Study of Anticorrosive Nature of Spray Coated Titanium Dioxide and Nickel oxide Composite Thin Films on Stainless Steel in Briny Surroundings

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Abstract. The present work focus the anticorrosive behavior of composite thin films of TiO_2 and NiO on steel specimen by spray coating technique. The Energy Dispersive Analysis of X ray (EDAX) studies revealed that nanocomposite coatings of desired stoichiometry can be synthesized using present method. The E_{corr} and coating resistance values of the composites of TiO_2 and NiO in various proportions reveals that the corrosion resistance was enhanced on coating. The composites of TiO2: NiO in the proportion 5:1 attained improved corrosion resistance compared to other proportions.

INTRODUCTION

Nanoparticles and nanostructured materials are in lime light in last decades owing to their applications in diverse fields of science and technology. Nanostructured thin films, which have their grain size in nanometers, exhibited novel and improved properties compared to their bulk counterparts [1-5]. Nanocomposite thin films comprising titania for anticorrosion applications had been widely reported in the literature [6-11]. The existing literature suggests that the addition of SiO_2, CeO_2, PANI etc improves the corrosion properties of thin films. Yan et al [6] investigated the corrosion behaviour of Al_2O_3-TiO_2 and Al_2O_3-Si_2O_3-TiO_2 ceramic coatings in HCl solution and found that the addition of 13% TiO_2 to Al_2O_3 improved the anticorrosion property. They attributed the increase in anticorrosion property to decrease in porosity of the coatings on the inclusion of TiO_2. Salahnejad et al [7] investigated the effect on annealing temperature on anticorrosion properties of zirconium titanate. They reported that the improved corrosion protection on annealing can be attributed to a compromise between defect density and adhesion. Sathyanarayan et al [11] compared the corrosion behavior of PANI-TiO_2 nanocomposite as well as conventional TiO_2 pigment coating on steel substrate and observed that PANI-TiO_2 coating offers improved corrosion resistance. Madhup et al [12] studied the anticorrosion characteristics of NiO epoxy nanocomposite on mild steel specimen. Their result indicated that the inclusion of NiO imparted superior corrosion resistant properties to the epoxy nanocomposites. Nghia et al [13] showed that the protective performance of polyurethane paint was improved with the addition of Fe_2O_3-NiO-PANI nanocomposites. These results suggest that addition of NiO improves the anticorrosion properties of conventional protective coatings. Previous reports on nanocomposites of TiO_2 and NiO has been mainly focused on applications such as dye sensitized solar cells [14], sonophotocatalyst

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