

EXAFS measurement of perpendicularly magnetized Fe/Co/Pd(111) films

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Fe/Co/Pd(111) film shows twice spin-reorientation transitions (SRT) depending on the thickness of Fe, and the phase diagram was reported in the paper[1]. The origin of the SRTs has not been revealed yet, and we have investigated the structure of Co layer in the Fe/Co/Pd(111) system by measuring Co K-edge extended X-ray absorption fine structure (EXAFS).

Our experiments were performed at BL-7C of Photon Factory in the Institute of Materials Structure Science, High Energy Accelerator Research Organization (KEK-PF). Fe/Co films were deposited on a Pd(111) single crystal at room temperature with the electron-beam evaporation method. XAFS spectra were taken at grazing incidence (GI, $\theta=30^\circ$) and normal incidence (NI, $\theta=90^\circ$) of the Xrays, and all the spectra were measured in the fluorescence-yield mode detected by a solid-state detector.

The Fourier transforms (FT) of the EXAFS function $k^2\chi(k)$ of Fe/Co(5 ML)/Pd(111) are shown in Fig. 1, which were measured in the geometry of NI, and Fig. 2 shows the Co-Co distances of the films. The in-plane Co-Co distance becomes slightly larger as the Fe thickness increases, while the out-of-plane one is almost unchanged. Thus the structural change of Co layer was induced by depositing iron on the surface.

The obtained in-plane Co-Co distance is more close to that of bulk Co(2.51 Å) than that of Pd(2.75 Å). Co films don't grow pseudomorphically on Pd(111).

The FT of Fe(1 ML)/Co(5 ML)/Pd(111) shows a broad structure around 4 Å, while that of Co(5 ML)/Pd(111) exhibits clear contribution from higher coordination shells. The broadening of the structure can be attributed to some disordering caused by Fe deposition. However it is recovered to an ordered structure as seen in the FT of Fe(2 ML)/Co(5 ML)/Pd(111).

We would like to present detailed discussion about relation to the SRTs in the poster session.

References

[1] H. Abe, et al., Phys. Rev. B **78**, 014424 (2008).

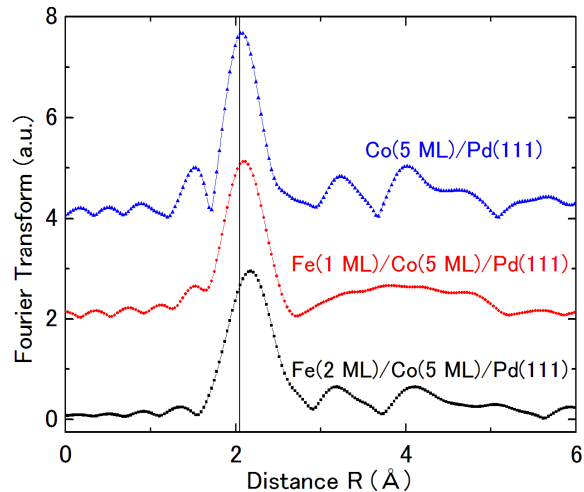


Fig. 1. The Fourier transforms of $k^2\chi(k)$ taken at NI for each Fe/Co/Pd(111) films.

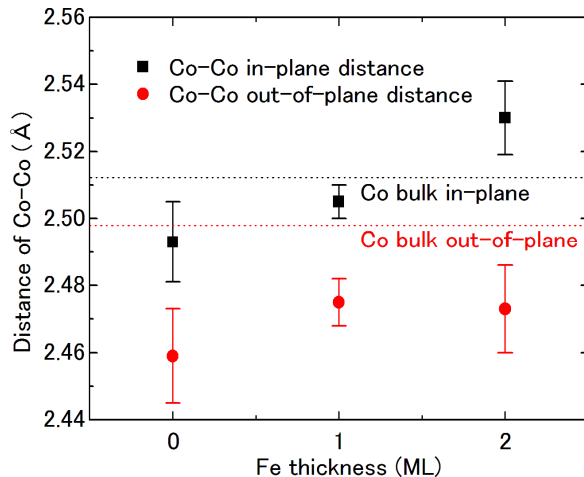


Fig. 2. In-plane and out-of-plane Co-Co distance plotted as a function of the Fe thickness of Fe/Co(5 ML)/Pd(111).