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SODIUM ALGINATE AS CORROSION INHIBITOR FOR STEEL IN NEAR NEUTRAL ENVIRONMENT

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ABSTRACT

Corrosion is a critical issue in many industries which is particularly affecting steel structures exposed to near neutral environments. This study investigates the potential of biosurfactants which particularly sodium alginate as a corrosion inhibitor for steel in near neutral environments. The challenge in maintaining the SA adsorptivity on the metal surface in near neutral medium induced the investigation on using a good concentration. The focus of this study is to evaluate the corrosion inhibition efficiency of mild steel in 0.6 M and 2 M of NaCl solutions with varying concentrations of SA which is 100 ppm to 500 ppm. The study includes corrosion inhibition performance was assessed using the immersion test (weight loss method) for 3 hours. The functional group identification via Fourier Transform Infrared Spectroscopy (FTIR) and surface morphology analysis using optical microscopy are also has been investigated. The results demonstrate that SA forms a protective layer on the steel surface and reducing corrosion rates significantly through adsorption of functional groups (-OH and -COO). It also revealed that corrosion rate (CR) without SA was 4.0175 mm/yr in 2 M NaCl and 1.016 mm/yr in 0.6 M NaCl which is both categorized as poor corrosion. The inhibition efficiency (%IE) with the addition of SA are reached up to 88.5% at 500 ppm in 2 M NaCl and 95.45% at 500 ppm in 0.6 M NaCl. Both results indicate a significant decrease in CR and effective surface protection. The optical microscope results reveal that as the concentration of SA increases, the surface roughness decreases with smoother surfaces observed at higher SA concentrations particularly at 0.5 g/L of SA. In terms of corrosion, the types of corrosion range from severe uniform and localized corrosion at higher NaCl concentrations to negligible corrosion at smoother surfaces with lower SA concentrations. The findings suggest that sodium alginate is an effective and eco-friendly alternative to inorganic corrosion inhibitors particularly in marine and industrial applications.

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