

The relation between the ratio of orbital to spin magnetic moment and anisotropy of Au/CoFeB/Au and Au/CoFe/Au thin films

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The magnetic anisotropy is known to arise from several contributions like e.g. the difference in the orbital moment between the easy and hard magnetization axes. When the thickness of a thin film approaches a single nanometer range, the interface effects start to play the dominant role. At the interface, where the breaking of translation symmetry occurs, extra phenomena can be observed like e.g. Dzyaloshinskii–Moriya interaction and surface anisotropy. In that paper, we study how the interface influences the effective magnetic anisotropy and orbital to spin magnetic moment ratio. The Au/CoFeB-wedge/Au and Au/CoFe-wedge/Au samples were deposited by magnetron sputtering. We have measured the ratio of orbital to spin magnetic moment using vector network analyzer ferromagnetic resonance (VNA-FMR). The results were compared with ab initio calculations. We show that the effective magnetic anisotropy (the sum of a shape and surface anisotropy) and the ratio of orbital to spin moment follow the same inverse proportionality with the thickness of the ferromagnetic layer. These results suggest that the orbital magnetic moments at the interface are larger than the value for bulk. This enhancement of orbital moment at the interface may be a source of the surface anisotropy in those systems.

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