Inhibition Synergism Between Alkyl Imidazoline and Potassium Iodide on the Corrosion of Carbon Steel in Citric Acid Solution

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The synergistic inhibition effect of the complex of 2-undecyl-N-carboxymethyl-N-hydroxyethyl imidazoline (UHCI) and potassium iodide (KI) on the corrosion of 45# carbon steel subjected to 4 wt.% citric acid solution is explored by weight loss testing, electrochemical measurement, and X-ray photoelectron spectroscopy (XPS) analysis. Based on the weight loss test, 94.15% inhibition capacity is obtained by compound inhibitors (UHCI:KI=30:10) after immersion in 4 wt.% citric acid for 8 h, which is consistent with the results from electrochemical technology. The discussion extends to the effects of temperature and immersion time to achieve the ideal inhibition performance for further protection. The adsorption of the studied compound fitted well with the Langmuir isotherm model. The XPS analysis confirms physical and chemical interactions between the UHCI/KI complex inhibitors and metal surface to defend the aggressive electrolyte. Additionally, the corrosion inhibition mechanism of UHCI inhibitor in the presence of iodine ions in the citric acid solution is discussed.

Keywords: Carbon steel; Corrosion inhibitor; Synergism; EIS; XPS.

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