

Eric D. Wachsman

*Director, University of Maryland Energy Research Center
William L. Creutz Centennial Chair in Energy Research
University of Maryland, College Park, MD*

EDUCATION:

Ph.D. Materials Science & Engineering, Stanford University, Stanford, California, 1990

M.S. Chemical Engineering, Stanford University, Stanford, California, 1986

B.S. Chemical Engineering, University of California, Berkeley, California, 1982

PROFESSIONAL EXPERIENCE:

Director, University of Maryland Energy Research Center, College Park, MD, 2009-present - Lead university wide energy research center in developing a broad array of sustainable energy technologies and resources, from fuel cells and hydrogen production, to batteries, photovoltaics and biomass. Integrating technology, economics and policy to address US energy needs.

William L. Creutz Centennial Chair in Energy Research, Departments of Materials Science and Engineering, and Chemical Engineering, University of Maryland, College Park, MD, 2009-present. Solid ionic-conductors and electrocatalysts, includes the development of solid state fuel cells, batteries, sensors, and gas separation membranes, and the elucidation of both transport mechanisms (through structural analysis, defect equilibria, and computer modeling) and electrocatalytic mechanisms (by combined catalytic and electrochemical analytical techniques).

Director, Florida Institute for Sustainable Energy, University of Florida, Gainesville, FL, 2006-2009. Florida Center of Excellence devoted to developing a broad array of sustainable energy technologies and resources, from fuel cells and hydrogen production to photovoltaics and biomass. Integrating technology, economics and policy to address Florida and US future energy needs.

Director, UF-DOE High Temperature Electrochemistry Center, University of Florida, Gainesville, FL, 2005-2009.

US Department of Energy research center focused on fundamental investigations of transport in, and heterogeneous reactions on the surface of, ion conducting ceramics. Research spans from first principle calculations to development of materials and material microstructures for high temperature electrochemical energy devices.

Rhines Chair Professor, Department of Materials Science and Engineering, University of Florida, Gainesville, FL, 1997-2009.

Electronically and chemically functional materials. Research is focused on solid ionic-conductors and electrocatalysts, and includes the development of solid state fuel cells, batteries, sensors, and gas separation membranes, and the elucidation of both transport mechanisms and electrocatalytic mechanisms. Teaching includes courses in solid state ionics and the electronic properties of ceramics.

Senior Scientist, Materials Research Center, SRI International, Menlo Park, CA, 1989-1997.

Established an externally funded research program on oxide-ion conducting ceramic materials and their applications. Principal investigator for projects on the development of moderate temperature solid oxide fuel cells (SOFC), solid state gas sensors, and the electrocatalytic reduction of NO_x, using a solid oxide electrochemical cell. Led a group in the synthesis and fabrication of functional ceramic materials and devices, characterization (physical, thermochemical, and electrochemical) of metal oxide electrocatalysts and kinetic evaluation employing such analytical techniques as temperature programmed desorption and reaction (TPD & TPR).

Lecturer, Department of Materials Science and Engineering, Stanford University, Stanford, CA, 1993.
Graduate and undergraduate courses in Materials Thermodynamics.

Member Research Staff, Xerox Palo Alto Research Center, Palo Alto, CA, 1984-86.

Developed and transferred large-area (30 cm x 13 cm) α -Si processing technology from Fuji-Xerox (Japan) and set up pilot-line facility at Xerox, including dielectric, photolithography, and etch processes. Designed clean-room and process equipment. Received Achievement Award for fabricating first large-area integrated circuits.

Process Engineer, Non Volatile Memory Division, Intel, Santa Clara, CA, 1982-84.

HONORS & AWARDS:

Fellow of The Electrochemical Society, 2008

Fellow of The American Ceramic Society, 2012

Sir William Grove Award, International Association for Hydrogen Energy, 2014

Pfeil Award, The Institute of Materials, Minerals, and Mining, 2014

Outstanding Invention of 2013, University of Maryland, Office of Technology Licensing

Fuel Cell Seminar & Exposition Award, 2012

HTM Outstanding Achievement Award, The Electrochemical Society, 2012

Rhines Chair Professor of Materials Science & Engineering, 2008-2009

University of Florida Research Foundation Professor, 2005-2008

Materials Science & Engineering Faculty Excellence Award, 2007-2008

Materials Research Society, Top 5 Hot Talks/Cool Papers, Spring 2007 Meeting

University of Florida Faculty Achievement, 2007

NASA Johnson Space Center Achievement Award, 2007

Materials Science & Engineering Faculty Excellence Award, 2006-2007

Materials Science & Engineering Faculty Excellence Award, 2005-2006

Materials Science & Engineering Faculty Excellence Award, 2004-2005

Progress in Ceramic Basic Science: Challenge Toward the 21st Century, The Basic Science Division, The Ceramic Society of Japan, 1996

Xerox Achievement Award, 1984

PROFESSIONAL SERVICE:

Editor-In-Chief, *Ionics* (Springer)

Editor, *Science Reports* (Nature Publishing Group)

Editor, *Energy Systems* (Springer)

Editor, *Energy Technology* (Wiley)

Associate Editor, *Journal of the American Ceramic Society*, 1997-2005

Board of Directors, Maryland Clean Energy Center, 2011-2015 – **Governor Appointment**

Board of Directors, The Electrochemical Society, 2006-2007 and 2013-2016

Chair, Interdisciplinary Science & Technology Subcommittee, The Electrochemical Society, 2013-2016

Chair, New Technology Subcommittee, The Electrochemical Society, 2011-2013

Chair, National Capitol Section, The Electrochemical Society, 2011-2013

Chair, Olin Palladium Award Committee, The Electrochemical Society, 2009-2012

Chair, High Temperature Materials Division of the Electrochemical Society, 2006-2007

Chair, Florida Section of the American Ceramic Society, 2001-2004

Senior Vice Chair, High Temperature Materials Division of the Electrochemical Society, 2004-2005

Junior Vice Chair, High Temperature Materials Division of the Electrochemical Society, 2002-2003

Secretary/Treasurer, High Temperature Materials Division of the Electrochemical Society, 2000-2001

Faculty Advisor, University of Maryland Student Chapter, The Electrochemical Society, 2011-present

Faculty Advisor, University of Florida Student Chapter, The Electrochemical Society, 2005-2010

Technical Affairs Committee, The Electrochemical Society, 2011-2016

Finance Committee, The Electrochemical Society, 2009-2011

Fellows Selection Subcommittee, The Electrochemical Society, 2011-2014

Honors and Awards Committee, The Electrochemical Society, 2008-2012

Society Meeting Committee, The Electrochemical Society, 2007-2009

Symposium Subcommittee, The Electrochemical Society, 2004-2007, 2011-2016

Fuel Cell Subcommittee, The Electrochemical Society, 2006-2016

Councilor, Florida Section of the American Ceramic Society, 2004-2007

Executive Committee, Council for Energy Research Education Leaders, 2011-present

Advisory Board, Nanostructures for Electrical Energy Storage, - **US DOE Energy Frontier Research Center**

Advisory Board, Maryland Clean Energy Center, 2009-2010

Scientific Advisor, Redox Power Systems

Technical Advisory Board, Kainos Energy, Inc.

Scientific Advisor, Emissions Detection Technologies, Inc.

