Abstract Submitted
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In Search of the Quantum Anomalous Hall Effect in Ferromagnetic Cr-Bi_2Se_3 Topological Insulator Thin Films[1] PASCAL P.J. HAAZEN, J.-B. LALOE, Francis Bitter Magnet Lab, MIT, D. HEIMAN, Dept. of Physics, Northeastern University, P. JARILLO-HERRERO, Dept. of Physics, MIT, J.S. MOODERA, Francis Bitter Magnet Lab, MIT — A recent prediction that the topological insulator Bi_2Se_3 can become magnetically ordered upon doping with Cr or Fe opens up the possibility of observing the quantum anomalous Hall effect, in the absence of an external magnetic field [1]. We report on molecular beam epitaxy-grown Cr-Bi_2Se_3 thin-films with a Cr content of $0 \sim 10$ at.%, and their properties. Our films show highly oriented crystallinity up to a Cr content of 8%, as required for ferromagnetic ordering. Films with Cr were ferromagnetic; the measured saturation magnetic moment per Cr atom is $1\mu_B$ for the crystalline films, with a T_C of up to $\sim 25K$. Currently we are investigating the transport characteristics. Varying the electro-chemical potential level in our quantum anomalous Hall insulators by gating should give rise to plateaus of Hall conductance as the Fermi level passes through the energy gap, due to the breaking of time-reversal symmetry caused by the magnetic ions.

[1] R. Yu et al. Science 329, 61 (2010)

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