Novel magnetic textures in MnSi thin films

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ABSTRACT: Helical magnets are one class of material where the spins spiral about a particular crystallographic direction. These materials have recently attracted the interest of the spintronics community since they present novel opportunities to control electron spin. Heterostructures consisting of thin layers of helical magnets and traditional ferromagnetics would enable injection of spin-polarized currents into helical magnets. A spin-polarized current flowing in a helical magnetic system is predicted to induce a torque that would produce new kinds of magnetic excitations. This spin-transfer torque, which enables switching of traditional ferromagnetic heterostructures, has attracted considerable attention.

I will present the structural and magnetic characterization of epitaxial MnSi layers on Si(111) to determine their suitability for spintronics studies. I will show that, the 3% lattice mismatch between MnSi(111) and the Si(111) induces a uniaxial magnetocrystalline anisotropy. Theoretical calculations based on a Dzyaloshinskii model predict a variety of modulations to the magnetic order that are not observed in bulk MnSi crystals. Polarized neutron reflectometry and SQUID magnetometry reveal the magnetic structure of the films and uncover evidence for novel magnetic textures. This work identifies the challenges and opportunities that MnSi thin films hold for spintronics studies in chiral magnetic systems.

ALL ARE WELCOME!!!