The effect of temperature on the inhibition mechanism of 3-mercaptopropionic acid at carbon steel corrosion in citric-phosphoric acid compound solution

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Abstract

The inhibition mechanism of 3-mercaptopropionic acid (3-AMP) on ST38 carbon steel corrosion in citric-phosphoric acid compound solution at 300K – 360K was studied. The investigations involved potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) methods, and computer simulation of Zview program. The results showed that the inhibition mechanism takes place through formation of passive layers that coverage over carbon steel surface with inhibition efficiency up to 85%. Functional group dominantly involved in the formation process of the passive layers is –SH at low temperature, and $–NH_3^+$ at high temperature. The increasing temperature alters the carbon steel corrosion/inhibition process from kinetics of charge transfer to diffusion process.

Keywords*: amino acids, 3-mercaptopropionic acid, corrosion inhibitor, carbon steel, polarization, EIS, Tafel plot.*