Perpendicular magnetic anisotropy induced by NiMn-based antiferromagnetic films

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Abstract

Antiferromagnetic (AFM) NiMn films draw particular attention because of its thermal stability, corrosion resistance, and high Neel temperature (1070 K). In this work, we study the behavior of induced perpendicular magnetic anisotropy (PMA) in epitaxially grown e-fct Ni_xMn_{1-x}/2 ML Co/14 ML Ni/Cu(001) (x <50%). Magneto-Optical Kerr Effect (MOKE) shows that e-fct Mn films can induce PMA of either Co/Ni or 1 ML NiMn/Co/Ni when t_{Mn} reaches 6 ML. By contrast, AFM NiMn films can only enhance the in-plane coercivity of Co/Ni film. However, when one Mn layer is inserted at the interface between NiMn and Co/Ni films, NiMn thickness can lead to presence of PMA when t_{NiMn} about 11 ML. According to literature [1,2]**,** the uncompensated level of spins in each layer of the AFM Ni_xMn_{1-x} film could be reduced when increasing the Ni concentration. Thus, a significant different behaviors of induced magnetic anisotropy observed between e-fct NiMn/Co/Ni/Cu(001**)** and e-fct Mn/1 ML NiMn/Co/Ni/Cu(001) films suggest that the uncompensated level of either volume or interfacial moments of the AFM films plays significantly roles for the behavior of inducing PMA on FM layers.

Keywords: Antiferromagnetism, NiMn film, perpendicular magnetic anisotropy

Reference:

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