Synergistic Effect of Iodide Ion and Methyl Violet on the Corrosion Inhibition of Carbon Steel in Phosphoric Acid

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The corrosion inhibition effects of iodide ion and its synergistic effect with methyl violet (MV) on carbon steel in 1.0 mol/L phosphoric acid solution have been investigated using potentiodynamic polarization, electrochemical impedance spectroscopy and weight loss measurements. The results show that there is an excellent synergistic effect between iodide ion and MV for carbon steel corrosion inhibition in 1.0 mol/L H₃PO₄. The electrochemical studies reveal that single iodide ion or combination of iodide ion and MV acts as a mixed-type inhibitor and the corrosion reaction is controlled by charge transfer process. Adsorption of iodide ion on the steel surface obeys Langmuir adsorption isotherm in the absence or presence of MV. The values of K_{ads} , ΔG_{ads}^0 , ΔH_a , ΔS_a and E_a were obtained and discussed. The adsorption of inhibitor molecules on the steel surface is a spontaneous process containing a mixed physical and chemical adsorption mechanism.

Keywords: Carbon steel, Corrosion, Phosphoric acid, Iodide ion, Methyl violet, Synergistic inhibition.

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