

Investigation of Some Nonionic Surfactants as Corrosion Inhibitors for Carbon Steel in Sulfuric Acid Medium

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Four nonionic surfactants have been investigated as corrosion inhibitors for carbon steel type OL37 in sulfuric acid solution by electrochemical methods, FT-IR spectroscopy and metallurgical microscopy techniques. The influence of inhibitor concentration on the corrosion rate, inhibition effectiveness and surface coverage was analyzed. Results indicate that these surfactants accomplish a great inhibiting action on carbon steel corrosion and acts that a mixed-type inhibitor. The inhibition effect of noionic surfactants may be due to either the adsorption of inhibitor molecules building a protective layer or the constitution of an insoluble complex of the inhibitor adsorption obeys the Langmuir model. The negative value of thermodynamic parameter like Gibbs free energy of adsorption ΔG_{ads}° indicates the spontaneity of adsorption process. Moreover, characterization utilizing FT-IR confirms the adsorption of inhibitors and the constitution of corrosion products on the carbon steel surface. EIS and potentiodynamic polarization results demonstrate its corrosion protection capacity.

Keywords: organic inhibitor, nonionic surfactant, carbon steel, potentiodynamic polarization, electrochemical impedance spectroscopy and FT-IR.

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