Electrochemical Deposition of Bright Nickel on Titanium Matrix from Ammoniacal Solution in the Presence of Thiourea

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The electrodeposition behaviors of nickel on titanium cathode were investigated in ammoniacal electrolyte in the absence and presence of thiourea. Tafel polarization curve and cyclic voltammogram studies demonstrate that with the presence of thiourea stimulates cathodic polarization and shifts the nucleation potential ($E_{nu}$) towards more negative values. Moreover, the electrodeposition of nickel proceeds via 3D instantaneous nucleation whatever the presence of thiourea or not. There is noticeable improvement in surface morphology and deposit quality by introducing thiourea to the bath. Smooth and bright nickel deposits with small globular nickel crystals can be obtained when thiourea concentration is over 25 mg/L. The X-ray diffraction analysis indicates that thiourea can influence the crystallographic orientations of nickel crystals, thus improving the grain refinement and surface smoothness. Moreover, the effects of thiourea on the cathodic current efficiency (CE), energy consumption (EC) and kinetics parameters of cathodic process were also discussed. These results are beneficial for the nickel metallurgy or nickel plating in ammoniacal media.

Keywords: Nickel electrodeposition; Thiourea additive; Inhibiting nucleation; Bright surface

FULL TEXT

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