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EINLADUNG zum IFP-SEMINAR

Topologically protected magnetoelectric switching in a multiferroic

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Termin: Mittwoch, 26. April 2023, 16:00 Uhr

Ort: Institut für Festkörperphysik, TU Wien
Wiedner Hauptstraße 8-10, 1040 Wien
Seminarraum DC rot 07 (roter Bereich, 7. OG)

Abstract:

Magnetoelectric materials are characterized by a strong coupling of magnetism and electricity. This enables the tuning of electric properties via magnetic fields and vice versa, which is a desired feature for many kinds of electronics. Here we show an unusual magnetoelectric switching behavior in multiferroic $GdMn_2O_5$, where the application and subsequent removal of a magnetic field reverses the electric polarization of the material and appears together with an unusual 4-state hysteresis cycle [1]. In this cycle half of the spins undergo a rotation of about 90° each time the magnetic field is ramped leading to a full-circle rotation when applying and removing a magnetic field two times in a series. $GdMn_2O_5$ acts as a magnetic crankshaft that converts the back-and-forth variations of the magnetic field into a circular spin motion. This peculiar four-state magnetoelectric switching emerges as a topologically protected boundary between different two-state switching regimes. Further, this switching behavior can be controlled through the application of constant electric voltages during the switching process.

[1] L. Ponet, S. Artyukhin, Th. Kain, J. Wettstein, Anna Pimenov, A. Shuvaev, X. Wang, S.-W. Cheong, M. Mostovoy, and A. Pimenov, "Topologically protected magnetoelectric switching in a multiferroic", Nature **607**, 81 (2022).