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Magnetical Characterization of o-LuMnO₃ and TbMnO₃ thin films

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Magnetoelectrics, materials with ferromagnetism and -electricity in the same phase gained a lot of interest with the discovery of materials with improved properties. A strong coupling, caused by the magnetic-ordering induced polarization, has been found in orthorhombic rare-earth manganates. These materials are of large interest for basic research as well as for applications like high-sensitivity sensors and novel storage materials. TbMnO₃ and LuMnO₃ were grown as thin films on (110) YAlO₃ by pulsed laser deposition. XRD has shown phase pure growth and good crystalline quality. The epitaxial growth introduces strain as a parameter, thus allows to investigate the multiferroic properties as a function of the structural parameters and temperature. For a 90nm LuMnO₃ thin film a magnetic Bragg peak, characteristic for an E-type AFM structure, was observed by neutron diffraction, an important improvement for neutron scattering characterization of thin films. Polarized neutron reflectometry points to the existence of a strain-induced ferromagnetism at the substrate/film interface. This is also evidenced by depth-dependent spin-dynamics measured by low energy muon spin spectrometry.

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Multiple Order Parameter Systems

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Poster

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