

Antiferromagnet-induced perpendicular magnetic anisotropy: the roles of the coupling at interface and from volume

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Antiferromagnetic (AFM) thin films are promising materials for inducing perpendicular magnetic anisotropy (PMA) on adjacent ferromagnetic (FM) films. This work investigates the effects of induced PMA on adjacent FM Co/Fe films by applying e-fct Mn films with in-plane layered AFM spin structure. The epitaxially grown e-fct Mn/Co/3 ML Fe films were prepared on Cu(001) substrate in an ultrahigh-vacuum preparation chamber with a base pressure of 2×10^{-10} torr. The results show that the PMA induced by e-fct Mn/Co/Fe film can only be observed at low temperature, which is attributed to an enhanced perpendicular interface anisotropy of the Mn film. The thickness and temperature-dependent measurements further identify a phase transition of magnetic anisotropy of e-fct Mn/Co/Fe films, which is inverse to the finite-size tendency in usual and is caused by a competition between the non-collinear and collinear coupling established at AFM-FM interface.

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