DU08

Hf Composition Dependence of High-frequency Ferromagnetic Properties of $(Fe_5Co_5)_xHf_y$ Thin Films

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Abstract $(Fe_5Co_5)_xHf_y$ films with Hf composition gradient varied from 7.7 to 16.8 at% were prepared by gradient sputtering (GS) method. Magnetic properties and high-frequency characteristics of the samples were sensitive to the Hf composition. A large magnetization of 15.2-22.1 kG, strong uniaxial anisotropy with a anisotropy field up to 400 Oe and high resonance frequency (f_r) over 3 GHz were achieved in the magnetic-field-annealed. These clearly indicated that $(Fe_5Co_5)_xHf_y$ film is a potential magnetic material for applications at GHz bands.

Keywords: Magnetic materials; Anisotropy; Nanostructured materials; Transition metal alloys and compounds.
PACS: 75.70.-I, 75.30.Gw, 75.50.Bb, 72.30.+q

DU09

Magnetic Behaviors of Surface Modified Superparamagnetic Magnetite Nanoparticles

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We investigated the synthesis and magnetic properties of the magnetite and the poly ethylene glycol (PEG) coated magnetite nanoparticles, respectively. The magnetite nanoparticles were synthesized by a co-precipitation method. And then the magnetite nanoparticles were encapsulated with PEG under a nitrogen atmosphere to prevent oxidation. The polymerization process was proven by comparison of the FT-IR spectra of the uncoated magnetite nanoparticles with those of the FT-IR spectra of PEG coated magnetite particles. All the samples have characteristic absorption band of the Fe-O bond of magnetite at 572 cm^{-1} . In PEG coated magnetite, the absorption bands exhibit the C-O bond and the C=C bond at 1087 $cm^{-1}$and 1642 cm^{-1}, respectively. The average particles size of the uncoated and the PEG coated magnetite particles were 10.4 nm and 12.6 nm, respectively, which were determined by HRTEM (Fig. 1 (a) and (b)) and DLS. It means the magnetite magnetic particles were well coated by PEG. In order to characterize the magnetic properties of the surface modified magnetite nanoparticles, the magnetization processes of the magnetic nanoparticles were measured by PPMS with the temperature range from 5 K to 300 K. The blocking temperatures of the uncoated and PEG coated magnetite particles exhibit at 260 K and 130 K by ZFC and FC magnetizations curves, respectively. The magnetizations of the uncoated magnetite and the coated magnetite nanoparticles decreased with the increase of the temperature. The coercivities decreased to nearly zero with the increase of temperature as expected.

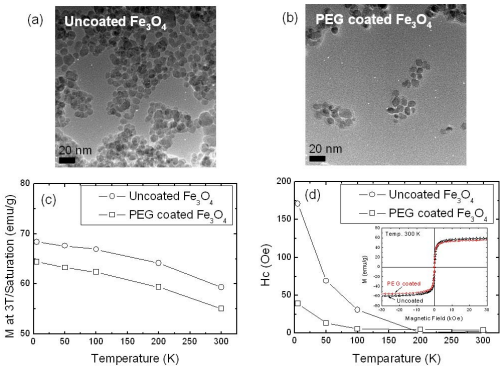

Fig. 1. TEM images of the Fe_3O_4 magnetic particles (a), (b) and magnetization (c), coercivity (d) with the change of temperature and the typical magnetization curves at 5 K. before and after modification by PEG, respectively.

This study was supported by National Center for Nanomaterials and Technology (NCNT) through Yeungnam University.

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