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The Structure and Magnetic Characteristics of Sputtered Ag and Bi Underlayers on the FePtAlloy Thin Films

Se Young O[1,2], Alexander Shapiro[2], William F. Egelhoff, Jr.[2], and Chan-Gyu Lee[1]*

[1]Department of Nano & Advanced Materials Engineering, Changwon National University, #9 Sarim-dong, Changwon, Gyeongnam 641-773, Republic of Korea

[2]Magnetic Materials Group, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA

*Corresponding author: e-mail: chglee@changwon.ac.kr

Hard magnetic FePt nanoparticles have attracted much interest due to their potential application to the future high-density magnetic storage media. Large coercivity of ordered FePt nanoparticles originates from the $L1_0$-type ordered structure with high magnetocrystalline anisotropy [1]. In order to fabricate the granular films suitable for recording media applications, the process to fabricate $L1_0$ FePt nanoparticles without grain growth is required. For this purpose, many attempts have made to form $L1_0$ FePt films at lower temperature, e.g., addition of elements [2-5], monolayer deposition using the molecular-beam epitaxy method [6], annealing of Fe/Pt multilayer films [6,7], and deposition on heated substrates [8,9]. We have investigated the possible means of lowering the ordering temperature by depositing underlayers on the FePt films.

The MgO/ Ag_{xnm}/ $FePt_{20nm}$ (x = 0.4, 0.92, 1.32) films and MgO/ Bi_{xnm}/ $FePt_{20nm}$ (x = 0.83, 1.95, 2.75) films were prepared on MgO(100) substrates in a DC magnetron sputtering system. We discovered that the coercivity of the FePt thin films increased as the thicker Ag or thinner Bi underlayers were deposited, respectively. Magnetic properties of the films determined by a vibrating sample magnetometer show that the ordering temperature decreased in both the FePt/Ag and FePt/Bi films by 200~250°C as compared to the FePt film grown without the underlayer.

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ER08

Improvement of Magnetic Properties and Texture of MgO/FePt Multilayer Thin Film by Sn Addition

DongWon Chun, GyeungHo Kim, and WonYoung Jeung*

Division of Materials Research Korea Institute of Science and Technology, 39-1 Haweolgok-dong, Seongbuk-gu, Seoul, Republic of Korea

*Corresponding author: e-mail: wyjeung@kist.re.kr

FePt $L1_0$ alloy has much interest due to its potential applications for ultrahigh density magnetic recording [1, 2]. An attempt is made in this study to incorporate alloying element such as Sn having different ionic radius to lower the order-disorder transformation temperature of FePt alloy. MgO/$Fe49.8Pt_{50.2}$ multilayer thin films were deposited on Si(100)/SiO_2 substrate using magnetron sputtering system with a base pressure of better than 1×10^{-7} torr. Magnetic properties were measured using VSM and microstructure of FePt and FePtSn film was characterized by HR-TEM and HR-XRD. From Fig. 1, it is obvious that Sn addition promotes the ordering temperature of FePt thin film, increase coercivity was about 2200Oe at 500°C. Our results show that Sn addition which was distributed into FePt alloy matrix effectively reducing the activation energy for the $L1_0$ ordering-disordering of FePt alloy. As a consequence, high coercivity (Hc) at lower annealing temperature is obtained from FePtSn film.

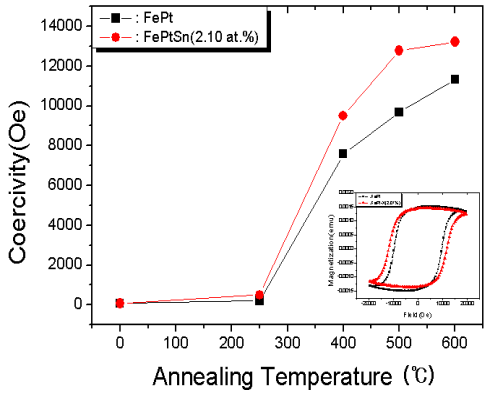

Fig. 1. Variation of Coercivity of FePt and FePtSn as a function of annealing temperature and the inset is hysteresis of FePt and FePtSn film.

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