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Characterization of Pure Nickel Coatings Fabricated under Pulse Current Conditions

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Abstract : Pure nickel coatings have been successfully electrodeposited on copper substrates by the pulse plating technique. The influence of current density, duty cycle and pulse frequency on the surface morphology, crystal orientation, and microhardness was determined. It was found that the crystallite size of the deposit increases with increasing current density and duty cycle. The crystal orientation progressively changed from a random texture at 1 A/dm2 to (200) texture at 10 A/dm2. Increasing pulse frequency resulted in increased texture coefficient and peak intensity of (111) reflection. An increase in duty cycle resulted in considerable increase in texture coefficient and peak intensity of (311) reflection. Coatings obtained at high current densities and duty cycles present a mixed morphology of small and large grains. Maximum microhardness of 193 Hv was achieved at 4 A/dm2, 10 Hz and duty cycle of 50%. Nickel coatings with (200) texture are ductile while (111) texture improves the microhardness of the coatings.

Keywords : current density, duty cycle, microstructure, nickel, pulse frequency
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