Physics Colloquium

Wednesday

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4:00 P.M.

Rm 118 NSH

Spin dynamics of topological spin textures in chiral magnets

Dr. Emrah Turgut

Postdoctoral Associate, Cornell University

The chiral spin textures are a consequence of the anti-symmetric exchange interaction, which presents in the material systems with broken inversion symmetry, such as B20 FeGe. This interaction enables chiral magnetic order, including topologically non-trivial magnetic skyrmions, which display rich new magnetic phenomena and require low critical current densities to manipulate. This makes magnetic skyrmions a promising platform for power-efficient spintronics applications. Therefore, a deeper understanding of the static and dynamic magnetic properties of these materials will be a key step toward their application in spintronic devices. In this talk, I will present our study of both sputtered, epitaxial B20 FeGe and B20 FeGe grown using vapor transport. In particular, I will discuss microwave absorption spectroscopy (MAS) of bulk, single crystal FeGe with which we identify the spin dynamics of all magnetic phases. These results reveal the critical role of substrate-induced strain on the magnetic phases of B20 FeGe. To gain better control over strain and to tune the strength of anti-symmetric exchange, I grew B20 FeGe and $Mn_xFe_{1-x}Ge$ on Si with MBE. After characterization using electron and X-ray diffraction, magnetometry, and cryo-Lorentz-STEM imaging, we study MAS of these films. We identify a new spin wave mode along the film thickness, with a wavelength that matches its helical period, enabling a new, simple method of quantitatively characterizing the anti-symmetric exchange.

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