NEXTECH MATERIALS

MULTILAYER FUEL CELL ALLIANCE

NETL

Low-Cost Manufacturing of Multilayer Ceramic Fuel Cells

Scott L. Swartz, Ph.D.
Director of Technology
NexTech Materials, Ltd.

2nd Annual SECA Workshop
Arlington, Virginia
March 29-30, 2001

Advanced Materials Technologies EMTEC Gas Technology Institute Iowa State University Michael A. Cobb & Company
NexTech Materials Northwestern University Oak Ridge National Laboratory Ohio State University University of Missouri-Rolla

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Low-Cost Manufacturing of Multilayer Ceramic Fuel Cells

DOE Contract No. DE-AC26-00NT40706

Program Manager: William Dawson, NexTech Materials

Principal Investigator: Scott Swartz, NexTech Materials

NETL Project Manager: Tom George

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Program Plan

Phase I (3 months)

Manufacturing Cost and Risk Assessment

Michael A. Cobb & Co.
Advanced Materials Technologies
Gas Technology Institute

Phase II (12 months)

Development of Fabrication Processes for Planar Cells

NexTech Materials
Oak Ridge National Laboratory
University of Missouri-Rolla

Phase III (9 months)

SOFC Testing, Destructive and Non-Destructive Testing

Northwestern University
Gas Technology Institute
Ohio State, Iowa State

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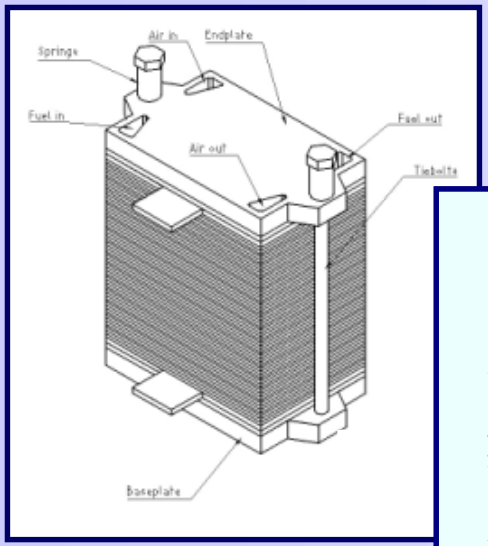
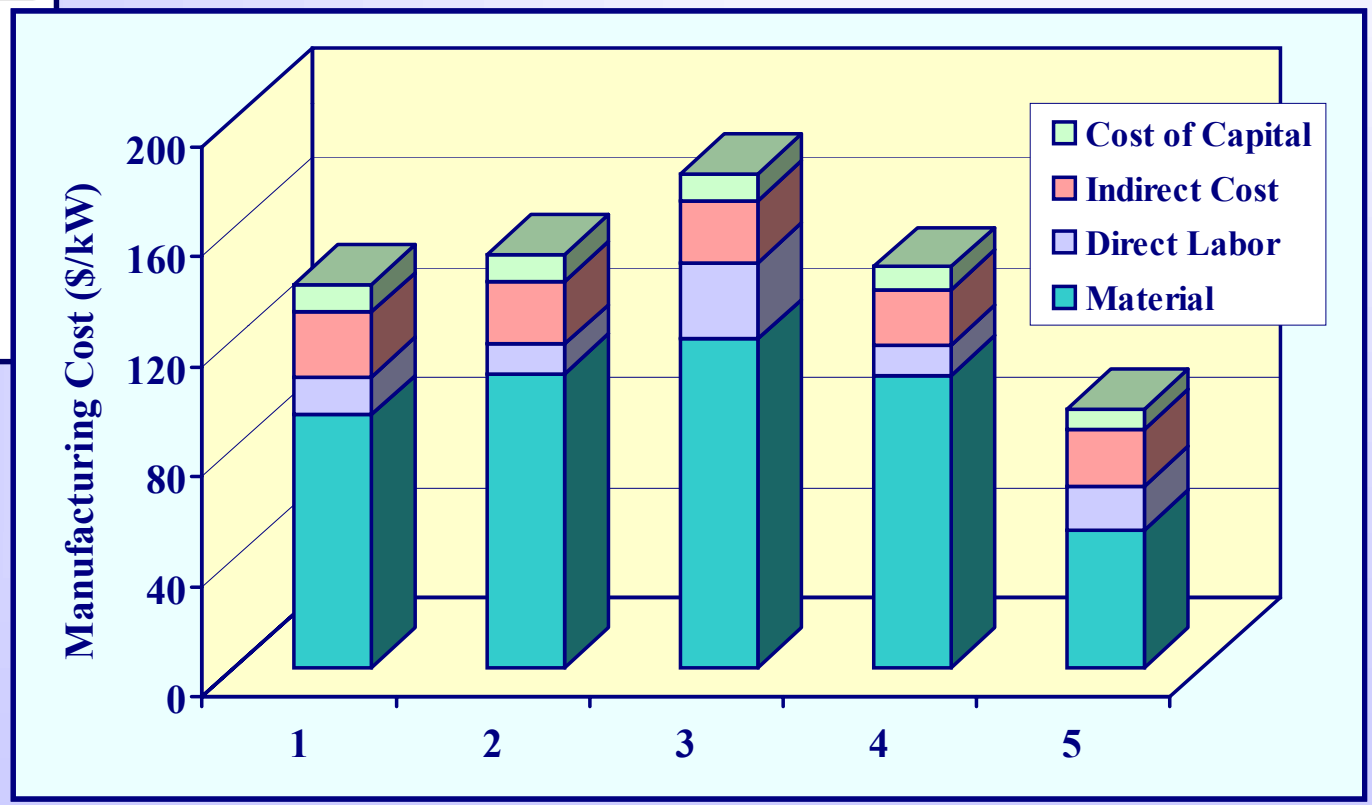
Manufacturing Cost





