عنوان مقاله:

Corrosion Characteristics of Zn-TiO۲ Nanocomposite Coatings Fabricated by Electro-Codeposition Process

محل انتشار:

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خلاصه مقاله:

Zn based composite coatings reinforced with TiO۲ nanoparticles were fabricated via electrodeposition with ۵, ۱۰, and ۱۵ g/L TiO۲ concentration under variant current densities of ۰.۰۸, ۰.۱ and ۰.۱۲ A/cm۲. Field emission scanning electron microscopy (FESEM), energy dispersive spectroscopy (EDS), x-ray diffraction analysis (XRD), weight loss measurements, salt spray technique, anodic polarization, and eventually potentiodynamic polarization tests were conducted and the corresponding findings were discussed. Rising the electrodeposition current density from ۰.۰۸ to ۰.۱۲ A/cm۲ for both pure Zn and Zn-TiO۲ coatings led to deposit more and smaller crystals and with incorporation of TiO۲ nanoparticles, the morphology changed from hexagonal crystals to flake type grains. Increasing the TiO۲ concentration from ۵ to ۱۵ g/L, steadily lowered the TiO۲ incorporate rate (vol.%). Accordingly, the same smoothness and even more uniformity with smaller crystallites was observed at ۱۵ g/L compared to that of ۵ g/L. Weight loss measurements, salt spray tests and anodic polarization test showed remarkable superior corrosion resistance of Zn-TiO۲ (۵ g/L) than that of pure Zn coating. An increas in icorr (μA/cm۲) from ۰.۰۸ to ۰.۱ A/cm۲ occurred, followed by a decrease from ۰.۱ to ۰.۱۲ A/cm۲ for pure zinc coating. By increasing the current density from ۰.۰۸ to ۰.۱۲ A/cm۲ for Zn-TiO۲ coating, a steadily decrease of icorr was observed. Furthermore, by rise of TiO۲ (%C) from ۵ to ۱۵ g/L, icorr experienced a significance increase that could be ascribed to the remarkable reduction in TiO۲ vol.%. Ultimately, the optimum corrosion resistance belonged to the electrodeposited Zn-TiO۲ (۵ g/L) coating deposited ۰.۱۲ A/cm۲ exhibiting the lowest amount of icorr of ۲.۷ μA/cm۲ equal to ۱.۶ mpy.

کلمات کلیدی:

Electro-codeposition, Nanocomposite Coating, zinc, TiO۲, Corrosion behavior, morphology