# Bioremediation of Petroleum Hydrocarbons in Cold Regions



## Bioremediation Of Petroleum Hydrocarbons In Cold Regions

Barnes David L Snape Ian Filler Dennis M,Dennis M. Filler,Ian Snape,David L. Barnes

#### **Bioremediation Of Petroleum Hydrocarbons In Cold Regions:**

Bioremediation of Petroleum Hydrocarbons in Cold Regions Dennis M. Filler, Ian Snape, David L. Barnes, 2008-02-21 This guide to bioremediation in cold regions is designed to aid environmental practitioners industry and regulators in the remediation of petroleum spills and contaminated sites in cold regions Remediation design and technology used in temperate climates does not necessarily work in cold climates and cleanup takes longer due to shorter treatment seasons sub freezing temperatures ground freezing and thawing and limited bioactivity Environmental engineers and scientists from eight countries working in the polar regions combine their experiences and expertise with petroleum contamination to write this book It contains in depth discussions on regulations freezing and frozen ground identification and adaptations of cold tolerant bacteria contaminant transport in cold soils and permafrost temperature effects on biodegradation analytical methods treatability studies and nutritional requirements for bioremediation Emphasis is given to practical and effective bioremediation methods for application in cold regions Emerging technologies are also discussed **Bioremediation of** Petroleum Hydrocarbons in Cold Regions Dennis M. Filler, Ian Snape, David L. Barnes, 2008 Bioremediation of Petroleum Hydrocarbons in Cold Regions Barnes David L Snape Ian Filler Dennis M, Dennis M. Filler, Ian Snape, David L. Barnes, 2014-05-14 This guide to bioremediation in cold regions is designed to aid environmental practitioners industry and regulators in the remediation of petroleum spills and contaminated sites in cold regions Remediation design and technology used in temperate climates does not necessarily work in cold climates and cleanup takes longer due to shorter treatment seasons sub freezing temperatures ground freezing and thawing and limited bioactivity Environmental engineers and scientists from eight countries working in the polar regions combine their experiences and expertise with petroleum contamination to write this book It contains in depth discussions on regulations freezing and frozen ground identification and adaptations of cold tolerant bacteria contaminant transport in cold soils and permafrost temperature effects on biodegradation analytical methods treatability studies and nutritional requirements for bioremediation Emphasis is given to practical and effective bioremediation methods for application in cold regions Emerging technologies are also discussed

<u>Cold-adapted Yeasts</u> Pietro Buzzini,Rosa Margesin,2013-10-07 Yeasts are a versatile group of eukaryotic microorganisms exhibiting heterogeneous nutritional profiles and an extraordinary ability to survive in a wide range of natural and man associated ecosystems including cold habitats Cold adapted yeasts inhabit numerous low temperature environments where they are subjected to seasonal or permanent cold conditions Hence they have evolved a number of adaptation strategies with regard to growth and reproduction metabolic activities survival and protection Due to their distinctive ability to thrive successfully at low and even subzero temperatures cold adapted yeasts are increasingly attracting attention in basic science and industry for their enormous biotechnological potential This book presents our current understanding of the diversity and ecology of cold adapted yeasts in worldwide cold ecosystems their adaptation strategies and their biotechnological

significance Special emphasis is placed on the exploitation of cold adapted yeasts as a source of cold active enzymes and biopolymers as well as their benefits for food microbiology bioremediation and biocontrol Further aspects of food biodeterioration are considered Bioremediation of Petroleum Hydrocarbons Ali Akbari, 2014 Indigenous cold adapted hydrocarbon degrading bacteria have been frequently detected in soils from cold region sites suggesting bioremediation as a cost effective remediation technology is potentially viable for cleanup of contaminated sites in cold regions Previous studies on bioremediation of petroleum hydrocarbons in cold regions have been conducted with coarse textured soils However fine grained or clayey soils are commonly found in several cold regions. The overall objective of this research was to investigate the factors controlling biodegradation of aged clayey petroleum hydrocarbon contaminated soils from a sub arctic site under relevant temperature regimes. The biodegradation rates and extents of petroleum hydrocarbons were investigated for a clayey site contaminated soil in four pilot scale biopiles maintained at 15 C Non volatile petroleum hydrocarbons C16 C32 were biodegraded 24 to 38% under continuous aeration and with amendments of 17 5% or 23 5% moisture and also 17 5% moisture with 95 mg N kg soil In contrast statistically significant biodegradation of the non volatile hydrocarbon fraction was not observed in a biopile tank containing soils amended with 23 5% moisture content and 1340 mg N kg soil While a significant shift occurred in soil microbial community over 60 days in the biopile tank amended with 23 5% moisture only there was no change in the microbial community of soil samples amended with a similar level of moisture and 1340 mg N kg soil indicating that high amounts of nitrogen amendment inhibited bioremediation This study investigates the effect of diurnal temperature variations on the biodegradation of petroleum hydrocarbon contaminated soil typical for the site from northern Canada from which contaminated soils were obtained The extents of biodegradation of petroleum hydrocarbons after 70 days in systems incubated at temperatures varying between 5 C to 15 C daily representative of daily high and low temperatures were similar to systems incubated at constant temperature of 15 C and were significantly higher than systems incubated at 5 C The soil microbial community of systems with daily changes in temperatures between 5 C to 15 C was similar to those incubated at 15 C but significantly different than those incubated at 5 C based on both 16S rRNA and alkB gene analyses The results suggest that the highest temperature 15 C to which the soil was frequently exposed to determined the microbial community profile in the site soil and periods of low temperatures did not reduce the overall biodegradation efficiency or the microbial community compared to that maintained solely at 15 C Experiments were conducted to investigate if hexadecane a biodegradable but effectively insoluble hydrocarbon phase was accessible to and degraded by hydrocarbon degrading bacteria when the hexadecane water interface was separated from the microbial culture by membranes with specific pore sizes In these systems bacteria were unable to degrade hexadecane when the membrane pore size was 0 4 m or 3 m but was able to degrade hexadecane when separated by pore sizes of 12 m To investigate the implications of these results to aggregates from clayey and sandy soils the in situ aggregate micro structure of representative soil aggregates from

