



Relation Between Mass Transfer And Biodegradation Of Hydrophobic Pollutants In Soil

Blaise Lindsey



Relation Between Mass-transfer And Biodegradation Of Hydrophobic Pollutants In Soil:

Relation Between Mass-transfer and Biodegradation of Hydrophobic Pollutants in Soil Hendricus Mulder, 1999

Biodegradation and Bioremediation Ajay Singh, Owen P. Ward, 2004-06-21 The diverse metabolic capabilities of microorganisms and their interactions with hazardous organic and inorganic compounds have long been recognized. Microbial processes are environmentally compatible and can be integrated with non biological processes to detoxify, degrade and immobilize environmental contaminants. Bioremediation, the application of biological methods, has been used successfully for soil remediation. For this volume, a number of experts from universities, government laboratories and industry share their specialist knowledge in environmental microbiology and biotechnology. Chapters dealing with microbiological, biochemical and molecular aspects of biodegradation and bioremediation cover numerous topics including bioavailability, biodegradation of various pollutants, microbial community dynamics, properties and engineering of important biocatalysts and methods for monitoring bioremediation processes.

Biodegradation and Bioremediation Blaise Lindsey, 2018-10-11 Biodegradation is the break down of organic matter by microbes. Bioremediation is an engineered technique applied by people to clean up organic matter by helping microbes with the biodegradation process. One way of doing that is to introduce oxygen into the subsurface to help more aerobic microbes grow in order to clean up oil in the soil. The potential toxicity, harmful action inherent in a substance is manifest only when that substance comes in contact with that susceptible living biological system. A chemical normally thought of as harmless will evoke a toxic response if added to a biological system in sufficient amount. The toxic potency of a chemical is defined by the relationship between dose, the amount of the chemical, and the response that is produced in a biological system. The toxicity of industrial wastes is not often managed and it has caused serious damage to earth and water. The most important aspect of environmental biotechnology is the effective management of hazardous and toxic pollutants, xenobiotics, by bioremediation. The environmental clean up process through bioremediation can be achieved in two ways: in situ and ex situ bioremediation. The book aims to provide relevant theoretical and practical frameworks and the latest empirical research findings in this area along with case studies. It is written for students, academicians and industry professionals who want to improve their understanding of the strategic role of biodegradation and bioremediation at different levels of the biodegradation and bioremediation research and knowledge that is heavy metal pollution, toxicity, remediation methods and strategies to manage the waste in industries, which are a global concern.

Surfactant-Enhanced In situ Biodegradation of Strongly Sorbing Organic Substances in Soil Environments, 1992 Slightly soluble, high molecular weight chemicals and Polycyclic Aromatic Hydrocarbons (PAH) are common pollutants of concern in the remediation of oil spill sites. Low volatility coupled with hydrophobic characteristics make them more persistent in nature. In place, biological transformation is believed to be the most effective process for their removal. The hydrophobic nature of the contaminants results in a partition onto the soil matrix. In most cases, this can account for 95-99% of the total contaminant.

mass This limits the biological transformation by reducing the soluble concentration thereby making them unavailable to the microbial population Thus a well designed bioremediation process should consider a way of mobilizing the contaminants from the soil surface to make them available to the microbial population Surfactants have been found to be effective in mobilizing hydrophobic contaminants from soil surface Mobilization of contaminants by surfactants depends on the surfactant soil contaminant interactions Edwards et al 1991 developed a model for the prediction of the mobilization of low solubility organic contaminants by surfactants in soils

Polycyclic Aromatic Hydrocarbon Biodegradation for Soil

Bioremediation Claire Baranger, 2020 The present work examines several aspects of the fungal bioremediation of polycyclic aromatic hydrocarbons following three main axes mobilization uptake and biodegradation This study focuses on the interactions between the pollutant fungus and the environment through the example of benzo a pyrene BaP mobilization by *Talaromyces helicus* BaP is a carcinogenic mutagenic and reprotoxic compound well studied as a model hydrophobic pollutant while *T. helicus* in a soil fungus recently identified as holding potential for the remediation of multiple contaminations Result predictability depending on each site's characteristics is a limitation in the field of bioremediation and having adapted experimental tools is important to identify relevant biostimulation strategies on a case by case basis Therefore several experimental set ups were used As a first step tests in liquid cultures were carried out to quantify BaP degradation in controlled conditions Soil microcosms are also a classical approach for the study of pollution remediation used here to evaluate the strain's performance in conditions closer to a real site and to test several biostimulation parameters Finally a compartmentalized model environment was set up in the form of a microfluidic chip the goal being to develop a transparent adaptable model of porous medium to study pollutant mobilization and uptake by a non motile organism at the microscale

