

Neutron Study of Magnetic Phase Transition in SrCoO₃ Thin Films

Thursday, 12 November 2020 17:28 (1 minute)

Transition metal oxides represent a wide set of materials with a broad range of functionalities which can be tuned by the careful choice of parameters such as strain, oxygen content, and applied electric or magnetic fields. When the material exhibits more than one primary ferroic ordering- ferromagnetism, ferroelectricity, ferroelasticity or ferrotoridicity in the same phase, it becomes multiferroic. Such class of materials are of immense technological interest as magnetic and electric transitions can be driven through external factors. This opens new avenues for fundamental research and technical applications in spintronic or magnonic devices. Here, we present results we obtained from neutron-based techniques to investigate the magnetic properties of SrCoO₃ and similar thin films.

SrCoO₃ provides a particularly interesting system for these investigations. Lee and Rabe have simulated the effect of strain and have predicted that the magnetic state can be tuned through compressive or tensile strain with a ferromagnetic-antiferromagnetic phase transition. Such a phase transition would be accompanied by a metal-to-insulator phase transition and a transition to a ferroelectric polarized state.

By using different substrates, we investigated the effect different epitaxial strain has on SrCoO₃ thin films. Previously, our neutron diffraction experiments on these 40 nm thin films have confirmed the predicted but hitherto unobserved phase transition from ferromagnetism to G-type antiferromagnetism when the film was grown on SrTiO₃ and DyScO₃ substrate respectively. As such, SrCoO₃ would constitute a new class of multiferroic material where magnetic and electric polarizations can be driven through external strain. This tunability makes them ideal candidate materials for use in developing novel information and energy technologies.

Level of Expertise

Early Career <5 Years

Speakers Gender

Male

Do you wish to take part in the poster slam

No

Primary authors: YICK, Samuel (UNSW and ANSTO); Mr PEROZ, Md Firoz (School of Physics, The University of New South Wales); VALANOOR, Nagarajan (UNSW Australia); Prof. KLOSE, Frank (Material and Science Engineering Program, Technion-Israel Institute of Technology); Prof. SEIDEL, Jan (School of Material Science and Engineering, The University of New South Wales); ULRICH, Clemens (The University of New South Wales)

Presenter: YICK, Samuel (UNSW and ANSTO)

Session Classification: Poster Session

Track Classification: Advanced Materials