Abstract Submitted
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Spin excitation gap in epitaxial Co2FeSi thin films revealed by longitudinal resistivity and negative magnetoresistance[1] C. LIU, P. DANG, University of Minnesota, S. PATEL, University of California, Santa Barbara, D. LATTERY, J. ZHU, X.J. WANG, University of Minnesota, C. J. PALMSTRØM, University of California, Santa Barbara, P. A. CROWELL, University of Minnesota — Heusler alloys hold great promise for spintronic applications because of their potential half-metallicity, as suggested by electronic structure calculations for certain cases, such as $Co_2Fe_xMn_{1-x}Si$ [B. Balke *et al.*, PRB **74**, 104405 (2006)]. Here we report on signatures of a minority spin gap in Co_2FeSi using transport measurements. The 5-nm thick Co_2FeSi thin film sample studied in this work is grown epitaxially on a GaAs (100) substrate. In addition to typical phonon and weak-localization contributions, the temperature dependence of the resistivity shows a spin-fluctuation contribution that is suppressed at low temperatures, consistent with the presence of a minority spin gap of approximately 500 K. Most significantly, the Co_2FeSi shows a linear and isotropic negative magnetoresistance that increases with increasing temperature, reaching a magnitude of 0.012 $\mu\Omega$ cm T^{-1} at room temperature. Once the weak localization contribution at low temperature is removed, the temperature dependence of the negative magnetoresistance can be fitted using a simple model that includes a zero-field spin gap obtained from the resistivity measurement and a field-dependent contribution that can be obtained from ferromagnetic resonance measurements.

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