

# **Tuning the physical properties of $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_{3-\delta}$ via oxygen off-stoichiometry using thermal annealing**

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## **Abstract:**

The oxygen off-stoichiometry in  $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_{3-\delta}$  (LSMO) thin films on  $\text{SrTiO}_3$  (STO) substrates has been investigated employing Al-assisted vacuum annealing. The gradual deoxygenation during annealing induces a topotactic phase transition from the as-prepared Perovskite (PV,  $\text{ABO}_3$ ) phase to a layered oxygen-vacancy-ordered Brownmillerite (BM,  $\text{ABO}_{2.5}$ ) phase. The structural change is monitored by XRD. A metal-to-insulator and simultaneously a ferromagnetic (FM)-to-antiferromagnetic (AF) transition is found. The variation of the manganese oxidation state is characterized using XAS. The BM phase shows in magnetization vs. temperature curves a peculiar peak above room temperature which cannot be explained within the usual AF ordering at low temperatures. Moreover, to elucidate the role of the strain to the substrate, bulk-like LSMO powder samples were prepared and annealed at similar conditions as the film samples. Also here the PV-BM phase transition is achieved.