Relative strength of perpendicular magnetic anisotropies at bottom and top interfaces in [Pt/Co/Pt] trilayers

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The relative strength of perpendicular magnetic anisotropies (PMA) at bottom and top interfaces in [Pt (3.0 nm)/Co (t_{Co})/Pt (t_{Pt})] trilayers (where t_{Co} and t_{Pt} denote the thickness of the Co and Pt layers) have been investigated. An asymmetry in the magnetic anisotropies of Pt/Co and Co/Pt interfaces was observed in [Pt/Co/Pt] trilayers. The PMA properties are sensitive to tPt and they are significantly better at t_{Pt} = 0.2 nm than at t_{Pt} = 3.0 nm. The present results are agreement with the previous observation showing that inverted [Pt/Co] multilayers with a very thin Pt layer of 0.2 nm exhibit a strong PMA and high-post annealing stability. Both interfaces of Pt/Co and Co/Pt in the [Pt/Co/Pt] trulayers are responsible the observed PMA properties. However, it is reasonable to consider that the Co/Pt interface is responsible for the change in the PMA strength as a function of t_{Pt}. The reason for this responsibility is the quality of Co/Pt interface significantly depends on t_{Pt}. This information is of great importance in understanding PMA properties in multilayers and furthermore developing new PMA structures with improved properties.

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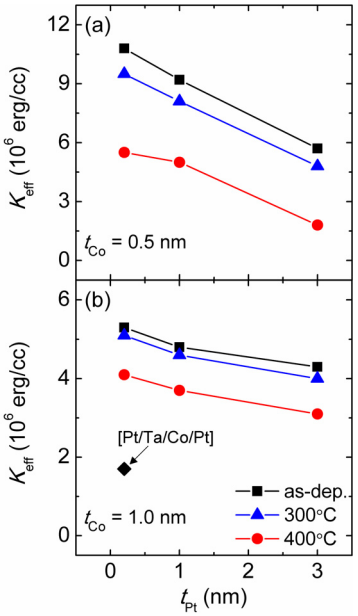

Fig 1. Observed K_{eff} values plotted as a function of the top Pt layer thickness (t_{Pt}) for the two different samples of (a) [Pt (3.0 nm)/Co (0.5 nm)/Pt (t_{Pt} nm)] and (b) [Pt (3.0 nm)/Co (1.0 nm)/ Pt (t_{Pt} nm)] at various annealing temperatures as well as in the as-deposited state. Note that K_{eff} value for the sample of [Pt (3.0 nm)/Ta (5.0 nm)/Co (1.0 nm)/Pt (0.2 nm)] in the as-deposited state is also presented by diamond symbol.