Magnetoelastic Properties of Co/Pd Nanomultilayer Films

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One of the important parameters to investigate the magnetic property in ultrathin ferromagnetic films is magnetoelastic property, since magnetoelastic property could provide a new way to control the spin orientation and to stabilize magnetic anisotropy in magnetic devices. [1] Enormous studies have been carried out on the magnetic and magneto-optical (MO) properties of Co/Pd system, but very little work has been done on the magnetoelastic properties of Co/Pd nanomultilayers. In this study, we have investigated magnetoelastic properties for Co/Pd nanomultilayer film using *in situ* stress/magnetoelastic coupling (MEC) constant measurement system. The stress and MEC constant were measured via highly sensitive optical deflection-detecting system in an ultrahigh vacuum (UHV) chamber equipped with SMOKE, RHEED, and STM. In Fig. 1, we plot the evolution of longitudinal SMOKE hysteresis loop with respect to the Co and Pd sublayer deposition. It is worthwhile to note that reversible spin switching was occurred in the 1st and 2nd Co(Pd) sublayer. However, after 3rd Co(Pd) sublayer, one cannot observe the reversible spin switching. To understand the evolution of the SMOKE hysteresis loop, we have performed layer-by-layer measurement of film stress and MEC constant. It revealed that magnetoelastic anisotropy plays an important role for the observed reversible spin switching. We also found that the evolution of MEC constant at interface is intimately related with intrinsic stress rather than interface formation and second-order strain correction is crucial to describe the dependence of MEC on the film strain.

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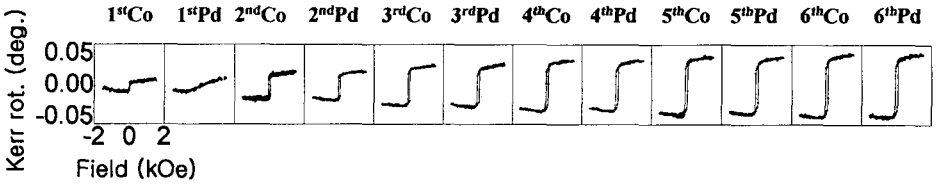

Fig. 1. Evolution of longitudinal SMOKE hysteresis loop with respect to the Co and Pd sublayers in (6-Å Co/ 20-Å Pd)$_6$ multilayer film.

References

[1] J.-R. Jeong and S.-C. Shin, Appl. Phys. Lett. **75**, 3174 (1999).