UA05

Preparation of Boron Carbide Thin Films by DC Magnetron Reactive Sputtering

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This experiment wascarried out to apply to the surface of computer hard-disk. Boron carbide thin films were prepared by DC magnetron sputtering. The films were deposited onto CoCr/Cr/SiO_2/Si(100) substrates with a power of 100W at room temperature, 100°C and 200°C. The reactive gas was introduced up to 1.6% (CH_4/(Ar + CH_4)) during deposition, and the resulting composition of the films matched these ratios, as observed by X-ray photoelectron spectroscopy (XPS). Two well-resolved peaks in C(1s) spectra were observed around 284 eV. The peak at 284.5 eV indicated C-C bond, while a lower binding energy feature at 283.5 eV was assigned to carbide as B4C. The X-ray diffraction results of these films showed the amorphous or nanocrystalline characteristics. The surface hardness was measured using nano-indenter. The values increased up to about 2500 Hv with the substrate temperature of 100°C and the gas volume ratio of 0.8% using nano-indentator. Also, the scratched films endured the load of 35N.

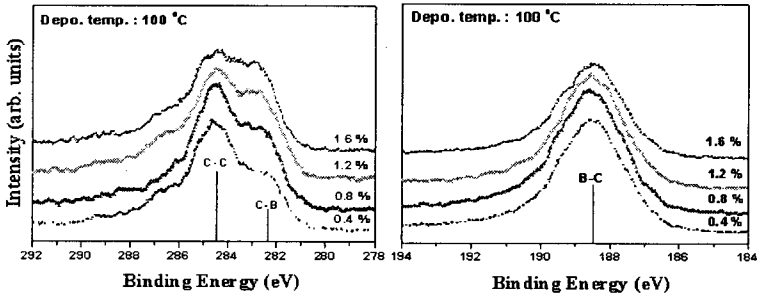

Fig. 1. XPS spectra of carbon(1s) and boron(1s) for boron carbide thin films prepared with CH_4/(Ar+CH4) of 0.8% at substrate temperature 100°C and working pressure of 3.6 mTorr.

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UA06

Magnetic Properties and Microstructure of TbCo/(Co/SiN_x)$_n$ Films

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In this study, the $Tb_{32}Co_{68}$/(Co/SiN_x)$_3$ films with high saturation magnetization (M_s) about 263 emu/cm^3 which is high enough as a heat-assisted magnetic recording (HAMR) medium were prepared by magnetron sputtering. The magnetic anisotropy of all $Tb_{32}Co_{68}$/(Co/SiN_x)$_n$ films (n = 0~3) are perpendicular to the film plane. The vibrating sample magnetometer (VSM) measurements indicate that the M_s and perpendicular coercivity ($H_{c\perp}$) of $Tb_{32}Co_{68}$/(Co/SiN_x)$_3$ film (n = 3) are 263 emu/cm^3 and 3592 Oe, respectively. These are higher than those of single-layered $Tb_{32}Co_{68}$ film (M_s = 167 emu/cm^3 and $H_{c\perp}$ = 3284 Oe). The enhancement of M_s is due to the contribution of Co layers moments. The cross-sectional high resolution transmission electron microscope (HRTEM) image in figure 1 shows that the interface roughness between the (Co/SiN_x)$_n$ layers and TbCo layer is increased as n increases from 1 to 3. The rough surface provides more obstacles and pinning sites that hinder the motion of the domain walls [1-3] at interface between the (Co/SiN_x)$_n$ layers and TbCo layer, and therefore the $H_{c\perp}$ value of the $Tb_{32}Co_{68}$/(Co/SiN_x)$_n$ films is increased from 3103 Oe to 3592 Oe as n increases from 1 to 3.

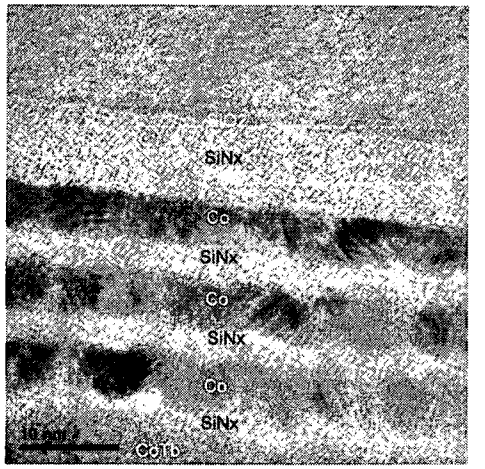

Fig. 1. The cross-sectional TEM image of the (Co/SiN_x)$_3$/CoTb multilayer films.

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