World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:18, No:10, 2024

Corrosive Bacteria Attached to Carbon Steel Used in Oil and Gas Company

Authors : Hadjer Didouh, Mohammed Hadj Melliani, Izzeddine Sameut Bouhaik

Abstract : Microbiologically influenced corrosion (MIC) is a major cause of pipeline failure in the oil and gas industry, particularly affecting carbon steel, which is widely used for its cost-effectiveness and mechanical properties. This study investigates the adhesion of sulfate-reducing bacteria (SRB) and other corrosive microbial species on API 5L X52 carbon steel in crude oil and injection water environments. Experimental results showed that after 72 hours of exposure, biofilm formed extensively, leading to significant corrosion rates. Weight loss measurements indicated a corrosion rate of 0.39 mm/year, with localized pitting observed at depths reaching 120 µm. Electrochemical impedance spectroscopy (EIS) revealed a drastic decrease in charge transfer resistance, from 1200 Ω/cm² for sterile samples to 240 Ω/cm² in the presence of SRB biofilm. Scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS) analyses confirmed the presence of iron sulfide deposits, indicating active bacterial colonization and biofilm-induced pitting corrosion. This study highlights the severe impact of MIC on pipeline infrastructure, emphasizing the need for efficient microbial control strategies. Furthermore, the results provide a framework for the development of enhanced protective coatings and environmentally friendly biocides to mitigate the economic and environmental risks associated with MIC in oilfield operations in Algeria.

Keywords : MIC, corrosion, bacteria, API 5L X52
Conference Title : ICCEPS 2024 : International Conference on Chemical Engineering and Physical Sciences
Conference Location : Istanbul, Türkiye
Conference Dates : October 17-18, 2024