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*Research article*

# Enhancement of anticorrosion properties of stainless steel 304L using nanostructured ZnO thin films

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**Abstract:** Nanostructured ZnO thin films were coated on stainless steel specimen (304L SS) by depositing nanoparticles of zinc oxide. The morphology and optical properties of the thin films were epitomized using Field Emission Scanning Electron Microscopy (FESEM), Energy Dispersive Analysis of X ray (EDAX), Atomic Force Microscopy (AFM) and Photoluminescence spectroscopy (PL) techniques. FESEM and AFM images revealed that the present depositing procedure is extremely proficient to synthesize uniform and homogeneous nanostructured thin films. The presence of excitonic peak in the PL emission spectrum confirmed the nanocrystalline nature of the thin films. The anticorrosion nature of the zinc oxide coated stainless substrate in the brackish environment was studied using Tafel, Electrochemical Impedance Spectroscopy analysis and Open Circuit Potential studies (OCP) methods. The $E_{corr}$, $I_{corr}$, corrosion rate before and after salt spray were calculated from Tafel plot. These parameters indicated that the anticorrosion properties of coated thin films are substantially higher to that of bare steel. The Nyquist plot before and after salt spray was fitted using an equivalent circuit and the coating resistance $R_{ct}$ was calculated. The different mechanisms involved in the corrosion behavior of the thin films were discussed on the basis of equivalent circuit. The physical stability of the coated samples in saline surroundings was studied by AFM assisted nanoindentation techniques. The absence of the cracks and blisters in the sample after nanoindentation before and after salt spray revealed the adherent nature of the nanostructured thin films.