Electrochemical Corrosion Behavior of Ni-doped ZnO Thin Film Coated on Low Carbon Steel Substrate in 3.5% NaCl Solution

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doi: 10.20964/2020.05.25

Received: 1 January 2020 / Accepted: 23 February 2020 / Published: 10 April 2020

A facile sol-gel technique was successfully used to deposit Ni-doped ZnO thin film on low carbon steel substrates for evaluation of electrochemical corrosion resistance. The morphology, composition and crystalline phase of the coatings were obtained by scanning electron microscopy, energy dispersive X-ray spectroscopy, X-ray diffraction and atomic force microscopy. The evaluation of corrosion protection was carried out by potentiodynamic and electrochemical impedance spectroscopy analysis in 3.5% NaCl solution. The electrochemical results show that the uniform and thick coatings of Ni-doped ZnO thin film as an insulator indicated higher resistances and lower capacitances than other samples. The assessment of coating thickness influences on corrosion protection revealed that the sample with 454 nm thickness had a lower corrosion current density and higher corrosion potential than that of the other samples, indicating a better performance in corrosion resistance.

Keywords: Ni-doped ZnO; Corrosion resistance; Low carbon steel; Sol-gel technique; Electrochemical study

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