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Adhesion of Biofilm to Surfaces Employed in Pipelines for Transporting Crude Oil

Authors : Hadjer Didouh, Izzaddine Sameut Bouhaik, Mohammed Hadj Meliani

Abstract : This research delves into the intricate dynamics of biofilm adhesion on surfaces, particularly focusing on the widely employed X52 surface in oil and gas industry pipelines. Biofilms, characterized by microorganisms within a self-produced matrix, pose significant challenges due to their detrimental impact on surfaces. Our study integrates advanced molecular techniques and cutting-edge microscopy, such as scanning electron microscopy (SEM), to identify microbial communities and visually assess biofilm adhesion. Simultaneously, we concentrate on the X52 surface, utilizing impedance spectroscopy and potentiodynamic polarization to gather electrochemical responses under various conditions. In conjunction with the broader investigation, we propose a novel approach to mitigate biofilm-induced corrosion challenges. This involves environmentally friendly inhibitors derived from plants, offering a sustainable alternative to conventional chemical treatments. Our inquiry screens and selects inhibitors based on their efficacy in hindering biofilm formation and reducing corrosion rates on the X52 surface. This study contributes valuable insights into the interplay between electrochemical processes and biofilm attachment on the X52 surface. Furthermore, the outcomes of this research have broader implications for the oil and gas industry, where biofilm-related corrosion is a persistent concern. The exploration of eco-friendly inhibitors not only holds promise for corrosion control but also aligns with environmental considerations and sustainability goals. The comprehensive nature of this research aims to enhance our understanding of biofilm dynamics, provide effective strategies for corrosion mitigation, and contribute to sustainable practices in pipeline management within the oil and gas sector.

Keywords : bio-corrosion, biofilm, attachment, X52, metal/bacteria interface
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