

ASYMMETRIC MAGNETIZATION REVERSAL IN EXCHANGE-BIASED Co/Pt MULTILAYERS

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A detailed study of the magnetization reversal process in [2 nm Pt/t nm Co]₃/10 nm IrMn/2 nm Pt multilayers with $0.4 \text{ nm} \leq t \leq 0.9 \text{ nm}$ is presented. The films with $t = 0.4 \text{ nm}$ exhibit a square hysteresis with full out-of-plane remanence and a perpendicular exchange bias field ($\mu_0 H_{eb}$) of 10.2 mT. For $t \geq 0.5 \text{ nm}$, however, the magnetization curves are highly asymmetric. Kerr microscopy images reveal that the reversal process is different in the two branches of the hysteresis curves: In one of the branches magnetization reversal proceeds by the nucleation of numerous small inverse domains, whereas in the other a few inverse domains steadily grow by domain wall propagation. This asymmetry is explained by a lateral variation in the perpendicular exchange bias direction due to the growth of IrMn onto multidomain ferromagnetic Co/Pt multilayers. Annealing at 220°C for 1 hour in a perpendicular applied field of 0.8 T removes the switching asymmetry. For these films a maximum exchange bias field of 16.3 mT is obtained for $t = 0.7 \text{ nm}$. This indicates that the relation $\mu_0 H_{eb} \sim 1/t$ does not hold for Co/Pt multilayers with small Co layer thickness.

9.7 cm

13.4 cm

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