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Sl. No.	Name of the teacher	Title of the book/ chapters published	Title of the paper	ISBN/ISSN number of the proceeding	Name of the publisher
1	Dr.R.Karthika, Dr.T.Selvankumar	Microbes for a sustainable Environment and Human welfare	Bioremediation of Hydrocarbons using Microbial Species	978-1-53619-120-2	Nova Science Publishers
2	Dr.R.Karthika, Dr.T.Selvankumar	Microbes for a sustainable Environment and Human welfare	Role of Microbial Electrolysis cell in Clean hydrogen Production	978-1-53619-120-2	Nova Science Publishers
3	Dr.R.Karthika	New Technologies in the Oil and Gas Industry	Technologies Involved in the Demulsification of Crude Oil	978-953-51-0825-2	IntechOpen Limited
4	Dr.R.Karthika, Dr.B. Jayanthi, Dr.T.Selvankumar	Recent Advancements in Bioremediation of Metal Contaminants	Microbial Enzymes and Their Mechanisms in the Bioremediation of Pollutants	978-1-7998-4888-2	IGI Global
5	Dr.Yuvarajan, Dr.N.Kannan, Dr.R.Thirumalaisamy Dr.T.Selvankumar	Recent Advancements in Bioremediation of Metal Contaminants	Recent Advancements in Bioremediation of Metal Contaminants	978-1-7998-4888-2	IGI Global

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Microbes for a Sustainable Environment and Human Welfare

Advancements and Opportunities

RONALDO ANUF ALEXANDER
VISHNU SANKAR SIVASANKARAPILLAI
EDITORS

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Chapter 7

BIOREMEDIATION OF HYDROCARBONS USING MICROBIAL SPECIES

R. Karthika, Ph.D., B.Jayanthi, Ph.D. and T. Sevankumar, PhD

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ABSTRACT

Hydrocarbons are the primary energy sources of the world that produces heat when burnt. Quite often, these hydrocarbon fuel sources after burning release unsaturated hydrocarbons that affect the biological component of the environment. Soil contaminated with hydrocarbon disturbs its microflora, thereby reduces the ability of soil to support the plant growth through its nutrient supply. However, direct and indirect exposure of hydrocarbons in animals causes lung cancer from inhalation, stomach cancer from ingesting, skin cancer through skin contact, etc. In birds, exposure to hydrocarbon changes in their hormonal balance, especially in luteinizing protein and may cause death. At the same time, the breakdown of this hydrocarbon into nontoxic simpler compounds is also facilitated by biological enzymes. Hence, the biodegradation of hydrocarbon is a promising technology since it is environmentally safe and economically effective. In the process, it has been identified that indigenous microorganisms capable of hydrocarbon degradation are more effective in addition to biosurfactant activity. These biosurfactants increase the availability of long-chain hydrocarbons to microbes and render them more surface area to microbial enzyme system act upon for hydrocarbon degradation. This is possible because the microorganisms have an enzyme system to degrade and utilize hydrocarbon as a source of carbon and energy.

Keywords: bioremediation, hydrocarbons, bioaccumulation, biosurfactants, microflora, indigenous microorganisms

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Chapter 8

ROLE OF MICROBIAL ELECTROLYSIS CELL IN CLEAN HYDROGEN PRODUCTION

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ABSTRACT

Microbial Electrolysis Cells (MECs) technology is one of the specific and interesting research fields in hydrogen fuel cell production. Hydrogen is a high value, renewable resource of sustainable energy, a comparably missing attribute from other sustainable energy sources such as solar and wind. Hydrogen needs only two electrons from the electrochemical process and protons are available in water and wastewater, while compared to other electrolytic products. MEC has

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One of the major challenges faced by the world today are developing innovative and cost-effective bio-based technologies for sustaining a greener Earth. This book deals with the description of all Advancements and Opportunities in creating a sustainable environment for the welfare of humans with the help of potential Microbes. Microbial activities are unique. Their approaches can reduce stress on the environment, agricultural ecosystem, and soil biodiversity sustainably and ultimately facilitate the transformation of the era towards Greenery. A multidisciplinary picture of microbial sustainability has been captured in this book. Through the ten chapters, the readers will find the description of varied aspects of microbial mediated environmental services and about the modern methodologies, including microbial-based bioremediation, treatment of industrial outpours, biosynthesis of nanoparticles, clean hydrogen production, therapeutic, biofuel production, and pharmaceutical applications. Microorganisms in terms of their physiology and metabolism and their relevance as microbial models contribute to climbing one step in the pillars of sustainability (Environmental /Economic/ Industrial sustainability). The publication of this book would not have been possible without the contribution of the authors. We have felt the need to put their write-ups together to enable the readers to get an overall idea about the aspect. Thus the book will provide sufficient information on the role of Microbes in developing a sustainable environment in the present scenario.

