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Study of Ni-Bi_2O_3-CeO_2 composite coatings: Hierarchical microstructure and augmented microhardness for surface engineering application

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ABSTRACT

In this present study, bismuth oxide (Bi_2O_3) and cerium oxide (CeO_2) 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 CeO_2 and Bi_2O_3 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 Bi_2O_3 and CeO_2 particles.

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

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