

Nano Zinc Phosphate Coatings for Enhanced Corrosion Resistance of Mild Steel

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Abstract

Nano crystalline zinc phosphate coatings were developed on mild steel surface using nano zinc oxide particles. The chemical composition and morphology of the coatings were analyzed by X-ray diffraction analysis (XRD), scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDX). The particles size of the nano zinc phosphate coating developed was also characterized by TEM analysis. Potentiodynamic polarization and electrochemical impedance studies were carried out in 3.5% NaCl solution. Significant variations in the coating weight, morphology and corrosion resistance were observed as nano ZnO concentrations were varied from 0.25 -2g/L in the phosphating baths. The results showed that nano ZnO particles in the phosphating solution yielded phosphate coatings of higher coating weight, greater surface coverage and enhanced corrosion resistance than the normal zinc phosphate coatings (developed using normal ZnO particles in the phosphating baths). Better corrosion resistance was observed for coatings derived from phosphating bath containing 1.5g/L nano ZnO. The activation effect brought about by the nano ZnO reduces the amount of accelerator (NaNO_2) required for phosphating.

Keywords

Nano ZnO, mild steel, nano zinc phosphate coating, normal zinc phosphate coating

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