



Inhibition study of *Andrographis paniculata* plants extract for the corrosion control Of Aluminum in hydrochloric acid medium

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Abstract : The inhibitive effect of *Andrographis panniculata* plants extract (APPE) on the corrosion control of aluminum was investigated in hydrochloric acid medium of pH=3 using Tafel polarization and electrochemical impedance spectroscopy (EIS) techniques in the temperature range of 303 to 323K. The concentration of inhibitor used was in the range of 0.05–0.4g L⁻¹. The surface morphology was studied using scanning electron microscopy (SEM) and EDX. The kinetic and thermodynamic parameters were calculated and discussed in detail. Inhibition efficiency was found to increase with increasing inhibitor concentration and decrease with temperature. APPE acted as an anodic type of inhibitor at lower concentrations of inhibitor and mixed type at higher concentrations of inhibitor. Optimum inhibition efficiency of 91.55% was achieved at 0.4g L⁻¹ of APPE. Adsorption of inhibitor was through both physisorption and chemisorption on the surface of the metal. Adsorption of the inhibitor obeyed Langmuir adsorption isotherm. The results obtained by both the methods were in good agreement with one another. A suitable mechanism was proposed for the corrosion inhibition process. Surface studies confirmed the adsorption of inhibitor onto the surface of the metal. APPE emerged as a potential, cost effective and eco-friendly natural inhibitor for the corrosion control of aluminum in hydrochloric acid medium.

Keywords: Aluminum, Green inhibitor, *Andrographis paniculata* plants, Tafel polarisation, EIS studies, SEM.

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