RC01

In Comparison with W-C-N and SiO_2 Buffer Layer on Si Substrate for $La_{0.67}Sr_{0.33}MnO_3$ Layer

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Recently, there has been a great deal of interest in Perovskite magnetic oxide thin films for giant magnetoresistance (GMR) and colossal magnetoresistance (CMR) due to their physical properties and that offers potential for various devices such as magnetic field sensors and hard disk heads[1,2]. Though the GMR, CMR and TMR films have been successfully deposited on several single crystal substrates, these technology must be deposited by viable buffer layer on Si substrate for future semiconductor applications. So we suggest W-C-N buffer layer instead of SiO_2 buffer layer on Si substrate[3]. Polycrystalline thin films of $La_{0.67}Sr_{0.33}MnO_3$ (La-Sr-MnO) were prepared by water-based sol-gel processed on nitrogen concentration of W-C-N and SiO_2 buffer layer. We studies application W-C-N diffusion barrier for La-Sr-MnO magnetic device at nitrogen gas flow 0 sccm to 2 sccm. The La-Sr-MnO thin films deposition by spinning process and the films annealed in air 3 hours at 800℃ in oxygen ambient. We studied the comparison with W-C-N and SiO_2 buffer layer effect on Si substrate for La-Sr-MnO Manganese oxide layer. We also examine the grain size, lattice constant, hysteresis loop, and other La-Sr-MnO properties which are presumably related with magnetic properties.

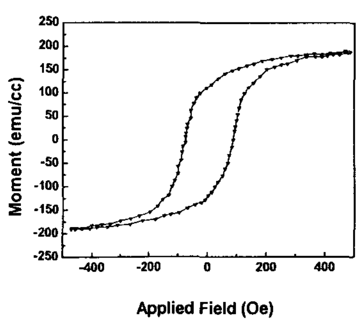

Fig. 1. Hysteresis loop of LSMO/SiO2/Si thin films (VSM)

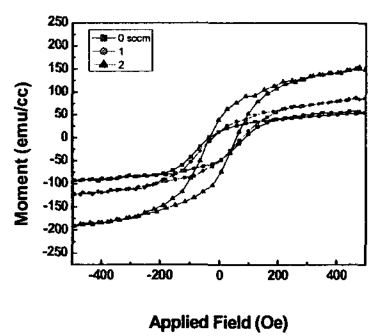

Fig. 2. Hysteresis loop of LSMO/WCN/Si thin films as a function of N_2 gas flow of (a) 0, (b) 1, and (c) 2sccm.

REFERENCES
[1] R. von Helmholt, J. Wecker, B. Holzapfel, L. Schult, K. Samwer. Phys.Rev. Lett. **71**, 2331(1993).
[2] J. Kim, Y. Choi, S. J, S. Y. Kim, and C. W. Lee, IEEE Trans. Magn. 42(5), 3267(2006)
[3] I.-B. Shim, C. S. Kim, K. T. Park, and Y. J. Oh, J. Magn. Magn. Mater. **226**, 1672 (2001).

RC02

Uniaxial Anisotropy of Amorphous FeSiB Films Deposited onto $LiNbO_3$ Substrates

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Iron base amorphous films have been expected to be used in electronic signal conditioning and sensor application areas, since they show attractive capabilities based on their unique magnetoelastic properties, such as large magneto-mechanical coupling factors with both soft magnetic properties and large magnetostrictions. In previous study [1], we reported that the magnetic softness of amorphous FeSiB films could disappear when the films deposited onto the substrates of which thermal expansion coefficients largely differ from that of films. Basically, there is very deep relation between coercive force and anisotropy of soft magnetic material. In this study, we have investigated whythe amorphous FeSiB films had extremely large uniaxial magnetic anisotropies in which the films deposited onto $LiNbO_3$ substrates. Figure 1 shows the comparison of the magnetization curves measured in the direction of easy axis and hard axis of the film deposited onto $LiNbO_3$ substrate. *Indeed, the anisotropic field of the film (150 Oe) with 400 nm thick was almost 100 times larger than its intrinsic uniaxial* anisotropic field (1.5 Oe). Figure 2 shows the thickness dependence of coercive force and anisotropy field of the film with the thickness of from 50 nm to 2000 nm deposited onto $LiNbO_3$ substrates. The coercive force was dramatically changed with the increase of the film thickness from 400 nm to 500 nm due to that the direction of uniaxial anisotropy changed from in-plane to perpendicular. The anisotropic field was increased with increase of the film thickness, except the case of the film with 200 nm thick. This is due to that there is large difference of thermal expansion on the crystal direction of the substrate (12 ppm/C). It is not clear why the anisotropy is so large inthe case of 200 nm at the moment, but this is probably due to that thermal conductivity of the substrate affects the anisotropy.

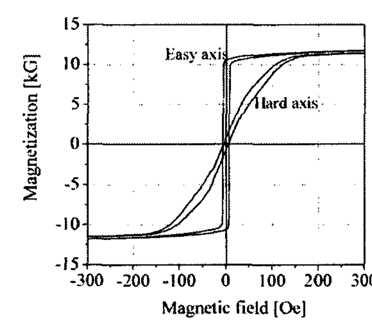

Fig. 1. Magnetization curves of amorphous FeSiB film with 400 nm thick, which was deposited onto LiNbO3 substrate.

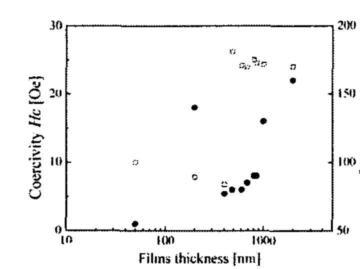

Fig. 2. Thickness dependence of coercive force (▢ and anisotropic field ()of amorphous FeSiB films deposited onto LiNbO3 substrate.

REFERENCES
[1] D. Ishida, K. Kanemoto, K.H. Shin, P.B. Lim, H. Uchida and M. Inoue, Journal of Magnetism and Magnetic Materials, (2007) accepted to be published.