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Thickness- and magnetic-field-driven suppression of antiferromagnetism in V_5S_8 single crystals WILL HARDY, Applied Physics Graduate Program, Smalley-Curl Institute, Rice University, JIANGTAN YUAN, Department of Materials Science and NanoEngineering, Rice University, PANPAN ZHOU, Department of Physics and Astronomy, Rice University, JUN LOU, Department of Materials Science and NanoEngineering, Rice University, DOUGLAS NATELSON, Department of Physics and Astronomy, Rice University — The search for novel materials approaching the 2d limit can be expanded beyond the transition metal dichalcogenides (TMDs) to related compounds, widening the range of available physical phenomena and tuning parameters. V_5S_8, a metal with an antiferromagnetic (AFM) ground state below $\sim$ 32 K, displays a prominent spin-flop transition at $\sim$ 4.2 T. Here we study the AFM state in thin CVD-grown single crystals of V_5S_8, focusing on temperatures close to $T_{N\acute{e}el}$, where the exact transition temperature depends on the crystal thickness. Magnetoresistance (MR) measurements performed just below $T_{N\acute{e}el}$ reveal magnetic hysteresis, likely a result of a first-order magnetic field-driven breakdown of the AFM state. In thin crystals, on the order of 10 nm thick, monotonic MR measurements suggest that antiferromagnetism is suppressed as the thickness nears the 2d limit. This work demonstrates the possibility of growing single crystals of a relatively complicated magnetic system with thicknesses approaching one unit cell, thereby allowing the tuning of magnetic properties by a field-driven phase transition.

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