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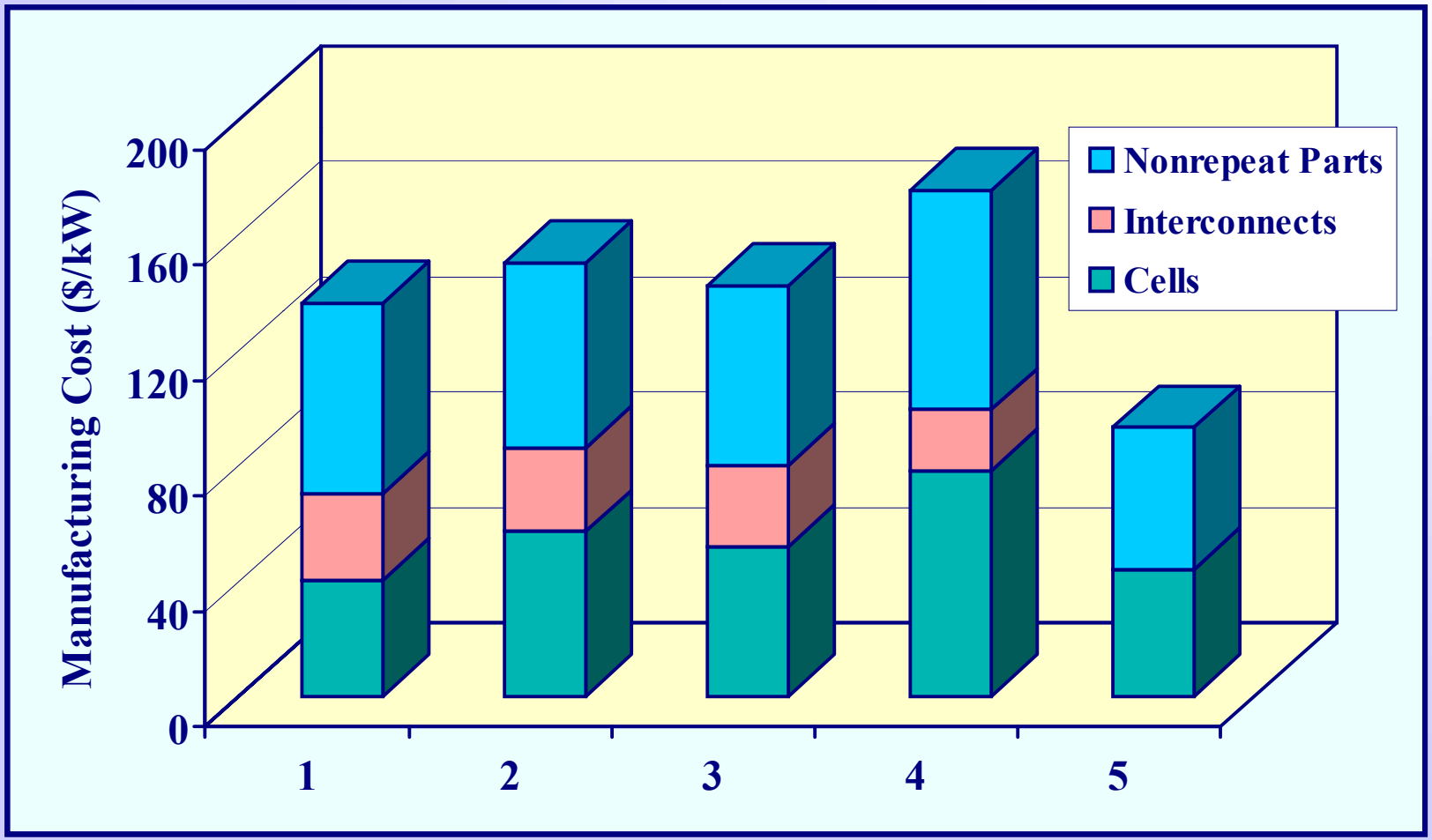
Manufacturing Cost



