Contribution ID: **187** Type: **Talk (17 + 3 min)**

Magnetism of pure and Fe-doped multiferroic CoCr2O4 thin films under strain

Monday 20 March 2023 15:00 (20 minutes)

Mutliferroic materials are under investigation due to the prospect of controlling the magnetic state with electrical potentials or vice versa. We present an investigation of thin film multifferroic $CoCr_2O_4$ (CCO) in pure and Fe-doped form grown with different crystallographic orientation and strain on either $MgAl_2O_4$(001) (MAO) or Al_2O_3(0001) (ALO) substrates. Bulk CCO shows a ferrimagnetic transition temperature at about 95 K with 0.08 μ_B/f.u. and a transition into a conical spin state with multiferroic character at 26 K [1]. The doping with Fe leads to different sublattice magnetizations, magnetic compensation and increased transition temperatures [2].
Both substrates accommodate epitaxial growth of CCO, while the lattice mismatch of about 3% leads to a compressive strain. CCO on MAO follows the orientation of the substrate with a (001) film normal. The oxygen sublattice match of the (0001) ALO plane leads to a (111) growth. Polarized neutron reflectometry, in combination with several complementary techniques, is used to investigate the chemical and magnetic morphology as a function of depth. The measurements reveal a homogeneous magnetization profile with a magnetization 0.18 μ_B/f.u. at 2 K, which is higher than reported magnetizations in bulk. Despite the large strain, the substrate interfaces are sharp and structural and magnetic effects do not exceed 5 nm. We will compare these results to the magnetization behavior of thin film Fe-doped CCO.
[1] Y. Yamasaki et al. PRL 96, 207204 (2006).
[2] R. Padam et al. APL 102, 112412 (2013).

Author: SAERBECK, Thomas (Institut Laue-Langevin)

Co-authors: Prof. LEUNG, Chi-Wah (The Hong Kong Polytechnic University); Prof. LIEROP, Johan van (The University of Manitoba); Prof. LIN, Ko-Wei (Hong Kong Polytechnic University); Dr NICKEL, Rachel (The University of Manitoba)

Presenter: SAERBECK, Thomas (Institut Laue-Langevin)

Session Classification: Magnetic Thin Films & Nano

Track Classification: Magnetism, Superconductivity, Topological Systems, Magnetic Thin Films an other electronic phenomena