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Corrosion Inhibition of AA2024 Alloy with Graphene Oxide Derivative: Electrochemical and Surface Analysis

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Abstract : The goal of this research is to investigate the corrosion inhibition potential of functionalized graphene oxide (GO) with oxime derivative on AA2024-T3 surface in synthetic seawater. The utilization of functionalized graphene oxide is creating a category of corrosion inhibitors known as organically modified nanomaterials. In our work, the functionalization of GO by chalcone oxime enables graphene oxide to have enhanced water solubility and a good corrosion mitigation capacity. Fourier-transform infrared (FT-IR) spectroscopy was utilized to evaluate the main functional groups of the inhibitor. Electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization curves (PDP) showed that the inhibitor acts as a mixed-type inhibitor. The inhibitory efficiency (IE) improved as the concentration increased to a value of 96% after one hour of exposure to a medium containing 60 mg/L ppm of the inhibitor. According to thermodynamic calculations, the adsorption of the inhibitor on the AA2024-T3 surface in 3% NaCl followed the Langmuir isotherm. The formation of a barrier layer was further confirmed by surface analysis. The protective film prevented the alloy dissolution and limited the accessibility of attacking ions, as evinced by solution analysis techniques.

Keywords : AA2024-T3, NaCl, electrochemical methods, FT-IR, SEM/AFM, DFT, MC simulation
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