Biodegradation, Pollutants and Bioremediation Principles Ederio Dino Bidoia, Renato Nallin

Montagnolli, 2021-04-19 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

Biodegradation and Bioremediation Martin

Alexander, 1999 Alexander presents the basic principles of biodegradation and how these principles relate to bioremediation All the subject's microbiological chemical toxicological environmental engineering and technological aspects are covered

Biodegradation Jaime Alvarez, 2016 This book provides an overview of biodegradation The first chapter provides a detailed description on the ability of *Rhodococcus* UKMP 5M to act as a biological tool to remediate phenol chlorinated

compounds nitrile oil spillage and cyanide which selection was primarily based on their large scale presence in industrial wastewater Chapter Two presents advances made in recent decades on the understanding of the metabolic capabilities of sulfate reducing bacteria SRB from marine and other types of sediment i e freshwater estuarine for the biotransformation of carbon compounds and sulfate that are present as pollutants in several types of waters and soils Chapter Three concentrates on the different parameters that influence biodegradation speed and energy release potential Chapter Four reports and discusses several examples on biodegradation with bacteria and fungi of organochlorides organophosphates and more recently of pyrethroid pesticides Chapter Five discusses heavy metals as biodegradation inhibitors of the forest litter in contaminated areas Chapter Six introduces ecologically feasible ways of treating environments contaminated by BTEX a mixture of benzene toluene ethylbenzene and xylene based on efficient microbial metabolism Solubilization and Biodegradation of Hydrophobic Organic Compounds in Soil, 1992 Nonionic surfactants may strongly interact with hydrophobic organic compounds HOCs soil and microorganisms in soil aqueous systems These interactions affect the potential for surfactant facilitated HOC transport in soil and groundwater systems and the feasibility of engineered surfactant cleanup of contaminated sites McCarthy and Wober 1991 At sufficiently high bulk liquid concentrations at 25 C most nonionic surfactants form regular micelles in single phase solutions whereas certain surfactants such as C12E4 may form bilayer lamellae or other types of aggregates in more complex two phase solutions The critical concentrations for the onset of micelle and aggregate formation are termed the critical micelle concentration CMC and the critical aggregation concentration CAC respectively Important changes occur in surfactant sorption surfactant solubilization of HOCs and microbial mineralization of HOCs in the presence of nonionic surfactants at or near these critical surfactant concentrations

Study of Biodegradation and Bioremediation Ewa Kaczorek, Wojciech Smulek, 2022-01-17 Despite many years of efforts to reduce the emission of toxic pollutants into the environment the contamination of air soils and water by heavy metals and organic xenobiotics is still a serious problem This has urged many scientists around the world to undertake research that aims to find effective methods of removing pollutants from the environment Special attention is paid to biological methods which thanks to their numerous advantages meet the expectations of the whole society As part of the Special Issue Study of Biodegradation and Bioremediation in the MDPI journal Processes several valuable articles have been published which together form a picture of the current state of advanced research on the effective fight against environmental pollution These include papers on the biodegradation of petroleum compounds or synthetic dyes by microorganisms or the enzymes they produce In addition the Special Issue includes papers on the bioremediation of dangerous heavy metals such as mercury and copper and the results make a valuable contribution to our current state of knowledge on this topic A separate and valuable part of this collection of publications are review articles devoted to the remediation of antineoplastic drugs as well as the hopes and challenges connected with the application of nanotechnology in

bioremediation We are pleased that so many researchers from different parts of the world have submitted their articles on this topic We are very grateful to them We hope that readers of this collection will find many interesting ideas and relevant information that will lead to new solutions in the bioremediation and biodegradation of emerging environmental contaminants Prof Ewa Kaczorek Dr Wojciech Smulek

