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Study of Ni-Bi₂O₃-CeO₂ composite coatings: Hierarchical microstructure and augmented microhardness for surface engineering application

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ABSTRACT

In this present study, bismuth oxide (Bi₂O₃) and cerium oxide (CeO₂) nanoparticles reinforced Ni coatings are successfully made-up from a Watt's bath by means of an efficient and controllable galvanostatic deposition technique. The prodigious influences of composite particle concentration and electrolyte temperature on the composite coating properties (i.e. texture coefficient, lattice distortion, microhardness, and morphology) are investigated. X-ray diffraction studies specify that the crystallite size value, minimize with a rise in co-deposited particle content. This induces strain and dislocation in the lattice planes. SEM micrographs examination insists that the formation of the pyramid, petal, and acicular-like morphology depending on the deposition conditions. The addition of CeO₂ and Bi₂O₃ particles in the nickel bath improves the microhardness value of the Ni deposits. The roughness value of the composite deposits diminishes with elevation in the concentration of Bi₂O₃ and CeO₂ particles.

Keywords: X-ray diffraction; Grain refinement; Nanocomposite; Ni matrix; Lattice strain.

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