Title: A Novel Integrated Stack Approach for Realizing Mechanically Robust Solid Oxide Fuel Cells

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Abstract

This poster will describe a solid oxide fuel cell (SOFC) configuration in which many small devices are interconnected in series on porous planar supports. We term this configuration the "integrated SOFC stack" based on the analogy with integrated circuits.

In the first stages of this project, the focus has been on materials processing and predicting performance. Calculations show that for cells < 2 mm in width, the short electrode current paths yield very small ohmic losses even for relatively low thicknesses (≈ 20 μm). Shunting currents in Ca-stabilized Zirconia (CSZ) supports are shown to be negligible (<1% of the stack current) for an operating temperature of 600°C. Integrated SOFC stacks are being fabricated by patterned colloidal deposition of the active layers – Ni-YSZ anode, YSZ electrolyte, (La,Sr)MnO_3 cathode, and (La,Ca)CrO_3 interconnects – onto CSZ planar supports. The challenge is to co-sinter the CSZ, Ni-YSZ, and YSZ while matching shrinkages, achieving a dense, pore-free electrolyte, and maintaining porous CSZ and Ni-YSZ. Both nanoscale and conventional powders are being used in the fabrication to help control sintering behavior. Patterned Ni-YSZ and dense YSZ layers have been successfully prepared.

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Publications, Presentations, Students

Published Journal Articles:	none
Submitted Journal articles:	none
Completed Presentations:	none
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Supported students:	Tammy Lai