Nontrivial anomalous Hall effect in ultrathin Pt/permalloy bilayers

YANQING ZHANG, RONG SHAN, Tongji Univ — Anomalous Hall effect of Pt (2.5 nm)/permalloy bilayers with the thickness \( t_{Py} = 0.6\sim10 \text{ nm} \); Pt/permalloy (2.2 nm) bilayers with the thickness \( t_{Pt} = 1.5\sim10 \text{ nm} \) and Pt (2.5 nm)/permalloy (2.2 nm) bilayers with the post-annealing temperature 100~500° grown on MgO (001) substrates are investigated. The Pt/permalloy bilayer shows distinguished performance from the single permalloy layer due to the interfacial influence. Effective magnetic anisotropy of the bilayer with \( t_{Py} < 2.2 \text{ nm} \) turns to be perpendicular to the film plane and it increases with decreasing measured temperature. More interestingly, the anomalous Hall effect is also greatly enhanced in these Pt/permalloy bilayers, comparing with that in bulk permalloy. The parameters presenting skew scattering, side jump and intrinsic contribution become extremely large, indicating a strong influence of spin orbit coupling coming from Pt/permalloy interface on the anomalous Hall effect.

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