

Studies on the inhibitive effect of some synthesized surfactants from petroleum oils on the acid corrosion of carbon steel

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Abstract

Four types of commercial petroleum fractions: total gasoline (TG), heavy solvent (HS), kerosene (KE) and gasoil (GO) were obtained by distillation method from Algerian crude oil. They were used as reactant in sulfonation reaction. Oleum and calcium hydroxide $\text{Ca}(\text{OH})_2$ were used as sulfonating agent and neutralizer, respectively. The major components that can be sulfonated in petroleum fractions are aromatic hydrocarbons. The resulting anionic surfactants are: total gasoline sulfonate (TGS), heavy solvent sulfonate (HSS), kerosene sulfonate (KES) and gasoil sulfonate (GOS). Their inhibiting effect on carbon steel corrosion in hydrochloric solution (1 M HCl) is studied, using weight loss measurements, electrochemical polarization and electrochemical impedance spectroscopy (EIS) methods. The choice of these surfactants as corrosion inhibitors is based on the following reasons: these molecules can be synthesised easily, they contain sulfonate groups as active centres, and they have high solubility in acidic media and are not expensive. The results obtained from all the methods employed are in good agreement. The inhibition efficiency for the inhibitors decreases in the order: GOS > KES > SLS > ETS. It was found that these surfactants act predominately as cathodic inhibitors. The inhibition efficiency increases with rising of the inhibitor concentration. Effect of temperature on the corrosion of steel in 1M HCl with and without inhibitors has been studied in the temperature range 298-318 K. The inhibitors are adsorbed on the surface according to the Langmuir adsorption isotherm. Some thermodynamic data have also been calculated.