Corrosion Inhibition of Cold Rolled Steel by Methyl Violet in Phosphoric Acid Containing Chloride Ion

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This paper investigates the inhibition effects of methyl violet (MV) without and with chloride ion on cold rolled steel corrosion in 1.0 mol/dm³ phosphoric acid (H₃PO₄) solution using weight loss, potentiodynamic polarization and electrochemical impedance spectroscopy techniques. The results reveal that combination of MV and chloride ion shows as excellent inhibitor and there is a stronger synergistic effect between MV and chloride ion for cold rolled steel corrosion in 1.0 mol/dm³ H₃PO₄. The electrochemical studies reveal that single MV or combination of MV and chloride ion acts as a cathodic type inhibitor and the corrosion reaction is controlled by charge transfer process. Adsorption of MV on the steel surface follows Langmuir adsorption isotherm with chloride ion and Temkin adsorption isotherm without chloride ion, respectively. The thermodynamic and kinetic parameters (ΔG°_{ads} , ΔH°_{ads} , ΔS°_{ads} , K_{ads} and E_a) were obtained and discussed. The adsorption of inhibitor molecules on the surface of cold rolled steel contains a mixed physical and chemical adsorption mechanism and the chemisorption is dominant.

Keywords: Corrosion, Cold rolled steel, Acidic solution, Electrochemistry, Methyl violet, Synergistic inhibition.

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