International Advisory Board/Committee:

International Symposium of Functional Materials, August 4-7, 2014, Singapore

CIMTEC Forum on New Materials, June 13-18, 2010, Montecatini Terme, Italy.

Euroconferences on Science and Technology of Ionics, Sponsored by the European Community DGXII:
"Human Potential Program - High Level Scientific Conferences," 2001 - 2009.

International Conference on Solid State Ionics, June 22-27, 2003, Monterey, CA

International Conference on Solid State Ionics, July 8-13, 2001, Cairns, Australia.

International Ceramics Congress, July 14-19, 2002, Florence, Italy.

Conference/Symposium Organizer:

"Energy and Climate Change," 15th National Conference and Global Forum on Science, Policy and the Environment, National Council for Science and the Environment, Washington, DC, January 27-29, 2015 - **Conference Leadership Group**

"The Energy-Water Nexus," The Electrochemical Society, Cancun, Mexico, October 5-9, 2014.

"Solid-State Ionic Devices X," The Electrochemical Society, Cancun, Mexico, October 5-9, 2014.

"Eleventh International Symposium on Solid Oxide Fuel Cells: Materials, Science and Technology," American Ceramic Society, Daytona Beach, FL, January 26-31, 2014.

"The Energy-Water Nexus," The Electrochemical Society, San Francisco, CA, October 27- November 1, 2013.

"Solar 2013", American Solar Energy Society, Baltimore, MD, April 16-20, 2013 - **Conference Chair**

"Tenth International Symposium on Solid Oxide Fuel Cells: Materials, Science and Technology," American Ceramic Society, Daytona Beach, FL, January 27-February 1, 2013.

"Solid-State Ionic Devices IX - Thin Films and Multilayers," The Electrochemical Society, Honolulu, HI, October 7-12, 2012.

"Ninth International Symposium on Solid Oxide Fuel Cells: Materials, Science and Technology," American Ceramic Society, Daytona Beach, FL, January 22-27, 2012.

"Ionic Conductors for Solid Oxide Fuel Cells and Batteries," Electronic Materials Conference 2011, The Minerals, Metals, & Materials Society, Santa Barbara, CA, June 22-24, 2011.

"Eighth International Symposium on Solid Oxide Fuel Cells: Materials, Science and Technology," American Ceramic Society, Daytona Beach, FL, January 23-28, 2011.

"Ionic Conductors for Solid Oxide Fuel Cells and Batteries," Electronic Materials Conference 2010, The Minerals, Metals, & Materials Society, Notre Dame, IN, June 23-25, 2010.

"Solid-State Ionic Devices VIII - NEMCA," The Electrochemical Society, Las Vegas, October 10-15, 2010.

"Seventh International Symposium on Solid Oxide Fuel Cells: Materials, Science and Technology," American Ceramic Society, Daytona Beach, FL, January 24-29, 2010.

"Innovation in Fuel Cells: From Advanced Materials to Novel Devices," 11th International Conference on Advanced Materials - ICAM 2009, Rio de Janeiro, Brazil, September 20-25, 2009.

"Hydrogen Production, Transport and Storage 3," The Electrochemical Society, San Francisco, May 24-29, 2009.

"Sixth International Symposium on Solid Oxide Fuel Cells: Materials, Science and Technology," American Ceramic Society, Daytona Beach, January 18-23, 2009.

"Solid-State Ionic Devices VI - Nanoionics," The Electrochemical Society, Honolulu, HI, October 12-17, 2008.

"Fifth International Symposium on Solid Oxide Fuel Cells: Materials, Science and Technology," American Ceramic Society, Daytona Beach, January 27 - February 1, 2008.

"Solid-State Ionic Devices V," The Electrochemical Society, Washington D.C., October 7-12, 2007.

"Hydrogen Production, Transport and Storage 2," The Electrochemical Society, Chicago, May 6-11, 2007.

"Fourth International Symposium on Solid Oxide Fuel Cells: Materials, Science and Technology," American Ceramic Society, Daytona Beach, January 21-26, 2007.

"Hydrogen Production, Transport and Storage," The Electrochemical Society, Denver, May 7-12, 2006.

"Fundamental Mechanisms of SOFC Cathode Reactions," UF-DOE High Temperature Electrochemistry Center Workshop, Cocoa Beach, January 27, 2006.

"Solid-State Ionic Devices IV," The Electrochemical Society, Los Angeles, October 16-21, 2005.

"Solid-State Ionics," Materials Research Society, Boston, November 29-December 3, 2004.

"Solid-State Ionic Devices III," The Electrochemical Society, Salt Lake City, October 20-25, 2002.

"Solid-State Ionic Devices II," The Electrochemical Society, Phoenix, October 22-27, 2000.

"Solid-State Ionic Devices," The Electrochemical Society, Seattle, May 2-7, 1999.

"Oxide-Ion Conducting Ceramics," American Ceramic Society, San Francisco, October 12-15, 1997.

Invited Panelist/Participant:

State of Virginia, \$100M R&D Commercialization Fund Review Panel, 2010-present

Patuxent Policy Group, "Influence of US Energy Boom on US Military," August 21, 2013, St. Mary's College, MD.

National Science Foundation, Solid Oxide Fuel Cell Promise, Progress, and Priorities, July 11-12, 2013, Arlington, VA.

Maryland Grid Resilience Task Force, Roundtable, August 21 - September 11, 2012, Annapolis, MD.

Maryland Clean Energy Summit, October 4, 2010, Baltimore, MD.

National Science Foundation Proposal Review Panel, March 22-23, 2010, Arlington, VA.

36th Annual Public Utility Research Center (PURC) Conference, "Changes in Climate and Information Technologies: Who's Driving Utility Policy?" February 4-5, 2009, Gainesville, FL.

Florida Water and Environment Association Conference, “Sustainability for Public Utilities,” September 4-5, 2008, Orlando, FL.

14th Annual Public Interest Environmental Conference, “Reducing Florida’s Footprint: Stepping Up to the Global Challenge,” February 28-March 1, 2008, Levin College of Law, Gainesville, FL.

International SOFC Symposium in Taiwan, May 28-June 3, 2005, Taipei, Taiwan.

The National Academies (USA) and The Science Council of Japan, “Japan-US Workshop on the Future of Sensors and Sensor Systems,” February 28-March 2, 2005, Tsukuba, Japan.

US Department of Energy, “Basic Research Needs Related to High Temperature Electrochemical Devices for Hydrogen Production, Storage and Use,” July 22-23, 2003, Washington DC.

NATO Advanced Research Workshop, “Mixed Ionic-Electronic Conducting (MIEC) Perovskites for Advanced Energy Systems,” June 1-5, 2003, Kiev, Ukraine.

US Department of Energy, “Fuel Cell Report to Congress,” February 21-22, 2002, Washington DC.

European Union, “Euroconference on Science and Technology of Ionics,” September 15-21, 2002, Rhodes, Greece.

US Department of Energy, “Solid State Energy Conversion Alliance Workshop,” March 29-30, 2001, Arlington, VA.

US Department of Energy, “Solid State Energy Conversion Alliance Core Technology Planning Workshop,” February 14-15, 2001, Atlanta, GA.

