

**Title: Correlation between the electronic and atomic structure with the magnetic behaviour on  $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$  strained thin films.**

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The objectives proposed through the corresponding proposal were focused on the study about the influence of the strain imposed on the  $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$  (LSCO) thin films, which is a ferromagnetic semiconductor. Initially HAXPES measurements would provide both compositional and electronic depth profiles, and this would be allowed to correlate with chemical homogeneity degree, oxygen vacancies presences or valence states. This would be analysed together crystallographic structure info by HRXRD with the mismatch imposed by the substrate and the films magnetic behaviour.

However, in our case due to the large resistance of the samples (thin semiconductor films) the HAXPES measurement couldn't be carried out and we focus on the crystallographic characterization of strained films. Thus, a total of 9 samples of the LSCO thin films were measured by varying their thickness and the lattice parameter (one tensile and one compressively) and orientations substrates.

Sample	Thickness (nm)	Substrate	Orientation
1	30	STO	(1 0 0)
2	6	STO	(1 0 0)
3	30	STO	(1 0 0)
4	7	STO	(1 0 0)
5	64	STO	(1 0 0)
6	30	LAO	(1 0 0)
7	7	LAO	(1 0 0)
8	5	LAO	(1 1 1)
9	5	STO	(1 1 1)

For each sample the characterization started with general L coordinate scans around the main peaks (1 0 L; 1 1 L; 2 0 L; 2 1 L; 2 2 L and 1 1 L). Based on the preliminary results of the general scans, more accurate scans were done in selected peaks. Complementary scans by varying simultaneously the H and K components by fixing L also were acquired. In addition, scans around half integer order peaks were acquired to evaluate their octahedral tilting.

Through this experiment we get useful information about the influence of the imposed strain on the magnetic hardness and electrical transport of the thin films studied. The HRXRD experiment succeeded satisfactorily as planned and the high-quality data obtained has been started to be analysed. Unfortunately, as we have pointed, the lack of the HAXPES characterization due to the moderate electrical resistance of the films reduced valuable information related to compositional etc profiles in these samples.

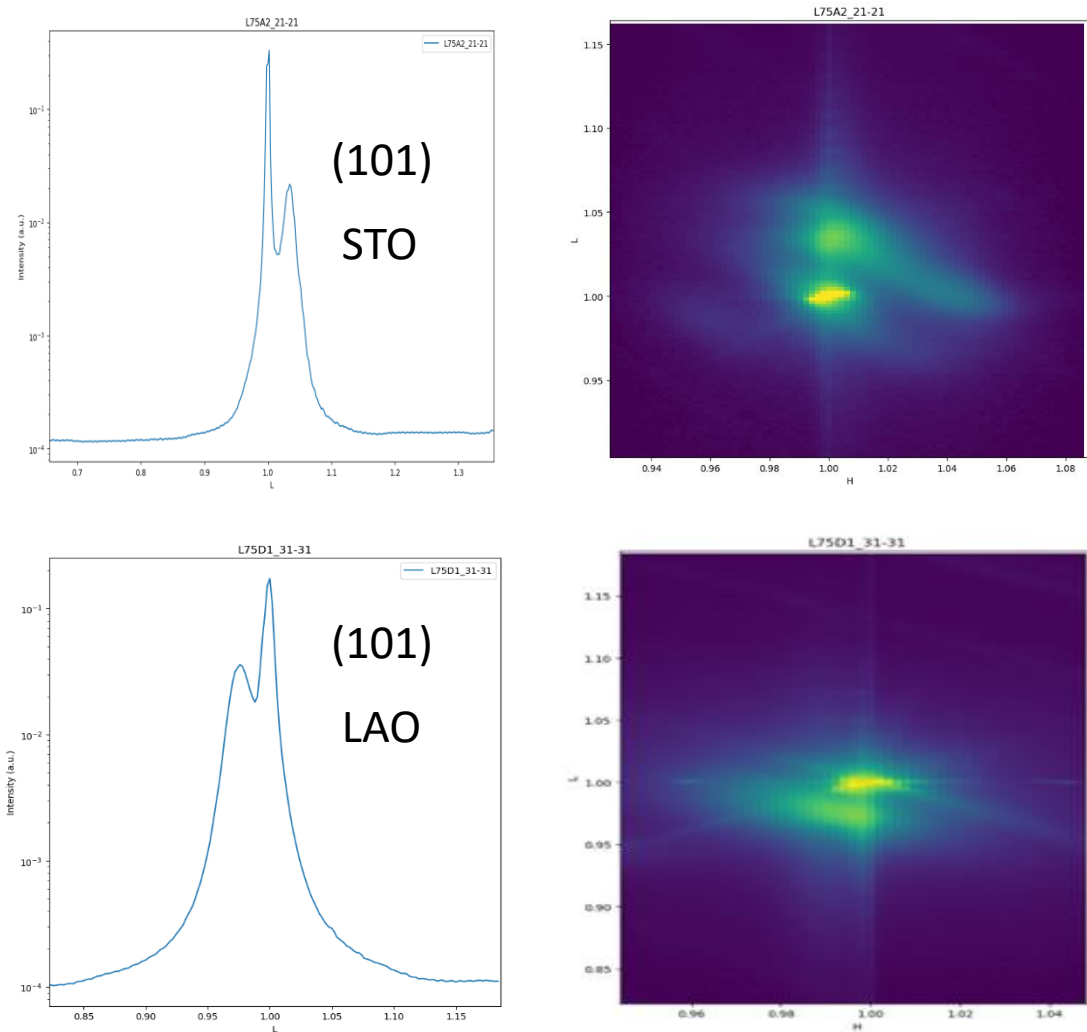


Figure 1 Details of (1 0 1) scans on LSCO films (30 nm) on tensile (up) and compressively (down) strains.

The preliminary analysis of the HRXRD together the magnetic characterization points towards a strong influence of the strain via the competition between different sources of anisotropies. At this stage, the agreement between structural and macroscopic characterizations is positive, thus supporting the need for a more comprehensive analysis of the currently processed scans.