Corrosion Inhibition Effect of N-benzyl-N-(2,4-diamino) butyl imidazoline ammonium chloride on mild steel in 1.0 M HCl solution

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Novel imidazoline derivative, named N-benzyl-N-(2,4-diamino) butyl imidazoline ammonium chloride (BIA) based on soybean oil was synthesized and its structure was characterized by FTIR. The inhibition behavior of BIA inhibitor for mild steel in 1.0 M HCl was investigated using gravimetric measurements, potentiodynamic polarization, electrochemical impedance spectroscopy (EIS), scanning electron microscopy (SEM) and energy dispersive spectrum. Both the gravimetric results and SEM studies revealed that BIA acted as an efficient inhibitor for mild steel in 1.0 M HCl solution. Gravimetric measurements suggested that the corrosion rate decreased with the increase of inhibitor concentration and the inhibition efficiency reached the maximum value of 96.4% at 200 mg/L. Potentiodynamic polarization results demonstrated that the synthesized imidazoline derivative performed as mixed-type inhibitor, predominantly cathodic. Adsorption of BIA inhibitor on mild steel surface in 1.0 M HCl solution was spontaneous and conformed to Langmuir adsorption isotherm and the adsorption free energy was found to be -22 kJ/mol. Meanwhile, some thermodynamic parameters (E_a , ΔH^* , ΔS^*) were calculated and discussed.

Keywords: mild steel; inhibition; polarization; EIS

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