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Efficient spin injection in $Co_2Mn_xFe_{1-x}Si$/GaAs heterostructures[1] KEVIN CHRISTIE, CHAD GEPPERT, LEE WIENKES, University of Minnesota, SAHIL PATEL, CHRIS PALMSTRØM, University of California, Santa Barbara, PAUL CROWELL, University of Minnesota — Several Heusler alloys that are well lattice-matched to the $In_yGa_{1-y}As$ family of semiconductors are also candidates for half-metallic ferromagnets. We investigate here their potential for generating near unity spin polarizations in a semiconductor channel. We report on all-electrical measurements of the spin transport properties of epitaxial $Co_2Mn_{1-x}Fe_xSi$ / n-GaAs heterostructures. The FM/n-GaAs interface is degenerately doped to form a narrow Schottky barrier as in previous work on Fe-based devices. The heterostructures were patterned into lateral spin-valve devices, and spin accumulation has been detected at temperatures up to 200 K using both spin-valve and Hanle techniques over a contact separation of 10 μm. In Co_2MnSi devices, a spin splitting of the chemical potential on the order of the Fermi energy (over 2 mV) is observed at 30 K. This is the largest spin accumulation observed to date in a FM/III-V system. We observe a change in sign of the spin accumulation at high Fe concentrations. The connection of this sign inversion to either the bulk of the ferromagnet or interfacial band structure is being investigated.

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