

Fabrication and characterization of nanostructured Fe-Co alloy powders by chemical solution mixing and hydrogen reduction

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1. Introduction

Conventional Fe-Co alloys are important soft magnetic materials that have been widely and commercially used in industry. Nanostructured (NS) Fe-Co soft magnetic could show some major technological advantages due to their predicted low coercivity and high saturation magnetization¹⁾. In this study, nanocrystalline Fe-Co alloy powders were fabricated by chemical solution mixing and hydrogen reduction.

2. Experimental procedure

FeCl₂ and CoCl₂ with 99.9 % purities were used to fabricate the NS Fe-Co alloy powders. FeCl₂ and CoCl₂ powders dissolved in ethyl alcohol as being composition of Fe-50wt.%Co and dried to mix the salts at 70°C for 24h. The salts mixture was reduced at 450~550°C for 1h in H₂ atmosphere. Phase identification of prepared powders was determined by X-ray diffraction (XRD) analysis and transmission electron micrographs (TEM). Microstructural characteristics such as morphology, particle size and crystal structure were analyzed by TEM. The magnetic properties of the powders were estimated using a vibrating sample magnetometer (VSM) with an applied magnetic field up to 15 kOe at room temperature.

3. Result and discussion

The particle size of Fe-Co alloy powder was 45nm and Fe-Co alloy powder showed a phase with lattice parameter of 2.858Å and B2-BCC from TEM analysis. The coercivity and saturation of Fe-Co alloy powder by CSHR were 32.50e and 214emu/g, respectively.

Reference

1. R. Hamzaoui, O. Elkedim, N. Fenineche, E. Gaffet, J. Craven, Materials Science and Engineering A., 18 (2003) p. 299.