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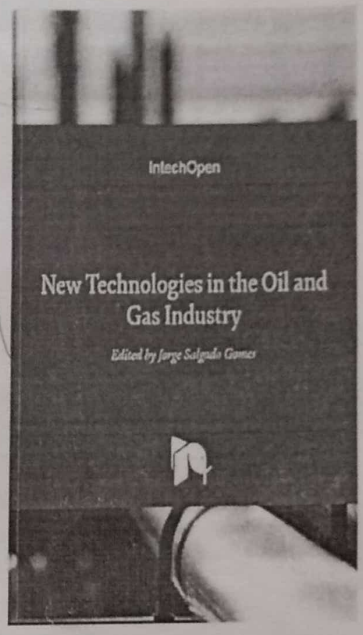
New Technologies in the Oil and Gas Industry

Edited by Jorge Salgado Gomes



Oil and gas are the most important non-renewable sources of energy. Exploring, producing and managing these resources in compliance with HSE standards are challenging tasks. New technologies, workflows and procedures have to be implemented.This book deals with some of these themes and describes some of the advanced technologies related to the oil and gas industry from HSE to field management issue...

Chapter

Technologies Involved in the Demulsification of Crude Oil

Karthika Rajamanickam

Abstract

Due to the use of enhanced recovery processes that necessitate the use of a considerable amount of water, mature petroleum reservoirs generate crude oil with huge amounts of water. The majority of this water gets emulsified into crude oil during production, increasing viscosity and making flow more difficult, resulting in production, transportation, and refining operational challenges that have an influence on corporate productivity. Natural surfactants with a strong potential to create stable emulsions are naturally mixed with crude oils. Because crudes with a high amount of stable emulsion have a lower value, the stable emulsion must be adequately processed to meet industrial requirements. As a result, basic research on natural surfactants that contribute to emulsion stability is examined in order to effectively separate emulsions into oil and water. This would need a review of various emulsification methods as well as the proper formulation for effective demulsification. The petroleum industry recognizes the importance of an efficient demulsification procedure for treating emulsions. Numerous studies on the mechanisms of emulsification and demulsification have been undertaken for decades. To guarantee optimal hydrocarbon output, effective treatment is required. The present paper is to review reported works on the formation of petroleum emulsions, demulsification treatments, and characteristics of fit-for-purpose demulsifiers as well as research trends in emulsion treatment.

Keywords: crude oil, demusification, w/o emulsion, treatment

1. Introduction

Crude oil is a type of petroleum which has not been treated yet. In general, geologists agree that over millions of years crude oil was formed out of remains of small aquatic plants and animals living in ancient seas. Brontosaurus may be cast into bits for good, but petroleum is largely owed to one-cell marine organisms. Geological history of crude oils is the one most important when its characteristics are determined; therefore, crude oils in similar marine deposits can resemble each other on different continents. However, regions characterized by different deposits of the marine environment, pressure and temperature can produce a variety of crude oil, from sweet to greenish, to black, light or heavy, waxy or not.

Water is usually found in crude oil reservoirs or injected into oil production by steam. When rising through the well and passing through the valves and pumps, water and oil can blend into relatively stable dispersions of water droplets in crude oil, usually referred to as emulsions from oil fields [1]. In combination with gas and saline-forming water, crude oil is found. As the reservoir is depleted, the amount

of components with a difference of conductivity and polarity, and the main and main charge-bearing component is asphalt [29].

