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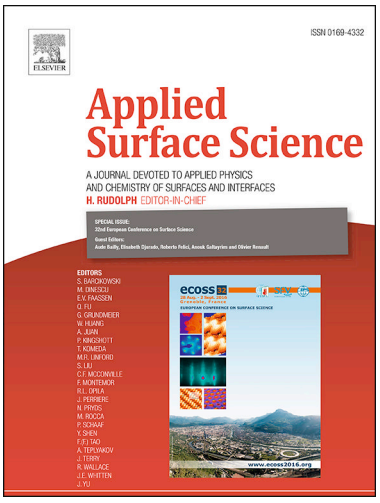

Full Length Article

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Characterization of Ni-Cu matrix, Al_2O_3 reinforced nano-composite coatings prepared by electrodeposition

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Abstract

In this work, Cu atoms and Al_2O_3 nanoparticles were simultaneously incorporated into a Ni coating during an electrodeposition process to produce Ni-Cu/Al_2O_3 nano-composite coatings. Then, the effect of the additions of the Cu and Al_2O_3 species on some properties of these coatings was investigated. X-ray diffraction and scanning electron microscopy equipped with energy dispersive X-ray spectroscopy were employed for the structural characterization of the products. The mechanical properties of the deposited coatings were also investigated by Vickers microhardness and pin-on-disc wear testing. Also, the corrosion behavior of the produced coatings was investigated in a NaCl solution. Results showed that the addition of Cu atoms and Al_2O_3 nanoparticles changes the texture of the pure Ni coating and decreases the crystallite size from 91 nm for pure Ni to 16 nm for Ni-Cu/Al_2O_3 (20 g/L) nano-composite coating. It was also found that the microhardness, wear resistance, and corrosion resistance of the deposited coatings are increased by the incorporation of Cu atoms and Al_2O_3 nanoparticles in the Ni coating. Typically, the microhardness and wear resistance are increased about 2.4 and 3.75 times, respectively.

Keywords: Coating; Nano-composite; Electrodeposition; Structure; Wear

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