

ELECTROCHEMICAL STUDIES OF THIOSEMICARBAZONE DERIVATIVE AND ITS TIN(IV) COMPLEX AS CORROSION INHIBITOR FOR MILD STEEL IN 1 M HYDROCHLORIC ACID

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Abstract. The inhibitive effects of 2-acetylpyridine 4-ethyl-3-thiosemicarbazone (HAcETSc) and dichlorophenyl tin(IV) 2-acetylpyridine 4-ethyl-3-thiosemicarbazone (Sn(HAcETSc)PhenCl₂) for mild steel in 1 M HCl solution at different concentrations were investigated using electrochemical measurements and scanning electron microscopy (SEM) analysis. The result of electrochemical measurement found that the inhibition efficiency increased with inhibitors' concentration. Polarisation data showed that the maximum inhibition efficiencies of HAcETSc and Sn(HAcETSc)PhenCl₂ were 71.31 % and 88.44 % respectively. Moreover, both inhibitors were categorised into a mixed-type inhibitor based on polarisation data. The electrochemical impedance spectroscopy (EIS) data showed that the maximum inhibition efficiencies of HAcETSc and Sn(HAcETSc)PhenCl₂ were 64.80% and 87.81% respectively. The adsorption process of inhibitor on mild steel follows Langmuir adsorption isotherm with values of R²=0.954 and R²=0.992 for HAcETSc and Sn(HAcETSc)PhenCl₂, respectively. The Gibbs free energy of adsorption gave a negative value, -3.76 kJ mol⁻¹ for HAcETSc and -3.57 kJ mol⁻¹ for Sn(HAcETSc)PhenCl₂ which indicated that the adsorption process was occurred spontaneously and were adsorbed by the process of physical adsorption on the metal surface. SEM studies revealed that protective film formed on the mild steel surface agreed with the result shown in EIS. The results clarified that Sn(HAcETSc)PhenCl₂ had a better inhibitive effect than HAcETSc.

Keywords: 2-acetylpyridine, thiosemicarbazone, tin(IV) complex, mild steel, corrosion.