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Nanoparticle Based Green Inhibitor for Corrosion Protection of Zinc in Acidic Medium

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Abstract : Nano scaled materials have attracted tremendous interest as corrosion inhibitor due to their high surface area on the metal surfaces. It is well known that the zinc oxide nanoparticles have higher reactivity towards aqueous acidic solution. This work presents a new method to incorporate zinc oxide nanoparticles with white sesame seeds extract (nano-green inhibitor) for corrosion protection of zinc in acidic medium. The morphology of the zinc oxide nanoparticles was investigated by TEM and DLS. The corrosion inhibition efficiency of the green inhibitor and nano-green inhibitor was determined by Gravimetric and electrochemical impedance spectroscopy (EIS) methods. Gravimetric measurements suggested that nano-green inhibitor is more effective than green inhibitor. Furthermore, with the increasing temperature, inhibition efficiency increases for both the inhibitors. In addition, it was established the Temkin adsorption isotherm fits well with the experimental data for both the inhibitors. The effect of temperature and Temkin adsorption isotherm revealed Chemisorption mechanism occurring in the system. The activation energy (Ea) and other thermodynamic parameters for inhibition process were calculated. The data of EIS showed that the charge transfer controls the corrosion process. The surface morphology of zinc metal (specimen) in absence and presence of green inhibitor and nano-green inhibitor were performed using Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM) techniques. The outcomes indicated a formation of a protective layer over zinc metal (specimen).

Keywords : corrosion, green inhibitor, nanoparticles, zinc
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