

## *CT-82, High Power Density Solid Oxide Fuel Cell (SOFC) Materials for Aerospace Applications*

The goal of this project is to produce high power density solid oxide fuel cells that provide the bridge from stationary residential power systems to airborne auxiliary power units. The project focuses on developing improved materials and manufacturing processes for high-tech, high-value products in the State of Ohio. Cells and architectures will be developed that demonstrate optimum power densities ( $>1 \text{ W/cm}^2$ ), which will enable the compact, lightweight systems required for aerospace applications to become a reality. This project will further work to develop SOFCs that can be integrated into higher power systems to effectively displace inefficient, noisy, and polluting technologies, while providing an increase in clean, quiet electric power.

To reach the project goals, four research and development areas will be pursued: (1) materials development targeting higher performance anode and cathode materials compatible with scandium-stabilized zirconia electrolyte materials; (2) fabrication and testing of electrolyte and electrode-supported planar cells; (3) tailoring seal systems for high temperature operation; and (4) evaluation of advanced processing approaches to enhance cell performance. Overall, the objective is to produce cells with thermally and electrochemically compatible materials sets that demonstrate high power densities required for aerospace applications. As the optimized materials sets are identified, larger scale cells will be produced.

In Phase I, efforts will be spent identifying and evaluating planer cell configurations in promising material sets, as well as identifying seal materials required for incorporating these cells into planer stacks. Phase II will involve scale-up of the materials and fabrication technology, with the goal of establishing broader scope efforts in bringing this technology to fruition in military and aerospace applications. Also, full scale cells will be produced for evaluation in SOFCo's prototype SOFC stacks and systems.

The development of this technology will allow manufactures and research organizations across Ohio to establish a strong presence in second-generation SOFC applications and systems development, while providing high-performance cells and components to first-generation SOFC developers for residential and automotive power supplies.

Task Leader: Matthew M. Seabaugh, Ph.D., NexTech Materials, Ltd., 614-842-6606