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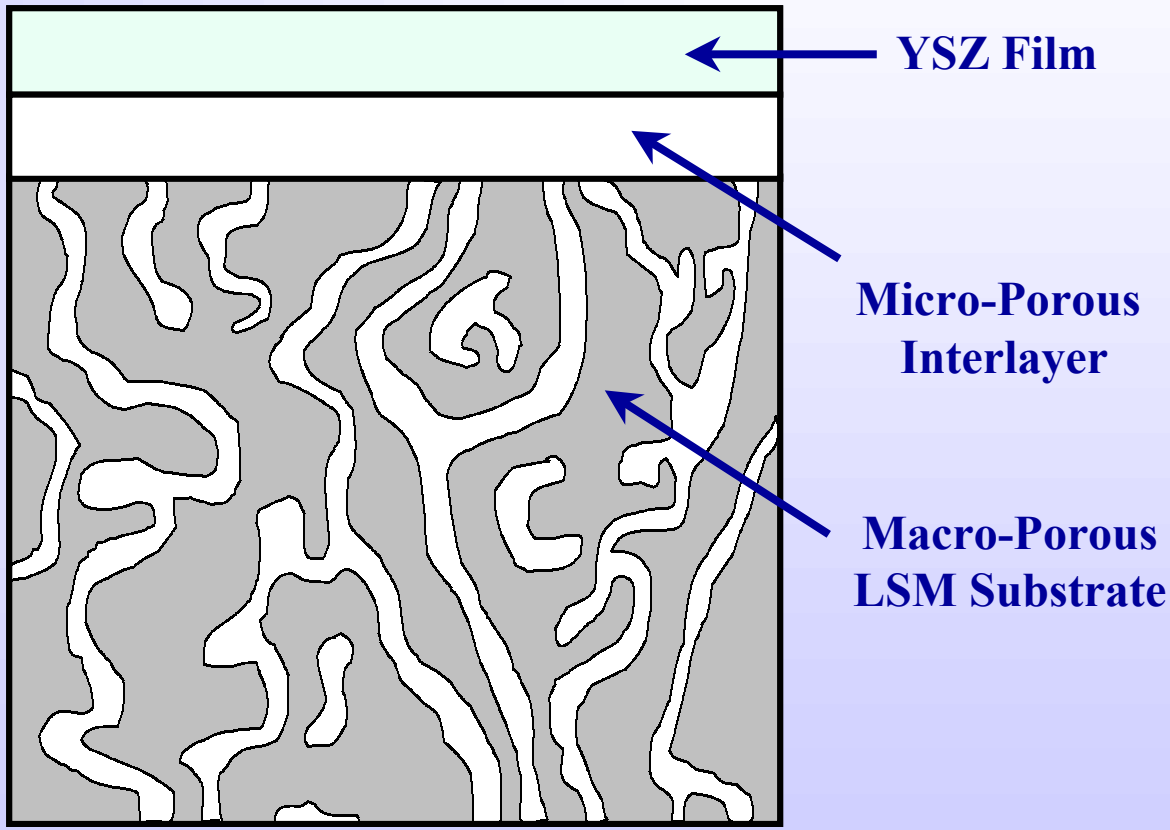
Technical Approach

Tape Casting (Cathode)

Colloidal Spray (Electrolyte)

Co-Sintering

Screen Printing (Anode)



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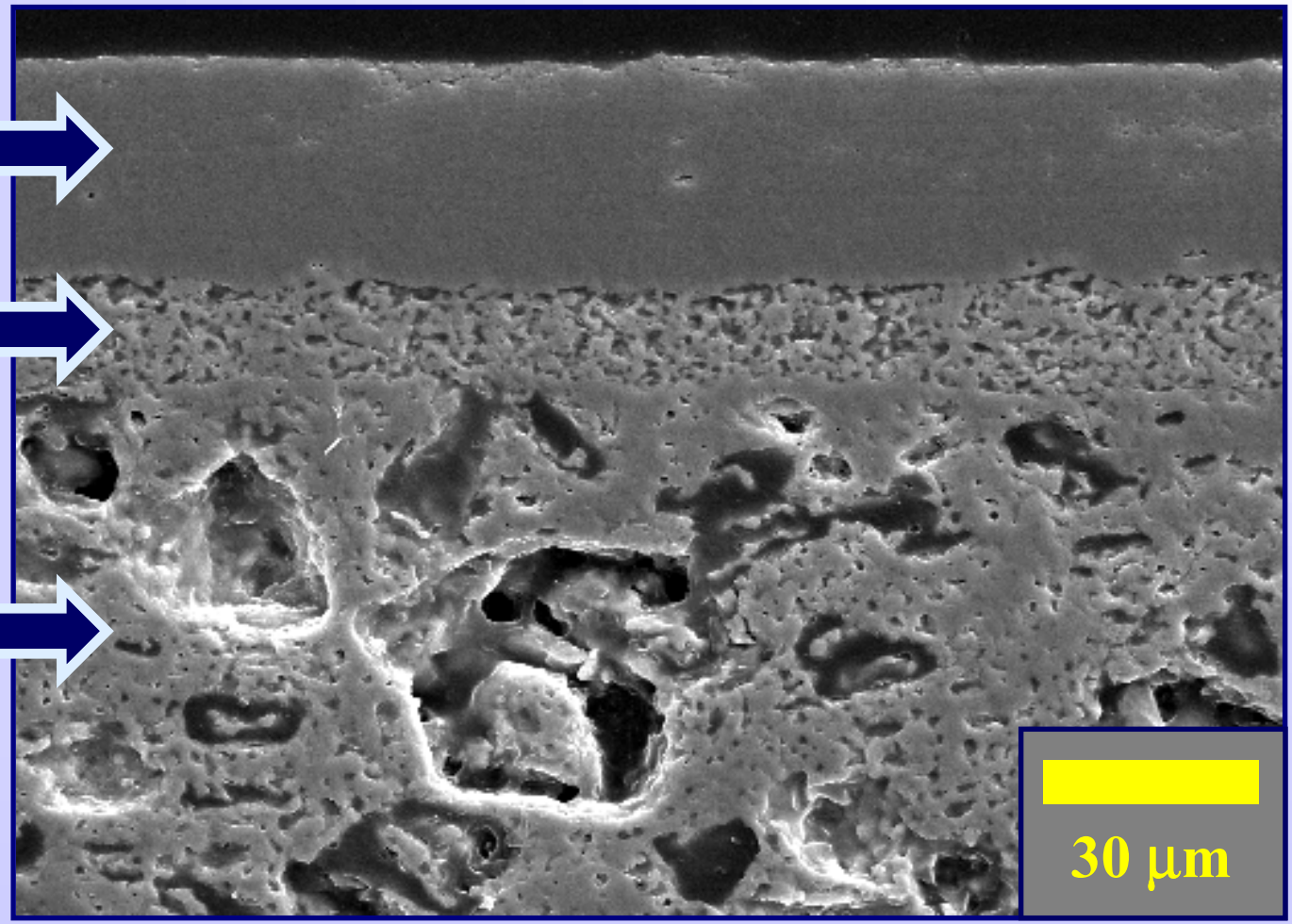
Current Status

