Electrochemical Deposition of Ni-Co/SiC Nanocomposite Coatings for Marine Environment

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Ni-Co/SiC nanocomposite coatings were prepared by electrodeposition from a modified watt type Ni-Co bath containing suspended SiC nanoparticles. The effects of SiC nanoparticles on the structure and morphology of Ni-Co coatings were studied by scanning electron microscopy (SEM), energy spectrum analysis (EDS), X-ray diffraction (XRD) and electrochemical technique. The electrochemical corrosion properties of Ni-Co/SiC composite coatings were studied by EIS and Tafel methods. The results show that the addition of Co²⁺ ions in the bath improves the refinement phase, reduces the porosity and strengthens the corrosion resistance of the nanocomposite deposits. SiC and Co content in the deposits varied with the change of deposition parameters and SiC nanoparticles concentration in the bath. The SiC nanoparticles have the dual role of promoting the nucleation and enhancing the hardness of the Ni-Co alloys which improved the wear resistance of the Ni-Co/SiC coatings. The incorporation of SiC nanoparticles into Ni-Co alloy matrix alters the chemical composition, increases the microhardness, significantly enhances the anti-corrosion behavior and wear resistance of the composite coatings. The composite coatings can provide long-term protection for metal parts in marine environment and have a good application prospect in the field of marine protection.

Keywords: Ni-Co/SiC nanocomposite coatings; Electrodeposition; wear resistance; corrosion behavior; marine protection

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