

عنوان مقاله:

Cerium Oxide Nanoparticles as an Accelerating Agent for Zinc Phosphate Coatings with Enhanced Corrosion Resistance

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خلاصه مقاله:

Cerium oxide (ceria, CeO_2) is a biocompatible ceramic oxide with a wide range of applications as catalysts, fuel cell systems, and sensors. In the present study, CeO_2 NPs were added to a zinc phosphate bath as an accelerator. The microstructural, morphological, and phase studies of coatings formed in the phosphating bath with and without CeO_2 NPs, were performed by scanning electron microscopy (SEM), field emission-SEM (FE-SEM), and X-ray diffraction spectroscopy (EDS). Besides, the corrosion behavior of phosphate coatings containing 0, 0.04, 0.07, and 0.1 g/L of CeO_2 NPs was evaluated using the Tafel polarization method and electrochemical impedance spectroscopy (EIS). The results showed significant differences in the microstructure, roughness, and phase structure of phosphate coatings with and without CeO_2 NPs. The optimum addition of CeO_2 NPs to the phosphating bath was equal to 0.07 g/L, in which, as compared to typical phosphate coating, the coating weight increased from 0.51 to 1.73 mg/cm² while the corrosion current density decreased from 12.5 to 2.2 $\mu\text{A}/\text{cm}^2$. Furthermore, the coating porosity decreased from 13.9 to 1.7 percent due to creating a denser coating with much better coverage by CeO_2 NPs.

کلمات کلیدی:

Zinc phosphate coating, Ceria nanoparticle, Phosphating bath accelerator, Phosphate coating morphology, Corrosion behavior study

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