**Overview: Mitigating Mn destabilization of YSZ**

- Reaction mechanisms in the YSZ-LSM system are dependent on atmosphere. Powder mixture compacts were annealed in air, humid air, and 10% CO₂ in air to study reaction mechanisms and phase evolutions.

- Mn destabilizes the cubic phase and destroys conductivity, ultimately compromising functionality of the SOFC. Powder mixture compacts were annealed in both atmospheres.

**Possible with Ca and Ni additions.**

**Zirconia Phase Destabilization**

- Mn destabilizes the cubic phase and destroys conductivity, ultimately compromising functionality of the SOFC.
- Increasing stability of the LSM may improve long-term LSM-YSZ stability.
- Possible with Ca and Ni additions.

**Water Inhibits Degradation via Lanthanum Zirconate**

- La₂Zr₂O₇ formation occurs in both air and CO₂ rich air.
- Ni containing samples did not form after annealing for 500 hours in humid air.

**Intentional Mn diffusion profile**

- Mn shows appreciable solubility in YSZ.
- XRD on both sides of the pellet indicates qualitatively that more La₂Zr₂O₇ forms on the Mn deficient side.

**Conclusions**

- Combined Ca and Ni additions yield highest-stability LSM.
- Mn diffusion from LSM is responsible for both zirconia destabilization and formation of La₂Zr₂O₇. This reaction is inhibited by water.

**References**


This work was supported by DOE under grant number DE-FE-00628. The valuable comments and guidance of Briggs White are also acknowledged.