Natural Kermes Dye as an Effective Additive for Electrochemical Deposition of Nickel from Watts-type Nickel Bath

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In this work, considerable improvements in the corrosion resistance as well as on the microhardness of the electrodeposited nickel from Watts-type nickel bath has been achieved by using Natural Kermes Dye (NKD) as an effective additive. The investigation was carried out to study the influence of different concentrations of NKD on the polarization behavior, anodic linear stripping voltammetry, cyclic voltammetry, cathodic current efficiency, current-time transients as well as on the microhardness. The microhardness was improved considerably, it changes from 130.4 to 225 kg f mm⁻² in the presence 8.0 x 10⁻⁶ M NKD. Moreover, the corrosion resistance of Ni coating was enhanced about five times in the existence of 1.0 x 10⁻⁵ M NKD. On the other side, the inclusion of NKD to the plating electrolyte leads to a large move in the polarization as well as on the deposition potential to nobler potentials, pointing out a catalytic action of NKD on nickel deposition process. The kinetic information emphasized that the exchange current is significantly increased with enhancing NKD concentration while α_c remains nearly constant, supposes that the addition of NKD does not change the Ni deposition mechanism. The phases and morphology of the nickel coatings were checked in the absence and presence of NKD by XRD and SEM.

Keywords: Natural kermes dye; Ni electrodeposition; corrosion resistance; current efficiency; microhardness.

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