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Comparative trial of saccharin-added electrolyte for improving the structure of an electrodeposited magnetic FeCoNi thin film

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Abstract

Magnetic thin films composed of FeCoNi alloy nanocrystals were electrodeposited on an indium tin oxide-coated polyethylene terephthalate sheet from sulfate electrolyte in the presence of saccharin. The resultant films were characterized by several analytical techniques, including X-ray diffraction, transmission electron microscopy (TEM), scanning TEM, X-ray photoelectron spectroscopy, and superconducting quantum interference device magnetometer. Microstructural analyses confirmed the formation of pure-phase ternary solid solutions of face-centered cubic FeCoNi. Saccharin was found to play an important role in controlling the crystallite size, composition, and morphology of the FeCoNi film that influenced the magnetic properties of the film. The FeCoNi film exhibited excellent soft magnetic behavior at room temperature with a relatively high saturation magnetization.

Keywords: Magnetic thin film; Iron cobalt nickel alloy; Electrodeposition; Flexible substrate; Saccharin