



# Relation Between Mass Transfer And Biodegradation Of Hydrophobic Pollutants In Soil

**Robert J. Steffan**



## **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* 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 a 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

### **Biodegradation and Detoxification of Environmental Pollutants**

A.M Chakrabarty, 2018-01-18 The basic objective of the book is to define and review the recent advances in our understanding of the biological mechanisms in the biodegradation and detoxification of various environmental pollutants The book encompasses recent studies on the mode of detoxification of such mercurial compounds by various microorganisms

*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      *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** 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* 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      **Consequences of Microbial Interactions with Hydrocarbons, Oils, and Lipids: Biodegradation and Bioremediation** Robert J. Steffan, 2019 In this book international experts discuss the state of the art in the biological degradation of hydrocarbons to meet remedial or disposal goals The work focuses on practical applications

often on globally important scales including the remediation of some of the world's largest crude oil spills. Other related chapters discuss important implications of microbial transformation of hydrocarbons including treatment of high fat processing wastes, impacts of microbial biodegradation activity on industrial processes and the implications of microbial oil degradation in relation to modern oil extraction processes like hydraulic fracturing of shales and extraction of oil sands.

**Biodegradation and Bioremediation** Martin Alexander, 1994. This text considers the microbiological, chemical, environmental, engineering and technological aspects of biodegradation and bioremediation. It explains the scientific principles needed to understand biodegradation in soils and waters.

**Solubilization and Biodegradation of Hydrophobic Organic Compounds in Soil**, 1992. Nonionic surfactants may strongly interact with hydrophobic organic compounds (HOCs) in 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.

Biodegradation and Bioremediation Ajay Singh, Owen P. Ward, 2014-01-15      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 finds 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, sphingolipid 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, with 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 the 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.

## The Enigmatic Realm of **Relation Between Mabtrasfer And Biodegradation Of Hydrophobic Pollutants In Soil**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing short of extraordinary. Within the captivating pages of **Relation Between Mabtrasfer And Biodegradation Of Hydrophobic Pollutants In Soil** a literary masterpiece penned with a renowned author, readers attempt a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting impact on the hearts and minds of people who partake in its reading experience.

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