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Ultrathin film magnetism study using *in situ* Kerr rotation and ellipticity

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실상황 Kerr 회전각과 타원율을 이용한 초박막 자성연구

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I. INTRODUCTION

Several attempts have been made to vectorially determine the magnetization components in ferromagnetic thin films to understand magnetic phenomena related to magnetization reversal and spin-reorientation transition (SRT). The magneto-optical Kerr effect (MOKE) has been successfully applied to determine two in-plane magnetization components by measuring two longitudinal Kerr effects in a special case where the magnetization vector lies in the film plane without any perpendicular component. However, in most situations the polar and longitudinal signals are mixed together since out-of-plane tilted magnetization component is involved. We present a novel method to determine all the components of magnetization vector in ultrathin ferromagnetic films by simultaneous measurement of Kerr rotation and Kerr ellipticity.[1]

II. RESULTS AND DISCUSSION

This technique is applied to *in situ* study of magnetization reversal and spin-reorientation transition in Co films grown on Pt(111) single-crystal substrate through full vector analysis of magnetization direction under a magnetic field applied normal to the film plane. Fig. 1 shows the representative hysteresis loops at three film thicknesses: below, within, beyond the SRT. There is an important and intriguing reason why one should measure the Kerr ellipticity as well as the Kerr rotation for vector analysis of magnetization. Very interestingly, there is no difference in the hysteresis loops of the Kerr rotation, however, the hysteresis loops of the Kerr ellipticity are significantly different between the two orthogonal measurement configurations. It is found that Kerr ellipticity is more strongly influenced by in-plane anisotropy than Kerr rotation, and this contrastive behavior in Kerr rotation and ellipticity is enhanced with increasing the Co film thickness since the in-plane anisotropy increase.

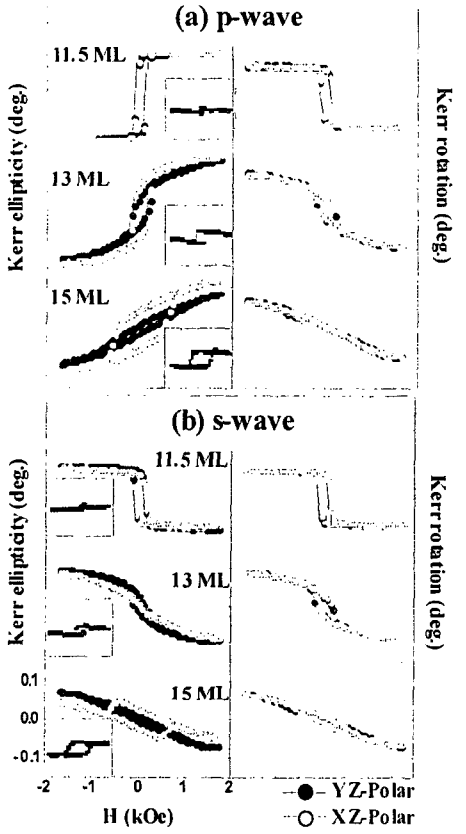

Fig. 1. Representative hysteresis loops at Co film thicknesses: below, within, beyond the SRT.

III. ACKNOWLEDGEMENT

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IV. REFERENCES

[1] Jeong-Won Lee *et al.*, Phys. Rev. B (in press).