European Union, “Euroconference on Science and Technology of Ionics,” October 1-7, 2000, Corsica, France.

National Science Foundation Proposal Review Panel, September 21, 2000, Arlington, VA.

US Department of Energy, “Universities for Fuel Cells,” May 1999 – 2002.

National Science Foundation Proposal Review Panel, February 15-16, 1999, Arlington, VA.

US Department of Energy, “Workshop on Next Generation Fuel Cells,” November, 3-4, 1998, Morgantown, WV.

National Science Foundation, “Workshop on Fundamental Research Needs in Ceramics,” June 10-11, 1997, Arlington, VA.

US Department of Energy, “Workshop on Solid Oxide Fuel Cells for Transportation,” April 26-27, 1995, Towson, MD.

PUBLICATIONS:

Proceedings/Transactions Editor:

11. *The Energy-Water Nexus*, E.D. Wachsman, J. Burgess, M.T. Carter, C. Hensman, B.Y. Liaw, S.D. Minter, W.E. Mustain, P.M. Natishan, and B.R. Stoner, Ed., The Electrochemical Society Inc., Pennington, NJ, **58-35**, 2014.
10. *Solid State Ionic Devices 10*, E. Traversa, G.S. Jackson, A.M. Herring, E.D. Wachsman, R. Mukundan, and P. Vanysek, Ed., The Electrochemical Society Inc., Pennington, NJ, **64-2**, 2014.

9. *Solid State Ionic Devices 9 - Ion Conducting Thin Films and Multilayers*, E.D. Wachsman, T. Gur, E. Traversa, J.A. Kilner, and S. Yamaguchi, Ed., The Electrochemical Society Inc., Pennington, NJ, **50-27**, 2013.
8. *Solid State Ionic Devices 8 - NEMCA*, E.D. Wachsman, C. Bock, G. Hunter, and E. Traversa, Ed., The Electrochemical Society Inc., Pennington, NJ, **33-40**, 2011.
7. *Solid State Ionic Devices 6 - Nanoionics*, E.D. Wachsman, J. Weidner, K. Abraham, E. Traversa, S. Yamaguchi, R. Mukundan, and S. Minter, Ed., The Electrochemical Society Inc., Pennington, NJ, **16-51**, 2009.
6. *Solid State Ionic Devices V*, E.D. Wachsman, F.H. Garzon, E. Traversa, R. Mukundan, and A. Manivannan, Ed., The Electrochemical Society Inc., Pennington, NJ, **11-33**, 217 pages, ISBN 978-1-56677-674-5, 2008.
5. *Solid State Ionic Devices IV*, E.D. Wachsman, F.H. Garzon, E. Traversa, R. Mukundan, and V. Birss, Ed., The Electrochemical Society Inc., Pennington, NJ, **1-7**, 407 pages, ISBN 1-56677-494-2, 2006.
4. *Solid State Ionics - 2004*, P. Knauth, C. Masquelier, E. Traversa, and E.D. Wachsman, Ed., Materials Research Society, Warrendale, PA, **835**, 378 pages, ISBN 1-55899-783-0, 2005.
3. *Solid State Ionic Devices III*, E.D. Wachsman, K.S. Lyons, M. Carolyn, F. Garzon, M. Liu, and J. Stetter, Ed., The Electrochemical Society Inc., Pennington, NJ, **2002-36**, 535 pages, ISBN 1-56677-388-1, 2003.
2. *Solid State Ionic Devices II - Ceramic Sensors*, E.D. Wachsman, W. Weppner, E. Traversa, M. Liu, P. Vanysek, and N. Yamazoe, Ed., The Electrochemical Society Inc., Pennington, NJ, **2000-32**, 530 pages, ISBN 1-56677-299-0, 2001.
1. *Solid State Ionic Devices*, E.D. Wachsman, J. Akridge, M. Liu, and N. Yamazoe, Ed., The Electrochemical Society Inc., Pennington, NJ, **99-13**, 424 pages, ISBN 1-56677-235-4, 1999.

Book Chapters:

1. "Designing for Thermochemical Applications," E.D. Wachsman, in *An Introduction to Ceramic Engineering Design*, D.E. Clark, D.C. Folz, and T.D. McGee, Ed., American Ceramic Society, 329-346, ISBN 1-57498-131-5, 2002.

Feature Articles:

11. "Low-Temperature Solid Oxide Fuel Cells," E. D. Wachsman, T. Ishihara, and J. Kilner, in *MRS Bulletin*, **39-9**, 773-779 (2014).
10. "Role of Nanostructures on SOFC Performance at Reduced Temperatures," K. T. Lee and E. D. Wachsman, in *MRS Bulletin*, **39-9**, 783-791 (2014).
9. "Solid Oxide Fuel Cell Commercialization, Research, and Challenges," E. D. Wachsman and S. C. Singhal, in *American Ceramic Society Bulletin*, **89-3**, 22-32 (2010).
8. "Solid Oxide Fuel Cells; Increasing Efficiency with Conventional Fuels," E. D. Wachsman, in *Interface*, The Electrochemical Society, **18-2**, 37 (2009).
7. "Solid Oxide Fuel Cell Commercialization, Research, and Challenges," E. D. Wachsman and S. C. Singhal, in *Interface*, The Electrochemical Society, **18-2**, 38-43 (2009).
6. "Solid State Ionics," E. D. Wachsman, in *Interface*, The Electrochemical Society, **16-4**, 27-28 (2007).
5. "Hot Materials, Hotter Impact," E. Wuchina and E. D. Wachsman, in *Interface*, The Electrochemical Society, **16-4**, 29 (2007).
4. "Solid State Ionic Devices," E. D. Wachsman and E. Traversa, in *Interface*, The Electrochemical Society, **16-4**, 37-40 (2007).

3. "High Temperature Materials," K. E Spear, S. Visco, E. J. Wuchina and E. D. Wachsman, in *Interface*, The Electrochemical Society, **15-1**, 40-44 (2006).
2. "Hydrogen Production from Fossil Fuels with High Temperature Ion Conducting Ceramics," E. D. Wachsman and M.C. Williams, in *Interface*, The Electrochemical Society, **13-3**, 32-37, (2004).
1. "High Temperature Ion Conducting Ceramics," T.A. Ramanarayanan, S.C. Singhal, and E. D. Wachsman, in *Interface*, The Electrochemical Society, **10-2**, 22-27, (2001).

