

Stephen Jesse

Education and Training:

University of Tennessee Ph.D. 2004 Materials Science
University of Tennessee M.S. 2000 Mechanical Engineering
University of Tennessee B.A. 1996 Mechanical Engineering

Research and Professional Experience:

2008–present R&D Associate, Center for Nanophase Materials Sciences, ORNL
2004–2008 Postdoctoral Research Associate, Imaging Functionality Group, Center for Nanophase Materials Sciences, ORNL

Synergistic Activities:

2002–present Materials Research Society (symposium organizer)
2009–present Electrochemical Society Member
2011 UT-Battelle Scientific Research Team Award: Electrochemical Strain Microscopy
2011 Microscopy Today Innovation Award: Electrochemical Strain Microscopy
2010 Roland B. Snow Award, American Ceramics Society: Electrochemical Strain Microscopy
2010 R&D 100 Award for “Z-therm Modulated Thermal Analysis”
2010 Microscopy Today Innovation Award: Band Excitation
2008 Southeast FLC Excellence in Technology Transfer
2008 Materials Research Society Best Poster Award
2008 R&D 100, “Band Excitation Method for Scanning Probe Microscopy”
2008 Cosslett Award, best invited paper, Microscopy & MicroAnalysis Conference
2006 ORNL Director’s Award, Outstanding Team Achievement in Science and Technology

Collaborators and Co-Editors:

M. Alexe	Max Planck Institute, Halle, Germany
L. Chen	Pennsylvania State
E. Eliseev	Ukrainian Academy of Science
V. Gopalan	Pennsylvania State
A. Gruverman	North Carolina State University
A. Morozovska	Ukrainian Academy of Science)
S. Troilier-McKinstry	Pennsylvania State
A. Vertegel	Clemson University

Research Synopsis:

- 1 *Multifrequency scanning probe microscopy techniques.*
Development of multifrequency SPM techniques based on band excitation for quantitative imaging of electrical, thermo-mechanical, magnetic, mechanical, and electromechanical phenomena and probing of associated energy dissipation pathways.
- 2 *Ionic transport and electrochemical phenomena in oxygen ion conductors.*
Electrochemical strain microscopy is used to probe oxygen reduction/evolution reaction in solid ionic conductors and mixed ionic-electronic conductors with dual goal of understanding gas-solid electrochemical reactions on single defect level and determining the role of local oxygen stoichiometry on physical properties.
- 3 *Electrochemical phenomena in Li-ion materials.*
Electrochemical strain microscopy is used to probe reversible and irreversible electrochemical phenomena in Li-air battery materials.

4 *Multi-dimensional data analysis.*

Large, multi-dimensional data sets captured during spectral imaging measurements require the development of novel analysis techniques capable of rapidly extracting the complex material properties.

5 *Polarization dynamics in ferroelectrics and multiferroics.*

Piezoresponse force microscopy and spectroscopy are used to probe bias-induced phase transitions in ferroelectric and multiferroic materials on a single defect level, and decipher corresponding mesoscopic mechanisms.

Graduate and Postdoctoral Advisors and Advisees:

Graduate Advisor: Anthony J. Pedraza, University of Tennessee

Postdoctoral Advisor: Art Baddorf, Oak Ridge National Laboratory

Total Graduate Students Advised: 0

Total Postdoctoral Scholars Advised: 3