Experimental and Theoretical Studies of the Inhibition Effects of 4-Hydroxycoumarin Derivatives on the Corrosion of Al in Hydrochloric Acid Solution

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The effect of 4-Hydroxycoumarin Derivatives (HCD), as a safe inhibitor, was examined by calculating the corrosion of Al in 1.0 M HCl solution at 25–45°C. Calculation was shown under numerous experimental conditions utilized mass loss (ML), Tafel polarization (TP), electrochemical impedance EIS and electrochemical frequency modulation EFM tests. The protection efficiency (% I) improved with raised in concentration of the inhibitors. Rise in temperature improved the corrosion rate in the existence and nonexistence of inhibitors but reduced the protection efficiency. (HCD) obeyed adsorption isotherm of Langmuir at all temperatures used. TP curves gave indication that the HCD act as mixed-kind inhibitor. The morphology of inhibited Al surface was analyzed by scanning electron microscope (SEM), Fourier transform infrared spectroscopy (FTIR) and nanotechnology atomic force microscopy (AFM). Finally, Theoretical data and experimental results were in good correlation.

Keywords: 4-Hydroxycoumarin Derivatives, Corrosion inhibition, HCl, SEM, EDX, AFM, FTIR

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