

# WILLIAM E. MUSTAIN

## HIGHLIGHTED ACHIEVEMENTS

---

- **72 Publications**
  - 52 Peer reviewed archival publications (3 more under review and more 2 in progress)
  - 20 Peer reviewed proceedings/conference presentations
  - h-index: 21, i10 index-37 (Google Scholar, Dec. 20, 2016)
- **Total funding value of \$5.8M**
  - 14 Funded Grants
  - \$2.9 M in funding directly to our group
- **United Technologies Corporation Professor of Engineering Innovation**
- **2013 DOE Early Career Award**
- **2015-2016 Fulbright Scholar Fellow**
- **Winner of 2009 Illinois Institute of Technology Young Alumni Award**
- **2014 CQIA Platinum Innovation Prize** (Shared with R. Maric, C.B. Carter and J. Roller)
- **2014 Electrochemical Society Supramaniam Srinivasan Young Investigator Award**
- **20 Graduate Students Advised**
  - 10 Ph.D. Students (5 Graduated)
  - 4 M.S. Students, and 6 Plan B Masters Students – all graduated
- **14 Conference Technical Volumes Edited, 2 Invited Book Chapters**
- **42 Invited Talks**
- **85 Conference Presentations**
- **Dedicated Educator with High Marks from Students**
  - Four Teaching Innovations
- **Significant Extramural Service**
  - Treasurer of the Energy Technology Division of the Electrochemical Society, Vice Chair of Electrochemical Division of AIChE; Conceived and Organized Symposia at ECS, AIChE and ACS
- **Accomplished Internal Service Record**
  - Associate Department Head, Chair Undergraduate Committee, Chair Graduate Committee, ABET Chair during successful reaccreditation
- **Widely Involved in University and Community Outreach**
  - 8 activities in the past 8 years – including Joule-Fellows, Explore Engineering (E<sup>2</sup>), UConn Mentor Connection, da Vinci and REU programs.

# WILLIAM E. MUSTAIN

## EDUCATION

---

**Postdoctoral Fellow**, July 2006 to July 2008  
Georgia Institute of Technology  
Department of Chemical and Biomolecular Engineering  
Advisor: Paul Kohl  
Atlanta, Georgia

**Doctor of Philosophy**, Chemical Engineering, June 2006  
"Development and Characterization of Cobalt-Palladium Electrocatalysts for Oxygen Reduction in Acid Media"  
Illinois Institute of Technology  
Department of Chemical and Biological Engineering  
Advisor: Jai Prakash  
Chicago, Illinois

**Bachelor of Science**, Chemical Engineering, May 2002  
Illinois Institute of Technology  
Department of Chemical and Biological Engineering  
Chicago, Illinois

## ACADEMIC APPOINTMENTS

---

University of Connecticut  
Department of Chemical & Biomolecular Engineering  
Storrs, Connecticut  
**Associate Professor**, August 2013 – Present  
**Associate Department Head**, 2013 – 2016  
**Assistant Professor**, August 2008 – August 2013

## OTHER APPOINTMENTS

---

Duracell Global Headquarters  
Research and Development  
Bethel, Connecticut  
**Visiting Scholar**, August 2015 – April 2016

University of Surrey  
Department of Chemistry  
Guildford, UK  
**Fulbright Scholar Fellowship**, April 2016 – August 2016

Politecnico di Milano  
Dipartimento di Energia  
Milan, Italy  
**Visiting Professor**, Spring 2013

## RESEARCH INTERESTS

---

- High Capacity Transition Metal Oxides for Li-ion Batteries
- Electrochemical CO<sub>2</sub> Separation and Concentration
- Room Temperature Conversion of Natural Gas to Methanol and Other Commodity Chemicals
- Understanding the Role and Impact of Carbonates in Low Temperature AEM Electrochemical Systems
- Increasing the Energy Density of Alkaline Primary Batteries
- Nanostructured Catalysts for PEM and AEM Electrolyzers and Fuel Cells
- Non-Carbon and Advanced Carbon Supports
- Improving Corrosion Resistance of Metals and Metal Oxides in Acidic and Alkaline Media
- Design and Manipulation of Biologically-Inspired Electrochemical Microfluidic Devices
- Electrochemical Modeling

