Title: **BI-LAYER P-N JUNCTION DEVICES FOR COAL-BASED SOLID OXIDE FUEL CELL INTERCONNECTIONS**

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ABSTRACT

OBJECTIVE AND PROJECT RATIONALE: Interconnection materials for state-of-the-art solid oxide fuel cells (SOFCs) are based on doped-lanthanum chromite (i.e. doped-$LaCrO_3$) perovskite materials. The present emphasis in SOFC research is to lower the operating temperatures of SOFCs to a temperature range of 600-800^oC. Lowering the operating temperature would enable the use of metals and metallic alloys in SOFC interconnections. We present a second approach based on using a bi-layer structure as a fuel cell interconnection. Our approach involves using a bi-layer structure constructed of one p-type layer and one n-type layer. During operation of the cell the p-type side of the bi-layer sample will be exposed to air and the n-type side to the reducing fuel-gas side.

ACCOMPLISHMENTS TO DATE: The following are the highlights of our accomplishments in the project to date:

1) Fabrication of bi-layer structures (1-2 mm thick) consisting of LSM (p-type)/YSTi(Yttrium doped-strontium titanate; n-type). The bi-layer structures were constructed by individually sintering powder compact s of the LSM and YSTi perovskite powders and diffusion bonding them at elevated temperature.

2) Conductivity measurements of the bi-layer structures in a dual-atmosphere setup.

3) Successul demonstration of the concept of a bi-layer interconnection through

conductivity measurements.

FUTURE WORK AND PLANS FOR REMAINING PERIOD OF PERFORMANCE: The results to date indicate that the concept of using such bi-layer structures as SOFC interconnections is possible in principle, but there are some challenges to be overcome. These include obtaining continuous contact between the two layers and fabricating layers which are sufficiently thin to minimize the interconnection resistance. Work is presently ongoing to improve bi-layer contact and fabrication of thinner layers.

LIST OF PAPER PUBLISHED: W. Huang and S. Gopalan, "A novel bi-layer structure for solid oxide fuel cell interconnections" (*In process for submission to Scripta Materialia)*

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