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Effects of saccharin and tetramethylammonium bromide on the microstructure and microhardness of thick cobalt electrodeposits

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ABSTRACT: Cobalt electrodeposition was carried out in Watts type bath to investigate the effects of sodium saccharin and tetramethylammonium bromide on the crystal structure, morphology, surface roughness and microhardness of thick cobalt deposits. The addition of sodium saccharin changed the crystal orientation from mixed hcp $(10\ \bar{1}0)$ and $(11\ \bar{2}0)$ planes to mixed hcp $(10\ \bar{1}0)$, (0002) and $(10\ \bar{1}1)$ planes; deposit morphology was correspondingly changed from curved dihedral structure to fine grained structure; it also favored the formation of deposits of small grain size and high microhardness, yet led to a much rougher surface. Tetramethylammonium bromide had minor effects on the crystal structure, morphology and microhardness of Co deposits; however, combined with sodium saccharin, it decreased both the density and height of hillock shaped surface structure resulted from the addition of saccharin and favored the formation of smoother deposit. These changes could be associated with the behaviors of the two additives in cobalt deposition process.

Keywords: electrodeposition; tetramethylammonium bromide; cobalt; surface roughness

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