

Abstract Submitted
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Ultrafast Coherent Precession of Interfacial Electron Spins in Fe/AlGaAs (001) YICHUN FAN, 1327A, Mount Vernon Avenue, Williamsburg 23185,VA, HAIBIN ZHAO, GUNTER LUPKE, AUBREY HANBICKI, C. LI, BEREND JONKER — Magnetic second harmonic generation (MSHG) is used to selectively study the spin dynamics of the interface magnetization for Fe films on AlGaAs(001) in both the dc and time-resolved domain. The interface spin precession is compared with the bulk Fe precession obtained by MOKE. We find: (a) the coherent precession of the interface magnetization is largely non-collinear to the bulk Fe electron spins even at the picosecond time scale; (b) higher frequency spin precession occurs at the interface than in the bulk; (c) the phase of the interface precession is opposite to that of the bulk at low fields; and (d) the interface and bulk precession exhibit different hysteretic behavior. Model calculations of the field dependence of precession frequencies show a large out-of-plane magnetic anisotropy and a large ratio of in plane uniaxial to cubic anisotropy at the interface, attributed to its tetragonal structure and Fe-As bonding. These may account for the significant reduction in exchange coupling between the interface and bulk magnetization. These effects are studied as a function of Fe film thickness and the corresponding evolution of the anisotropy, as well as for the Fe/Si(001) and Fe/Al₂O₃ interfaces.

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