Peer Reviewed Publications:

229. "Lithium Ion Conductivity and Thermodynamic Activity of Li₂O of Li_{0.23}La_{0.61}TiO₃," S-Y. Jeon, H-N. Im, D-K. Lim, E.D. Wachsman, and S-J. Song, *Journal of Materials Science*, submitted
228. "Improving Ionic Conductivity of NASICON Through Aliovalent Cation Substitution of Na₃Zr₂Si₂PO₁₂," A.G. Jolley, G. Cohn, G.T. Hitz, and E.D Wachsman, *Ionics*, accepted
227. "Structural Investigation of Monoclinic-Rhombohedral Phase Transition in Na₃Zr₂Si₂PO₁₂ and Doped NASICON," A.G. Jolley, D.D. Taylor, N.J. Schreiber, and E.D Wachsman, *J. American Ceramic Soc.*, (2015) DOI: 10.1111/jace.13692
226. "Effect of Excess Li on the Structural and Electrical Properties of Garnet-Type Li₆La₃Ta_{1.5}O_{0.5}O₁₂," S. Narayanan, G.T. Hitz, E.D Wachsman, and V. Thangadurai, *Journal of the Electrochemical Society*, **162**, A1771-1777 (2015).
225. "Higher Conductivity Li-Garnets by a Multi-Element Doping Strategy," X. Tong, V. Thangadurai, and E.D Wachsman, *Inorganic Chem.*, **54**, 3600-3607 (2015).
224. "Enhancement of La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3.8} Surface Exchange through Ion Implantation," Y-L, Huang, C. Pelligrinelli, K.T. Lee, A. Perel, and E.D. Wachsman, *Journal of the Electrochemical Society*, **162**, F965-970 (2015).
223. "Towards a Fundamental Understanding of the Cathode Degradation Mechanisms," E.D. Wachsman, Y-L, Huang, C. Pelligrinelli, J.A. Taillon, and L.G. Salamanca-Riba, *Ionic and Mixed Conducting Ceramics 9, ECS Transactions*, M.B. Mogensen, T.M. Gur, X.D. Zhou, T. Armstrong, T. Kawada, A. Manivannan, Ed, **61**, 47-56 (2014).
222. "A Model for Extracting Fundamental Kinetic Rates of SOFC Cathode Materials from Oxygen Isotope Experiments," Y-L, Huang, C. Pelligrinelli, and E.D. Wachsman, *Ionic and Mixed Conducting Ceramics 9, ECS Transactions*, M.B. Mogensen, T.M. Gur, X.D. Zhou, T. Armstrong, T. Kawada, A. Manivannan, Ed, **61**, 93-107 (2014).
221. "Three Dimensional Microstructural Characterization of Cathode Degradation in SOFCs Using Focused Ion Beam and SEM," J.A. Taillon, C. Pelligrinelli, Y-L, Huang, E.D. Wachsman, and L.G. Salamanca-Riba, *Ionic and Mixed Conducting Ceramics 9, ECS Transactions*, M.B. Mogensen, T.M. Gur, X.D. Zhou, T. Armstrong, T. Kawada, A. Manivannan, Ed, **61**, 109-120 (2014).
220. "Rational Design of Lower Temperature Solid Oxide Fuel Cell Cathodes via Nano-tailoring of Co-assembled Composite Structures," K.T. Lee, A.A. Lidie, H.S. Yoon, and E.D. Wachsman, *Angewandte Chemie*, **53**, 13463-13467 (2014) DOI: 10.1002/anie.201408210
219. "Photosensitive Oxide Semiconductors: 1. Materials for Solar Hydrogen Fuel," J. Nowotny, A.J. Atanacio, T. Bak, S. Fiechter, Y. Ikuma, M. Ionescu, B.J. Kennedy, P. Majewski, G.E. Murch, and E.D. Wachsman, *International Materials Reviews*, **59**, 449-478 (2014).
218. "Terbium and Tungsten Co-doped Bismuth Oxide Electrolytes for Low Temperature Solid Oxide Fuel Cells," D.W. Jung, K.T. Lee, and E.D Wachsman, *Journal of the Korean Ceramic Society*, **51**, 260-264 (2014).
217. "Free-Standing Na_{2/3}Fe_{1/2}Mn_{1/2}O₂@Graphene Film for a Sodium-Ion Battery Cathode," H. Zhu, K.T. Lee, G.T. Hitz, X. Han, Y. Li, J. Wan, S. Lacey, A.W. Cresce, K. Xu, E.D Wachsman and L. Hu, *ACS Applied Materials & Interfaces*, **6**, 4242-4247 (2014).

216. "Chemical Expansion: Implications for Electrochemical Energy Storage and Conversion Devices," S.R. Bishop, D. Marrocchelli, C. Chatzichristodoulou, N.H. Perry, M.B. Mogensen, H.L. Tuller, and E.D. Wachsman, *Annual Reviews of Materials Research*, **44**:6.1-6.35 (2014).
215. "Effect of Composition and Microstructure on Electrical Properties and CO₂ Stability of Donor-doped, Proton Conducting BaCe_{1-(x+y)}Zr_xNb_yO₃," C. Gore, E.D Wachsman, and V. Thangadurai, *J. Materials Chem. A*, **2**, 2363-2373 (2014).
214. "Enhanced Oxygen Reduction Reaction with Nano-Scale Pyrochlore Bismuth Ruthenate via Cost-Effective Wet-Chemical Synthesis," K.T. Lee, B.W. Lee, M.A. Camaratta, and E.D Wachsman, *RSC Advances*, **3**, 19866-19871 (2013).
213. "Highly Li-Stuffed Garnet-Type Structured Li_{7+x}La₃Zr_{2-x}Y_xO₁₂," G.T. Hitz, E.D Wachsman, and V. Thangadurai, *J. Electrochem. Soc.*, **160**, A1248-A1255, (2013).
212. "Highly Functional Nano-scale Stabilized Bismuth Oxides via Reverse Strike Co-precipitation for Solid Oxide Fuel Cells," K.T. Lee, A.A. Lidie, S.Y. Jeon, G.T. Hitz, and E. D. Wachsman, *Journal of Materials Chemistry*, **1**, 6199-6207 (2013) DOI: 10.1039/c3ta10570a
211. "Performance of La_{0.1}Sr_{0.9}Co_{0.8}Fe_{0.2}O_{3-d} and La_{0.1}Sr_{0.9}Co_{0.8}Fe_{0.2}O_{3-d}-Ce_{0.9}Gd_{0.1}O₂ Oxygen Electrodes with Ce_{0.9}Gd_{0.1}O₂ Barrier Layer in Reversible Solid Oxide Fuel Cells," M.-B. Choi, B. Singh, E. D. Wachsman, and S.-J. Song, *Journal of Power Sources*, **239**, 361-373 (2013).
210. "Effect of Nanocomposite Au-YSZ Electrodes on Potentiometric Sensor Response to NO_x and CO," T. Striker, V. Ramaswamy, E.N. Armstrong, P.D. Willson, E.D. Wachsman, and J.A. Ruud, *Sensors and Actuators B: Chemical*, **181**, 312-318 (2013).
209. "Effect of A and B-site Cations on Surface Exchange Coefficient for ABO₃ Perovskite Materials," E.N. Armstrong, K.L. Duncan, and E.D. Wachsman, *Physical Chemistry Chemical Physics*, **15**, 2298-2308 (2013).
208. "Comprehensive Quantification of Ni-Gd_{0.1}Ce_{0.9}O_{1.95} Anode Functional Layer Microstructures by Three-Dimensional Reconstruction Using a FIB/SEM Dual Beam System," K. T. Lee, N. J. Vito, and E. D. Wachsman, *Journal of Power Sources*, **228**, 220-228 (2013).
207. "Solvochemical Synthesis of High Hydrogen Permeable Pd/Ag Alloy Nanoparticles and their Hydrogen Transport Properties," S.-Y. Jeon, H.-N. Im, J.-S. Lim, E. D. Wachsman, and S.-J. Song, *Ionics*, **19**, 171-176 (2013).
206. "Feasibility of Low Temperature Solid Oxide Fuel Cells Operating on Reformed Hydrocarbon Fuels" K.T. Lee, C.M. Gore, and E. D. Wachsman, *Journal of Materials Chemistry*, **22**, 22405-22408 (2012).
205. "Electrochemical Properties of Ceria-Based Intermediate Temperature Solid Oxide Fuel Cells Using Microwave Heated La_{0.1}Sr_{0.9}Co_{0.8}Fe_{0.2}O_{3-d} as a Cathode," M.-B. Choi, K.-T. Lee, H.-S. Yoon, S.-Y. Jeon, E. D. Wachsman, and S.-J. Song, *Journal of Power Sources*, **220**, 377-382 (2012).
204. "SrCe_{0.7}Zr_{0.2}Eu_{0.1}O₃-based Hydrogen Transport Water Gas Shift Reactor," J. Li, H. Yoon, T. K. Oh, and E. D. Wachsman, *International Journal of Hydrogen Energy*, **37**, 16006-16012 (2012).
203. "Carbon Dioxide Reforming of Methane in a SrCe_{0.7}Zr_{0.2}Eu_{0.1}O₃ Proton Conducting Membrane Reactor," J. Li, H. Yoon, and E. D. Wachsman, *International Journal of Hydrogen Energy*, **37**, 19125-19132 (2012).
202. "The Evolution of Low Temperature Solid Oxide Fuel Cells," K. T. Lee, H. S. Yoon, and E. D. Wachsman, *Journal of Materials Research*, **27**, 2063-2078 (2012) - **Invited Feature Paper**.
201. "Interfacial Modification of La_{0.80}Sr_{0.20}MnO_{3-d}- Er_{0.4}Bi_{0.6}O₃ Cathodes for High Performance Lower Temperature Solid Oxide Fuel Cells," K. T. Lee, D.W. Jung, H. S. Yoon, A.A. Lidie, M.A. Camaratta, and E. D. Wachsman, *Journal of Power Sources*, **220**, 324-330 (2012).
200. "Mechanism of La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3- δ} Cathode Degradation," D. Oh, D. Gostovic, and E. D. Wachsman, *Journal of Materials Research*, **27**, 1992-1999 (2012).

