LSGM Based Composite Cathodes for Anode Supported, Intermediate Temperature (600-800 °C) Solid Oxide Fuel Cells

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Objectives

- Develop LSGM-based composite cathodes for intermediate temperature solid oxide fuel cells
- Fabricate composite cathodes and cells
- Study cathode interlayers
- Anode-supported SOFCs with YSZ electrolyte
- Cathode interlayer thickness
- Optimize cathode composition
- Doping of Sr and Mg for porosities
- Optimize cathode microstructure for optimal performance
- Composition
- Firing temperatures and times
- Particle size and powder processing
- Powders
- Cathode interlayer thickness
- Cathode stability
- Study diffusion between LSGM and electrocatalysts
- Electrochemical testing (DC polarization)
- Electrochemical testing (AC impedance)

LSGM Based Cathodes

- LSGM: Sr and Mg doped LaGaO₃
- High oxide ion conductivity ~0.1 S/cm at 800°C
- Mixed ionic and electronic conductor (MIEC)
- Other Perovskites:
  - LSM, Sr doped LaMnO₃
  - LSCF, Sr and Co doped LaFeO₃
  - LSC, Sr doped LaCoO₃
- Mixed ionic conducting (MIEC)
- LSC; Sr doped LaCoO₃

Effect of Cathode Firing Temperature

- Cathode interlayer composition of 50 wt.% LSGM + 50 wt.% LSC:
  - Tested at 800°C
  - Cathode interlayers fired for 2 h.

Effect of LSGM Particle Size on Cathode Interlayer Performance

- Tested at 800°C

Stack Testing

- Anode-supported cells with LSGM-based composite cathodes will be fabricated and tested in similar stacks

Current and Future Work

- Optimization of powder processing and particle size
- Fabrication of submicron and nanosized powders
- Development of low temperature cathode sintering
- Optimization of cathode interlayer microstructure
- Electrochemical testing of cathodes
- Long term phase stability studies
- Fabrication of larger cell with LSGM based cathodes
- Stack testing of cells with LSGM based cathodes

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