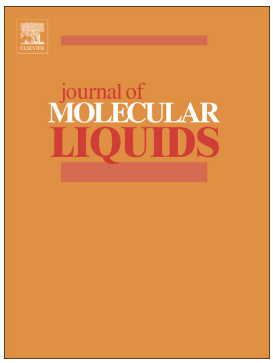

Comprehensive adsorption characteristics of a newly synthesized and sustainable anti-corrosion catalyst on mild steel surface exposed to a highly corrosive electrolytic solution

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Comprehensive adsorption characteristics of a newly synthesized and sustainable anti-corrosion catalyst on mild steel surface exposed to a highly corrosive electrolytic solution

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Abstract

A new environmental-friendly imine compound viz. 4-(2-amino-3-methylphenyl)imino) methyl)benzaldehyde (AMIB) was sustainably synthesized at room temperature utilizing green solvents, reagents and assessed as an anti-corrosion catalyst for the commercially important mild steel (MS) alloy subjected to highly aggressive 0.5 M sulphuric acid (H_2SO_4) solution by several electrochemical methods (polarization techniques and Electrochemical impedance spectroscopy) allied with various surface characterization techniques such as attenuated total reflectance (ATR), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS) and atomic force microscopy (AFM). Furthermore, the experimental results were theoretically supplemented by density functional theory (DFT) treatment. AMIB delivered significant corrosion protection even at very low concentrations and at various temperatures. The findings from electrochemical and surface characterization techniques were also supplemented by temperature kinetics study. The adsorption mechanism of AMIB molecules on metal substrate follow Langmuir's adsorption isotherm. The overall corrosion mitigation mechanism assessed from various techniques and methods was found to be comprehensive in nature. The present study may pave the way for combating corrosion with this cost effective and eco-friendly strategy.

Keywords: Corrosion inhibition, Density functional theory, Polarization, Adsorption, Surface characterization, Atomic force microscopy.