Electronic Structure Determination of $La_xSr_{1-x}MnO_3$ films for Solid Oxide Fuel Cell Cathodes

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We have employed soft X-ray spectroscopies to investigate the electronic structure of $La_xSr_{1-x}MnO_3$ films intended as solid oxide fuel cell cathodes. These techniques are sensitive to both chemical and electronic properties of a material, which makes a combination of these techniques (XPS, XES, XAS) particularly useful when investigating potential catalytic materials. Determining the structure of the active portion of the cathode refines the understanding of the structure-function relationship, ultimately influencing material design for the cathodes being studied.

This poster will highlight selected results from the characterization of the $La_xSr_{1-x}MnO_3$ (LSMO) films synthesized by the Salvador group at Carnegie Mellon University. These films include different La/Sr ratios, thicknesses, and substrates. In addition to these parameters, the films have been measured at temperatures up to 800 °C. We will further demonstrate our progress towards XES measurements of the films under realistic SOFC operating conditions (800 °C and 1 atm) using an *in-situ* gas cell built in a collaboration with the University of Würzburg and the Helmholtz-Zentrum Berlin für Materialien und Energie.

Our results give direct insights into the interaction of LSMO matrix elements with ambient conditions, analyze segregation processes, indicate minority species, and allow an evaluation of the electronic surface band gap. All of these findings help in the understanding of the chemical and electronic changes occurring at cathode surfaces under operating conditions.