199. "Bimodally-Integrated Anode Functional Layer for Lower Temperature Solid Oxide Fuel Cells" K.T. Lee, H.S. Yoon, J.S. Ahn, and E. D. Wachsman, *Journal of Materials Chemistry*, **22**, 17113-17120 (2012).
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16. "Effect of Ru-Loading on the Catalytic Activity of Ru-NaZSM-5 Zeolites for Nitrous Oxide Decomposition," Y. F. Chang, J. G. McCarty, and E. D. Wachsman, *Applied Catalysis B*, **6**, 21-23 (1995).
15. "Solid-Oxide Electrochemical Reduction and Selective Absorption of NO_x," E. D. Wachsman, P. Jayaweera, V. L. K. Wong, J. G. McCarty, and A. Sanjurjo, in *Proceedings of the 1995 Diesel Engine Emissions Reduction Workshop*, U.S. Department of Energy, 59-66 (1995).
14. "Isotopic Study of NO Decomposition over Cu- or Co-Exchanged ZSM-5 Zeolite Catalysts," Y. F. Chang, J. G. McCarty, E. D. Wachsman and V. L. K. Wong, in *Proceedings of the 1995 Diesel Engine Emissions Reduction Workshop*, U.S. Department of Energy, 25-38 (1995).
13. "Catalytic Decomposition of Nitrous Oxide Over Ru-Exchanged Zeolites," Y. F. Chang, J. G. McCarty, E. D. Wachsman, and V. L. Wong, *Applied Catalysis B*, **4**, 283-299 (1994).
12. "Aging Phenomenon of Stabilized Bismuth Oxides," N. Jiang, R. M. Buchanan, F. E. G. Henn, D. A. Stevenson, and E. D. Wachsman, *Materials Research Bulletin*, **29-3**, 247-254 (1994).
11. "Luminescence of Anion Vacancies and Dopant-Vacancy Associates in Stabilized Zirconia," E. D. Wachsman, F. E. G. Henn, N. Jiang, P. B. Leezenberg, R. M. Buchanan, C. W. Frank, D. A. Stevenson, and J. F. Wenckus, in *Science and Technology of Zirconia V*, S. P. S. Badwal, M. J. Bannister, and R. H. J. Hannink, Eds., Technomic Publishing Co., Penn. 584-592 (1993).
10. "Structural and Defect Studies in Solid Oxide Electrolytes," E. D. Wachsman, G. R. Ball, N. Jiang, and D. A. Stevenson, *Solid State Ionics*, **52**, 213-218 (1992).
9. "Development of Higher Yield Processes for the Direct Oxidative Catalytic Conversion of Natural Gas," J. G. McCarty, E. D. Wachsman, V. Wong, and C. H. Becker, *Proceedings of the International Gas Research Conference*, (1992).
8. "Production, Mass Spectrometry and Thermal Properties of Fullerenes," R. Malhotra, D. C. Lorents, Y. K. Bae, C. H. Becker, D. S. Tse, L. G. Jusinski, and E. D. Wachsman, in *Large Carbon Clusters*, ACS Symposium Series **481**, Chapter 9, 127-139 (1992).
7. "Spectroscopic Investigation of Oxygen Vacancies in Solid Oxide Electrolytes," E. D. Wachsman, N. Jiang, C. W. Frank, D. M. Mason, and D. A. Stevenson, *Applied Physics A* **50**, 545-549 (1990).
6. "Solid State Oxygen Kinetics in Er₂O₃ Stabilized Bi₂O₃," E. D. Wachsman, N. Jiang, D. M. Mason, and D. A. Stevenson, in *Proceedings of the First International Symposium on Solid Oxide Fuel Cells*, Electrochemical Society **89-11**, 15-29 (1989).
5. "Cure Studies of PMDA-ODA and BTDA-ODA Based Polyimides By Fluorescence Spectroscopy," E. D. Wachsman, P. S. Martin, and C. W. Frank, in *Polymeric Materials for Electronic Packaging and Interconnection*, ACS Symposium Series **407**, Chapter 2, 26-48 (1989).
4. "Cure Studies of Polyimides Via Fluorescence Spectroscopy," P. S. Martin, E. D. Wachsman, and C. W. Frank, in *Polyimides: Materials Chemistry and Characterization*, 371-378 (1989).
3. "Electrochemical Abatement of Pollutants NO_x and SO_x in Coal Combustion Exhaust Gases Employing a Solid Oxide Electrolyte," E. D. Wachsman, N. Jiang, D. M. Mason, and D. A. Stevenson, *Proceedings of the 1989 International Conference on Coal Science, Tokyo, Japan* 1103-1106 (1989).

2. "Rates of Electrocatalytic Reactions Employing a Stabilized-Bi₂O₃ Electrolyte Operating at Moderate Temperatures," E. D. Wachsman, N. Jiang, and D. M. Mason, in *Proceedings of the 1988 Fuel Cell Seminar, Long Beach, CA*, 65-68 (1988).
1. "Effect of Cure History on the Morphology of Polyimide: Fluorescence Spectroscopy as a Method for Determining the Degree of Cure," E. D. Wachsman, and C. W. Frank, *Polymer* **29**, 1191-1197 (1988).