5. Conclusion

Demulsification by chemical, biological, mechanical, mechanical, thermal, electrical, ultrasonic, and membrane technologies of crude oil emulsions is investigated. It should be noted that each of these techniques depends on its operational parameters and interplay. In addition, the use of synergistic effects by combining one or more of the techniques discussed in the present review could achieve a more effective demulsification process. The efficiency of separation and the rate of demulsification are the main factors of interest in most demulsification techniques. During processing and transport, the occurrence of crude oil emulsions has proven problematic by increasing the cost of production and the use of chemicals that affect the environment. These facts in the petroleum sector have attracted the interest of scientists who are seeking to identify scientific ways to monitor and prevent the formation of raw oil emulsion. A positive demulsification technique therefore is not only robust and applicable to various types of emulsions, it must also be respectful of the environment with minimum environmental impacts, respect for environmental standards and regulations and at lower cost. Recent literature shows that a correct understanding of the properties and types of crude oil involved in the formation or demulsification of emulsions (O/W or W/O) will help to formulate appropriate methods for demulsifying emulsions. It is apparent from the overview of recent studies that different techniques for demulsifying raw oil emulsions vary in efficiency and effectiveness. But the effect of viscosity on the demulsification process was not taken into account by most researchers. Furthermore, most of the crude oil demulsification scenarios are based on laboratory experiments. In field cases or on-site crude oil demulsification cases, there is scarce literature. Therefore, research should be aimed at proposing, at site with real operating parameters used in crude oil treatment plants in small scale or on the pilot scale,

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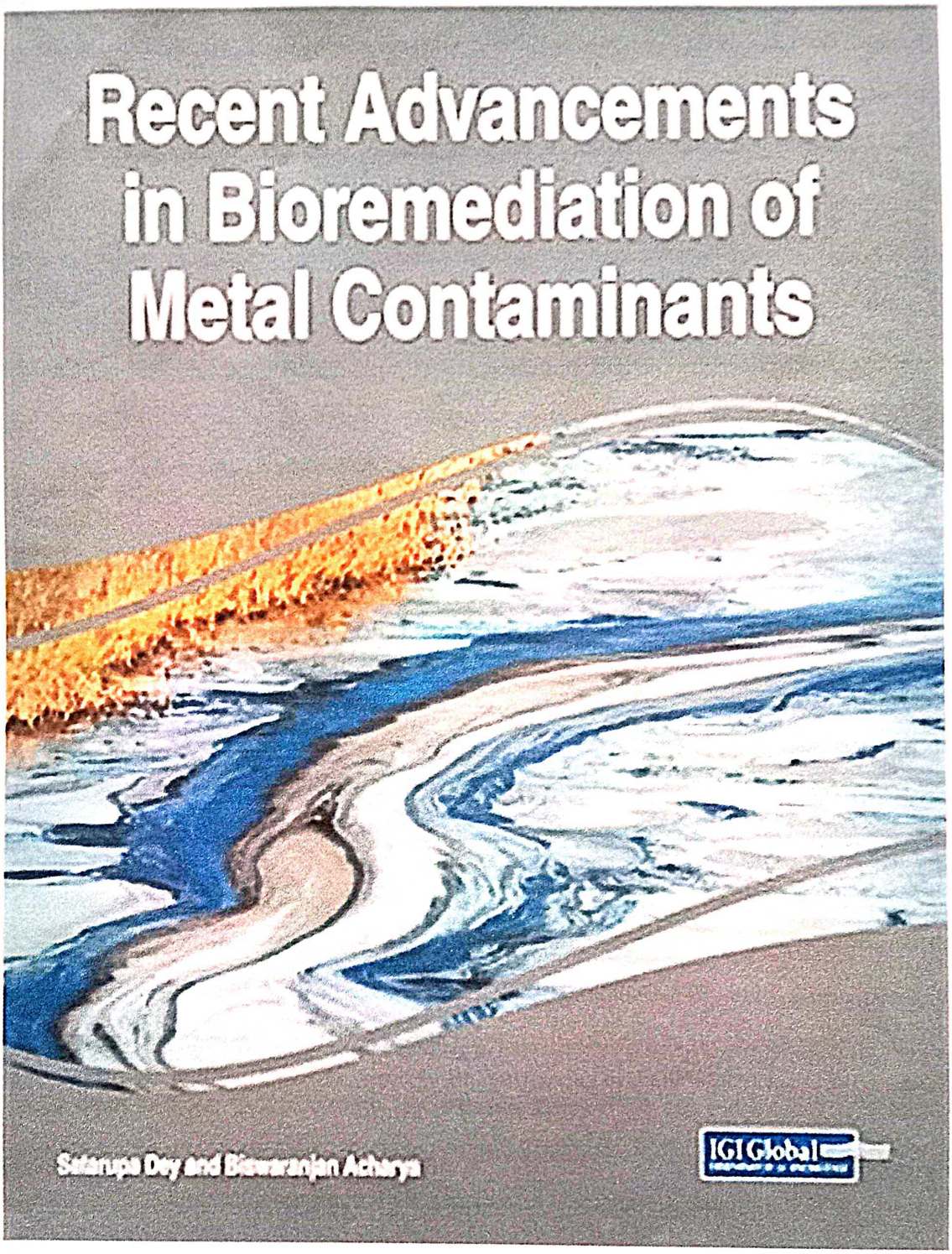

