Effect of CeO₂ on Electrochemical Corrosion Resistance of Ni–P–CeO₂ Composite Coatings Prepared by Submerged Jet Electrodeposition

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A novel method of submerged jet electrodeposition with incorporation of CeO₂ nanoparticles (NPs) was applied to remodel Ni–P alloy coatings. Surface morphologies of the coating surface were characterized by scanning electron microscopy observations, the composition and phase structure were studied using energy dispersive spectroscopy and X-ray diffraction, and the corrosion resistance was analyzed by the polarization curves and electrochemical impedance spectroscopy. Experimental results confirmed successful deposition of a homogenous coating on the surface of the metal matrix and improvement of the corrosion resistance after incorporation of CeO₂ NPs. The composite coatings showed the smallest corrosion current and the largest polarization resistance when 1.0 g/L of CeO₂ NPs was added in the plating solution, revealing the greatest corrosion resistance. The underlying potential mechanism is that the introduction of the nano-CeO₂ phase effectively reduces the adsorption of corrosive media and protects the insoluble corrosion products, thereby promoting the occurrence of uniform corrosion.

Keywords: Submerged jet electrodeposition; CeO₂ nanoparticles; Electrochemical corrosion behavior; Corrosion mechanism

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