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Synthesis of low-moment CrVTiAl: a potential room temperature spin filter GREGORY STEPHEN, JACOB WOLFSBERG, IAN MCDONALD, BRIAN LEJEUNE, LAURA LEWIS, DON HEIMAN, Northeastern University — The efficient production of spin-polarized currents at room temperature is fundamental to the advancement of spintronics. Spin-filter materials – semiconductors with unequal band gaps for each spin channel – can generate spin-polarized current without the need for spin-polarizing electrodes. In addition, a spin-filter material with zero magnetic moment would have the advantage of not producing fringing fields to interfere with neighboring components. Several quaternary Heusler compounds have recently been predicted to have spin-filter properties and Curie temperatures T_C >1000 K[1]. In this work, CrVTiAl has been synthesized in the Y-type Heusler structure, as confirmed by X-ray diffractometry. Magnetization measurements exhibit an exceptionally small temperature-independent moment of 10^{-3} μ_B/f.u. up to 400 K, a result that is consistent with zero-moment ferrimagnetism. In addition, temperature dependent resistivity measurements reveal the existence of a semiconducting conduction channel. These results suggest that CrVTiAl is a promising candidate for future spintronic devices. [1] I. Galanakis, K. Ozdoğan, and E. Saşıoglu, J. Phys. Condens. Matter 26, 086003 (2014).

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