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Electrical Measurements of the Extrinsic Spin Hall Effect in Fe/$In_xGa_{1-x}As$ Heterostructures[1] CHAD GEPPERT, ERIC GARLID, MUN CHAN, PAUL CROWELL, University of Minnesota, QI HU, CHRIS PALMSTRØM, University of California at Santa Barbara — We report on all-electrical measurements of the extrinsic spin Hall effect in Fe/$In_xGa_{1-x}As$ heterostructures with n-type channel doping (Si) and highly doped Schottky tunnel barriers. The spin Hall effect refers to the transverse spin current generated by application of a longitudinal unpolarized charge current. Complementary spin accumulation at opposing edges of the channel is detected via a Hanle effect in the voltage measured by pairs of ferromagnetic Hall contacts. The spin Hall conductivity is extracted by fitting the data to a drift-diffusion model incorporating spin precession and relaxation. Tuning the channel conductivity with applied bias allows the skew and side-jump contributions to be determined independently. The resulting magnitude is in agreement with models based on ionized impurity scattering. Further quantitative comparison to theoretical models is achieved by increasing the In concentration beyond previously reported values.

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