

Study of the inhibiting effect of a quaternary ammonium surfactants mixture synthesized from petroleum fraction (reformate) against the carbon steel corrosion in HCl 1 M

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Abstract: Quaternary ammonium cationic surfactants were synthesized from reformate, a liquid mixture of hydrocarbons (aromatics, naphthenes and paraffins), via chloromethylation/quaternization sequences. The petroleum surfactants thus obtained were evaluated as corrosion inhibitors for carbon steel in 1 M HCl, by gravimetry, potentiodynamic polarization and electrochemical impedance spectroscopy. The corrosion inhibiting efficiency was assessed as functions of surfactant concentration. The results showed that the inhibiting efficiency increased with surfactant concentration; its optimal value of 70 % was for a surfactant concentration of 320 mg/L at 25 °C. Potentiodynamic polarization measurements showed that the mixture acts as a mixed type inhibitor. The corrosion inhibiting mechanism is thought to proceed via an adsorption of the surfactant molecules on the steel surface, generating a film and hindering the active sites. Our experimental adsorption data were found to obey the Langmuir adsorption isotherm. SEM images of the treated specimens, revealing the likely formation of a protective film, demonstrated the inhibiting capacity of the petroleum quaternary ammonium surfactants against the carbon steel corrosion.

Keywords : Corrosion inhibition Carbon steel Petroleum quaternary ammonium Cationic surfactants mixture