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OMAN  DAILY

Observer





A decade of achievements

Microbial Enhanced Oil Recovery (MEOR) is one of the major themes at the Oil and Gas Research Center. Biotechnology can play a quite beneficial role for petroleum industry, in an environment-friendly manner. Petroleum biotechnology applications consists of: MEOR, environmental bioremediation (such as oil-spill bioremediation), upgrading of heavy crude oil, mitigation of souring of oil-fields by sulfate reducing bacteria (SRB), to list a few applications. Petroleum Biotechnology research group at SQU is actively involved in providing solutions for petroleum industry in Oman, in an efficient, environmentally friendly manner by developing in-house novel technologies.

MEOR is one of the major research fields, which is considered as one of the environment friendly, economical and quite efficient EOR methods for extending the life of production wells in a declining oil reservoir. The focus of this study was on biosurfactant-biopolymer based ex-situ MEOR processes, which are the types of metabolites produced by microorganisms that can be useful for oil recovery.

The project was initiated in 2007 and was divided in several phases, mainly supported by the His Majesty Research fund, SQU, and Petroleum Development of Oman (PDO)

Oil and Gas Research Center at SQU makes strides in Microbial Enhanced Oil Recovery

grants. The possibility of MEOR technology in Oman was investigated in Phase I. In Phase II, the research was focused on biosurfactant production and application in enhancing oil recovery.

In Phase I and II, different types of biosurfactant producing bacterial strains were isolated from Oman oil fields and identified at SQU. Biosurfactant production media were optimised and environmental conditions were standardised. Further analysis of the biosurfactant showed the economic aspects for field applications. Four types of biosurfactants showed better oil recovery (10-22 per cent) of light/heavy crude oil even after 20X dilutions. When mixed with chemical surfactant, it showed even better oil recovery (28 per cent additional recovery) as compared to when

either used individually.

In phase III, two types of biopolymers produced by fungal strains, isolated from Oman were investigated. The biopolymer showed 9.4 per cent additional oil recovery over residual oil saturation (Sor), in core-flood experiments. The chemical structural and physical characteristics of both biopolymers were determined and found to be stable for over 6 months at different salinity, pH and temperature.

A combination of both biosurfactants and biopolymers were tested to recover crude oil in a process known Alkaline: Biosurfactant: Biopolymer (ABsBp). About 10-15 per cent extra oil recovery using either biosurfactant alone or in combination with alkaline, or ABsBp combinations. However, using biopolymer alone gave better oil recovery (>22 per cent) as compared to the other different combinations. Based on those experimental results it was concluded that we successfully managed to reach the target of producing biosurfactants and biopolymers, and tested its EOR potential under laboratory conditions. The biosurfactant-biopolymer based MEOR technique is a viable and quite promising environmental friendly technique, and in Phase IV (proposed) it should be carried-forward for further applications. The MEOR team is seeking the support for Phase IV.

In addition of the above research, the MEOR team has established additional technologies with high potential to field applications.

THE RESEARCH TEAM

Dr Ali al Bimani: He is the 5th Vice Chancellor of SQU since February 12, 2008. He is an associate professor in the Department of Petroleum & Chemical Engineering in the College of Engineering, and served as the Head of the Department.



Prof Abdulkader Elshafie: He is a full professor in the Department of Biology, College of Science, SQU. His current research interests are mainly in the field of MEOR includes biosurfactants, biopolymers, biomass, bioremediation and microbial nanotechnology.



Wafa al Alawi: She is currently a member in the Central and Applied Research Unit (CAARU), where she is in-charge for the following instruments: Genetic Analyzer, Flow cytometer, GC-MS and GC-FID.



Prof Saif al Bahry: He is a full professor in the Department of Biology, College of Science, Sultan Qaboos University. He was a Head of the Department and later became a Dean of the College. Currently, he is a Director of Oil and Gas Research Center, SQU.



Dr Sanket Joshi: He is a member of Central Analytical and Applied Research Unit, College of Science. He is working as an application specialist, Oil & Gas Science at SQU.



Asmaa al Bahri: She is a Central and Applied Research Unit (CAARU) member, College of Science, SQU. In CAARU, she is in charge of the following instruments: MALDI Biotyper, Flow cytometer, high performance thin layer chromatography (HPTLC) and X-Ray diffraction (XRD) sample preparations. She is also responsible for CAARU-store.



Dr Yahya al Wahaibi: He is an associate professor of petroleum engineering and the Dean of Research. Prior to this he served as Director of Oil and Gas Research Center and Head of the Petroleum and Chemical Engineering Department.



Ratiba al Maaini: She graduated from Department of Biology, College of Science, SQU with BSc in Biotechnology. In 2010, she was employed in the Department of Biology, College of Science. Currently she works at CAARU as molecular biology specialist.



Houda al Farsi: She is a Chemical Engineer graduated from SQU in 2012. Currently working as an engineer in Oil and Gas Research Center.