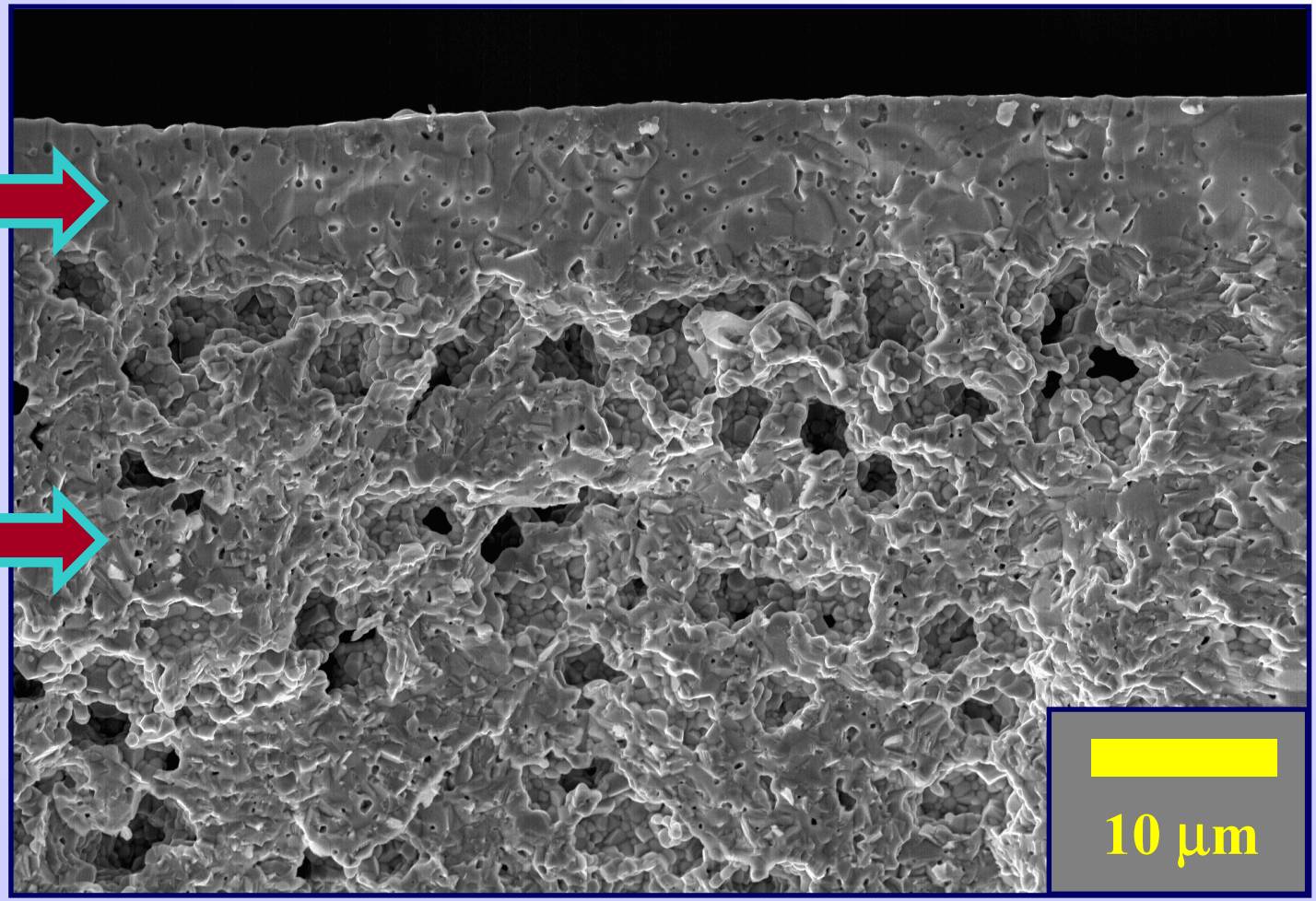


Technical Approach

- **Tape Casting (Anode)**
- **Screen Printing (Electrolyte)**
- **Co-Sintering**
- **Screen Printing (Cathode)**

