

Microstructure and Magnetic Properties of NiP Alloys

S. Alleg, A. Boussaha, W. Tebib, M. Zergoug, J. J. Su?ol

Abstract: Ni-P alloys were prepared by electrodeposition on a copper substrate at different plating conditions (applied potential and deposition time). The morphology, composition, microstructure, structure, and magnetic properties of the films were investigated by scanning electron microscopy, energy-dispersive spectrometry, X-ray diffraction, and vibrating sample magnetometry, respectively. The phosphorous content is about 8.6–12.2 at.%. The deposits exhibit either a nanocomposite structure where Ni(P)–1 and Ni(P)–2 solid solutions are embedded into an amorphous matrix, or a mixture of Ni₂P phosphide and Ni(P)–1 and Ni(P)–2 solid solutions. The coercivity and magnetization are plating condition dependent. All samples exhibit a soft magnetic character with coercivity lower than 58 Oe. The squareness ratio M_r/M_s values that are in the range 0.019–0.123 correspond to a multidomain (<0.1) for all samples except sample B (1.15 V, 10 min) which falls into a pseudo-single domain ($M_r/M_s = 0.123$).

Keywords : Electrodeposition Ni-P alloys Microstructure Magnetic properties X-ray diffraction