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Reversing the sign of the spin-polarized current across a Fe/GaAs tunnel barrier at finite voltage bias S.A. CROOKER, Los Alamos National Laboratory, X. LOU, C. ADELMANN, E.S. GARLID, J. ZHANG, S.M. REDDY, S.D. FLEXNER, C.J. PALMSTROM, P.A. CROWELL, University of Minnesota — As a function of the voltage bias across a Fe/GaAs Schottky tunnel barrier, we measure the sign and magnitude of the electrically-injected electron spin polarization in the semiconductor, P_{GaAs}, using magneto-optical Kerr rotation at 10 K. Both images and Hanle depolarization curves reveal that the sign of P_{GaAs} inverts when sweeping from small reverse bias (electrons flowing into GaAs) to small forward bias (electrons flowing into Fe), as expected from linear response. More strikingly, P_{GaAs} inverts sign again at higher bias across the Fe/GaAs barrier. This crossover bias ($|V_{cross}| < 0.1$ V in the structures studied) is sample-dependent, and can occur under either forward- or reverse-bias conditions, depending on sample. These data concur with all-electrical measurements of P_{GaAs} in lateral spin transport devices having a source, drain, and a third 'non-local' detection electrode. Models to describe these data will be discussed. We further show that, when Fe/GaAs tunnel barriers are employed as electrical spin *detectors*, both the sign and magnitude of the detection sensitivity can be tuned with applied bias on the detector. This work is supported by the Los Alamos LDRD and NSF MRSEC programs, and ONR.

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