MULTILAYER FUEL CELL ALLIANCE

Current Status



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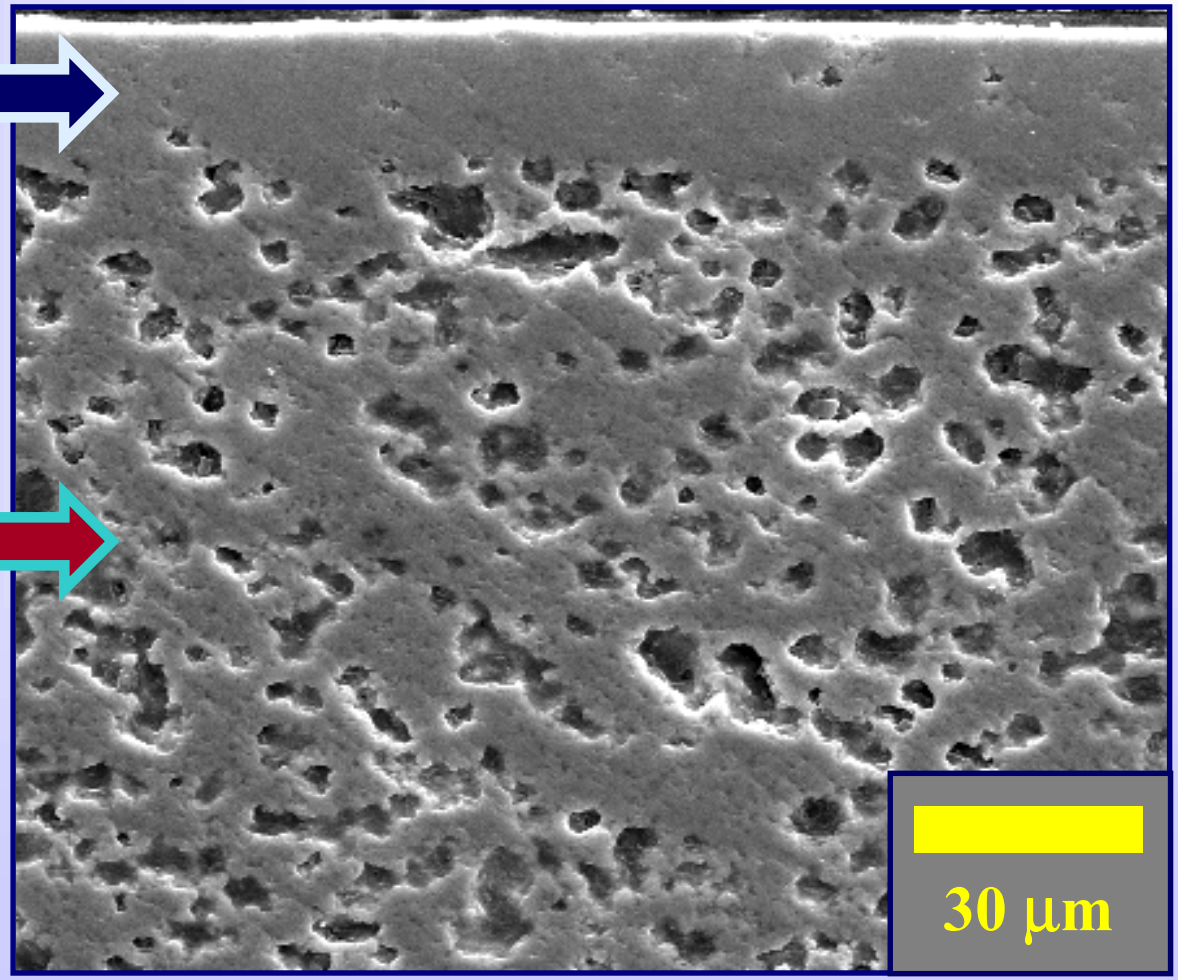
Collaboration

Colloidally deposited YSZ Film (NexTech)

Tape Cast Anode Substrate (ORNL)



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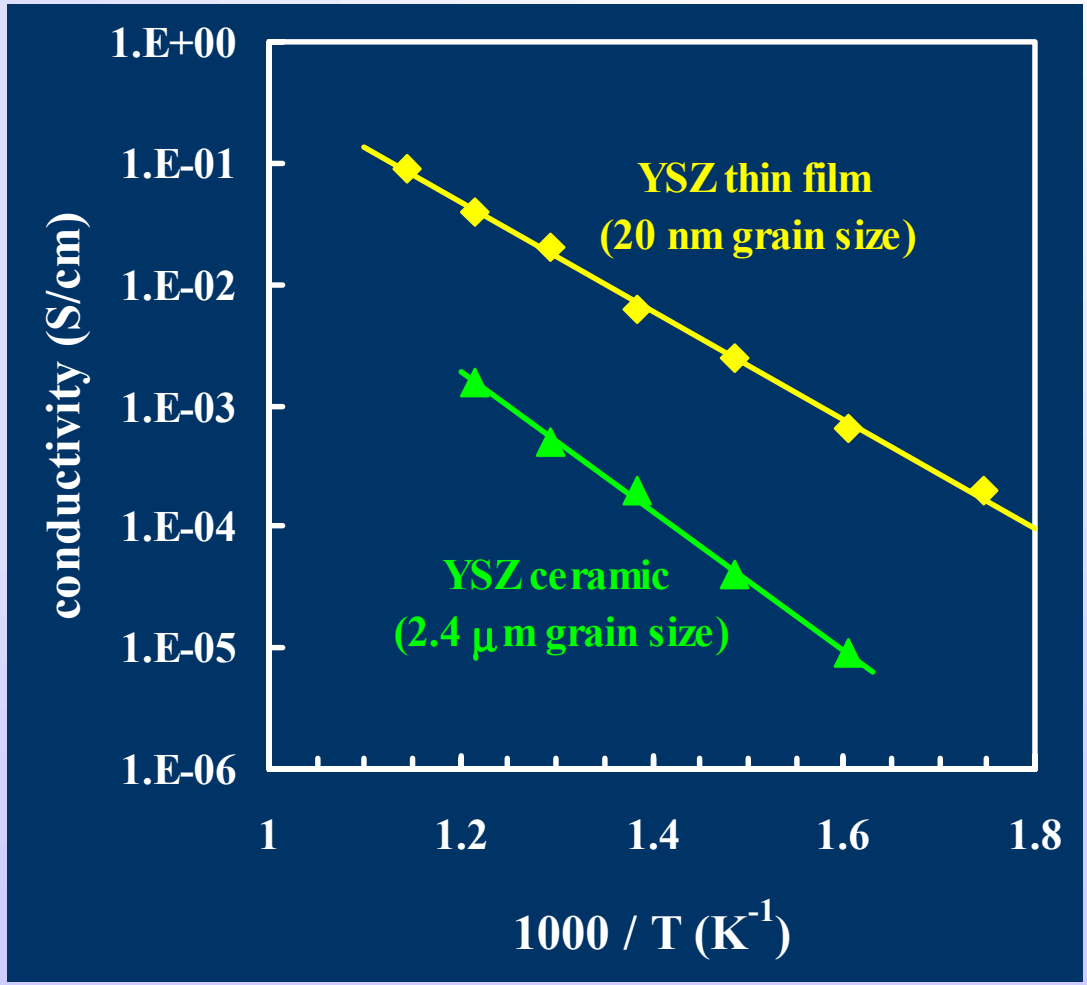
Technical Approach