Patents:

21. "Atomic Layer Deposition Modifications for all Solid State Metal Ion Batteries", L. Hu, X. Han, and E. D. Wachsman, March 12, 2015, U.S. Patent Application Serial No. 62/131955.
20. "Even Higher Conductivity Na⁺ Electrolyte," E.D Wachsman and A.G. Jolley, Filed March 9, 2015, U.S. Patent Application Serial No. 62/130082.
19. "Overcoming Interfacial Impedance in Solid State Batteries", L. Hu, X. Han, E. D. Wachsman, and Y. Mo, Filed October 28, 2014, U.S. Patent Application Serial No. 62/069748.
18. "Ion Conducting Batteries with Solid State Electrolyte Materials", E.D. Wachsman, L. Hu, and V. Thangadurai, Filed March 21, 2014, U.S. Patent Application Serial No. 14/222306.
17. "Higher Conductivity NASICON Electrolyte for Room Temperature Solid-State Sodium Ion Batteries," E.D Wachsman, G.T. Hitz, and K.T. Lee, Filed September 25, 2012, U.S. Patent Application Serial No. 61/705,352.
16. "Porous Ceramic Molten Metal Composite Solid Oxide Fuel Cell Anode," E. D. Wachsman and S. Bishop, Filed March 10, 2011, U.S. Patent Application Serial No. 61/451,252.
15. "Fabrication of Dual Structure Ceramics by a Single Step Process," F. Basoli, S. Licoccia, E. Traversa, and E. D. Wachsman, Filed October 18, 2009, U.S. Patent Application Serial No. 61/255,645.
14. "Advanced Materials and Designs for Low Temperature SOFCs," E. D. Wachsman, Filed October 14, 2008, U.S. Patent Application Serial No. 61/105,294.
13. "Electric-Field Enhanced Performance in Catalysis and Solid-State Devices Involving Gases," B. M. Blackburn, E. D. Wachsman, and M. F. Van Assche, May 19, 2015, U.S. Patent No. 9,034,170.
12. "Multifunctional Potentiometric Gas Sensor Array with an Integrated Heater and Temperature Sensors," B. M. Blackburn and E. D. Wachsman, May 12, 2015, U.S. Patent No. 9,027,387.
11. "Proton Conducting Membranes for Hydrogen Production and Separation," E. D. Wachsman, H. Yoon, T. Oh, and J. Li, September 30, 2014, U.S. Patent No. 8,845,768.
10. "Concurrent O₂ Generation and CO₂ Control for Advanced Life Support," E. D. Wachsman, K. L. Duncan and H. Hagelin-Weaver, December 24, 2013, U.S. Patent No. 8,613,848.
9. "Solid State Electrochemical Cell for Measuring Components of a Gas Mixture, and Related Measurement Method," E. D. Wachsman and P. Jayaweera, Filed May 7, 1996, U.S. Patent Application Serial No. 08/646,448.
8. "Solid State Potentiometric Gaseous Oxide Sensor," E. D. Wachsman and A. Azad, July 29, 2003, U.S. Patent No. 6,598,596.
7. "Hydrogen Permeation Through Mixed Protonic-Electronic Conducting Materials," E. D. Wachsman and N. Jiang, October 2, 2001, U.S. Patent No. 6,296,687.
6. "Two-Phase Hydrogen Permeation Membrane," E. D. Wachsman and N. Jiang, May 22, 2001, U.S. Patent No. 6,235,417.

5. "Stable High Conductivity Functionally Gradient Compositionally Layered Solid State Electrolytes and Membranes," E. D. Wachsman, P. Jayaweera, and B. G. Pound, November 16, 1999, U.S. Patent No. 5,985,476.
4. "Stable High Conductivity Functionally Gradient Compositionally Layered Solid State Electrolytes and Membranes," E. D. Wachsman, P. Jayaweera, and B. G. Pound, March 10, 1998, U.S. Patent No. 5,725,965.
3. "Electrochemical Cells and Methods Using Perovskites," E. D. Wachsman, July 1, 1997, U.S. Patent No. 5,643,429.
2. "Method and Apparatus for Treating Nitrogen-Oxide Containing Gas Streams Using a Combined Electrochemical-Sorbent Approach," E. D. Wachsman, October 10, 1995, U.S. Patent No. 5,456,807.
1. "Sensor and Method for Accurately Measuring Concentrations of Oxide Compounds in Gas Mixtures," E. D. Wachsman, March 14, 1995, U.S. Patent No. 5,397,442.

INVITED-PLENARY-KEYNOTE PRESENTATIONS AND SEMINARS:

89. "Solid Oxide Fuel Cell Cathode Oxygen Reduction Reaction Mechanisms under Real World Conditions," 20th International Conference on Solid State Ionics, June 14-19, 2015, Keystone, CO - **Keynote**
88. "How U.S. Can Transition to 100% Renewable Energy and Why it Won't Anytime Soon," Manufacturing of Green Fuels from Renewable Energy, April 14-16, 2015, Denmark Technical University, Risø, Denmark
87. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," TMS2015, The Minerals, Metals, and Materials Society 144th Annual Meeting, March 15-19, 2015, Orlando, FL - **Keynote**
86. "Solid State Batteries and Fuel Cells," Defense Strategies Institute, Military Mobile Power Summit, January 13-14, 2015, Alexandria VA
85. "The Energy-Water Nexus," Materials Research Society, December 1-5, 2014, Boston, MA.
84. "Towards a Fundamental Understanding of the Cathode Degradation Mechanisms," Research Institute of Industrial Science & Technology, November 20, 2014, Gyeongbuk, Korea.
83. "Ion Conducting Oxides for Electrochemical Energy Conversion and Storage," DGIST Global Innovation Festival, November 19-21, 2014, Daegu-Gyeongbuk Institute of Science and Technology, Daegu, Korea.
82. "Protonic Membrane Reactor; Converting Hydrocarbon resources and CO₂ to Fuels," Solid State Protonic Conductors-17, September 14-19, 2014, Seoul, Seoul, Korea.
81. "Role of Solid Oxide Fuel Cells in a Balanced Energy Strategy," European SOFC & SOE Forum, July 1-4, 2014, Lucerne, Switzerland.
80. "Ion Conducting Oxides for Electrochemical Energy Conversion and Storage," June 20, 2014, Hanyang University, Seoul, Korea.
79. "Ion Conducting Oxides for Electrochemical Energy Conversion and Storage," June 18, 2014, Chonnam National University, Gwangju, Korea.
78. "Towards a Fundamental Understanding of the Cathode Degradation Mechanisms," The Electrochemical Society, May 11-16, 2014, Orlando, FL.
77. "Redox Power System's Revolutionary SOFC Technology; 25 Years of Persistence," DOE Hydrogen and Fuel Cell Technical Advisory Committee, April 1-2, 2014, Arlington, VA
76. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," Electro-Ceramics for Highly Efficient Energy Conversion and Storage, March 24-25, 2014, King Abdullah University of Science and Technology (KAUST), Saudi Arabia - **Keynote**

