PC06

Capping Layer Impacts on Kerr Magneto-optic Signal

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Thickness and material of capping layerplay important roles in magneto-optic Kerr effect (MOKE) measurement. Suitable capping on magnetic layer and appropriate incident angle of leaser beam will greatly enhance output signal of MOKE that leads to higher density of application or weaker magnetic signal detected. In this study, three kinds of sheet film were fabricated in HV DC/ RF sputtering system to investigate the capping layer impacts on the rotation angle of longitudinal-MOKE (beam wavelength: 632.8 nm). Thin film structure of Ta (6 nm)/ $Co_{50}Fe_{50}$ (100 nm) / Capping-Layer was grown on Si (1,1,1) wafer, where Ta is adopted as a seed layer of CoFe and the Capping-Layer is Ta, MgO, and Si_3N_4, respectively with thickness adjusted ranging from 6 to 100 nm. Kerr rotation angles of three series sample were measured with fixed incident angle to compare the capping influence of different thicknesses and material. Moreover, Kerr rotation angles of third series sample adopting Si3N4 as capping layer were also measured with incident angles ranging from 15 to 75 degrees. With fixing incident angle, the rotation angle shows a decadent relation with Ta thickness increasing due to the principle of electromagnetic wave decaying in a conductor, and arises out an oscillating behavior with MgO or SiN thickness increasing because of the optic path difference changing between capping layer.In SiN capping series sample measurements with varying incident angles, it is found that the best enhancing thickness of SiN capping is shifting to thicker thickness with higher incident angle. In addition, the intensity of MOKE signal is increasing over ten times at 80nm SiN capping and 75 degrees than without capping. The enhancement of intensity is driving from both the thickness of capping layer and incident angle of leaser beam.

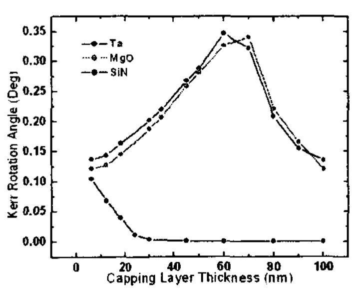

Fig. 1. Relations of Kerr rotation angle with the thickness of capping layer Ta, MgO, and SiN.

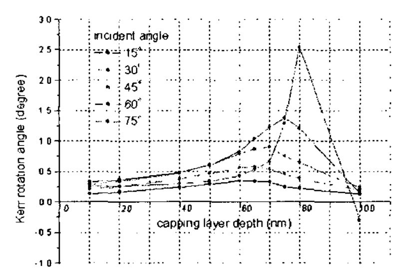

Fig. 2. Dependences of Kerr rotation angle on MgO capping thickness with incident angle of 15, 30, 45, 60, 75 degrees.

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PC07

Characterization of FePt Sputtered Films by Post-annealing: A Study of X-ray Specular Reflectivity

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The $L1_0$ FePt films have been considered to be potential candidates of ultrahigh-areal-density perpendicular storage materials (>1 Tb/in^2) due to their extremely large magnetic anisotropy which confers the stability of magnetic polarization even at an average gain size of only a few nanometer. As the areal density of recording media is raised to 1 Tb/in^2, the flying-height was lower than 5 nm [1]. Therefore the surface roughness resulting from the fcc-fct ordering transformation of the annealed FePt thin films should be strictly controlledin recording applications. The ordering transformation could further lead to the volume expansion of crystal lattice [2] and the change in microstructural defects, thus changing the mass density of FePt thin films. In this article, the effects of annealing temperatures on the surface roughness and mass density of FePt films have been studied by x-ray reflectivity (XRR) method. The Fe50Pt50 thin films were sputtered onto quartz substrates using an equi-atomic FePt target. The FePt films with a thickness of about 40 nm were deposited at room temperature, and subsequently annealed at 200～700℃ for 10 minutes in argon atmosphere. The x-ray reflectivity and crystallographic structure were performed using high-resolution x-ray diffractometer with a rotating anode Cu Kα1 source. The XRR data indicates that the thicknesses of the films are controlled at 40±2 nm. The obtained RMS roughness and x-ray mass density of the films exhibit irregular variations with the annealing temperatures in a range close to the ordering transformation temperatures of FePt (300-400℃), as indicated in Fig. 1 Similar results were also confirmed from x-ray diffraction patterns and the measured magnetic data.

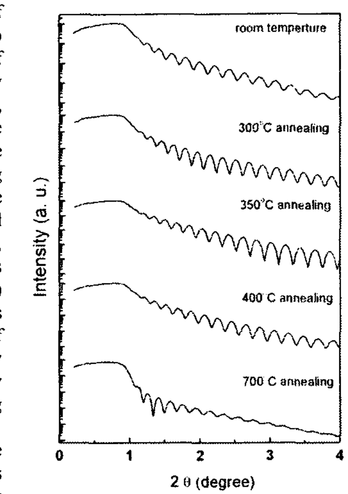

Fig. 1. The XRR curves of the annealed FePt thin films.

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