Tape Casting (Cathode)

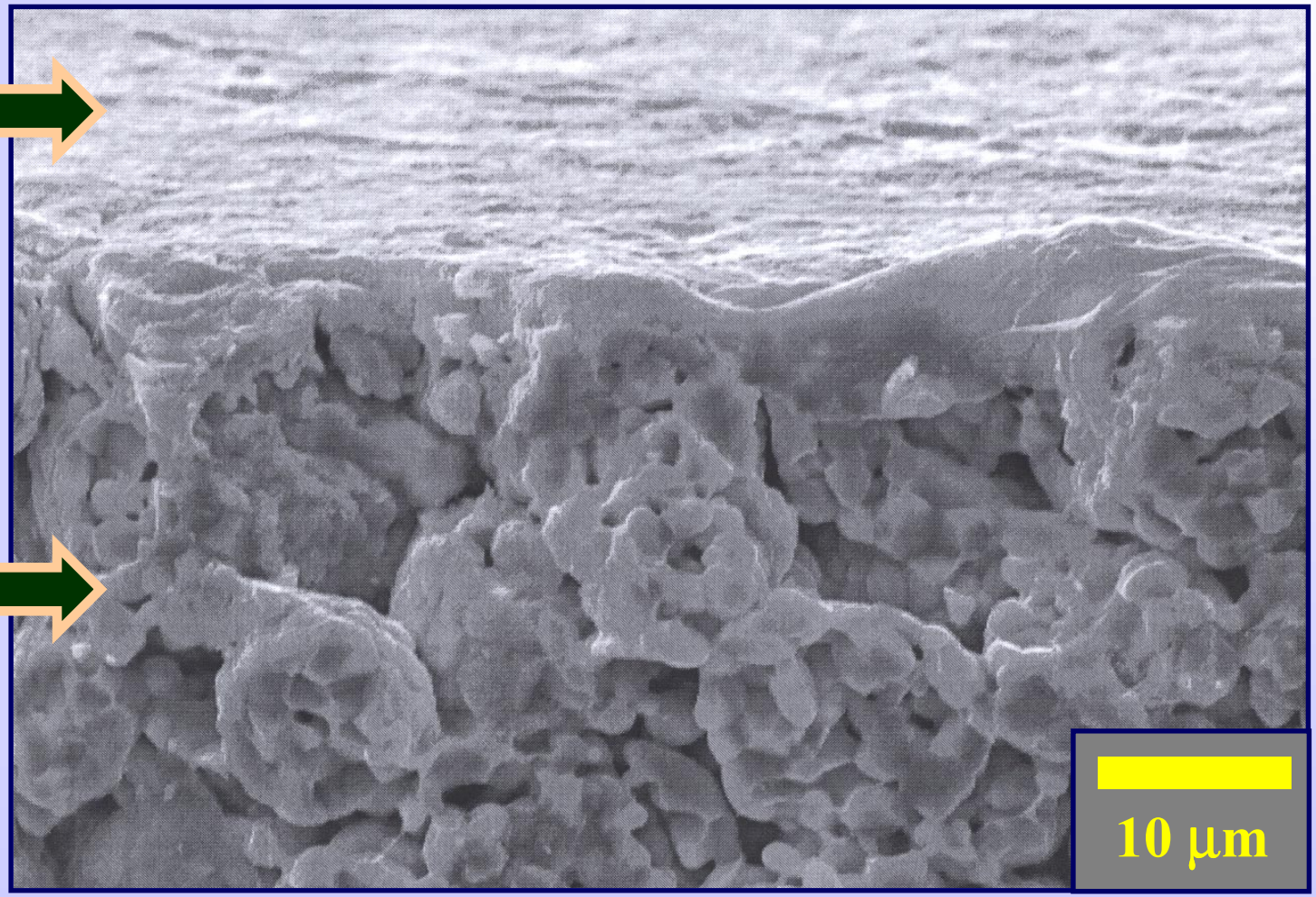
Sintering

Spin Coating (Electrolyte)

Screen Printing (Anode)