## JOURNAL PUBLICATIONS (CORRESPONDING AUTHOR IN BOLD)

---

52. L. Wang, E. Magliocca, E.L. Cunningham, W. Mustain, S.D. Poynton, R. Escudero-Cid, M.M. Nasef, J. Ponce-Gonzalez, R. Bance-Souahli, R.C.T. Slade, D.K. Whelligan and **J.R. Varcoe**, “An optimised synthesis of high performance radiation-grafted anion-exchange membranes”, *Green. Chem.*, Accepted. DOI: 10.1039/C6GC02526A.
51. X. Peng, T.J. Omasta, W. Rigdon and **W.E. Mustain**, “Fabrication of high performing PEMFC catalyst-coated membranes with a low cost air-assisted cylindrical liquid jets spraying system”, *J. Electrochem. Soc.*, **163** (2016) E407-E413. [Open Access](#).
50. X. Peng, S. Zhao, T. Omasta, J.M. Roller and **W.E. Mustain**, “Activity and durability of Pt-Ni nanocage electrocatalysts in proton exchange membrane fuel cells”, *Applied Catalysis B: Environmental*, DOI: 10.1016/j.apcatb.2016.10.081.
49. A. Palmieri, R. Kashfi-Sadabad, S. Yazdani, M. Pettes and **W.E. Mustain**, “High Performance Bi-Metallic Manganese Cobalt Oxide/Carbon Nanotube Li-ion Battery Anodes”, *Electrochimica Acta*, **213** (2016) 620-625.
48. J. He, Y. Liu, Y. Meng, X. Sun, S. Biswas, M. Shen, Z. Luo, R. Miao, L. Zhang, W.E. Mustain and **S.L. Suib**, “High-rate and long-life of Li-ion batteries using reduced graphene oxide/Co<sub>3</sub>O<sub>4</sub> as anode materials”, *RSC Advances*, **6** (2016) 24320-24330.
47. Y. Liu, A. Palmieri, J. He, Y. Meng, N. Beaugard, S.L. Suib and **W.E. Mustain**, “Highly Conductive In-SnO<sub>2</sub>/RGO Nano-Heterostructures with Improved Lithium-Ion Battery Performance”, *Scientific Reports*, **6** (2016) 25860; doi: 10.1038/srep25860. [Open Access](#)
46. W.A. Rigdon, T.J. Omasta, C. Lewis, M. Hickner, J.R. Varcoe, J.N. Renner, K.A. Ayers and **W.E. Mustain**, “Carbonate dynamics and opportunities with low temperature, AEM-based electrochemical CO<sub>2</sub> separators”, *J. Electrochem. En. Conv. Stor.*, Accepted, DOI: 10.1115/1.4033411.
45. T. Myles, S. Kim, R. Maric and **W.E. Mustain**, “Application of a Coated Film Catalyst Layer Model to a High Temperature Polymer Electrolyte Membrane Fuel Cell with Low Catalyst Loading Produced by Reactive Spray Deposition Technology”, *Catalysts*, **5** (2015) 1673-1691. [Invited Contribution](#).

