Structure refinement of a strained $LaVO_3$ thin film made by a combined analysis. H. Rotella,[1] M. Morales,[2] D. Chateigner,[1] P. Boullay,[1] L. Lutterotti,[3] and W. Prellier[1]

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In thin film materials, the structural properties of epitaxial films is mainly driven by the substrate-induced strain. This strain induce a distorted structure in order to accommodate the difference in lattice parameters between the substrate and the film material. In oxides, such changes lead to important effects on electronic properties which have been widely studied qualitatively. However, a detailed understanding of the structure, including the atomic positions and cristallographic domains, is required to quantitatively explained the observed effects. Using a combined analysis methodology based on High resolution X-ray diffraction and transmission electron microscopy, we have investigated the structural behavior of compressively strained $LaVO_3$, a Mott insulator, grown on (001)-oriented $SrTiO_3$ substrate. This thin film study is based on a combination between 2 analyses. First, a refinement is obtained with MAUD [1] starting from the bulk cristallographic structure, using the reciprocal space maps recorded on the film. Second, a local analysis using transmission electron microscopy, which gives the information on the peculiar orientation and texture (domains). In this talk, I will present how $LaVO_3$, a distorted rare-earth perovskite (Pnma space group in bulk), exhibits at room temperature a monoclinic structure when deposited under compressive strain.

[1] L. Lutterotti, "Total pattern fitting for the combined size-strain-stress-texture determination in thin film diffraction", Nuclear Inst. and Methods in Physics Research, B, 268, 334-340, 2010.

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