

## CCST Seminar:

- › Tuesday, October 28, 2008
- › 2:00 P.M. (refreshments available at 1:45 p.m.)
- › 366 Colburn Laboratory

### Joshua Hertz

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Dr. Joshua Hertz joined the Department of Mechanical Engineering at the University of Delaware as an assistant professor in September. His education started with a B.S. in ceramic engineering from Alfred University in 1999 and then a Ph.D. in materials science and engineering from the Massachusetts Institute of Technology in 2006. Following this, he worked at the National Institute of Standards and Technology in Gaithersburg, MD, where he was awarded a postdoctoral fellowship by the National Research Council. In addition to his work using microfabrication to understand and improve solid oxide fuel cells, he has published on topics including novel thin film growth techniques and chemical sensors.

#### “Nanomaterials, Megawatts:

#### The Use of Microfabrication Within Solid Oxide Fuel Cells”

Solid oxide fuel cells (SOFCs) are high efficiency electrochemical power sources that typically operate at very high temperatures (800-1000 °C). While these temperatures are beneficial in that complex fuels can be directly used, drawbacks include increased system size, long startup time and low thermomechanical stability. Simply reducing the operating temperature leads to reduced power output, largely because of insufficient reaction kinetics at the electrodes. Understanding and improving these kinetics is, thus, crucial to achieving sufficient power at lower temperatures. A barrier to this understanding is the complex device geometries that arise from traditional powder processing. In this talk, I will first discuss the use of microfabrication to produce idealized electrodes with well-defined geometry. Using these, the fundamental materials properties are decoupled from purely geometric parameters. An important finding includes the drastic effects electrolyte surface impurities can have on the electrode performance. In the second part of the talk, I will discuss the use of sputtering to create nanocomposite electrodes with very high performance characteristics. Finally, I will conclude with a look to the future and how the techniques described can be extended and applied to other renewable energy systems.