44. S. Zhao, H. Yu, R. Maric, N. Danilovic, C.B. Capuano, K.E. Ayers and **W.E. Mustain**, “Calculating the Electrochemically Active Surface Area of Iridium Oxide in the Application of Proton Exchange Membrane Electrolyzers”, *J. Electrochem. Soc.*, **162** (2015) F1292-F1298.
43. H. Yu, J.M. Roller, W.E. Mustain and **R. Maric**, “Influence of the ionomer/carbon ratio for low-Pt loading catalyst layer prepared by reactive spray deposition technology”, *J. Power Sources*, **283** (2015) 84-94.
42. Y. Liu, L. Zhang, B.G. Willis and **W.E. Mustain**, “Importance of Particle Size and Distribution in Achieving High-Activity, High-Stability Oxygen Reduction Catalysts”, *ACS Catalysis*, **5** (2015) 1560-1567.
41. S. Zhao, A. Wangstrom, Y. Liu, W.A. Rigdon and **W.E. Mustain**, “Stability and Activity of Pt/ITO Electrocatalyst for Oxygen Reduction Reaction in Alkaline Media”, *Electrochim. Acta*, **157** (2015) 175-182.
40. N.S. Spinner, A. Palmieri, N. Beauregard, L. Zhang, J. Campanella and **W.E. Mustain**, “Influence of Conductivity on the Capacity Retention of NiO Anodes in Li-ion Batteries”, *J. Power Sources*, **276** (2015) 46-53.
39. S. Shrestha, N. Morse and **W.E. Mustain**, “Effect of Surface Chemistry on the Double Layer Capacitance of Polypyrrole-Derived Ordered Mesoporous Carbon”, *RSC Advances*, **4** (2014) 47039 – 47046.
38. **J.R. Varcoe**, P. Atanassov, D.R. Dekel, A.M. Herring, M.A. Hickner, P.A. Kohl, A.R. Kucernak, W.E. Mustain, K. Nijmeijer, K. Scott, T. Wu and L. Zhang, “Anion-exchange membranes in electrochemical energy systems”, *Energy Environ. Sci.*, **7** (2014) 3135-3191.
37. J.M. Roller, J. Renner, H. Yu, C. Capuano, T. Kwak, Y. Wang C.B. Carter, K. Ayers, W.E. Mustain, and **R. Maric**, “Flame-based processing as a practical approach for manufacturing hydrogen evolution electrodes”, *J. Power Sources*, **271** (2014) 366-376..
36. A. Kadilak, Y. Liu, S. Shrestha, J.R. Bernard, W.E. Mustain and **L.M. Shor**, “Selective deposition of chemically-bonded gold electrodes onto PDMS microchannel side walls”, *J. Electroanal. Chem.*, **727** (2014) 141-147.
35. S.D. Poynton, R.C.T. Slade, T. Omasta, W.E. Mustain, R.E. Cid, O. Pilar and **J.R. Varcoe**, “Preparation of radiation-grafted powders for use as anion exchange ionomers in alkaline polymer electrolyte fuel cells”, *J. Mater. Chem. A*, **2** (2014) 5124-5130.
34. N. Spinner, L. Zhang and **W.E. Mustain**, “Investigation of Nickel Oxide Anode Degradation in Lithium-ion Batteries via Identical-Location TEM”, *J. Mat. Chem. A*, **2**(6) (2014) 1627-1630. [Inside cover feature article](#).
33. Y. Liu and **W.E. Mustain**, “Stability limitations for Pt/Sn–In<sub>2</sub>O<sub>3</sub> and Pt/In–SnO<sub>2</sub> in acidic electrochemical systems”, *Electrochimica Acta*, **115** (2014) 116-125.
32. N. Spinner and **W.E. Mustain**, “Electrochemical Methane Activation and Conversion to Oxygenates at Room Temperature”, *J. Electrochem. Soc.*, **160**(11) (2013) F1275-1281.
31. N. Spinner and **W.E. Mustain**, “Nanostructural Effects on the Cycle Life and Li<sup>+</sup> Diffusion Coefficient of Nickel Oxide Anodes”, *J. Electroanal. Chem.*, **711** (2013) 8-16.
30. L. Su, S. Shrestha, Z. Zhang, W.E. Mustain, and **Y. Lei**, “Platinum-Copper Nanotube Electrocatalyst with Enhanced Activity for Oxygen Reduction Reactions”, *J. Mater. Chem. A*, **1** (2013) 12293-12301.

