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Evaluation of corrosion, mechanical and structural properties of new Ni-W-PCTFE nanocomposite coating

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Abstract:

Polychlorotrifluoroethylene (PCTFE) particles were co-deposited with nickel-tungsten (Ni-W) coatings through electro-deposition process. The nanocomposite coatings have been prepared in four different concentrations (0, 4, 8 and 20g/l). Corrosion performance of the coatings was examined using potentiodynamic polarization and Electrochemical Impedance Spectroscopy (EIS). Surface morphology and composition of the composite coatings were characterized by Scanning Electron Microscopy (SEM), Energy Dispersive X-ray (EDAX) measurements and X-ray Diffraction (XRD) analysis. The tribological properties of a surface have been investigated in ambient condition by Atomic Force Microscopy (AFM). Results show that, there is a significant shift in corrosion potential towards the noble direction, decrease in corrosion current density, and increase in charge transfer resistance and decrease in double-layer capacitance values with the incorporation of PCTFE particles in the Ni-W matrix. Higher PCTFE contents, however, negatively affected the corrosion behavior of the coatings. Co-deposition of the PCTFE particles into the Ni-W coating changed the structure and morphology of the deposited coating and decreased the nodules and crystalline size. By increasing the PCTFE concentration of coatings, microhardness decreased and the elastic behavior of coating, increased. The coatings with 4 and 8 g l⁻¹ PCTFE shows the low friction force in comparison with other samples.

Keywords: Nickel-tungsten coatings, nanocomposite coatings, Corrosion, Tribological,

Polychlorotrifluoroethylene (PCTFE) nanoparticles

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