petroleum contaminated clayey soil and petroleum contaminated sandy soil were compared by micro scale computed tomography micro CT imaging The bioaccessible porosity defined as fraction of aggregate volume corresponding to pores Microbial Action on Hydrocarbons larger than 4 m was comparable in case of clayey 26 27% and sandy 24% aggregates Vivek Kumar, Manoj Kumar, Ram Prasad, 2019-02-08 The book discusses ways to overcome the side effects of using hydrocarbon based products as energy sources Hydrocarbons produce raw crude oil waste of around 600 000 metric tons per annum with a range of uncertainty of 200 000 metric tons per year The various chapters in this book focus on approaches to reduce these wastes through the application of potential microbes in a process called bioremediation. The book is a one stop reference resource on the methods mechanisms and application of the bio composites in the laboratory and field Focusing on resolving a very pressing environmental issue it not only provides details of existing challenges but also offers deeper insights into the possibility of solving problems using hydrocarbon bioremediation Proceedings of the Canadian Society of Civil Engineering Annual Conference 2021 Scott Walbridge, Mazdak Nik-Bakht, Kelvin Tsun Wai Ng, Manas Shome, M. Shahria Alam, Ashraf El Damatty, Gordon Lovegrove, 2022-09-13 This book comprises the proceedings of the Annual Conference of the Canadian Society of Civil Engineering 2021 The contents of this volume focus on specialty conferences in construction environmental hydrotechnical materials structures transportation engineering etc This volume will prove a valuable resource Handbook of Oil Spill Science and Technology Merv Fingas, 2015-02-02 Provides for those in academia and industry a scientific basis for the cleanup and for the assessment of oil spills Enables Non scientific officers to understand the science they use on a daily basis Multi disciplinary approach covering fields as diverse as biology microbiology chemistry physics oceanography and toxicology Covers the science of oil spills from risk analysis to cleanup and through the effects on the environment Includes case studies examining and analyzing spills such as Tasman Spirit oil spill on the Karachi Coast and provides lessons to prevent these in the future Permafrost Soils Rosa Margesin, 2008-10-31 Most of the Earth's biosphere is characterized by low temperatures Vast areas 20% of the soil ecosystem are permanently frozen or are unfrozen for only a few weeks in summer Permafrost regions occur at high latitudes and also at high ele tions a significant part of the global permafrost area is represented by mountains Permafrost soils are of global interest since a significant increase in temperature is predicted for polar regions Global warming will have a great impact on these soils especially in northern regions since they contain large amounts of organic carbon and act as carbon sinks and a temperature increase will result in a release of carbon into the atmosphere Additionally the intensified release of the clima relevant tracer gas methane represents a potential environmental harzard Significant numbers of viable microorganisms including bacteria archaea p totrophic cyanobacteria and green algae fungi and protozoa are present in per frost and the characteristics of these microorganisms reflect the unique and extreme conditions of the permafrost environment Remarkably these microorg isms have been reported to be metabolically active at subzero temperatures even down to 20 C Fresh Water Pollution

Dynamics and Remediation Humaira Qadri,Rouf Ahmad Bhat,Mohammad Aneesul Mehmood,Gowhar Hamid Dar,2019-07-17 Freshwater is a finite resource and is being deteriorated directly and indirectly by anthropogenic pressures Preserving the quality and availability of freshwater resources is becoming one of the most pressing environmental challenges on the international horizon To ensure the preservation as well as availability of freshwater resources there is a need to understand the ecology of the freshwater systems pollution problems their impacts restoration techniques to be opted and the conservation measures In this backdrop the present book on Freshwater Pollution Dynamics and Remediation has been compiled The book provides an understanding about the present state of art pollution impacts including the changes in the environmental quality as well as the shift in the aquatic biological communities of the fragile freshwater ecosystems Besides the impact of deteriorating quality of the freshwater ecosystems on the animal and human health is also discussed in detail This book provides a comprehensive account of the techniques based on updated research in biotechnology bio remediation phyto remediation and nano bioremediation The role of biosorpers and biofilms as a remediation tool has also been detailed The book is a ready reference for researchers scientists and educators who are involved in the freshwater pollution remediation and management studies The book editors with an expertise in diverse research fields in freshwater ecosystems have congregated the most inclusive research accounts on the freshwater pollution and remediation and thus developed a repository of diverse knowledge on the subject

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