29. S. Shrestha, S. Asheghi, J. Timbro and **W.E. Mustain**, “Temperature Controlled Surface Chemistry of Nitrogen Doped Mesoporous Carbon and Its Influence on Pt ORR Activity”, *Applied Catalysis A: General*, **464-465** (2013) 233-242.
28. Y. Liu, T.G. Kelley, J.G. Chen and **W.E. Mustain**, “Metal Carbides as Alternative Electrocatalyst Supports”, *ACS Catalysis*, **3** (2013) 1184.
27. S. Shrestha, S. Asheghi, J. Timbro and **W.E. Mustain**, “Effects of pore structure in nitrogen functionalized mesoporous carbon on oxygen reduction reaction activity of platinum nanoparticles”, *Carbon*, **60** (2013) 28-40.
26. Y. Liu and **W.E. Mustain**, “High stability, high activity Pt/ITO oxygen reduction electrocatalysts”, *J. Am. Chem. Soc.*, **135** (2013) 530.
25. N. Spinner and **W.E. Mustain**, “Influence of non-conducting zirconia on the electrochemical performance of nickel oxide in alkaline media at room temperature”, *J. Electrochem. Soc.*, **159** (2012) E187.
24. Y. Liu, and **W.E. Mustain**, “Evaluation of Tungsten Carbide as the Electrocatalyst Support for Platinum Hydrogen Evolution/Oxidation Catalysts”, *Int. J. Hydrogen Energy*, **37** (2012) 8929.
23. Y. Liu, Sujun Shrestha and **W.E. Mustain**, “Synthesis of nano-size tungsten oxide and its evaluation as an electrocatalyst support for oxygen reduction in acid media”, *ACS Catalysis*, **2** (2012) 456.
22. N.S. Spinner, J.A. Vega and **W.E. Mustain**, “Recent progress in the electrochemical conversion and utilization of CO<sub>2</sub>”, *Catal. Sci. Technol.*, **2** (2012) 19-28. Invited Contribution.
21. J.A. Vega, S. Shrestha, M. Ignatowich and **W.E. Mustain**, “Carbonate Selective Ca<sub>2</sub>Ru<sub>2</sub>O<sub>7-y</sub> Pyrochlore Enabling Room Temperature Carbonate Fuel Cells – Part I. Synthesis and Physical Characterization”, *J. Electrochem. Soc.*, **159** (2012) B12-B17.
20. J.A. Vega, N. Spinner, M. Catanese and **W.E. Mustain**, “Carbonate Selective Ca<sub>2</sub>Ru<sub>2</sub>O<sub>7-y</sub> Pyrochlore Enabling Room Temperature Carbonate Fuel Cells – Part II. Verification of Carbonate Cycle and Electrochemical Performance”, *J. Electrochem. Soc.*, **159** (2012) B19-B24.
19. N. Spinner and **W.E. Mustain**, “Effect of Nickel Oxide Synthesis Conditions on its Physical Properties and Electrocatalytic Oxidation of Methanol”, *Electrochimica Acta*, **56** (2011) 5656.
18. S. Shrestha, Y. Liu and **W.E. Mustain**, “Electrocatalytic Activity and Stability of Pt clusters on State-of-the-Art Supports: A Review”, *Catalysis Reviews*, **53** (2011) 256-336. Invited Contribution.
17. J.A. Vega, S. Smith and **W.E. Mustain**, “Hydrogen and Methanol Oxidation Reaction in Hydroxide and Carbonate Alkaline Media”, *J. Electrochem. Soc.*, **158** (2011) B349.
16. Y. Liu and **W.E. Mustain**, “Structural and Electrochemical Studies of Pt Clusters Supported on High Surface Area Tungsten Carbide for Oxygen Reduction”, *ACS Catalysis*, **1** (2011) 212.
15. S. Shrestha and **W.E. Mustain**, “Properties of Nitrogen-Functionalized Ordered Mesoporous Carbon Prepared Using Polypyrrole Precursor”, *J. Electrochem. Soc.*, **157** (2010) B1665.
14. J.A. Vega, C. Chartier and **W.E. Mustain**, “Effect of Hydroxide and Carbonate Alkaline Media on Anion Exchange Membranes”, *J. Power Sources*, **195** (2010) 7176.

