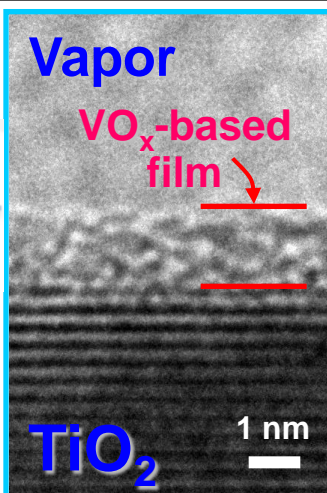


Oxide surfaces & nanoscale films



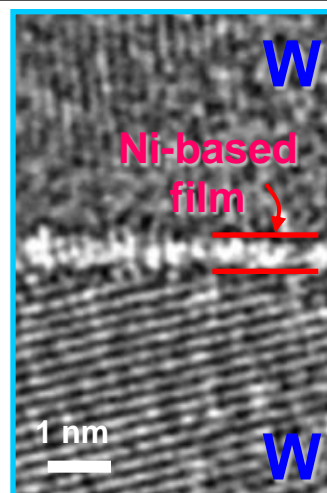
Supported by
National Science
Foundation
CAREER Award



Refractory metals & high-*T* materials



Supported by
Air Force Office of
Scientific Research
Young Investigator
Award



Grain boundary transitions in silicon

Supported by
Department of Energy
Office of Basic Energy Science
DMSE



Office of Basic Energy Sciences

Technological Relevance (Selected):

- Supported oxide catalysts
- Li ion battery cathode materials
- Nanoparticles; Ultrathin dielectrics

Selected Publications:

- Annu. Rev. Mater. Res. 38:227 (2008)
- Acta Mater. 56:4702 (2008)
- Acta Mater. 56:862 (2008)
- Appl. Phys. Lett. 91:061909 (2007)
- Mater. Sci. Eng. A 422:19 (2006)
- Langmuir 21:7358 (2005)

Technological Relevance (Selected):

- High-*T* materials (Mo-Si-B, ceramics)
- Microstructural development
- Nanocrystalline materials (e.g., nano-W for anti-armor applications)

Selected Publications:

- Crit. Rev. Solid State Mater. Sci. 32: 67 (2007)
- Appl. Phys. Lett. 94:251908 (2009)
- Appl. Phys. Lett. 92:101901 (2008)
- Acta Mater. 55:3131 (2007)
- Appl. Phys. Lett. 87:231902 (2005)

Technological Relevance:

- Si Solar cells
- Realizing predictable fabrication of materials by design

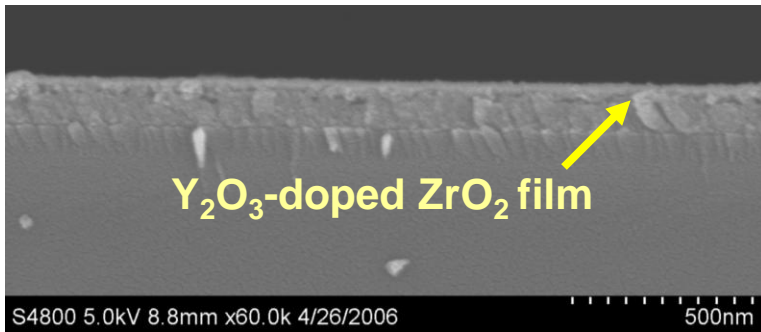
Selected Publications:

- Curr. Opin. Solid State Mater. Sci. 12:81 (2008)
- Appl. Phys. Lett., 95:071911 (2009)
- Microscopy Today, 17:22 (2009)
- JOM (Dec. 2009) in press

Capabilities Relevant to These Programs

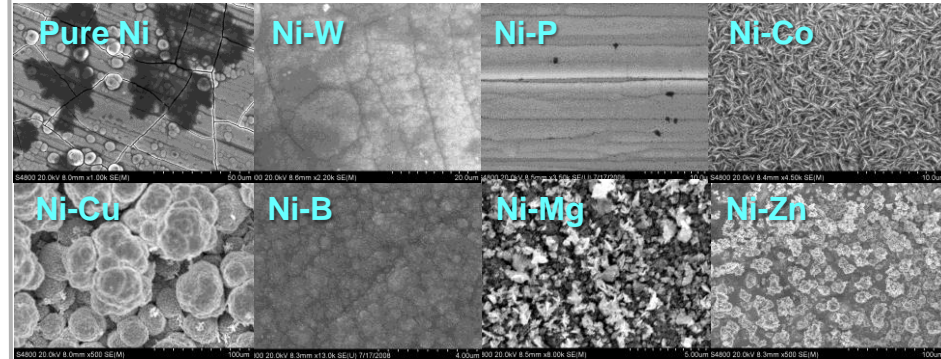
- Sintering of ceramics and metals; various high-*T* quench furnaces (controlled atmospheres)
- Materials characterization (TEM, HRTEM, STEM, diffraction, surface analysis, etc)
- High-*T* (up to 1500 °C) optical microscopy in controlled atmospheres; high-*T* wetting measurements
- Chemical adsorption and temperature-programmed desorption, reduction and reaction
- Some device testing capabilities; some modeling capabilities

Solution-based (cost-effective) synthesis of functional oxide films & multilayers

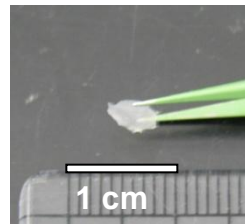
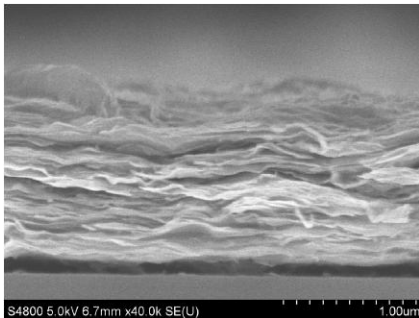
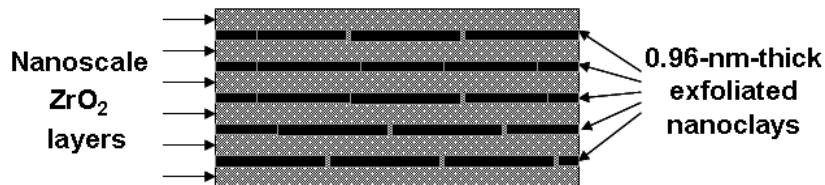


Selected Publication: Surf. Coat. Tech. 202:2690 (2008)

Electrodeposition of nanocrystalline metal films: Controlling morphology & microstructure via doping & grain boundary chemistry



Synthesis of nanostructured [nanoclay-oxide]_n multilayers via layer-by-layer assembly



Free-standing films

Selected Publications: J. Nanomaterials 2008: 749508;
J. Mater. Res. 24:777 (2009)

Technological Relevance:

- Multi-functional & functionally-graded films
- Bio sensors (with Prof. Guigen Zhang, BioE)
- Biomimetic “artificial nacre” for high-*T* protective coatings
- MEMS components
- Interface-based fast oxygen ionic conductors for fuel cells and electrochemical sensors

Capabilities Relevant to These Programs

- Fabrication of various ceramic & metal films and coatings
- Dip coating w/ 1-8 solutions & fine controls
- Spin coating
- Electrodeposition
- Materials characterization