12TH JOINT MMM–INTERMAG CONFERENCE

January 14–18, 2013
Chicago, Illinois, USA

2013 Intermag MMM

ABSTRACTS

IEEE MAGNETICS

AIP | American Institute of Physics

grown on ITO substrates by reduction of Fe(III)-triethanolamine complex in aqueous alkaline solution. XRD & SEM data indicated that Fe_3O_4, Fe_3O_4-ferrihydrite bi-layer structure and ferrihydrite nanowall were obtained with increasing reduction potentials. A <511> preferred orientation spontaneously formed in the samples prepared at the potentials -1.06 V and -1.08 V. Through XRD data refinement and AGM measurement, we demonstrated that the appearance of preferred orientation can significantly reduce the coercivity of magnetite films. The decrease of coercivity can be described by a model considering competition of shape anisotropy and magnetocrystalline anisotropy in the films as the preferred orientation presents. The magnetocrystalline anisotropy in those oriented films causes an out-of-plane equilibrium magnetization, which reduces the energy barrier when the magnetization is reversed. Our research supplies a new way to tune the magnetic anisotropy in magnetic films.

1.P. Sensor et al., Appl. Phys. Lett. 74, 4017(1999). 2.Shawn Chatman et al., J. Appl. Phys. 98, 113902 (2005) 3.Elizabeth A. Kulp et al., Chem. Mater. 21, 5022-5031(2009)
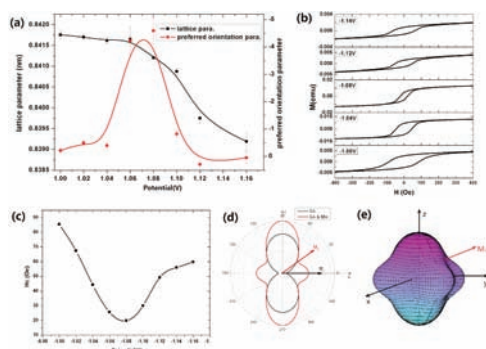

Figure. (a)The lattice parameters (black) and the preferred orientation parameters (red) of <511> given by the refinement of the XRD data. The hysteresis (b) and coercivity (c) of samples deposited at different potentials with external field parallel to the plane. (d)The xz section of shape anisotropy only (SA, black) and coexistence of shape anisotropy and magnetocrystalline anisotropy (SA & MA, red). Here, the xy section lies in the sample plane. M0 is the equilibrium magnetization. (e)The energy landscape of coexistence of shape anisotropy and magnetocrystalline anisotropy.

CW-07. Magnetic properties of Sr substituted Y-type hexaferrite.K. Cho[1], C. Rhee[1] and C. Kim[1]*1. Department of Physics, Kookmin University, Seoul, Republic of Korea*

Due to recent advances in high frequency antennas and RF devices requiring miniaturization, broader bandwidth, and impedance matching, hexaferrites with high resonance frequency have been studied extensively [1, 2]. Here, we synthesized the Sr substituted Y-type hexaferrites ($Ba_{2-x}Sr_xCo_{1.6}Zn_{0.4}Fe_{12}O_{22}$; BSCZ-Y) and investigated their crystalline and magnetic properties by XRD, SEM, VSM, and network analyzer. BSCZ-Y were prepared by solid state reaction method and sintered at various temperatures. XRD patterns show that while BSCZ-Y with x less than 1.5 has Y-type hexagonal structure, BSCZ-Y (with x = 2) prepared under various sintering temperatures, have mixed phase including M-type. Complex permeability and permittivity of BSCZ-Y were measured by network analyzer between 100 MHz to 4 GHz. The difference in ion radius of Sr^{2+} (1.27 Å) and Ba^{2+} (1.43 Å) is responsible for its initial permeability. Even though, for x below 0.5, the initial permeability of BSCZ-Y increased with Sr concentration, at higher values of x, its value decreased with increasing Sr concentration as shown in figure 1. Furthermore, BSCZ-Y with x = 2, sintered at various temperatures, showed low initial permeability at GHz band due to the presence of M-type phase. The permeability and magnetic loss of BSCZ-Y (x = 0.5) sintered at 1050 °C are 2.28 and 0.094 at 2GHz, respectively, which are the best among the values

