

Solid Oxide Fuel Cells

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Objectives: The primary goal of this research is to develop materials and testing systems to demonstrate viability of a SOFC with capabilities for operations at 500-650 °C, much lower than the current SOFC operation at 800°C. This will lead to a significant reduction in the total cost of the system because inexpensive metallic hardware can be used.

Approach: Alternative, cathodes, anodes, and possibly lower temperature electrolytes are required for efficient operation of the SOFC at lower temperatures. Research will pursue processing and properties of the most attractive anode, cathode, and electrolyte material systems and fabrication of a SOFC. In addition, high temperature seals based on a novel self-healing glass currently being developed in another DOE-funded program will be applied and integrated into the lower-temperature SOFC program.

- Develop nanocrystalline solid oxide electrolytes and electrodes for low-temperature SOFC (Years 1,2)
- Develop high temperature seals for SOFC (Years 1,3)
- Demonstrate low temperature efficient SOFC based on above. (Year 3)
- Write proposals and secure major funding

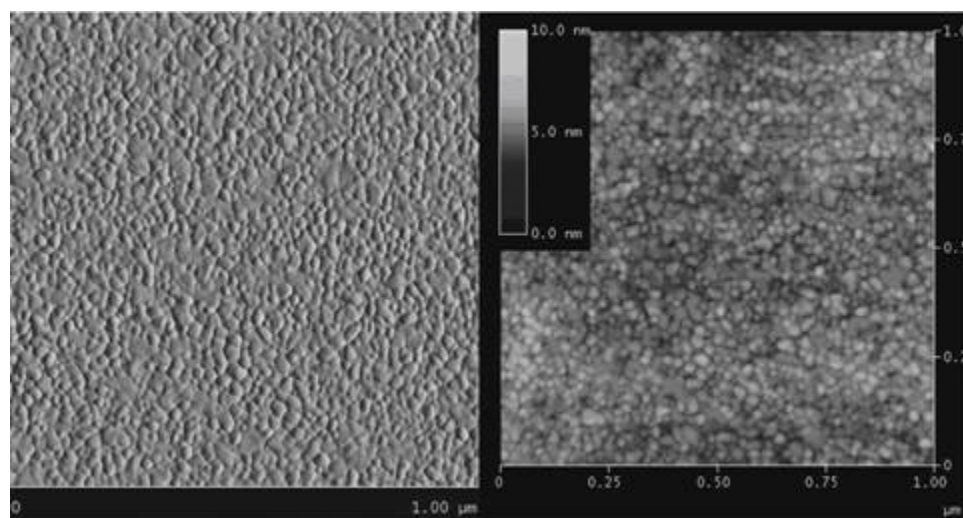


Fig. 1. AFM surface image of novel YSZ/SDC nanocrystalline heterophase electrolyte with conductivity sufficient for operation at <math><650^{\circ}\text{C}</math> (Dong & coworkers: *J. Mat. Res.*, 21, 2006; *J. Am Ceram. Soc.*, 88, 2005; *J. Nanosci. Nanotech.*, 2, 2002).