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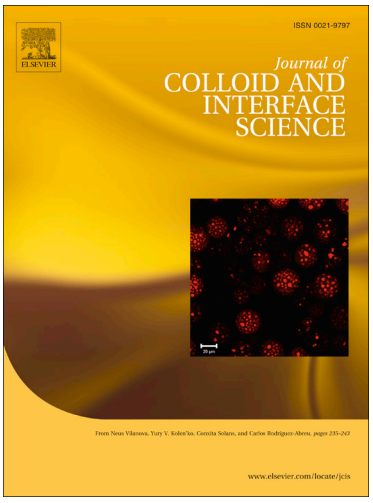

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Improvement in the Corrosion Resistance of Carbon Steel in Acidic Condition Using Naphthalen-2-ylnaphthalene-2-carboxammide Inhibitor

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Abstract

In the present investigation, the anti corrosive performance of synthesized Naphthalen-2-yl Naphthalene-2-Carboxammide (NNC) in 1 N HCl solution as corrosion inhibitor on carbon steel was studied at room temperature. Potentiodynamic polarization study revealed the mixed behavior of the inhibitor NNC along with inhibition efficiency. The inhibition efficiency of NNC increases with increasing inhibitor concentration. The electrochemical noise analysis (ENA) and electrochemical impedance spectroscopy (EIS) studies have showed that noise resistance (R_n) and charge transfer resistance (R_{ct}) values were increased with addition of inhibitor concentrations. The synthesized and adsorbed bonds of inhibitor with the metal atom were characterized by ATR-FTIR spectroscopy. The adsorption isotherm explored that the adsorption of NNC obeyed Langmuir adsorption to bond with metal surface at carbon steel/ HCl solution interface. The thermodynamic properties were calculated to discuss the adsorption mechanism of corrosion inhibition. Atomic force microscope (AFM) study showed a less corroded and roughness surface morphology, which is due to the formation of protective film layer on the surface. Quantum chemical parameters were calculated and correlated with respect to inhibitive performance of NNC. The study revealed that the adsorption nature of inhibitor has both physisorption and chemisorption phenomena.

Keywords: Carbon steel, EIS, ENA, Adsorption isotherm, Quantum chemical analysis, AFM.