CHEMISTRY JOURNAL OF MOLDOVA. General, Industrial and Ecological Chemistry. 2019, 14(1), 98-106
ISSN (p) 1857-1727 ISSN (e) 2345-1688
http://cjm.asm.md
http://dx.doi.org/10.19261/cjm.2019.545

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

Nur Nadira Hazani [a,b], Yusairie Mohd [a], Sheikh Ahmad Izaddin Sheikh Mohd Ghazali [b], Nur Nadia Dzulkifli [b,*]

[a]*Faculty of Applied Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia*
[b]*Faculty of Applied Sciences, Universiti Teknologi MARA, Negeri Sembilan Branch, Kuala Pilah Campus, 72000 Kuala Pilah, Negeri Sembilan, Malaysia*
[*]*e-mail: nurnadia@uitm.edu.my*

Abstract. The inhibitive effects of 2-acetylpyridine-4-ethyl-3-thiosemicarbazone (HAcETSc) and dichlorophenyltin(IV) 2-acetylpyridine-4-ethyl-3-thiosemicarbazone (Sn(HAcETSc)PhenCl$_2$) 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)PhenCl$_2$ 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)PhenCl$_2$ were 64.80% and 87.81% respectively. The adsorption process of inhibitor on mild steel follows Langmuir adsorption isotherm with values of R^2= 0.954 and R^2= 0.992 for HAcETSc and Sn(HAcETSc)PhenCl$_2$, 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)PhenCl$_2$ which indicated that the adsorption process occurred spontaneously and the compounds were adsorbed by the process of physical adsorption on the metal surface. SEM studies revealed that the protective film formed on the mild steel surface agreed with the result shown in EIS. The results clarified that Sn(HAcETSc)PhenCl$_2$ had a better inhibitive effect than HAcETSc.

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

Received: 14 January 2019/ Revised final: 05 May 2019/ Accepted: 07 May 2019