



the **ENERGY** lab

PROJECT FACTS

Advanced Research

Multifunctional Nanowire/Film Composites-Based Bimodular Sensors for In Situ, Real-Time High Temperature Gas Detection

Background

Real time monitoring of combustion gas composition is important for improving the efficiency of combustion processes and reducing the emission of pollutants. However, such measurement usually requires sensors to be operated at high temperatures in harsh environments. Currently, commercially available sensor technology capable of withstanding such harsh environments is extremely limited; therefore, there is an urgent need to develop novel high-temperature gas sensors. The materials and sensors developed under this project could also be used in other areas, such as energy harvesting and storage, petroleum refining, and industrial pollution control.

Description

Researchers at the University of Connecticut are developing a unique class of multifunctional metal oxide/perovskite-based composite nanosensors for industrial and combustion gas detection at high temperature (700°C–1300°C). A sensing platform will be designed and fabricated with an array of integrated electroresistive and electrochemical nanosensors to meet the challenge of gas detection in high-temperature, complex gaseous environments in various combustion conditions. The miniaturized platform will be bimodular (i.e., made up of two forms of new composite nanomaterials): three-dimensional (3D) nanowire/dendrite arrays and two-dimensional (2-D) composite nanofibrous thin film. The 3-D and 2-D composite architectures are assembled by single-crystal 3-D nanowire/nanodendrites or polycrystalline 2-D nanofibrous films made of multifunctional metal oxides. These nanocomposites will combine the functions of wire/dendrite arrays and thin film to increase the nanosensors' sensitivity to catalysts, stability at high temperatures, and ability to detect multiple gases.

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PERIOD OF PERFORMANCE

10/01/2009 to 9/30/2012

COST

Total Project Value
\$1,010,772

DOE/Non-DOE Share
\$795,607 / \$215,165

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