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Detecting spin accumulation in FM/n-GaAs heterostructures using ferromagnetic resonance[1] CHANGJIANG LIU, CHAD GEPPERT, KEVIN CHRISTIE, GORDON STECKLEIN, University of Minnesota, SAHIL PATEL, CHRIS PALMSTRØM, University of California, Santa Barbara, PAUL CROWELL, University of Minnesota — A distinguishing feature of spin accumulation in ferromagnet (FM)/semiconductor heterostructures is precession. This is the basis for detection techniques such as the Hanle effect, but these approaches become less effective as the spin lifetime in the semiconductor decreases. We report here on a technique in which the source magnetization is forced to precess at the ferromagnetic resonance frequency, allowing for the detection of spin accumulation even when the spin lifetime is short (less than 100 psec). The samples used in the experiments are MBE-grown FM/(001) n-GaAs heterostructures, in which the FM are the Heusler alloys Co_2MnSi and Co_2FeSi. These samples show non-local spin valve and Hanle signals in conventional electrical spin injection/detection measurements at low temperatures. Using the FMR technique, we detect the spin accumulation from 30 K to room temperature as a sharp resonance peak. The frequency dependence of the magnitude of the resonance peak allows for a measurement of the spin lifetime. Spin lifetimes as short as 40 psec are measured at room temperature in channels doped at $3x10^{16}\,cm^{-3}$.

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