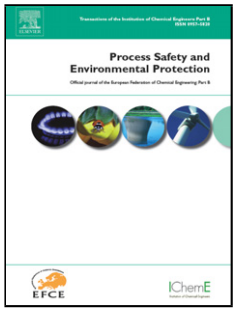

Title: Experimental and theoretical study on corrosion inhibition performance of environmentally benign non-ionic surfactants for mild steel in 3.5% NaCl solution

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Experimental and theoretical study on corrosion inhibition performance of environmentally benign non-ionic surfactants for mild steel in 3.5% NaCl solution

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A B S T R A C T

Two 'natural' non-ionic surfactants namely, *N*-alkyl-*N*'-glucosylethylenediamine with formula $C_nH_{2n+1}NH(CH_2)_2NHCO(CHOH)_4CH_2OH$ (n = 10, 12), designated as Glu (n) were prepared and identified by FT-IR and ^{1}H-NMR. Synthesized compounds were investigated for mild steel corrosion in 3.5% NaCl medium using electrochemical measurement, gravimetric measurement and surface characterization techniques like fourier transform infra-red spectroscopy (FT-IR), atomic force microscopy (AFM) and scanning electron microscopy (SEM)/energy dispersive spectroscopy (EDAX). The compounds act as predominantly anodic corrosion inhibitors and their inhibition efficiencies are observed to increase with increasing inhibitors concentrations, chain length and temperature. The adsorption of Glu (n) inhibitor on the mild steel surface in 3.5% NaCl solution followed the Langmuir adsorption isotherm. The AFM micrographs showed a reduction of surface roughness in the presence of the investigated inhibitor. SEM micrographs confirmed the existence of an adsorbed protective film on the mild steel surface. EDAX was carried out to characterize the chemical composition of the inhibitive film formed on the steel surface. Density functional theory (DFT) calculations are made to correlate the efficiencies of Glu (n) with their intrinsic molecular parameters.

Keywords: Mild steel; EIS; Polarization; AFM; Anodic protection; Neutral inhibition

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