75. "Towards a Fundamental Understanding of the Oxygen Reduction Mechanism," American Chemical Society, March 16-20, 2014, Dallas, TX.
74. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," THERMEC International Conference on Processing & Manufacturing of Advanced Materials, December 2-6, 2013, Las Vegas, Nevada - **Keynote**
73. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," Electrochemical Approaches to Modular Power Generation, DOE ARPA-E Workshop, June 6-7, 2013, Chicago, IL.
72. "Towards a Fundamental Understanding of the Oxygen Reduction Mechanism," 19th International Conference on Solid State Ionics, June 2-7, 2013, Kyoto, Japan.
71. "Ion Conducting Oxides for Electrochemical Energy Conversion and Storage," May 31, 2013, Kyushu University, Fukuoka, Japan.
70. "Energy Issues in the 21st Century," Chemical Society of Washington, May 9, 2013, College Park, MD.
69. "Role of Solid Oxide Fuel Cells in a Balanced Energy Strategy," American Ceramic Society, Daytona Beach, FL, January 27-February 1, 2013.
68. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," 2012 Fuel Cell Seminar and Exposition, November 5-8, 2012, Uncasville, CT - **Award Presentation**
67. "Innovative Oxide Materials for Electrochemical Energy Conversion," The Electrochemical Society, October 7 - 12, 2012, Honolulu, HI - **Award Presentation**
66. "The Energy-Water Nexus," The Electrochemical Society, May 7-11, 2012, Seattle, WA.
65. "Strategies to Reduce Dependence on Rare Earths in Ion Conducting Materials and Solid Oxide Fuel Cells," Materials Research Society, April 9-13, 2012, San Francisco, CA.
64. "Innovative Oxide Materials for Electrochemical Energy Conversion," American Physical Society, February 27 - March 2, 2012, Boston, MA.
63. "Towards a Fundamental Understanding of the Oxygen Reduction Mechanism," Materials Research Society, November 28 - December 2, 2011, Boston, MA.
62. "Protonic Membrane Reactors; Converting Hydrocarbon Resources and CO₂ and Biomass to Transportation Fuels," The Electrochemical Society, October 9-14, 2011, Boston, MA.
61. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," Lehigh University, September 28, 2011, Bethlehem, PA.
60. "Protonic Membrane Reactors; Converting Hydrocarbon Resources and CO₂ to Fuels," University of Southern California, September 7, 2011, Los Angeles, CA.
59. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," Korea Institute of Science and Technology, June 3, 2011, Seoul, South Korea.
58. "Towards a Fundamental Understanding of the Oxygen Reduction Reaction Mechanism," Korea Institute of Energy Research, June 2, 2011, Daejeon, South Korea.
57. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," Chungnam National University, June 1, 2011, Daejeon, South Korea.
56. "Energy Issues in the 21st Century," American Chemical Society, Middle Atlantic Regional Meeting, May 21-24, 2011, College Park, MD - **Plenary**

55. "Ion Conducting Materials; from Terrestrial Energy Conversion and Storage to Space Based In-Situ Resource Utilization and Life Support," Space, Propulsion & Energy Sciences International Forum, March 15-17, 2011, College Park, MD - **Plenary**
54. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," 10X Advanced Battery Research & Development Showcase, January 10 - 12, 2011, Santa Clara, CA.
53. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," Materials Research Society, November 28 - December 3, 2010, Boston, MA.
52. "Pushing the Limits with Bi₂O₃ Electrolytes; Increasing Ionic Conductivity and Addressing Stability," International Conference of Bi₂O₃-based Materials for Energy Applications, November 21-24, 2010, Taipei, Taiwan - **Plenary**
51. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," University of Delaware, September 10, 2010, Newark, DE.
50. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," Gordon Research Conference on Solid State Studies in Ceramics, August 15-20, 2010, New London, NH.
49. "Low Temperature Solid Oxide Fuel Cells; a Transformational Energy Conversion Technology," Pennergy Seminar, University of Pennsylvania, March 15, 2010, Philadelphia, PA.
48. "Fuel Cell Vehicles; Why a Systems Approach Would Have Led to a Different Technology," Power Systems Modeling 2009, March 18-20, 2009, University of Florida, Gainesville, FL.
47. "Why Florida Should Lead in Sustainable Energy," 15th Annual Public Interest Environmental Conference, "Beyond Doom and Gloom: Illuminating Florida's Future," February 26-28, 2009, Levin College of Law, Gainesville, FL - **Plenary**
46. "Why Florida Should Lead in Sustainable Energy," 36th Annual Public Utility Research Center (PURC) Conference, "Changes in Climate and Information Technologies: Who's Driving Utility Policy?" February 4-5, 2009, Gainesville, FL.
45. "Deconvolution of SOFC Cathode Polarization Mechanisms," American Ceramic Society, January 18-23, 2009, Daytona Beach, FL.
44. "Deconvolution of SOFC Cathode Polarization Mechanisms," Materials Research Society, December 1-5, 2008, Boston, MA.
43. "Conductivity in Highly Defective Fluorites," Materials Research Society, December 1-5, 2008, Boston, MA.
42. "Why Florida Should Lead in Sustainable Energy," Florida Water Environment Association, September 4-5, 2008, Orlando, FL.
41. "Why Florida Should Lead in Sustainable Energy," 14th Annual Public Interest Environmental Conference, "Reducing Florida's Footprint: Stepping Up to the Global Challenge," February 28-March 1, 2008, Levin College of Law, Gainesville, FL.
40. "Why Florida Should Lead in Sustainable Energy," Enporion, November 6, 2007, Clearwater Beach, FL - **Keynote**
39. "Designing for Functional Gradients in Fuel Cells and Membranes," Composites at Lake Louise 2007, October 28-November 2, 2007, Banff, Canada.
38. "Why Florida Should Lead in Sustainable Energy," The 2007 Alternative Energy Summit: Powering Florida's Energy Independence, August 27, 2007, Jupiter, FL - **Keynote**
37. "Can Nanotechnology Play a Role in Solid Oxide Fuel Cells?" Materials Research Society, April 9-13, 2007, San Francisco, CA.

