AT07

Study on Ultrathin Co/ZnO(002) Crystal Surface by Magneto-optical Faraday Effect

Y. C. Chang[1], C. W. Su[1]*, M .S. Huang, T. S. Tsai, Y. H. Lee[2], and J. C. Lee[2]

[1]Department of Applied Physics, National Chiayi University, 300 Syuefu Rd., Chiayi 600, Taiwan

[2]Department of Physics, National Cheng Kung University, 1 University Rd., Tainan 701, Taiwan

*Corresponding author: Chiung-Wu Su, e-mail: cwsu@mail.ncyu.edu.tw

Recently our group studied the samples of ultrathin Co films deposited on the Ar^+- and N^+-sputtered ZnO(002) transparent crystal surface by the magneto-optic Faraday effect. The thickness range of Co is from 0 to about 1.5 nm. When the Co film grows on the unannealled clean ZnO(002) surface, the growing curve shows 3-dimensional island mode from the measurement by Auger electron spectroscopy. From the thickness determination in ultrathin film range reported in ref. [1], we obtain a very good result in comparison with calculations. Interesting, the film growth is dominated to whether the studied face is oxygen-face or zinc-face. In the O-face surface, the in-plane hysteresis loop measurement corresponding to the film thickness reveals the behavior of hysteresis reversal with specific thickness. Besides, the Co/ZnO film revealed perpendicular magnetic anisotropy (PMA) even if the film thickness is thick to 1.3 nm. We also studied the effect of reactive ion irradiation on the surface. When the Co/ZnO surface was sputtered by N^+, the Co-N phase with constant composition as Co_3N_2 may exist. The possible mechanism of PMA in Co-N/ZnO(002) system will be discussed.

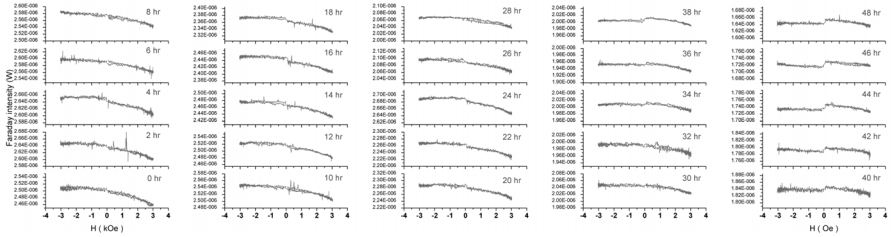

Fig. 1. the longitudinal hysteresis loops versus the thickness of Co ultrathin films.

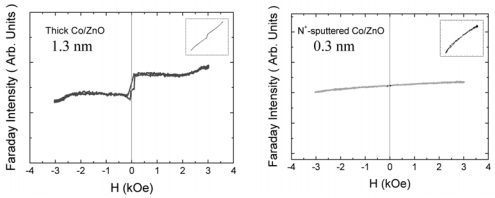

Fig. 2. the polar hysteresis loops of 1.3 nm Co/ZnO and N+ sputtered 0.3 nm Co/ZnO films.

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AT08

Magnetic and Magneto-transport Properties of Annealed Co/Co_2TiSn Thin Films

M.J. Park, Y.S. Cho, H.N. Lee, and T.W. Kim*

Department of Advanced Materials Engineering, Sejong University, Seoul, South Korea.

*Corresponding author: T. W. Kim e- mail: twkim@sejong.ac.kr

In two metallic phase magnets Co/Co_2MnSn and Co/Co_2TiSn consisting of two metallic magnetic phase[1,2], the two phase are exchange-coupled at the phase boundary. The Co/Co_2MnSn system which has a Co-Mn solid solution precipitates in Co_2MnSn Heusler alloy matrix showed that the Co solid solution precipitates are crystallographically coherent and there is exchange coupling at the phase boundary. The Co/Co_2TiSn system which has a Co_2TiSn Heusler alloy precipitates in the hexagonal Co matrix showed an unusual coercivity change with temperature which was modeled in the basis of wall formation caused by exchange coupling at the phase boundary. For measurements of magneto-transport properties, Co/Co_2TiSn thin films with two magnet phase were deposited using Co-deposition magnetron sputtering system. The magnetization process in the films is explained on the basis of the model of wall formation at the phase boundary. Annealed Co/Co_2TiSn films showed the GMR effect of 0.12% which indicates the scattering of polarized conduction electrons due to the antiparallel exchange coupling at the phase boundary. The scattering process of conduction electrons at the phase boundary was modeled with relation to magnetization process.

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