

Corrosion Inhibition of Carbon Steel in 0.5 M HCl Solution Using Cationic Surfactants

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Abstract:

The corrosion inhibition effect of cationic surfactants, namely: cetyl trimethyl ammonium bromide: CTAB and dodecyl trimethyl ammonium chloride: DTAC, have been used as corrosion inhibitors for C-steel in 0.5 M HCl. The inhibition efficiencies of the tested surfactants were depended on the hydrophobic chain length and the used doses of the surfactants. The results showed that the order of inhibition efficiency is CTAB > DTAC. Polarization measurements showed these surfactants are acting as mixed inhibitors for both anodic and cathodic reactions. Adsorption of these surfactants was found to follow the Langmuir's adsorption isotherm. Mixed physical and chemical adsorption mechanism is proposed. The density function theory (DFT) was used to study the structural properties of the surfactants. Inhibition efficiency values obtained from weight loss, potentiodynamic polarization, electrochemical impedance spectroscopy (IES) and electrochemical frequency modulation (EFM) are consistent.

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