

## MS18-P18 | THE SURFACE PHASE DIAGRAM OF $\text{La}_{0.8}\text{Sr}_{0.2}\text{MnO}_3$ IN STM

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Solid oxide fuel cells produce clean electricity by electrochemically oxidizing a fuel. This entails reduction of oxygen at the cathode's surface and its incorporation in the device. The rate of oxygen reduction and incorporation reactions at the cathode's surface is currently limiting the device efficiency. In most commercial applications, the cathode material is  $\text{La}_{0.8}\text{Sr}_{0.2}\text{MnO}_3$  (LSMO). Investigating the influence of the LSMO surfaces on its performance requires establishing models for its surface structures. To this end, we have combined PLD with *in-situ* surface science techniques to grow and investigate epitaxial, single-crystalline LSMO(110) films on  $\text{SrTiO}_3$ (110).

We observe a rich variety of composition-related surface reconstructions that compensate for the LSMO(110) bulk polarity. We show that we can control these structures by tuning the surface composition, e.g., via deposition of defined amounts of the constituents. By performing the deposition experiments at fixed temperature and pressure, we establish a composition phase diagram at fixed oxygen chemical potential ( $\mu_{\text{O}}$ ).

We then investigate the stability of these structures over a variety of  $\mu_{\text{O}}$ s by annealing the samples at oxygen pressures ranging from 0.2 mbar to UHV. The (La,Sr)-rich (1×1) structure is exceptionally stable, and stays unaltered upon annealing at all temperatures and pressures. The Mn-rich surfaces laterally separate into Mn-poor (1×1) areas and new Mn-richer structures, preserving the overall surface stoichiometry. We investigate this behaviour in detail and establish a surface phase diagram as a function of both,  $\mu_{\text{O}}$  and cation chemical potentials.