Recent Sealing Developments for Solid Oxide Fuel and Electrolysis Cells

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GasLok™ Sealing Concept

- Seals remains a persistent issue facing SOFC developers
- Reliable cost-effective seal required to achieve:
  - Long-term durability (< 0.2 % degradation per 1000 hours)
  - Cost targets (Stack $225/kW)
- GasLok is cost-effective, manufacturable sealing approach
- Designed to address critical issues associated with current sealing technologies:
  - Improve durability and thermal cycling performance

Thermomechanical COMSOL Modeling of Seal Behavior

- Guide optimization of the graded seal and critical design parameters
- Strengthen graded-seal value-proposition
- Alternative approach based on optimization of seal CTE to achieve zero stress state – experimental validation of model in progress

GasLok Coating Stability

- Anode side coating failure identified as key degradation mechanism
- More stable coating formulations under investigation

Promising Alternative Sealing Coating

Single-Cell SOFC Testing

- Electrolyte-supported single cell (28 cm² active area) used to assess seal performance and stability under SOFC conditions.
- Have developed electrochemical model to assess sealing based on OCV

Alignment of Seal Curing and SOFC Conditioning

- Using offline seal testing to down-select stack conditioning protocol
- Investigate the effect of stack compression and curing time and temperature

Manufacturability – Screen-Printed Integrated Seal/Shim

- Successful GasLok adoption requires seal format that easily integrates with customer’s cell platform and manufacturing process
- Developed an integrated seal/shim product
- Graded seal screen-printed directly onto metallic shim

Screen-Print System Screening Process Parameters Graded seal

- New integrated seal/shim sealing product provides key benefits
  - Screen-printing allows minimizes materials loss – lower cost
  - Simplified stack build (reduced alignment issues)

Cost-Reduction – Recycled Seal Tape Gaskets

- For reduce the cost of tape-cast seal gaskets need to minimize materials loss
- Demonstrated that scrap seal tape can be successfully recycled which minimizes materials loss during casting of picture-frame seals
- Equivalent seal performance with recycled tape gaskets demonstrated

Recycled Seal Tape Gaskets

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