ER03

Perpendicular Magnetic Anisotropy of FePt film on Si Substrate with SiO_2 Under Layer and B_4C Top Layer

H. Wang*, Q. Mo, J. Zhang, F.J. Yang, Y. Wang, and H.B. Wang

Faculty of Physics and Electronic Technology, Hubei University, Wuhan 430062, PR China

*Corresponding author: e-mail: nanoguy@126.com

Highly (001) oriented FePt thin film has been prepared using Fe/Pt multilayer precursors on silicon substrate with SiO_2 under layer and B_4C top layer by magnetron sputtering and post-annealing in vacuum. As shown in figure 1, the intensities of (001) and (002) superlattice peaks are found to be much stronger than that of (111) peak, indicating the well (001) orientation for the $L1_0$ ordered films. The ratio of *I(001)/I(111)* and the full width at half magnitude (FWHM) of the rocking curve at (001) peak for the film are 35.4 and 1.207°, respectively. While the *I(001)/I(111)* ratio is much larger than that previously reported in other FePt-based systems, the FWHM at (001) peak is much smaller, showing the film has better orientation and higher ordering degree. The perpendicular magnetic anisotropy for the film is suggested by the magnetic hysteresis loops with magnetic field applied along film normal and plane, as shown in Figure 2.

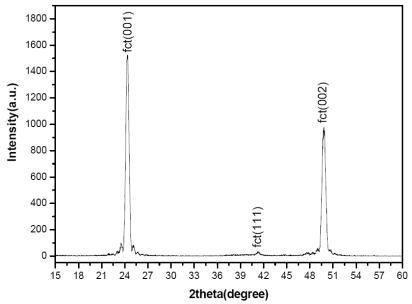

Fig. 1. XRD patterns of the annealed B_4C/ FePt/SiO_2 film.

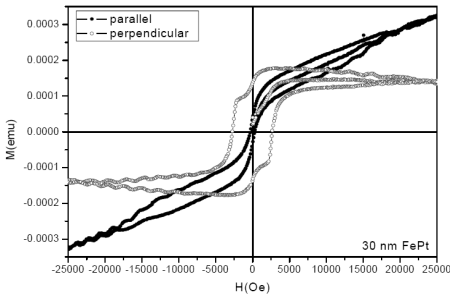

Fig. 2. M-H loops of the annealed B_4C/ FePt/SiO_2 film.

This work is supported by the National Nature Science Foundation of China under contract number 50371056 and 50772032, MOE of China (20060512004), MOST of China (No.2007CB936202), Natural Science Foundation Creative Team Project of Hubei Province (2007ABC005).

ER04

The Magnetic and Microstructural Properties of Zr-doped FePt/MgO Multilayer Films

Kisu Kim[1], Won Young Jeung[2], and Seong-Rae Lee[1]*

[1]Department of Materials Science and Engineering, Korea University, Seoul 136-713, Korea

[2] Division of Materials Science & Engineering, Korea Institute of Science and Technology, P. O. Box131, Seoul 136-791, Korea

*Corresponding author: e-mail: kumetsrl@korea.ac.kr

Post-annealing is required to achieve $L1_0$ ordered phase from disordered as-deposited films. However the annealing induces grain growth so that it makes the film detriment for high-density recording. The purpose of this study is to accelerate the ordering process and restrain the grain growth of the ordered FePt phase by using the Zr element [1]. The samples consisting of thermally oxidized SiO2 substrate / TiAl (4)/ $[MgO(3.2) / Fe_{100-x}Pt_xZr_3(2.8)]_n$ (x = 36.5~63.5 at.%, n = 4~8) were prepared by using an rf- and dc- magnetron sputtering system under base pressure 5.0×10^{-7} Torr at 600 °C for various annealing time. The magnetic and structural properties of FePt films were analyzed by using VSM, HRXRD, HRTEM, and AFM. Zr-doped FePt films showed accelerated ordering transformation kinetics with smaller grain size. We could make FePt-Zr/MgO nano-composite films with fine grain size (6 nm) and out-of-plane coercivity (over 2.0 kOe) within 5min annealing at 600°C. It is thought that the point defects and lattice strain induced by Zr-doping increased the nucleation rate of the ordered phase [2]. In addition to that, we could improve the magnetic and microstructural properties of FePt-Zr alloy films by varing the number of bilayer, compositon of Fe and using the TiAl underlayer [3]. Consequently the films with TiAl underlayer and Zr-doping showed the perfect (001)-textured LI0 FePt films with out-of-plane coercivity (over 3kOe), squareness (0.98), and Ku (over 1.2×10^7 erg/cc) in the optimum condition.

This work is supported by a grant from the Fundamental R & D Program for Core Technology of Materials funded by the Ministry if Commerce, Industry and Energy, the Korea Research Foundation (KRF-2004-005-C00068).

REFERENCES

[1] S. R. Lee, S. Yang, Y. K. Kim and J. G. Na, J. Appl. Phys. 91, 6857 (2002).
[2] S. R. Lee, S. Yang, Y. K. Kim and J. G. Na , Appl. Phys. Lett. 78, 4001 (2001).
[3] J. O. Song, S. R. Lee, and H. J. Shin, Appl. Phys. Lett. 86, 252501 (2005).