Study of the Magnetic Field Effect on the Electrochemical Behavior of a Ni Electrodeposit

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In this work, using a Watts bath, nickel electroplating on AISI 1018 steel were obtained in the presence, and absence, of a magnetic field of 0.15 T, at 30 °C and 60 °C, during electrodeposition times of 7, 12 and 17 minutes. The coatings were characterized by X ray diffraction (XRD), Scanning Electron Microscopy (SEM), Vickers Microhardness (HV), Atomic Force Microscopy (AFM) and roughness measurements. The anticorrosion properties of the Ni coating were studied by electrochemical techniques of direct current (Linear polarization resistance, LPR) and alternating current (Electrochemical Impedance Spectroscopy, EIS). In general, for both temperatures, the magnetic field showed an influence in the grain size and hardness of the electrodeposits; it has also an influence in the preferential orientation of electrodeposited Ni particles at 30 °C, for the different times studied, however the anticorrosive properties decreased as a function of the electrodeposition time in the Watts bath. At 60 °C, it has not been observed a significant effect of the magnetic field on the orientation of the electrodeposited Ni particles, but it has been observed a strong effect on anticorrosion properties from impedance diagrams and capacitance behavior.

Keywords: AISI 1018 steel, magnetic field, corrosion, electrodeposit, nickel.

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