World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:17, No:05, 2023

Quorum-Sensing Driven Inhibitors for Mitigating Microbial Influenced Corrosion

Authors : Asma Lamin, Anna H. Kaksonen, Ivan Cole, Paul White, Xiao-Bo Chen

Abstract : Microbiologically influenced corrosion (MIC) is a process in which microorganisms initiate, facilitate, or accelerate the electrochemical corrosion reactions of metallic components. Several reports documented that MIC accounts for about 20 to 40 % of the total cost of corrosion. Biofilm formation due to the presence of microorganisms on the surface of metal components is known to play a vital role in MIC, which can lead to severe consequences in various environmental and industrial settings. Quorum sensing (QS) system plays a major role in regulating biofilm formation and control the expression of some microbial enzymes. QS is a communication mechanism between microorganisms that involves the regulation of gene expression as a response to the microbial cell density within an environment. This process is employed by both Gram-positive and Gram-negative bacteria to regulate different physiological functions. QS involves production, detection, and responses to signalling chemicals, known as auto-inducers. QS controls specific processes important for the microbial community, such as biofilm formation, virulence factor expression, production of secondary metabolites and stress adaptation mechanisms. The use of QS inhibitors (QSIs) has been proposed as a possible solution to biofilm related challenges in many different applications. Although QSIs have demonstrated some strength in tackling biofouling, QSI-based strategies to control microbially influenced corrosion have not been thoroughly investigated. As such, our research aims to target the QS mechanisms as a strategy for mitigating MIC on metal surfaces in engineered systems.

Keywords : quorum sensing, quorum quenching, biofilm, biocorrosion
Conference Title : ICCDM 2023 : International Conference on Corrosion and Degradation of Materials
Conference Location : Montreal, Canada
Conference Dates : May 15-16, 2023