ANTI-CORROSIVE PROPERTIES OF SOME THIOSECARBAZIDE DERIVATIVES ON MILD STEEL CORROSION IN HYDROCHLORIC ACID

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The continued manifestation of corrosion and corrosion products on steel structures is still causing a lot of concern to corrosion scientists and engineers. The use of inhibitors is one of the most practical methods for the protection of steel against corrosion especially in acidic media. Among different nitrogen and sulphur containing compounds, thiosemicarbazide has been reported to be a potential inhibitor for different metals [1, 2].

In this study, the inhibition effect of different concentrations of 4-Nitrophenyl-3-thiosemicarbazide (TSC-NO₂) and 4-Chlorophenyl-3-thiosemicarbazide (TSC-Cl) on the corrosion behaviour of mild steel in 1.0 M HCl solution at 293 K temperature was studied in both short and long immersion times by using electrochemical measurement, and the results are shown in plots in Figure 1. Their IE values increase with increase in inhibitors concentration. Potentiodynamic polarisation studies showed that thiosemicarbazide derivatives exhibit both cathodic and anodic inhibition effects and therefore, this molecule could be classified as a mixed type inhibitor [3, 4]. The adsorption of these inhibitors on the mild steel surface in acidic medium obeys the Langmuir absorption isotherm. The free energy of adsorption (ΔG_ads) can be obtained from 39 kJ/mol and 37 kJ/mol for TSC-NO₂ and TSC-Cl, respectively. The negative values of ΔG_ads ensure the spontaneity of the adsorption process and thiosemicarbazide derivatives strongly adsorbed on the mild steel surface in 1 M HCl. Results showed that thiosemicarbazide derivatives performed excellent inhibiting effect for the corrosion of MS in 1 M HCl solution and inhibition efficiency is 98% after 120 h at 1.0x10⁻³ M.

Figure 1. (a) Nyquist (b) polarization curves obtained for mild steel in 1.0 M HCl for 1x10⁻³ M at 298 K (∗: Blank, o: TSC-NO₂, ♦: TSC-Cl) (c) Molecular formulas of TSC-NO₂ and TSC-Cl

References

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