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Influence of Working Pressure on Magnetic Properties of $Tb(Fe_{0.55}Co_{0.45})_{1.5}$ Thin Films

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In this work the magnetic anisotropy of large magnetostriction material $Tb(Fe_{0.55}Co_{0.45})_{1.5}$ (named as *a-TerfecoHan*) films were investigated. All the samples were prepared by dc-magnetron sputtering with the base pressure of 2×10^{-7} Torr and Ar working pressure in range of 1-7 mTorr. The thickness of films are 200 nm. The microstructural characteristics of the films were studied by X-ray diffraction. The hysteresis loop were measured at room temperature using vibrating sample magnetometry (VSM) with magnetic field applied perpendicular and parallel to the film plane. The obtained results show that with working pressure of 7 mTorr we can obtain perpendicular magnetic anisotropy (PMA). In order to clarify the origin of the PMA observed in $Tb(Fe_{0.55}Co_{0.45})_{1.5}$ films, we have performed XRD measurement. The XRD pattern shows that all the samples have amorphous state. Therefore we can consider that the effect can be explained by the stress produced on the film from internal relaxation process and also with the contribution of magnetic anisotropy via magnetoelastic interactions. The magnetic domain structure of films were measured by magnetic force microscopy (MFM) has also been reported.

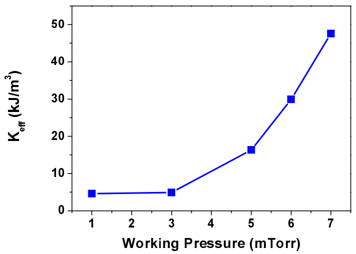

Fig. 1. The value of magnetic anisotropy of $Tb(Fe_{0.55}Co_{0.45})_{1.5}$ thin films as function of working pressure.

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BP14

Co-Ni-Pd Magnetic Intermediate Layers for CoPt-TiO_2 Perpendicular Recording Media

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The present CoCrPt-Oxcide type granular media requires Ru intermediate layer to ensure c-axis alignments of CoCrPt grains and good magnetic isolation among grains in the double layer Ru cases. However, thickness of Ru is presently in the range of 16nm to 20nm range and reduction of thickness is important in the view of writability as well as production cost. In the present work, we have studied effects of soft ferromagnetic Co-Ni-Pd film with fcc structure on Ru[0002] growth and consequently [0002] growth of CoPt grains. Also the variation of magnetic properties as a function of Co-Ni-Pd thickness was studied. The magnetic properties of Co-Ni-Pd can be easily controlled by adjusting the composition. In this work, $Co_{16}Ni_{19}Pd_{65}$ was used. The layer structure was SiO_2/Ta(3nm)/Co-Ni-Pd(t nm)/Ru2(10nm)/CoPt-TiO_2(16nm). As a reference, SiO_2/Ta(3nm)/Ru1(10nm)/Ru2(10nm)/CoPt-TiO_2(16nm) was used. Co-Ni-Pd and Ru1 were deposited at low pressure and Ru2 deposited at high pressure. Magnetic properties and structural analysis were investigated by VSM and XRD.

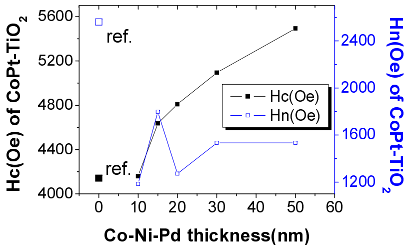

Fig. 1. Coercivity (Hc) and Negative nucleation field(Hn) of CoPt-TiO_2 layers deposited on Ta/Co-Ni-Pd(*t* nm)/Ru2 and Ta/Ru1/Ru2 structures.

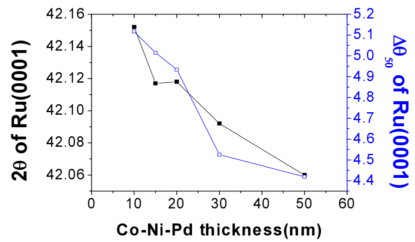

Fig. 2. 2θ and $\Delta\theta_{50}$ of Ru(0001) deposited on Ta/Co-Ni-Pd(*t* nm).

Fig. 1. shows variation of coercivity(Hc) and negative nucleation field(Hn) with increasing Co-Ni-Pd layer thickness. Compared with the reference, Hc was enhanced with increasing Co-Ni-Pd layer thickness from 10nm to 50nm. Hn generally decreased with Co-Ni-Pd layer than the reference. With increasing the Co-Ni-Pd layer thickness, $\Delta\theta_{50}$ of Ru(0002) was decreased(Fig. 2.). The microstructural change of CoPt-TiO_2 layers with the two different intermediate layers(Ru1 and Co-Ni-Pd) will be discussed. In conclusion, the hysteresis loop of CoPt-TiO_2 on Co-Ni-Pd and Ru intermediate layer was comparable with that of CoPt-TiO_2 on dual Ru intermediate layer, which implies the potential of the Co-Ni-Pd magnetic intermediate layer.