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Corrosion Resistance and Hardness Properties of Electrodeposited Ni-Fe Composite Coatings Containing Al_2O_3-TiO_2 Particles

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Abstract

Electrodeposited Ni-Fe composite coatings containing ceramic particles have been investigated due to their improved mechanical and corrosion resistant properties over plain Ni-Fe alloy coatings. In the present study, Ni-Fe/Al_2O_3-TiO_2 coatings have been electrodeposited using physically mixed commercial Al_2O_3 and TiO_2 powders with different powder compositions of 80 TiO_2-20Al_2O_3, 50 TiO_2-50Al_2O_3, and 20 TiO_2-80 Al_2O_3. The effect of composition on the properties of the coatings was examined. Field Emission Scanning Electron Microscopy (FESEM) and Energy Dispersive X-ray Spectroscopy (EDS) were used to analyze the surface morphology and chemical composition of coatings. X-Ray Diffraction analysis was used to determine the crystalline structure of the coatings. The electrochemical behavior of coatings was studied by polarization test in 3.5 wt-% NaCl solution. Finally, the hardness of the prepared coatings was measured by Vickers microhardness testing instrument. Results revealed that increase in TiO_2 reinforcement particles increased the hardness and corrosion resistance of the composite coatings.

Keywords*:* Electrodeposition, composite, Al_2O_3, TiO_2, FESEM, corrosion

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