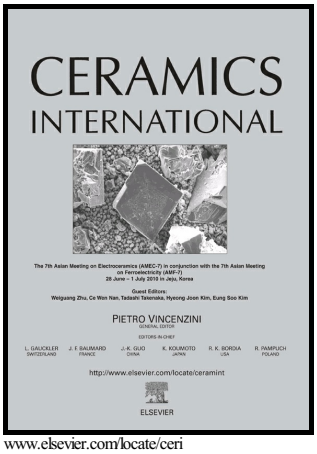

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The effect of pulse-reverse electroplating bath temperature on the wear/corrosion response of Ni-Co/tungsten carbide nanocomposite coating during layer deposition

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Abstract

In this article, the effect of bath temperature during layer deposition on the electrochemical/abrasion responses of Ni-Co/tungsten carbide nanocomposite coating has been investigated. The Ni-Co/tungsten carbide nanocomposite coating was obtained using simultaneous deposition of tungsten carbide nanoparticles in three Ni-Co bath temperatures of 20, 40, and 60^{o}C. Afterwards, in order to characterize the obtained coatings, Field Emission Scanning Electron Microscopy (FE-SEM) and Transmission Electron Microscopy (TEM), X-Ray diffraction (XRD), MAP analysis, potentiodynamic polarization and electrochemical impedance spectroscopy methods in 3.5wt% NaCl, and also abrasion test using a pin on disc method were carried out. The results of this study revealed that the deposition obtained from Ni-Co bath contains tungsten carbide nanoparticles and results in strong (200) and hard (111) textures in the coating at different temperatures. Also increasing the bath temperature from 20 to 40^{o}C results in the absorption of cobalt and tungsten carbide nanoparticles, as well as reducing the nickel content and corrosion resistance in the coating, and on one hand it increases the abrasion resistance of the coating. However, a bath-temperature increase from 40 to 60^{o}C results in reducing the absorption of cobalt and tungsten nanoparticles, and increasing the nickel content and corrosion resistance in the coating as well as reducing the abrasion resistance of the coating.

Keywords: pulse-reverse electroplating process, Ni-Co/tungsten carbide nanocomposite coating, bath temperature, corrosion resistance, abrasion resistance.