



Effect of anion on the corrosion inhibition of cationic surfactants and a mechanism study

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ABSTRACT

Four quaternary ammonium cationic surfactants, cetyl-trimethyl ammonium fluorine (CTAF), cetyl-trimethyl ammonium chlorine (CTAC), cetyl-trimethyl ammonium bromine (CTAB) and cetyl-trimethyl ammonium iodine (CTAI) were purchased as carbon steel corrosion inhibitors in HCl solution using weight-loss method. The correlation between inhibition efficiency and molecular structure of four inhibitors was studied. The experimental outcome showed that at the same concentration, solution temperature and HCl concentration, the inhibition efficiency of four inhibitors followed the order CTAI > CTAB > CTAC > CTAF, it seems to indicate that the type of halide ions of inhibitors greatly influence the inhibition efficiency. Based on weight loss results, the adsorption of studied inhibitors on the carbon steel surface in the HCl solution obeyed the Langmuir adsorption isotherm. The thermodynamic parameters including the standard adsorption free energy ($\Delta G_{\text{ads}}^{\circ}$), the standard heat of adsorption ($\Delta H_{\text{ads}}^{\circ}$) and the standard adsorption entropy ($\Delta S_{\text{ads}}^{\circ}$) were calculated and discussed, which well explained that the synergistic effect between the quaternary ammonium cations and the halide anions greatly influenced the effective inhibiting tendency.

Keywords: Quaternary ammonium cationic surfactant; Inhibitor; Acid corrosion; Adsorption; Mechanism

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