Interlayer Development



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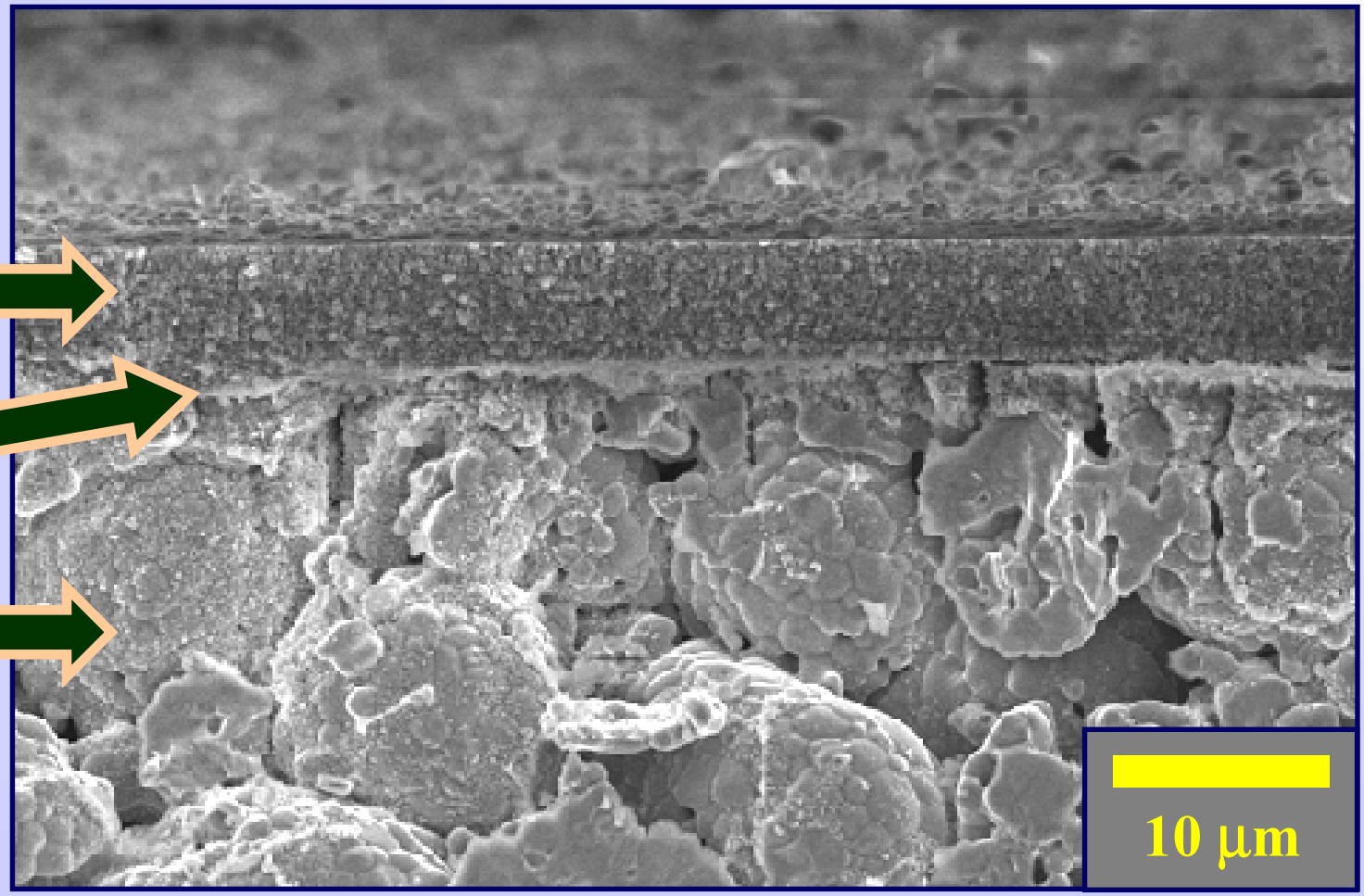
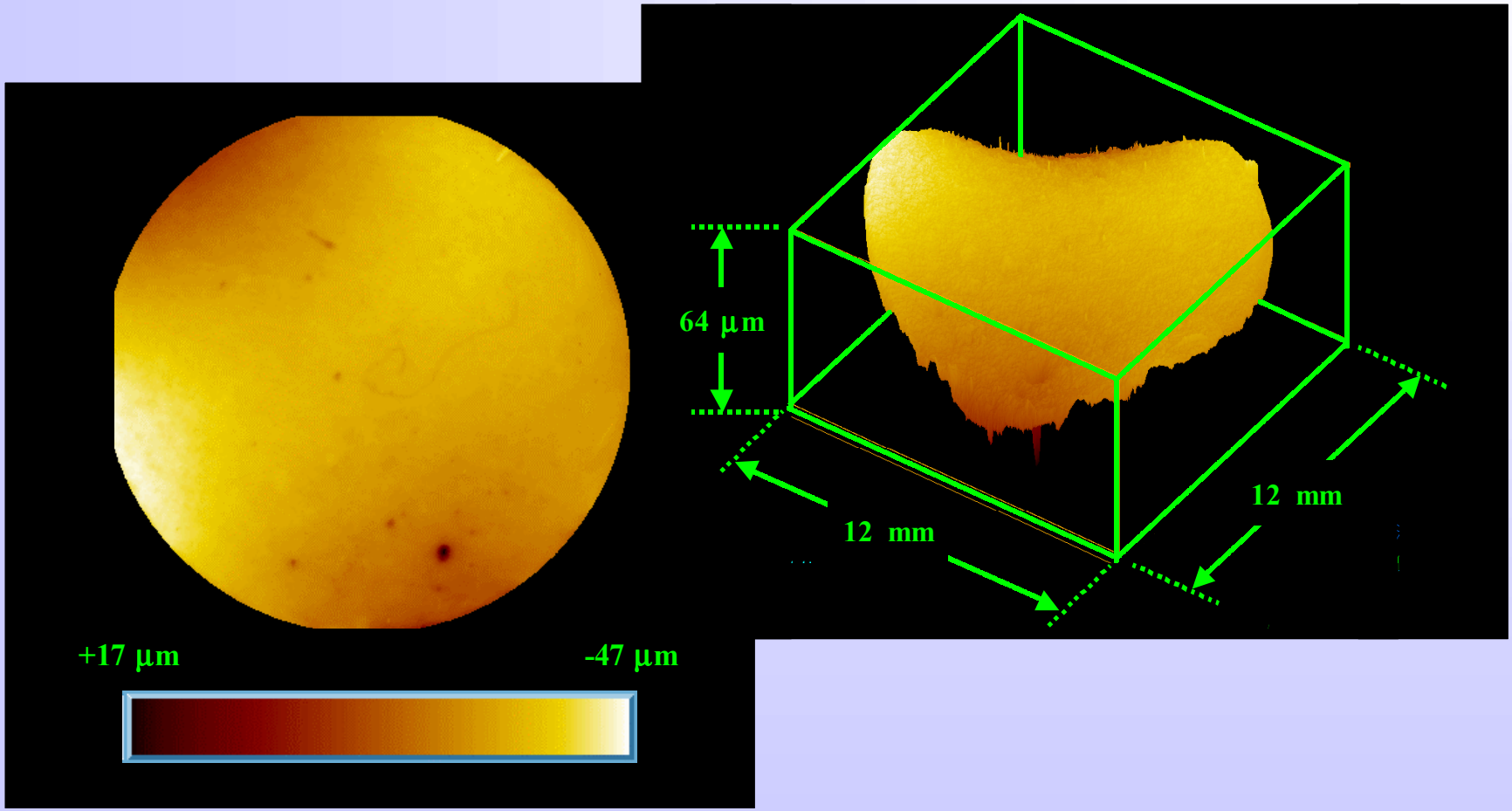


