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Magnetotransport and Structural Properties of Mn_2CoAl Thin Film Spin Gapless Semiconductor[1] MICHELLE E. JAMER, BADIH A. ASSAF, TRITHEP DEVAKUL, DON HEIMAN, Northeastern University — Spin gapless semiconductors (SGS) are predicted to have a density of states displaying both half-metallic and zero-gap semiconducting properties. They are being investigated for spintronic devices due to their unique magnetic and electrical properties. Calculations predict several SGS compounds[2,3] including Mn_2CoAl, Ti_2CoSi, V_3Al, and Ti_2MnAl. Mn_2CoAl thin films were grown by MBE on GaAs (100) substrates at 200 °C.[4] The as-grown thin films were epitaxial with the substrate, which resulted in a tetragonal distortion. Annealing studies showed that the films lose their epitaxial registration and approach an aligned cubic structure for 325 °C with a=c=5.80 Å. The resistivity shows a thermally-activated semiconducting-like negative slope at higher temperatures. The Hall resistivity scales with ρ_{xx}^2 for all temperatures and magnetic fields, expected for a topological intrinsic anomalous Hall effect computed from the Berry phase curvature. The connection of electrical and spin-gapless properties is discussed.

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