Electrochemical and Quantum Chemical Studies of Adsorption and Corrosion Inhibition of Two New Schiff Bases on Carbon Steel in Hydrochloric Acid Media

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The inhibiting effect of two newly synthesized Schiff bases was investigated on the corrosion of carbon steel in 1M hydrochloric acid solution under various conditions by weight loss, impedance, and potentiodynamic polarization measurements. The Schiff bases used were 4,4'-bis (2-hydroxy-1-naphthaldehyde imine) diphenylether (L1) and 4,4'-bis(2-Hydroxy-1-naphthaldehyde imine) diphenylmethane (L2). The inhibition efficiency of these compounds varied with concentration and immersion time. Potentiodynamic polarization study indicated that the tested compounds are mixed type (cathodic/anodic) inhibitors. Electrochemical impedance spectroscopy was also used to investigate the mechanism of corrosion inhibition, it showed that the charge transfer resistance (R_{ct}) increased and double layer capacitance (C_{dl}) decreased with an increase in the inhibitor concentration. The inhibition efficiency was found to increase with increasing inhibitor concentration. The adsorption of the inhibitor on the metal surface obeys Langmuir isotherm.

Keywords: Schiff base, Carbon steel, Corrosion inhibitor, EIS, Polarization, DFT.

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