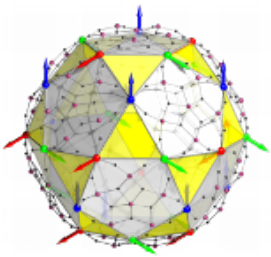

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Fabrication and characterization of $SrCoO_{3-\delta}$ thin films

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Because of its multivalent Co states and high oxygen mobility $SrCoO_{3-\delta}$ (SCO) is a promising material for energy and spintronic applications [1]. Upon changing its oxygen content it exhibits a topotactic phase transition. While $SrCoO_3$ is a ferromagnetic metal (T_C=305 K) with perovskite structure,
$SrCoO_{2.5}$ is an antiferromagnetic insulator(T_N =570 K) with brownmillerite structure.
In this contribution, we focus on the fabrication of $SrCoO_{2.5}$ thin films by molecular beam epitaxy on various substrates like $SrTiO_3$ and $LaAlO_3$. As Sr and Co are coevaporated from distinct effusion cells, the first task is to obtain stoichiometric thin films. We present results of RHEED assisted stoichiometric thin film growth and of driving the topotactic transition by annealing in low oxygen gas flow.
For bulk SCO it has been shown that the perovskite structure can be stabilized by adding of about 5 % rare earth ions [2]. For this reason we study the effect of Sm doping on the crystal structure of SCO thin films. The magnetic properties were studied with SQUID and the crystalline properties by surface characterization methods like LEED, RHEED and XRR.

[1] H. Jeen et al., Nature Materials 12, (2013) 1057
[2] M. James et al., Solid State Sciences 6 (2004) 655

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