology for Waste Management and Site Restoration** C. Ronneau,O. Bitchaeva,2012-12-06 Biotechnology for Waste Management and Site Restoration covers waste management solid gaseous liquid site restoration radioactivity organics toxic metals educational economic social and business aspects and international collaboration International collaboration is growing apace and many concrete projects have been started The body of knowledge is growing Over the long term it is envisaged that this international collaboration will result in a long term scientific and technological strategy new technologies and alternative solutions and practical implementations of biotechnology for the nuclear and industrial sectors of the economy **Selected Water Resources Abstracts** ,1991

Energy Research Abstracts ,1989 **Radioactive Pollutant** Nitish Kumar,2024-12-10 This book sheds light on the global environmental issue and proposes solutions to contamination through multi disciplinary approaches Radioactivity occurs naturally Ionizing radiation has always been a threat to humans and all other living things on earth While the average global readings could be a suitable benchmark for what must be deemed normal the natural level of radiation exposure varies by around an order of magnitude for different locations of the earth Regardless of whether this degree of radiation exposure qualifies as innocuous it cannot be avoided because some diseases may be caused by exposure to naturally occurring radiation As a result these natural exposures serve as the foundation for and comparison point for radiation protection principles such as dose limits or limitations The majority of the ionizing radiation that the world s population is exposed to comes from natural sources The public receives maximum doses from nuclear sites that are now in normal operation those are typically two orders of magnitude below the background radiation In industrialized nations medical uses of radioactivity and ionizing radiation result in mean doses that are comparable to those from natural radiation but individual doses vary greatly This edited book brings together a diverse group of researchers to address the challenges posed by global mass poisoning caused by radionuclides This book contains three sections First section describes the different sources of radioactive pollutant in the environment Second section explains the health risk linked to radioactive pollutant Third section addresses sustainable remediation strategies of radioactive waste and the potential applications of recent biological technology in providing solutions This book is a valuable resource to students academics researchers and environmental professionals doing field work on management of radioactive waste throughout the world *Interactions of Microorganisms with Radionuclides* M.J. Keith-Roach,F.R. Livens,2002-04-22 Many environmental processes are influenced if not controlled by microbial action and it is becoming increasingly important to develop an understanding of microbial roles in geochemistry

This book brings together state of the art research into microbiological processes and the extent to which they affect or can be used to control radioactive elements The basic principles and fundamental mechanisms by which microbes and radionuclides interact are outlined the methodology described potential microbial influences on waste repositories examined direct and indirect effects on transport both on local and global scales considered and potential technological applications identified The book is directed towards advanced undergraduate students postgraduates and researchers in the areas of environmental radioactivity environmental microbiology biotechnology and radioactive waste management It will also be of interest to regulators policy makers and non governmental organisations This novel and timely book offers a fully integrated approach to a topical international issue *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 *Containment of High-Level Radioactive and Hazardous Solid Wastes with Clay Barriers* Raymond N. Yong,Roland Pusch,Masashi Nakano,2010-05-31 One of the principal objections to or problems with the use of nuclear fuel is that a proven method for safe disposal of spent nuclear fuel has yet to be established The central focus of most schemes underway to dispose of these high level radioactive wastes relies on clay based buffers and barriers to isolate spent fuel canisters in borehole **Environmental Sustainability and**

Biotechnology: Opportunities and Challenges Naveen Kumar Arora,Piyush Pandey,Jitendra Mishra,2025-08-18 This book assembles a global perspective on the challenges and opportunities to achieve environmental sustainability through biotechnology The book highlights agenda for utilizing scientific knowledge including the use of beneficial microbes and biotechnological approaches for combating key global issues related to environmental sustainability Additionally to evolve adaptive processes and mitigation approaches certain novel insights on resilience mechanisms sustainability principles and bio inputs are discussed The book also showcases advanced technologies in the area of biotechnology including use of microbes in biodegradation bioremediation sustainable agriculture and food security This book is valuable for environmentalists ecologists policy makers and industrial entrepreneurs The book is also a reference source for researchers undergraduate and graduate students of the environment science and biotechnology fields Development in Wastewater Treatment Research and Processes Maulin P. Shah,Susana Rodriguez-Couto,Riti Thapar Kapoor,2021-10-16 Development in Waste Water Treatment Research and Processes Innovative Microbe Based Applications for Removal of Chemicals and Metals in Wastewater Treatment Plants focuses on the exploitation of various biological treatment technologies and their use to treat toxic and hazardous contaminants present in industrial effluent and restore the contaminated sites a topic which lacks discussion in existing titles on the global market This book encompasses advanced technologies and updated information as well as future directions for young researchers and scientists who are working in the field of wastewater treatment or effluent treatment plants and biodegradation of environmental contaminants for environmental safety and sustainable development Provides wide information to readers on state of the art applications of microbes for wastewater industrial effluent treatment and environmental protection Summarizes our current knowledge on the use of various microbes even the use of dead biomass for dye decolorization and degradation Explores different aspects of biological methods for contaminant removal and better advanced biotechnological applications

Reviewing **Microbial Processes In Radioactive Wast**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is truly astonishing. Within the pages of "**Microbial Processes In Radioactive Wast**," an enthralling opus penned by a highly acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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it divides the graph of quadratic function into two parts such that one half of the graph is a reflection of the other half a axis of symmetry b range c domain d vertex $(-\frac{b}{2a}, \frac{4ac - b^2}{4a})$ it is a polynomial equation of degree two that can be written in the form $ax^2 + bx + c = 0$ where a , b and c are real numbers and $a \neq 0$

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