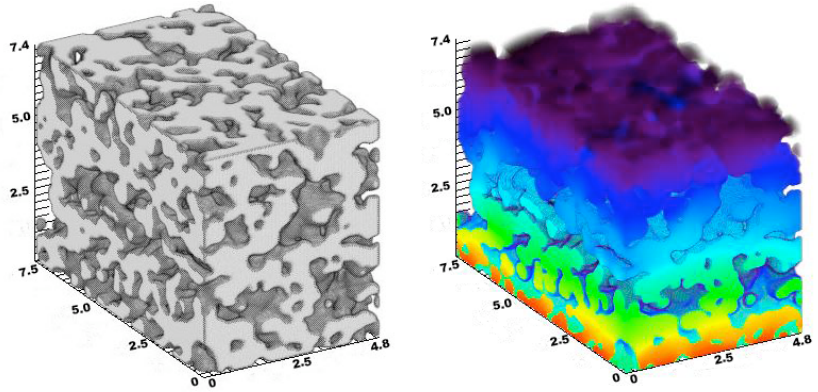
3D engineering of fuel cell electrode microstructure

Real microstructures to simulations

Michigan Memorial Phoenix Energy Institute

Complex microstructure of a solid oxide fuel cell electrode



Three-dimensional reconstruction of SOFC cathode using FIB-SEM (left), used for simulations of transport (right)

Objective:

Improve the solid oxide fuel cell performance through optimization of anode and cathode for transport and stability.

Approach:

U-M researchers, in collaboration with Northwestern and University of Washington, are combining their expertise in simulation and experiments.

The major components of this effort include 3D reconstruction and electrochemical characterization of the electrodes with various fabrication and operation conditions, and simulations of transport, electrochemistry, and coarsening using the experimentally obtained 3D microstructures.

Impact:

- Increasing efficiency of fuel cell electrodes through understanding electrochemistry, transport, and microstructural stability.
- Expanding knowledge of electrode microstructures in 3D through measurements and computationally intensive characterization.
- Making the link between processing, microstructure, properties and performance of SOFC electrodes.
- Creating fundamental understanding of the interplay between diffusion, electrochemistry and charge transport in complex microstructures

Contact:

Katsuyo Thornton
Materials Science Engineering

Kthorn@umich.edu
(734) 615-1498

http://www.mse.engin.umich.edu/people/faculty/thornton

Facilities and infrastructure:

U-M-owned facilities (computational nodes in a large-scale computer cluster) supports simulations as well as data and image analysis.