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In situ synchrotron measurements of surface compensation mechanisms in $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ thin films TIM FISTER, STEPHAN HRUSZKEWYCZ, DILLON FONG, JEFFREY EASTMAN, PAUL FUOSS, Argonne National Laboratory, HUI DU, PAUL SALVADOR, Carnegie Mellon University — With its desirable combination of thermal stability, catalytic activity, and electronic and ionic conductivity, $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ (LSCF) is rapidly becoming the standard cathode material for solid oxide fuel cells (SOFCs). Prior electrical measurements have isolated oxygen reduction at the cathode as a primary rate-limiting step in the performance of SOFCs. To better understand the nature of oxygen reduction at the high temperature, atmospheric oxygen partial pressure (pO2) conditions of a working SOFC, we study epitaxial LSCF thin films grown on (001)p-oriented $NdGaO_3$ and $SrTiO_3$ using in situ x-ray scattering and spectroscopy methods. We find that at sufficiently high temperatures, LSCF forms surface reconstructions at atmospheric pO2 levels. Using grazing-incidence spectroscopy methods, we also find that strontium segregates to the surface and that the minority B-site cation, cobalt, responds to changes in pO2 and temperature. We discuss the interplay between these changes in surface composition and structure and its implication on oxygen reduction in SOFCs.

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