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Striped lanthanum cobaltite films: how strain orders oxygen defects[1] AXIEL YAEL BIRENBAUM, MICHAEL D. BIEGALSKI[2], Oak Ridge National Laboratory, LIANG QIAO, School of Materials, University of Manchester, VALENTINO R. COOPER, ALBINA BORISEVICH, Oak Ridge National Laboratory — Oxygen-deficient metal cobalt oxides have been widely studied for solid oxide fuel cell cathode applications. In order to predict atomic-scale transport pathways, a thorough understanding of its defect properties is crucial. Previous studies, including Scanning Transmission Electron Microscopy (STEM), demonstrate lanthanum cobaltite, grown as thin films on $[100]_{pc}$ oriented perovskites, spontaneously order its oxygen vacancies. In this work, we investigate the behavior of $LaCoO_{3-\delta}$ thin films grown on $SrTiO_3$ [111] surface to determine if orientation can be used to shape the anisotropy of oxygen transport. For these films, STEM studies reveal ordered vacancy arrangements. We do so by establishing the structural and electronic properties of $LaCoO_{3-\delta}$ on $SrTiO_3$, using ab initio electronic structure calculations. We then treat how epitaxial strain leads to oxygen vacancies forming these distinctive stripe patterns. The impact of different substrates is addressed. In addition, this leads to an opportunity to discuss the effect of reduced symmetry in oxygen deficient compounds on cobalt oxide behavior compared to the ideal perovskite environment.

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