Biodegradation and Bioremediation: Pollution Control and Waste Management William Chang, 2019-06-19 Bioremediation is the process used to treat contaminated soil or water by encouraging biodegradation or natural decay mechanisms This is usually done by promoting growth of microorganisms It can also be done by introducing microbial cultures in polluted media or by injecting nutrients to stimulate growth of microbes naturally Bioremediation is a good alternative to traditional and industrial cleaning processes because of its affordability minimal invasiveness and ecological viability Research in this field extends into the core areas of soil remediation therapies lowering radioactivity curing metal contamination groundwater treatment and oil spills remediation In this book the various advancements in bioremediation and biodegradation are glanced at and their applications in pollution control and waste management are looked at in detail This book aims to equip students and experts with the advanced topics and upcoming concepts in this area

Bioemulsifiers and Biodegradation of Environmental Pollutants in Soil, 1996 The effect of enhancement of biodegradation has been shown by application of a number of biosurfactants and bioemulsifiers in vitro Among lipopeptides the highest activity has been found in experiments with open form of lichenysin A Lichenysin A itself and surfactin did not increase the biodestructive activity of microorganisms and moreover in most cases inhibited the PCB degradation A new glucose lipid surfactant MM1 showed in several tests a very high bioavailability enhancement In a number of experiments the alkane induced proteins from Gram negative strains and polysaccharides from bacilli strains appeared to be efficient PCB emulsifiers improving the biodegradation capabilities of several microbial strains It should be noted that generally bioemulsifiers and biosurfactants act very specifically i e depending on strain and amount of these compounds used in experiment Experiments set up with soil samples did not get a clear answer whether bioemulsifiers could critically enhance the rates of biodegradation processes in situ Only with glucose lipid MM1 the more less detectable positive effect i e approx 12% increase of PCB degradation comparing to control has been found

Effects of Biosurfactants on Remediation of Soils Contaminated with Pesticides Özlem Zenginyürek, İzmir Yüksek Teknoloji Enstitüsü, 2002 Pesticides have played a significant role in increasing food production and in view of growing worldwide food demand Nevertheless some of them have been classified as persistent toxic chemicals This has resulted in serious concern about environmental contamination Once a pesticide or toxic chemical find its way in the environment a major part of it comes in contact with soil There are several possible sources of pesticide contamination at manufacturing storage or user sites The most serious examples of pesticide contamination are typically the result of poor production and waste management practices of pesticide manufacturing formulation and application facilities Improper storage handling and also have resulted in pesticide

contamination at these sites and at landfills Today many remediation technologies are used to remove the pesticides from the soil One of the soil treatment methods is enhanced biodegradation Bioremediation of the soil has often proven to be a cheap solution for contaminated soil problem This research was conducted to investigate the effectiveness of biologically produced surfactants biosurfactants on the biodegradation of pesticide contaminated soil and evaluate the potential for biosurfactant enhanced bioavailability of pesticide in soil In order to determine the effectiveness of biosurfactants on pesticides sophorolipid and rhamnolipid type biosurfactants were used These biosurfactants were chosen since they are well characterized and their stimulating effect on the biodegradation of hydrophobic substrates was described in the literature In this study endosulfan and trifluralin were selected as pesticides The study was performed in two stages in laboratory conditions In the first part of the experiment degradation of endosulfan contaminated soil was studied by the presence of sophorolipid and in the second part of the experiment rhamnolipid JBR 425 was used on the removal of trifluralin contaminated soil Throughout the experiment three different concentrations of sophorolipid and rhamnolipid were applied to soil which are 0 98 9 75 and 195 ppm for sophorolipid and 1 6 100 and 1000 ppm for rhamnolipid The effectiveness of synthetic or microbial surfactants on biodegradation of chemicals has been investigated by many researchers However studies about the biosurfactant enhanced soil remediation for the pesticide contaminants are limited Besides that the outcome of surfactant applications has been highly system specific conflicting results reported in the literature Therefore despite the general trends outlined in literature the effect of biosurfactants on the biodegradation of organic compounds is poorly understood Opposed effects are frequently observed This study is the first M Sc thesis study about the use of biosurfactant enhanced bioremediation of pesticides in Turkey The results from first part of our study obtained from sophorolipid were not satisfactory since the degradation patterns for endosulfan were not affected by the presence of sophorolipid According to the second experiment results removal of trifluralin ranged from 24 35 % with the increase in rhamnolipid concentrations Addition of rhamnolipid JBR 425 into the soil was found to increase the degradation rate of trifluralin by 13 % as compared to the control soil column Additional time would probably increase the rate of degradation and bioavailability as a result of providing the adaptation of microorganisms in contaminated soil media and formation of more bioavailable metabolites

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