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Exploring Attachment Mechanisms of Sulfate-Reducing Bacteria Biofilm to X52 Carbon Steel and Effective Mitigation Through Moringa Oleifera Extract

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Abstract : Corrosion is a serious problem in industrial installations or metallic transport pipes. Corrosion is an interfacial process controlled by several parameters. The presence of microorganisms affects the kinetics of corrosion. This type of corrosion is often referred as bio-corrosion or corrosion influenced by microorganisms (MIC). The action of a microorganism or a bacterium is carried out by the formation of biofilm following its attachment to the metal surface. The formation of biofilm isolates the metal surface from its environment and allows the bacteria to control the parameters of the metal/bacteria interface. Biofilm formation by sulfate-reducing bacteria (SRB) X52 steel, poses substantial challenges in oil and gas industry SONATRACH of Algeria. This research delves into the complex attachment mechanisms employed by SRB biofilm on X52 carbon steel and investigates strategies for effective mitigation using biocides. The exploration commences by elucidating the underlying mechanisms facilitating SRB biofilm adhesion to X52 carbon steel, considering factors such as surface morphology, electrostatic interactions, and microbial extracellular substances. Advanced microscopy and spectroscopic techniques provide a support to the attachment processes, laying the foundation for targeted mitigation strategies. The use of 100 ppm of Moringa Oleifera extract biocide as a promising approach to control and prevent SRB biofilm formation on X52 carbon steel surfaces. Green extract undergo evaluation for their effectiveness in disrupting biofilm development while ensuring the integrity of the steel substrate. Systematic analysis is conducted on the biocide's impact on the biofilm's structural integrity, microbial viability, and overall attachment strength. This two-pronged investigation aims to deepen our comprehension of SRB biofilm dynamics and contribute to the development of effective strategies for mitigating its impact on X52 carbon steel.

Keywords : bio-corrosion, biofilm, attachement, metal/bacteria interface
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