Corrosion inhibition of aluminum alloy in H₃PO₄ solution using para-thiazolidinone derivatives

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ABSTRACT

The influence of p-thiazolidinone derivatives as corrosion inhibitors for aluminum alloy in 3 M H₃PO₄ solution has been studied by weight-loss and galvanostatic polarization techniques. A significant decrease in the corrosion rate of aluminum was observed in the presence of these investigated inhibitors. The inhibition efficiency of these derivatives increases with increasing the inhibitor concentration but decreases with increasing temperature. The inhibition efficiency values of the examined derivatives follow the order: 5-(4-methoxyphenylazo)-3-phenylamino-2-thioxo-4-thiazolidinone (e) > 5-(4-methylphenylazo)-3-phenylamino-2-thioxo-4-thiazolidinone (d) > 5-(4-hydrophenylazo)-3-phenylamino-2-thioxo-4-thiazolidinone (c) > 5-(4-chlorophenylazo)-3-phenylamino-2-thioxo-4-thiazolidinone (b) > 5-(4-nitrophenylazo)-3-phenylamino-2-thioxo-4-thiazolidinone (a). The galvanostatic polarization studies revealed that these compounds behave as mixed-type inhibitors. The effect of temperature on corrosion inhibition has been studied and activation energies, ⁹¹, have been calculated. Enthalpy of activation, ¹⁰¹, and entropy of activation, ¹¹, for the corrosion process are calculated and discussed. Addition of small amounts of KI, KSCN, and KBr to the acidic medium containing the p-thiazolidinone derivatives increases the inhibition efficiency of the system due to the synergistic effect. The adsorption of the investigated compounds on the aluminum alloy surface is found to obey Temkin’s adsorption isotherm. The mechanism of inhibition was discussed in the light of the chemical structure of the undertaken inhibitors.

Keywords: Corrosion; p-Thiazolidinone derivatives; Aluminum alloy; Synergistic effect; H₃PO₄

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