

Electrochemical, thermodynamic and quantum chemical studies of thoron compound as new corrosion inhibitor for C-steel in Acidic Media

Abstract

The corrosion rates in the presence of thoron as a steel corrosion inhibitor in 1M HCl and 1M H₂SO₄, were measured by the weight loss method, potentiodynamic polarization measurements and quantum chemical calculations. The weight loss method was studied in different times (1-4 hr) and in the range of temperatures from 298 to 318 K. Results obtained revealed that thoron performed excellently as a corrosion inhibitor for C-steel in these acids media and its efficiency attains to 91.99% at 1x10⁻³ M at 298 K, and by potentiodynamic polarization measurements its efficiency attains to 93.74% in the same conditions. The Langmuir adsorption isotherm was tested for their fit to the experimental data. The apparent activation energies, enthalpies and entropies of the dissolution process and the free energies and equilibrium constants for the adsorption process were determined and discussed. All the computed quantum chemical parameters are found to correlate well with experimental inhibition efficiencies of inhibitor.