with BSCZ-Y series for antennas and RF devices. From the VSM measurements, the Néel temperature was determined to be 555 K for x = 0 and its value slightly decreased with Sr concentration. However, the spin reorientation temperature, corresponding to helical to ferrimagnetic transition, of BSCZ-Y increased with Sr concentration, since the 183 K. Our study shows that all samples sintered 1050 °C have low magnetic loss less than 0.1 in 2 GHz band, indication the, potential application of BSCZ-Y in RF and antenna devices in UHF band.

[1] L. Zhang, A. Puri, K. Sertel, J. L. Volakis, *F. IEEE*, and H. Verweij, IEEE Trans. Magn. **47**, 8 (2011). [2] R. C. Pullar, Prog. Mater. Sci. **57**, 1191 (2012).
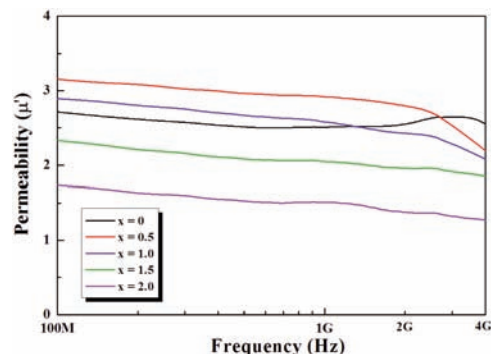

Figure 1. Frequency dependence of real part of complex permeability of BSCZ-Y sintered at 1100 °C.
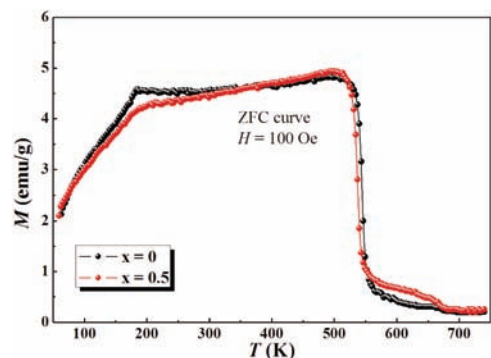

Figure 2. Néel and spin transition temperature of BSCZ-Y with 0, 0.5 Sr content.

CW-08. The dispersion spectra of permeability and permittivity for LiZn ferrite doped with Bi2O3.R. Guo[1], Z. Yu[1], X. Jiang[1], K. Sun[1], Z. Xu[1], Z. Lan[1] and *F. Bai*[1]*1. State Key Laboratory of Electronic Thin Films and Integrated Devices, University of Electronic Science and Technology of China, Chengdu, SiChan, China*

LiZn ferrites with a composition of Li0.35Zn0.3Mn0.06Fe2.29O4 were doped with Bi2O3 (x=0.0~1.0 wt%) and fabricated at 1000 °C by a conventional ceramic method. The dielectric and magnetic properties of LiZn ferrites have been investigated in detail. The results are as follows: optimum Bi2O3 can obviously improve the dielectric and magnetic properties of LiZn ferrites. As can be seen clearly from Fig.1, the permeability spectra of LiZn ferrites with different amounts of Bi2O3 have been resolved into two contribution components: domain wall movement and spin rotation magnetization[1-3]. The fitting results of permeability dispersion show that the spin rotation magnetization mechanism makes major contributions to the dispersion of LiZn ferrites except in the sample doped with 1wt% Bi2O3. With increasing Bi2O3 concentration, the permittivity(ε') gradually increases, and domain wall spectra changes from resonance-type to relaxation-type, but the spin rotation spectra varies in the opposite way. Dielectric loss tangent