Optical Profilometry



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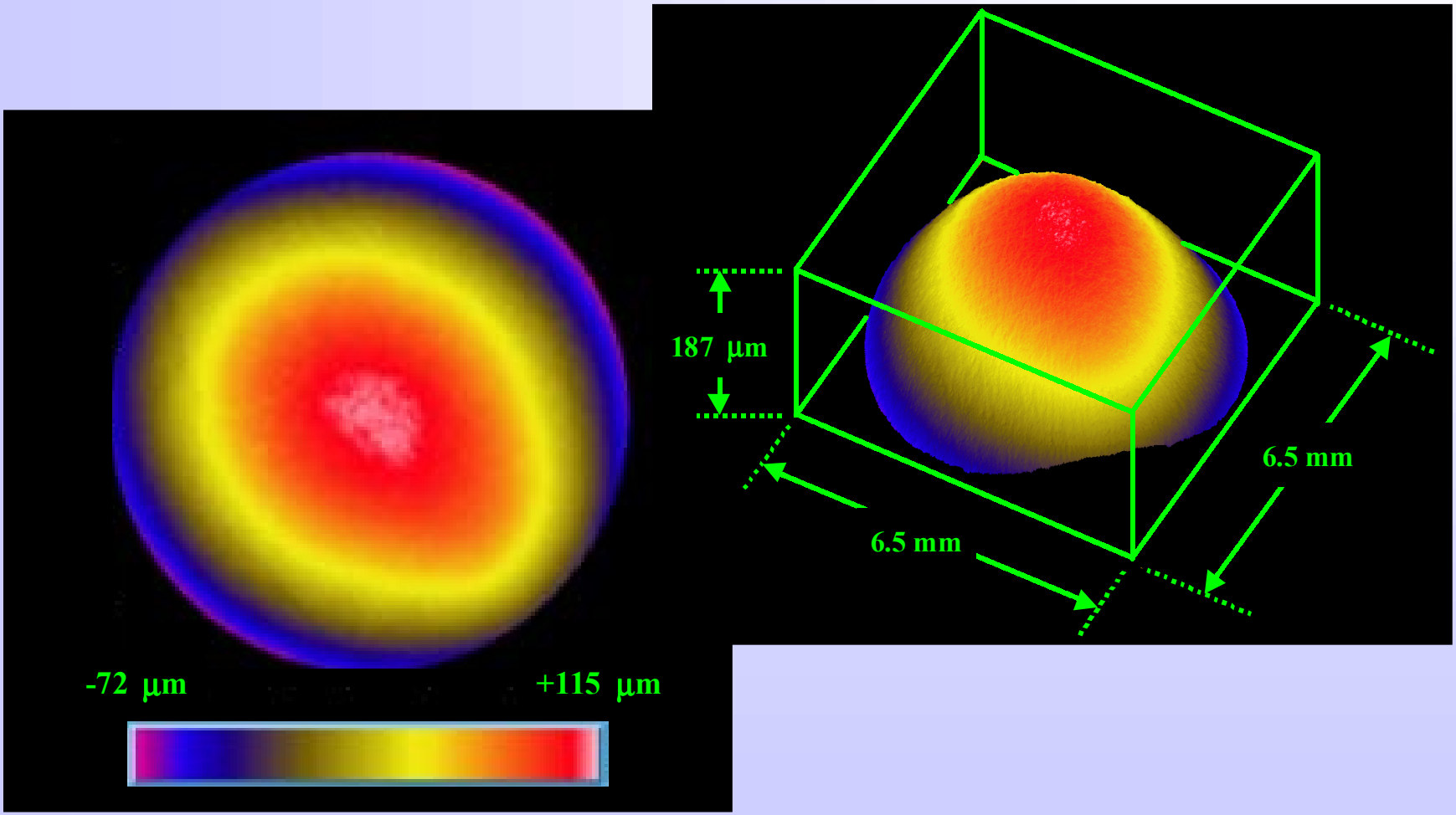

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Commercial Focus

- **SOFC materials (cathodes, anodes, electrolytes).**
- **Evaluation of low-cost manufacturing methods for planar, thin-film electrolyte SOFCs.**
- **Co-sintering technology.**
- **Evaluation by SOFC developers.**
- **Listing of products on *FuelCellMaterials.com*.**

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- **Nanoscale YSZ and Ceria electrolyte powders.**
- **Nanoscale YSZ and Ceria coating suspensions.**
- **Low-temperature cathode powders and inks.**
- **Advanced anode powders and inks.**
- **Anode-supported planar elements.**
- **Cathode-supported planar elements.**

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Future Work

- Scale-up of fabrication to 100-cm^2 areas.
- Screen printing of top electrodes.
- Single-cell and long-term SOFC performance testing to evaluate materials and process modifications.
- Development of non-destructive evaluation methods:
  - Optical profilometry
  - X-ray computed tomography
  - UV fluorescence spectroscopy
  - X-ray radiography

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Acknowledgments

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- Jim Stephan (Advanced Materials Technologies)
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