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Interface magnetization switching and precession in Fe/AlGaAs (001) GUNTER LUEPKE, HAIBIN ZHAO, DIYAR TALBAYEV, College of William and Mary, AUBREY HANBICKI, CONNIE LI, BEREND JONKER, Naval Research Laboratory — Understanding of interface magnetic properties is a key for efficient spin-polarized injection in semiconductor spintronic devices. Here, we have measured the reversal process of the Fe interface layer magnetization in Fe/AlGaAs (001) using magnetization-induced second harmonic generation (MSHG), and compared it with the bulk magnetization obtained from magneto-optic Kerr effect (MOKE). The switching characteristics are distinctly different – single step switching occurs at the interface layer, while two-jump switching occurs in the bulk Fe for the magnetic field orientations employed. The different switching processes lead to a deviation angle of 40-85^o between interface and bulk magnetization, which may result from reduced exchange interaction and different magnetic anisotropies at the interface. We also use time-resolved MSHG to investigate the coherent magnetization precession at the interface, and compare with the bulk spin precession obtained from time-resolved MOKE. The different switching behaviors are further revealed in the precession dynamics. The field dependence of precession frequency provides a quantitative analysis of magnetic anisotropies of the interface layer.

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