ER09

Structure and Magnetic Properties of Ordered Ferh-Pt Thin Films

W. Lu*, N. T. Nam, and T. Suzuki
Information Storage Materials Laboratory, Toyota Technological Institute, Nagoya 468-8511, Japan
*Corresponding author: W. Lu, e-mail: weilu@toyota-ti.ac.jp

Antiferromagnetic-Ferromagnetic (AFM-FM) phase transition process in ordered FeRh alloys with CsCl structure was found for the first time by Fallot in 1938. It has been drawn much attention in recent years because of its potential applications in heat-assisted magnetic recording, spin valves and MEMS devices. However, the mechanism of this transition is still not clear. In this study, the effect of Pt addition on the structure and magnetic properties of single crystalline Fe50(Rh1-XPtX)50 thin films were studied. Fe50(Rh1-XPtX)50 thin films with $0 \leq X \leq 0.15$ were deposited onto MgO(100) substrate by e-beam co-evaporating technique. The structure and magnetic properties were characterized by x-ray diffraction (XRD) and vibrating sample magnetometer (VSM). XRD $\Theta/2\Theta$ scan results indicate that the (001) oriented FeRh thin films were obtained on MgO (100) substrate and ϕ scan shows that the films are single crystalline. With increasing Pt contents, the lattice parameters a and c of ordered FeRhPt thin films increase. The c value is a little larger than a because of the misfit between film and substrate. The first-order AFM-FM phase transition was also observed in Fe50(Rh1-XPtX)50 ordered thin films with $0 \leq X \leq 0.15$. Fig.1 shows the temperature dependent magnetization curves of Fe50(Rh1-XPtX)50 ordered thin films. With increasing Pt contents, the Curie temperature and saturated magnetization decrease, and the critical transition temperature (Tc) shifts to high temperature side while the width of thermal hysteresis (ΔH) decreases and even there is almost no thermal hysteresis when X equals to 0.15. The field dependence of critical transition temperature was also studied and a shift rate of -8K/T to -3.3K/T was observed for Fe50(Rh1-XPtX)50 thin films with increasing Pt contents. It means that an external applied magnetic field will stabilize the ferromagnetic phase and consequently decrease the transition temperature. But the effect of external applied magnetic field on the AFM/FM phase transition is restrained by the addition of Pt.

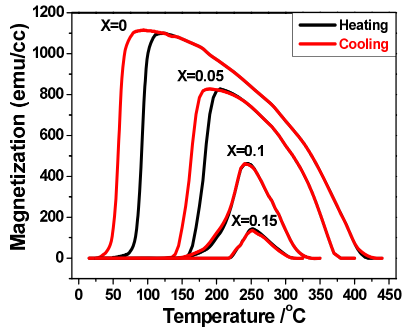

Fig. 1. Temperature dependent magnetization curves.

ER10

Exchange-Coupled $Ni_{81}Fe_{19}/Fe_{50}Pt_{50}$ Bilayers with Perpendicular Magnetization

Jae Young Ahn[1], Nyun Jong Lee[1], Sun Hee Kim[1], Tae Hee Kim[1]*
Je Eun Kim[2], Hyun Jung Kim[2], and Anny Michel[3]
[1]Department of Physics, Ewha Womans University, Seoul 120-750, Korea
[2]Department of Physics, Sogang University, Seoul 121-742, Korea
[3]Department of Physics, Université de Poitiers, Futuroscope-Chasseneuil 86862, France
*Corresponding author:Tae Hee Kim, e-mail: taehee@ewha.ac.kr

FePt is a leading candidate for future extremely high density magnetic recording media, due to its very high values of Ku. However, this very high anisotropy gives films with very high coercivity, too high for reliable recording using conventional write heads. Hard magnetic/soft magnetic bilayers could be an excellent solution to tailor their magnetic properties according to the specific requirements, thereby enabling efficient recording. In this work, we investigated the thickness-dependent magnetic response of exchange-coupled Ni81Fe19/Fe50Pt50 bilayers. The hard magnet films, such as FePt, were prepared beyond the soft magnetic permalloy layer, Ni81Fe19 (Py), of a material having an fcc crystalline structure by using UHV-MBE deposition technique. In order to have the fcc Py films, the epitaxial MgO(001) film was deposited as a buffer layer beyond the bare Si(100) substrate. Structural analysis by x-ray diffractometry and transmission electron microscope (TEM) showed the fairly well-crystallized face-centered-tetragonal FePt films beyond the Py film. The out-of-plane coercivity of the FePt films decreased dramatically as the soft Py film becomes thicker. Room-temperature magnetoresistance measurements reveal that perpendicular magnetic anisotropy exists for these films. Our results could open intriguing possibility for media applications for high density magnetic recording.

This research was supported by a grant from the Fundamental R&D Program for Core Technology of Materials funded by the Ministry of Commerce, Republic of Korea and supported by KOSEF grant R01-2006-000-11227-0.