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Nuclear enhancement of the spin Hall angle in n-$\mathbf{In}_x\mathbf{Ga}_{1-x}\mathbf{As}$[1] CHAD GEPPERT, KEVIN CHRISTIE, MUN CHAN, University of Minnesota, QI HU, CHRIS PALMSTRØM, University of California at Santa Barbara, PAUL CROWELL, University of Minnesota — We present measurements of the inverse spin Hall effect in vertical Fe/$In_xGa_{1-x}As$ heterostructures as identified via a Hanle effect in the local Hall voltage. The spin Hall angle is greatly enhanced in the presence of polarized nuclei, achieving typical values of $\gamma \simeq 5 \times 10^{-2}$. Phenomenological modeling of the observed line-shapes shows that the nuclear polarization acts as a linear prefactor to the standard spin Hall conductivity. This enhancement far exceeds expectations based on the energy splitting of the electron or nuclear spin systems. Our samples are doped just above the Mott transition ($n \simeq 3n_c$) where metallic impurity band conduction is dominant. A strong coupling between localized moments and delocalized states is evidenced by the temperature dependence and sensitivity to disorder at higher In concentrations. This leads us to interpret our results using an Anderson-like model of polarized impurities whereby both dynamic nuclear polarization and resonant skew scattering arise as a result of a spin polarized doubly occupied (D^-) impurity band.

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