13. J.A. Vega and **W.E. Mustain**, "Effect of CO<sub>2</sub>, HCO<sub>3</sub><sup>-</sup> and CO<sub>3</sub><sup>2-</sup> on Oxygen Reduction in Anion Exchange Membrane Fuel Cells", *Electrochimica Acta*, **55** (2010) 1638.
12. W. Mustain, H. Kim, V. Narayanan, T. Osborn and **P.A. Kohl**, "Electroless Deposition and Characterization of Pt<sub>x</sub>Ru<sub>1-x</sub> Catalysts on Pt/C Nanoparticles for Methanol Oxidation", *Journal of Fuel Cell Science and Technology*, **7** (2010) 041013.
11. H.Kim, S. Prakash, W.E. Mustain and **P.A. Kohl**, "Sol-Gel Based Sulfonic acid-functionalized Silica Proton Conductive Membrane", *J. Power Sources*, **193** (2009) 562.
10. S. Prakash, W.E. Mustain and **P.A. Kohl**, "Performance of Li-ion secondary batteries in low power, hybrid power supplies", *J. Power Sources*, **189** (2009) 1184.
9. W.E. Mustain, H. Kim, T. Osborn and **P.A. Kohl**, "Deposition of Pt<sub>x</sub>Ru<sub>1-x</sub> Catalysts for Methanol Oxidation in Micro Direct Methanol Fuel Cells", *Israel J. Chem.*, **48** (2008) 251.
8. S. Prakash, W.E. Mustain and **P.A. Kohl**, "Carbon Dioxide Vent for Direct Methanol Fuel Cells", *J. Power Sources*, **185** (2008) 392.
7. **S. Prakash**, W.E. Mustain, S. Park and P.A. Kohl, "Phosphorus-Doped Glass Proton Exchange Membranes for Low Temperature Direct Methanol Fuel Cells", *J. Power Sources*, **175** (2008) 91.
6. **W.E. Mustain**, H. Kim, S. Prakash, J. Stark, T. Osborn and P.A. Kohl, "Platinum-Glass Composite Electrode for Fuel Cell Applications", *Electrochem. Solid-State Lett.*, **10** (2007) B210.
5. **W.E. Mustain** and J. Prakash, "A Model for the Electroreduction of Molecular Oxygen", *J. Electrochem. Soc.*, **154** (2007) A668.
4. **W.E. Mustain** and J. Prakash, "Kinetics and Mechanism for the Oxygen Reduction Reaction on Polycrystalline Cobalt-Palladium Electrocatalysts in Acid Media", *J. Power Sources*, **170** (2007) 28.
3. W.E. Mustain, K. Kepler and **J. Prakash**, "CoPd<sub>x</sub> Oxygen Reduction Electrocatalysts for Polymer Electrolyte Membrane and Direct Methanol Fuel Cells", *Electrochim. Acta*, **52** (2006) 2102.
2. W.E. Mustain, K. Kepler and **J. Prakash**, "Investigations of Carbon-Supported CoPd<sub>3</sub> Catalysts as Oxygen Cathodes in PEM Fuel Cells", *Electrochem. Comm.*, **8** (2006) 406.
1. N.A. Tapan, **W.E. Mustain**, B. Gurau, G. Sandi and J. Prakash, "Investigation of Methanol Oxidation Electrokinetics on Pt Using the Asymmetric Electrode Technique", *J. New Nat. Electrochem. Systems*, **7** (2004) 281.

## CONFERENCE PROCEEDINGS PUBLICATIONS

---

20. W.A. Rigdon, T.A. Omasta, C.A. Lewis and W.E. Mustain, "Reaction Dependent Transport of Carbonate and Bicarbonate through Anion Exchange Membranes in Electrolysis and Fuel Cell Operations", *ECS Trans.* **69**(33) (2015) 1-9.
19. S. Zhao, H. Yu, R. Maric, N. Danilovic, C. Capuano, K.E. Ayers and W.E. Mustain, "Determining the Electrochemically Active Area of IrO<sub>x</sub> Powder Catalysts in an Operating Proton Exchange Membrane Electrolyzer", *ECS Trans.* **69**(17) (2015) 877-881.

