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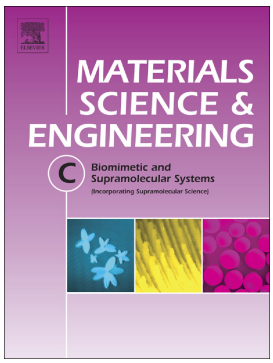

Evaluation of the corrosion inhibiting efficacy of a newly synthesized nitrone against St37 steel corrosion in acidic medium: Experimental and theoretical approaches

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Evaluation of the corrosion inhibiting efficacy of a newly synthesized nitrone against St37 steel corrosion in acidic medium: Experimental and theoretical approaches

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Abstract

A novel amphiphilic nitrone, N-phenyl-1-(4-((11-(pyridin-1-ium-1yl) undecanoyl) oxy)phenyl)methanimine oxide bromide (NP-1-4-11-PUOPMOB) has been synthesized from a fatty acid derivative as a starting material. Structural characterization of the new compound has been realized by spectroscopic techniques (FTIR, ^{1}H NMR, and ^{13}C NMR). The corrosion inhibition effect of the compound for St37 steel corrosion in 1 M HCl medium has been investigated using experimental (weight loss, electrochemical impedance spectroscopy, potentiodynamic polarization, dynamic electrochemical impedance spectroscopy) and theoretical approaches complemented by surface morphological examination using energy dispersive X-ray spectroscopy, scanning electron microscope, and atomic force spectroscopy. Results from both chemical and electrochemical techniques reveal that the presence of the nitrone in the acid solution impedes St37 steel corrosion. The inhibition efficiency obtained at 125 ppm and 150 ppm concentrations for all methods is found to be over 90%. NP-1-4-11-PUOPMOB behaves as a mixed type corrosion inhibitor according to the potentiodynamic polarization studies. The adsorption of NP-1-4-11-PUOPMOB molecules onto the metal surface follows Langmuir adsorption isotherm and the calculated K_{ads} (equilibrium constant of