

## Nanostructures for Microscale Fuel Cells

Fuel cell related research has experienced a boom in recent years due to the need for more efficient and environmentally friendly energy sources. Much news has been made of the interest in fuel cells for automotive applications as a green energy source that will reduce American dependence on foreign oil. Miniature and microscale fuel cells are being developed, and in some cases beginning to be commercialized, for portable electronics such as cellular phones and laptop computers as well as for on-chip applications such as power for microelectromechanical systems (MEMS) and chip scale chemical, biological, and environmental sensors. One reason for the attractiveness of fuel cells for portable applications is their high theoretical energy density when compared with traditional battery technologies. While fuel cells show much promise, many technical challenges remain to be overcome before they become a viable alternative energy technology for many applications. Among the most notable of these are the need for an improved membrane material and cheaper, more active catalyst materials and structures. Nanostructured materials have the potential to overcome these challenges. Ongoing work at Louisiana Tech focuses on the development of both nanostructured membrane materials and catalytic electrodes. Proton exchange membranes are being developed based on surface modified nanoporous silicon. Further work to develop metallic nanotubes (ie. platinum and palladium) as electrocatalytic electrode structures.