Departamento de Física de Materiales

Stabilizing and controlling helimagnetism in alkali earth ferrite thin films

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LUNES 9 DE FEBRERO A LAS 12:00

SALA DE GRADOS
FACULTAD DE CIENCIAS FÍSICAS, UCM

Helimagnets are a class of magnetically ordered materials in which magnetic moments are arranged in a helix. With no net magnetic moment and the possibility for chiral and topologically-protected magnetic structures, helimagnets are gaining interest as potential spintronic and magnonic components, and future qubit platforms, and may exhibit non-relativistic spin-momentum locking.

Alkali earth ferrites $SrFeO_3$ and $BaFeO_3$ are particularly interesting helimagnets due to their centrosymmetry, and thus lack of Dzyaloshinskii-Moriya interaction, and the short wavelength of their helimagnetic order (<2 nm). The 4^+ iron valence, however, means stabilizing these helimagnets is a materials challenge.

In this talk I will describe our work to stabilize the oxygen content in $SrFeO_3$ and $BaFeO_3$ thin films and the role that oxygen vacancies may play in the helimagnetic order. Our results from neutron and resonant x-ray scattering, as well as input from density functional theory, suggest that the helimagnetism of alkali earth ferrites is extremely sensitive to the thin film environment, which may be promising for the future development of helimagnet-based technology.