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(I) Skyrmions in Chiral Cubic Magnets

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Skyrmions are a topologically non-trivial state that has been observed in a number of different magnetic materials, such as the chiral cubic magnets Cu2OSeO3, FeGe, and MnSi. In these non-centrosymmetric systems, competition between the symmetric exchange interaction and Dzyaloshinskii-Moriya interaction results in the formation of non-trivial incommensurate spin textures, such as skyrmions. In bulk crystals, skyrmions typically only appear in a small pocket of field and temperature close to the critical temperature. These skyrmions can be manipulated by small electrical currents (in metallic systems) or electric fields (in insulators), allowing the possibility of their use in low energy storage applications.

In addition to the importance of the DMI and exchange interactions, various anisotropy energies are also highly important for the stabilization of skyrmions and other spin textures in these materials. For example, surface and shape anisotropies lead to a dramatically enhanced region of stability for skyrmions in lamella thinned out of bulk crystals, uniaxial anisotropy is thought to play a large role in the stabilization of skyrmions in epitaxially grown thin films, and cubic anisotropy has been shown to help stabilize a second isolated region of 'low temperature skyrmions'in Cu2OSeO3.

In this talk, I will discuss our recent work on skyrmions in bulk and thin lamella of FeGe and Cu2OSeO3. We have investigated these materials using x-ray and neutron scattering, as well as magnetic X-ray imaging techniques. We show the effects of various perturbations on the stability and metastability of skyrmions in these materials, including the application of electric fields, chemical substitutions, the contrast between thin lamella and bulk samples, and temperature dependent anisotropies.

Author: WILSON, Murray (Durham University)

Presenter: WILSON, Murray (Durham University)

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