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Direct Observation of Asymmetric Magnetization Reversal in Fe/Cr/Fe Thin Films

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We report our experimental finding that there exists an asymmetric magnetization reversal behavior along the direction normal to the easy axis in Fe/Cr/Fe thin films. Interestingly enough, magnetoresistance and Kerr hysteresis loops are found to be quite asymmetric between the decreasing and increasing-field branches of the loop in the applied-field direction normal to the easy axis (N configuration), whereas symmetric in the direction parallel to the easy axis (P configuration). To clarify the microscopic origin of the asymmetric magnetization reversal, we carry out direct time-resolved observation of domain evolution patterns at each switching field using a magneto-optical microscope magnetometer. It has been revealed that magnetization reversal takes place with fast, abrupt, and simple 180-degree domain wall configuration at the switching field in the increasing-field branch. While it takes place with irregular and complex configuration at the switching field in the decreasing-field branch, as demonstrated in Fig. 1.

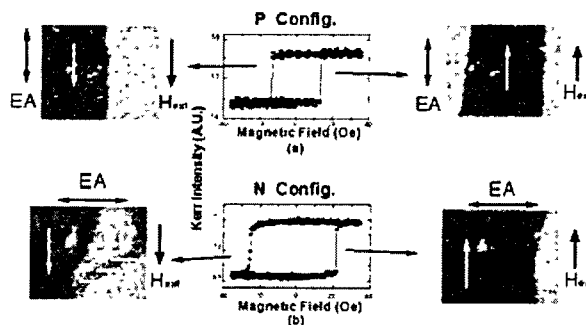


FIG. 1. Time-resolved domain reversal images in (a) P and (b) N configurations together with corresponding Kerr hysteresis loops.