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Comparison of Anticorrosion Studies of Titanium Dioxide and Nickel Oxide Thin Films Fabricated by Spray Coating Technique

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Abstract

The titanium dioxide and nickel oxide nanoparticles are synthesized by chemical precipitation method. The as prepared nanoparticles of titanium dioxide and nickel oxide are coated on steel substrate (304L SS) using spray coating technique. The corrosion resistance of 304L SS substrates spray coated with nanostructured titanium dioxide (TiO₂) and Nickel oxide (NiO) in 3.5% NaCl is studied from Tafel polarization curve and electrochemical impedance spectra. The polarization curves of coated 304L SS substrates showed positive shift in corrosion potential with respect to that of bare. The Nyquist plot of the coated films confirmed that the coatings have improved the corrosion resistance of 304L SS substrate. The variation of impedance with frequency of the coated 304L SS before and after salt spray test shows that NiO and TiO₂ films are quite stable in salt environment. There is no much change in surface morphology and surface roughness of films after corrosion test and this further confirm the film stability in corrosive environment. The absence of crack in AFM images of films subjected to load shows that the films are quite tough. The non-existence of rust in coated substrate exposed to salt environment (5% NaCl at 30°C) for 390 hrs confirms that the films can act as anticorrosive coating for 304L SS substrate in adverse salt environment.

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1. Introduction

In recent years, the battle against corrosion has attained momentous advancements, however the surface engineering technologies are still struggling to provide a satisfactory solution against corrosion and corrosion related issues. Corrosion issues are of great significant crisis due to the frequent economic cost in the society and various

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