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Chapter 3
Microbial Enzymes and Their Mechanisms in the Bioremediation of Pollutants

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ABSTRACT

Bioremediation is the process, with the help of microbes or their enzymes, to remove the pollutants present in the environment and change them into non-toxic compounds. Microbial enzymes have a wide range of metabolic activities and are involved in the transformation of pollutants. Enzymes like oxidoreductase, hydrolases, monooxygenase, dioxygenase, methyltransferases, and lipases are involved in the degradation process. Oxidoreductase catalyzes the transfer of electron and proton from the reduced organic substrate to another chemical compound from donor to acceptor. Monooxygenase and dioxygenases are the transferring oxygen from molecular oxygen (O_2) utilizing FAD/NADH/NADPH as a co-substrate in this process. Lyases catalyze the cleavage of the bonds by elimination, leaving double bonds. Peroxidases catalyze the oxidation of lignin and other phenolic compounds at the expense of hydrogen peroxide (H_2O_2) in the presence of a mediator. Lipases also involve catalyzing the hydrolysis of triacylglycerols to glycerol and free fatty acids.

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Chapter 15
Recent Advancements in Bioremediation of Metal Contaminants

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ABSTRACT

Biofilms are an accumulation of single or various populations of microorganisms that are present on the surfaces through membrane-bound substances due to the gene expression, which differs from free-floating expression and leads to expressed genes regulating biofilm formation and development. In this regard, recent advances in microbial-based heavy metals have propelled bioremediation as a prospective alternative to conventional techniques. Adsorption and biodegradation of organic contaminants and the immobilization, mobilization, and/or transformation of metals are the main remediation processes that can be mediated by the action of several microorganisms surviving in hostile environments with high concentrations of pollutants. The chapter discussed the formation and regulation of biofilms to degrade the metal contaminant, the importance of gene transfer, and applications of biofilm-mediated bioremediation processes.

DOI: 10.4018/978-1-7998-4888-2.ch015

Recent Advancements in Bioremediation of Metal Contaminants

Pollution and ways to combat it have become topics of great concern for researchers. One of the most important dimensions of this global crisis is wastewater, which can often become contaminated with heavy metals such as lead, mercury, and arsenic, which are released from different industrial wastes, mines, and agricultural runoff. Bioremediation of such heavy metals has been extensively studied using different groups of bacteria, fungi, and algae, and has been considered as a safer, eco-friendly, and cost-effective option for mitigation of contaminated wasteland. The toxicity of water impacts all of society, and so it is of great importance that we understand the better, cleaner, and more efficient ways of treating water.

Recent Advancements in Bioremediation of Metal Contaminants is a pivotal reference source that explores bioremediation of pollutants from industrial wastes and examines the role of diverse forms of microbes in bioremediation of wastewater. Covering a broad range of topics including microorganism tolerance, phytoremediation, and fungi, the role of different extremophiles and biofilms in bioremediation are also discussed. This book is ideally designed for environmentalists, engineers, policymakers, academicians, researchers, and students in the fields of microbiology, toxicology, environmental chemistry, and soil and water science.

Topics Covered

- Biofilms
- Chromate Reductase Enzyme
- Extremophiles
- Fungi
- Hexavalent Chromium Bioremediation
- Industrial Waste
- Microbial Enzymes
- Microorganism Tolerance
- Physical Remediation Practices
- Phytoremediation
- Pollution

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