Atomically sharp domain walls in epitaxial CuMnAs

Filip Krizek[1]*, Jan Zubáč[1], Kamil Olejník[1], Vít Novák[1], Tomáš Jungwirth[1]
*lead presenter: krizekfi@fzu.cz
1 Institute of Physics of the Czech Academy of Sciences, Czech Republic

High quality thin films of tetragonal CuMnAs [1] grown by molecular beam epitaxy, were recently implemented in novel Spintronic devices. These rely on different phenomena, as are for example Néel vector reorientation via spin-orbit coupling [2] or thermal Quenching into high resistivity states [3].

We will present the results of our transmission electron microscopy measurements of the magnetic structure of epitaxial CuMnAs thin films on the atomic scale to demonstrate the existence of atomically sharp antiferromagnetic domain walls [4]. These results do not only help us explain the physical mechanisms behind interesting functionalities of CuMnAs devices [5], but also to get a better understanding of the crystalline/magnetic structure interplay in antiferromagnets.

[1] Krizek, et al., Molecular Beam Epitaxy of CuMnAs, Physical Review Materials 2020, 4 (1), 014409.
[2] Wadley, et al., Electrical Switching of an antiferromagnet, Science 2016, 351(6273):587-90.
[3] Kaspar, et al., Quenching of an antiferromagnet into high resistivity states using electrical or ultrashort optical pulses, Nature Electronics 2020, 4 (1), 30-37.
[4] Krizek, et al., Atomically sharp domain walls in an antiferromagnet, Science Advances 2022, 8 (13), eabn3535.
[5] Zubáč, et al., Hysteretic effects and magnetotransport of electrically switched CuMnAs, Physical Review B, 2021, 104 (18), 184424.