Corrosion inhibition of pure zinc in 0.1 M NaCl by acyl thiosemicarbazide derivatives

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Abstract

The use of organic compounds as inhibitors of zinc alloys has shown great promise because they were able to either be adsorbed on the surface or chemically react with the metallic surface to form a barrier coating between the metallic surface and aggressive media [1]. The corrosion inhibition mechanisms of organic inhibitors was related to the sharing of the outer orbital electrons of heteroatoms and π-orbitals to unoccupied d-orbital spaces within corroded metals, which formed new coordination bonds and subsequently, a protective coating [2, 3]. The impact of picolinoyl N4-phenylthiosemicarbazide (HL) concentrations on the corrosion resistance of pure zinc substrate were investigated in this study. The inhibitory action of 10^{-5}, 10^{-4}, and 10^{-3} M HL on pure zinc substrate in 0.1 M NaCl was studied by electrochemical methods such as electrochemical impedance spectroscopy and potentiodynamic polarization, whereas the surface morphology and chemical compositions of all the surface substrates after exposure to 0.1 M NaCl with and without HL were observed via X-ray photoelectron spectroscopy (XPS), and electron microscopy/energy dispersive X-ray spectroscopy (SEM/EDS). The results indicated that the HL inhibitor can be considered as a mixed-type inhibitor with a predominant effect on the anodic zinc dissolution. The HL exhibited excellent corrosion inhibition of 99.26 % at 10^{-3} M.

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