Introduction and Background

Solid Oxide Fuel Cell

Experimental Procedure

Approach and Objectives

• Investigate the degradation mechanisms of different impurities to the cathode materials.
• Propose tolerant electrodes under different conditions.

Computational Procedure

Thermodynamic Databases
• Database Focusing on Perovskite/R-P phases[1-3]
• Database Expanded to Consider Gas Impurities(SSUB)

Thermodynamic Predictions
• Predictions based on the same experimental conditions for both sintering as well as operation conditions.
• Predictions expanded to consider other conditions or even more extreme conditions.

Results (Chromium+Humidity)

Results (Sulfur)

Conclusions
1. LSM is pretty stable based on the experiments we have done so far under its general operation conditions.
2. R-P phase, LNO can be a very promising cathode compared to LSCF since both of them are MIECs and will be used under intermediate conditions.

Summary
1. The Thermodynamic simulations were carried out to understand the effect of various impurities to the SOFC cathode materials: LSM/LSCF/LNO
2. Specific experiments have been designed and showed good agreement with simulation results.

Acknowledgement
Department of Energy (DOE)
• This material is based upon work supported by the Department of Energy under Award Number DE-FE0031652.
• Program managers, Jason Montgomery and Venkat K. Venkataraman.