Room temperature deposition of perpendicular magnetic anisotropic Co$_3$Pt thin films on glass substrate

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ABSTRACT

Co$_3$Pt alloy thin films were deposited on the glass substrate at room temperature (RT) and 300 °C, which showed high perpendicular magnetic anisotropy (PMA) and isotropy magnetic behaviors, respectively. Co$_3$Pt HCP (0002) planes grew along the substrate plane for the films deposited at RT. The easy axis [0001] was consequently vertical to the substrate surface and obtained the predominant PMA. Large magnetic domains and sharp boundary also supported high PMA in RT-deposited samples. On the other hand, the PMA was significantly decreased with increasing the deposition temperature from RT to 300 °C. Hard HCP(0002) and soft A1(111) co-existed in the film and the magnetic exchanged coupling between these two phases induced isotropy magnetic behavior. In addition, the various thicknesses (t) of the RT-deposited Co$_3$Pt films were deposited with different base pressures prior to sputtering. The Kerr rotation loops showed high PMA and out-of-plane squareness ($S_\perp$) of ~0.9 were found in low base pressure chamber. Within high base pressure chamber, Co$_3$Pt films just show magnetic isotropy behaviors. This study provides a fabrication method for the preparation of high PMA HCP-type Co$_3$Pt films on the glass substrate without any underlayer at RT. The results could be the base for future development of RT-deposited magnetic alloy thin film with high PMA.

Keywords: Co$_3$Pt Hexagonal-close-packed (HCP) Room temperature Perpendicular magnetic anisotropy

REFERENCES