Evaluation of Inhibition Efficiency of 1-(2-pyridylazo) -2-naphthol and Bromide Ion on the Corrosion of Mild Steel in Sulphuric Acid Solution

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The corrosion inhibition of mild steel in 0.5 mol/L sulphuric acid solution by bromide ion in the absence and presence of 1-(2-pyridylazo)-2-naphthol (PAN) has been studied by potentiodynamic polarization, electrochemical impedance spectroscopy and weight loss. Potentiodynamic polarization researches show that single bromide ion or the complex of bromide ion and PAN acts as a mixed-type inhibitor and do not change the mechanism of either hydrogen evolution reaction or metal dissolution. The charge transfer process controls the corrosion reaction. The studies reveal that the complex of bromide ion and PAN shows a quite well inhibition and their synergistic effect was observed and discussed. The adsorption of the inhibitors on the steel surface obeys the Langmuir adsorption isotherm. The thermodynamic parameters such as adsorptive equilibrium constant (K_{ads}), adsorption free energy (ΔG_{ads}^0), adsorption heat (ΔH_{ads}^0) and adsorption entropy (ΔS_{ads}^0), kinetic data such as apparent activation energy (E_a) and pre-exponential factor (A) were calculated and discussed. The values of ΔG_{ads}^0 indicate that the adsorption of the inhibitors on the mild steel surface in 0.5 mol/L H_2SO_4 solution is a mixed physical and chemical adsorption mechanism and the chemical adsorption is the dominant in the presence of bromide ion and PAN together.

Keywords: Corrosion inhibition, Mild steel, Electrochemical techniques, Adsorption, Thermodynamic properties, Synergistic effect, Sulphuric acid.

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