36. "Hydrogen Production with Mixed Protonic-Electronic Conducting Perovskite Membranes," Materials Research Society, November 27-December 1, 2006, Boston, MA.
35. "Hydrogen Permeation Through Mixed Protonic-Electronic Conducting Perovskites," ICMR Symposium on Materials Issues in Hydrogen Production and Storage, August 20-26, 2006, U.C. Santa Barbara, CA.
34. "The Search for a Low Temperature SOFC; How Low Can We Go?" Stanford University Seminar, March 24, 2006, Stanford, CA.
33. "The Search for a Low Temperature SOFC; How Low Can We Go?" Montana State University HiTEC Seminar, October 6, 2006, Bozeman, MT.
32. "Effect of Oxygen Sublattice Ordering on Conductivity in Highly Defective Fluorite Oxides," 6th Pacific Rim Meeting of the American Ceramic Society, September 11-16, 2005, Maui, HI
31. "The Search for a Low Temperature SOFC; How Low Can We Go?" International SOFC Symposium in Taiwan, May 28 – June 3, 2005, Taipei, Taiwan - **Keynote**
30. "Differential Electrode Equilibria: A More Comprehensive Potentiometric Sensor Mechanism," Ehime University Seminar, April 26, 2005, Matsuyama, Japan.
29. "Differential Electrode Equilibria: A More Comprehensive Potentiometric Sensor Mechanism," Electrochemical Society, May 15-20, 2005, Quebec City, Canada.
28. "Differential Electrode Equilibria: A More Comprehensive Potentiometric Sensor Mechanism," The National Academies (USA) and The Science Council of Japan Workshop on the Future of Sensors and Sensor Systems, February 28-March 2, 2005, Tsukuba, Japan.
27. "The Search for a Low Temperature SOFC; How Low Can We Go?" MIT Department of Materials Science Seminar, February 18, 2005, Boston, MA.
26. "Differential Electrode Equilibria: A More Comprehensive Potentiometric Sensor Mechanism," American Ceramic Society, January 24-28, 2005, Cocoa Beach, FL
25. "Low-Temperature Solid Oxide Fuel Cells Based on Stable High Conductivity Bilayered Electrolytes," Fuel Cell Seminar, November 3-6, 2003, Miami, FL.
24. "Hydrogen Permeation Through Mixed Protonic-Electronic Conducting Perovskites," Gordon Research Conference on Solid State Studies in Ceramics, August 10-15, 2003, New London, NH.
23. "Catalytic and Electrocatalytic Reduction of NO_x on LaBO₃ Surfaces," NATO Advanced Research Workshop on Mixed Ionic Electronic Conducting Perovskites for Advanced Energy Systems, June 1-5, 2003, Kiev, Ukraine - **Keynote**
22. "Hydrogen Separation with Protonic Conductors," Gordon Research Conference on Chemistry of Hydrocarbon Resources, January 12-17, 2003, Ventura, CA.
21. "Stable Low Temperature Bilayer Solid Oxide Electrolytes Based on Unstable Materials," Materials Research Society, December 2-5, 2002, Boston, MA.
20. "Selective Potentiometric Detection of NO_x by Differential Electrode Equilibria," 9th Euroconference on Science and Technology of Ionics, September 15-21, 2002, Rhodes, Greece.
19. "Effect of Oxygen Sublattice Ordering on Conductivity in Highly Defective Fluorite Oxides," 8th International Conference on Electroceramics, August 25-28, 2002, Rome, Italy - **Plenary**
18. "Stable Low Temperature Bilayer Solid Oxide Electrolytes Based on Unstable Materials," University of Rome Tor-Vergata, August 23, 2002, Rome, Italy.

17. "Modeling the Electrochemical Performance and Thermo-Mechanical-Chemical Stability of Mixed Ionic-Electronic Conductors for Applications in SOFCs," National Energy Technology Laboratory, June 20, 2002, Morgantown, WV.
16. "Stable High Conductivity Bilayered Electrolytes for Low Temperature Solid Oxide Fuel Cells," US Department of Energy Workshop on Solid Oxide Fuel Cells, June 18-19, 2002, Pittsburgh, PA.
15. "Functionally Gradient Bilayer Oxide Membranes and Electrolytes," International Conference on Solid State Ionics, July 8-13, 2001, Cairns, Australia.
14. "Hydrogen Permeation Through Mixed Protonic-Electronic Conducting Materials," International Consortia for the Conversion of Natural Gas, May 31-June 1, 2001, Ottawa, Canada.
13. "Thermochemical Considerations in Engineering Design; Ceramic Fuel Cells, Membranes and Sensors," The 25th International Conference on Advanced Ceramics & Composites, American Ceramic Society, January 21-26, 2001, Cocoa Beach, FL.
12. "Ion Transport Membranes for Partial Oxidation and Dehydrogenation of Hydrocarbons," Gordon Conference on Chemistry of Hydrocarbon Resources, January 7-12, 2001, Ventura, CA.
11. "Effect of Oxygen Sublattice Order on Conductivity in Phase-Stabilized Cubic Bismuth Oxides," 7th Euroconference on Ionics, October 1-7, 2000, Corsica, France.
10. "Effect of Oxygen Sublattice Ordering on Conductivity in Phase-Stabilized Cubic Bismuth Oxides," University of Rome Tor-Vergata, May 26, 2000, Rome, Italy.
9. "Hydrogen Permeation Through Mixed Protonic-Electronic Conducting Materials," International Consortia for the Conversion of Natural Gas, May 8-9, 2000, Montreal, Canada.
8. "Effect of Oxygen Sublattice Ordering on Conductivity in Phase-Stabilized Cubic Bismuth Oxides," University of Missouri, May 4, 2000, Rolla, MO.
7. "Ion Conducting Ceramics," University of Arkansas, December 15, 1999, Little Rock, AR.
6. "Stable High Conductivity Bilayer Electrolytes for Low Temperature Solid Oxide Fuel Cells," University of Rome Tor-Vergata, May 31, 1999, Rome, Italy.
5. "Catalytic and Electrocatalytic Reduction of NO_x on LaBO₃ Surfaces," 50th Pacific Coast Regional and Basic Science Division Meeting of the American Ceramic Society, October 21-24, 1998, Irvine, CA.
4. "Development of Mixed Protonic-Electronic Conducting Materials for Hydrogen Separation," International Consortia for the Conversion of Natural Gas, September 28-30, 1998, Milan, Italy.
3. "Stable High Conductivity Ceria/Bismuth Oxide Bilayer Electrolytes," Kyushu University, March 20, 1996, Fukuoka, Japan
2. "Oxide-Ion Conducting Ceramics: Defect Chemistry and Applications," Progress in Ceramic Basic Science: Challenge Toward the 21st Century, 30th Anniversary of the Basic Science Division of the Ceramic Society of Japan, March 17-18, 1996, Nagoya, Japan.
1. "Solid Oxide Electrolyte Research at SRI," US Department of Energy Workshop on Solid Oxide Fuel Cells for Transportation, April 26-27, 1995, Towson, MD.

UNIVERSITY GOVERNANCE & SERVICE:

University Level:

Council on the Environment, University of Maryland, 2012-present

University Sustainability Council, University of Maryland, 2012-present

Faculty Advisor, University of Maryland Student Chapter of The Electrochemical Society, 2011-present

Chair, Faculty Compensation Committee, University of Florida Faculty Senate, 2008-2009

Faculty Advisor, Society for Sustainable Engineering, 2008-2009

Faculty Advisor, University of Florida Student Chapter of The Electrochemical Society, 2007-2009

Energy and Climate Change Task Force, 2006-2009

Senator, University of Florida Faculty Senate, 2004-2009

Faculty Senate Ad-hoc Committee on Faculty Compensation, 2003-2005

Graduate Tuition Task Force, 2002-2004

College Level:

Associate Dean of Research Search Committee, 2008

College of Engineering Faculty Council, 2006-2009

College of Engineering Curriculum Committee, 2004-2007

College of Engineering Faculty Compensation Committee, 2004-2006

Department Level:

Chair, Materials Science & Engineering Curriculum Committee, 2004-2007

Academic Affairs Committee, 2004-2007

Chair, Faculty Search Committee, 2005-2006

Materials Science & Engineering Faculty Compensation Committee, 2004-2006

Chair, Faculty Search Committee, 2001-2002

Materials Science & Engineering Qualifying Exam Committee, 2001-2005

Materials Science & Engineering Curriculum Committee, 2001-2004