

## **Embeddable lithographically fabricated micro-fuel cells on silicon platforms for portable power**

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High performance energy generation for portable applications including transportation and electronic devices is a crucial component of environmentally sustainable clean power sources. Micro-power sources that are scalable and low-cost manufacturable are hence very important technologies with potential for reducing the carbon footprint.

I will discuss the case of low temperature solid oxide fuel cells fabricated in thin film form on silicon platforms as revolutionary power sources for portable applications. Conventional ceramic processing has some limitations in reducing dimensionality of functional layers down to nanoscale. However, thin film oxides may overcome these issues leading to fabrication of ultra-thin dense solid electrolyte layers. Advantages of ultra-thin membranes include reduced internal resistance of the energy conversion device as well as possibility of exploiting space charge enhanced conduction processes.

Complete lithographically patterned structures can therefore be fabricated with thin film processing leading to nanostructured fuel cell devices that are scalable. I will present a brief overview of the trends towards downscaling fuel cell devices over the years as well as present highlights of recent results from my group demonstrating high power density micro-fuel cells with sub-200nm functional layers.

Subsequently, I will discuss scientific themes in nanoscale ionic transport, interface-driven conductance changes in multi-component oxides and potential for exploiting interface phenomena in advanced energy conversion and generation applications.

Contributions from group members will be highlighted in the presentation.