البحث الخامس

Microstructural characterization and corrosion behaviour of ultrasound-assisted synthesis of Ni–xCo–yTiO_2 nanocomposites in alkaline environments

Abstract

Electroplated protective thin film is highly promising materials for advanced applications such as high corrosion resistance and energy conversion and storage. This work is to investigate the effect of Co content and TiO2 on the corrosion resistance of Ni–xCo–yTiO2 nanocomposites in alkaline media. The nanocrystalline Ni–xCo–yTiO2 composites were electroplated using the sulfate gluconate bath containing the suspended TiO2 nanograins under ultrasound waves and mechanical stirring. The microstructure and corrosion behavior of the electroplated Ni–xCo–yTiO2 nanocomposites have been investigated via X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray (EDX), potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) techniques. The XRD pattern of the electroplated Ni–Co matrices with 1–75% of cobalt arranged in face-centered cubic (FCC) system, while the electroplated Ni–Co matrices of further Co% more than 76% converted to hexagonal closed-package (HCP) crystal system. The surface of the Ni–xCo–yTiO2 nanocomposites after immersion in 1.0 M KOH electrolytes was investigated via SEM,

atomic force microscopy and EDX. The results displayed that the rate of corrosion of the different composites decreased by combining Ni, Co and the inclusion of TiO2. The improved corrosion resistance of Ni–47Co–3.77TiO2 composites is due to the formation of Ni/Co oxy/hydroxide layer and rebelling effect of OH- by TiO2 sites, which reduces the attacking effect of OH-, O2, and H2O, and notably retards the overall corrosion processes.

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