

Abstract Submitted
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Investigation of the structural and magnetic properties of MBE-grown Cr-doped Bi₂Se₃ thin films LIAM COLLINS-MCINTYRE, PIET SCHOENHERR, SHILEI ZHANG, ALEXANDER BAKER, University of Oxford, ADRIANA FIGUEROA, GIANNANTONIO CIBIN, GERRIT VAN DER LAAN, Diamond Light Source, NINA-JULIANA STEINKE, CHRISTY KINANE, TIMOTHY CHARLTON, DIEGO ALBA-VENERO, SEAN LANGRIDGE, ISIS Neutron Source, AKASH PUSHP, ANDY KELLOCK, STUART PARKIN, IBM Almaden Research Center, SARA HARRISON, JAMES HARRIS, Stanford University, THORSTEN HESJEDAL, University of Oxford — We report a study of the structural and magnetic properties of Cr-doped Bi₂Se₃ thin films grown by MBE. We will present a thorough exposition of the electronic character of the magnetic ground state of this material as determined by x-ray magnetic circular dichroism (XMCD) as well as complementary measurements by polarised neutron reflectometry, X-ray diffraction and SQUID magnetometry. We observe the formation of a ferromagnetic ground state (via SQUID), below a measured $T_c \sim 8.5$ K with a saturation magnetization of $2.1 \mu_B/\text{Cr}$. By XRD we observe a reduction in c -axis lattice parameter with increasing Cr concentration up to 12 at.% of dopant. XMCD and EXAFS studies indicate that, contrary to expectations, the Cr dopes into the system as Cr²⁺ due to covalency between the Cr- d and Se- p orbitals. We will demonstrate that no evidence is found of surface enhancement of the magnetic order and present recent work on the effect of ferromagnetic proximity coupling.

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