18. H. Yu, A. Baricci, J. Roller, Y. Wang, A. Casalegno, W.E. Mustain and R. Maric, "Ultra-Low Pt Loading Catalyst Layers for PEMFC Using Reactive Spray Deposition Technology", *ECS Trans.*, **69**(17) (2015) 487-496.
17. A. Palmieri, Y. Liu, J. He, Y. Meng, S.L. Suib and W.E. Mustain, "Metal Oxide/Reduced Graphene Oxide Anodes for Lithium-Ion Batteries", *ECS Trans.*, **66**(9) (2015) 47-55.
16. A. Kadilak, Y. Liu, L.M. Shor, W.E. Mustain, "In Situ Oxygen Gradient Generation Inside a Termite-Inspired Microfluidic Habitat", *ECS Trans.*, **66**(42) (2015) 1-5.
15. T.J. Omasta, W.A. Rigdon, C.A. Lewis, R.J. Stanis, R. Liu, C.Q. Fan and W.E. Mustain, "Two Pathways for Near Room Temperature Electrochemical Conversion of Methane to Methanol", *ECS Trans.*, **66**(8) (2015) 129-136.
14. Y. Liu, S. Zhao and W.E. Mustain, "Understanding the Growth of Pt Nanoparticles by Galvanic Displacement on ITO Nanocubes for ORR", *ECS Trans.*, **64**(3) (2014) 191-198.
13. Y. Liu and W.E. Mustain, "Pt/ITO Electrocatalysts with Excellent ORR Activity and Stability", *ECS Trans.*, **53**(22) (2013) 1-6.
12. N. Spinner and W.E. Mustain, "Electrochemical Methane Activation and Conversion to Oxygenates at Room Temperature", *ECS Trans.*, **53**(23) (2013) 1-20.
11. S. Shrestha, S. Asheghi, J. Timbro and **W.E. Mustain**, "Influence of Pore Structure of N-Doped Mesoporous Carbon in PEM Fuel Cells", *ECS Trans.*, **50**(2) (2013) 1287-1299.
10. J.A. Vega, M. Ignatowich, M. Catanese and **W.E. Mustain**, "New Cathode Catalysts for Room Temperature Carbonate Fuel Cells", *ECS Trans.*, **35**(32) (2011) 193.
9. S. Shrestha, S. Asheghi, J. Timbro, C.M. Lang and **W.E. Mustain**, "ORR and Fuel Cell Performance of Pt Supported on N-Functionalized Mesoporous Carbon", *ECS Trans.*, **41**(1) (2011) 1183.
8. N.S. Spinner and **W.E. Mustain**, "Effect of Nickel Oxide Synthesis Conditions on its Electrochemical Behavior in Alkaline Media", *ECS Trans.*, **35**(31) (2011) 43.
7. S. Shrestha and **W.E. Mustain**, "Platinum Nanoparticles Supported on Nitrogen Functionalized Ordered Mesoporous Carbon", *ECS Transactions*, **33**(1) (2010) 293.
6. J.A. Vega, C. Chartier, S. Smith and **W.E. Mustain**, "Effect of Carbonate on Anion Exchange Membrane Conductivity and Hydrogen Oxidation for AEMFCs", *ECS Transactions*, **28**(21) (2010) 103.
5. S. Shrestha and **W.E. Mustain**, "Electrochemical Studies of N-functionalized Mesoporous Carbon", *ECS Transactions*, **28**(23) (2010) 27.
4. J. Vega, C. Chartier, S. Smith and W.E. Mustain, "Effect of carbonate on oxygen reduction, hydrogen oxidation and anion exchange membrane chemical stability", *ECS Transactions*, **33**(1) 2010 1735.
3. S. Towne, M. Carella, **W. Mustain**, V. Viswanathan, P. Rieke, U. Pasaogullari and P. Singh, "Performance of a Direct Borohydride Fuel Cell Stack", *ECS Transactions*, **25**(1) (2009) 1951.

2. **W.E. Mustain**, H. Kim, S. Prakash, J. Stark, T. Osborn and P.A. Kohl, “Characterization of Thin-Film Electrodes on Proton Conducting Glass Membranes for Micro DMFC Applications”, *ECS Transactions*, **6**(25) (2008) 361.

1. **W.E. Mustain** and J. Prakash, “One Dimensional Diffusion-Controlled Kinetic Model for Oxygen Reduction” in: Fundamental Understanding of Electrode Processes, in Memory of Professor Ernest B. Yeager, *Electrochemical Society Proceedings*, 2003-30, page 71 (2003).

## INVITED TALKS

---

42. “An Electrochemical Approach for CO<sub>2</sub> Capture from Fossil Fuel Power Plants”, D Nora Research Symposium, De Nora Global R&D Headquarters, November 2016.

41. “Improvements in the Anion Exchange Membrane Transport of Carbonate and Bicarbonate for Low-Temperature CO<sub>2</sub> Capture and Energy Conversion”, 230<sup>th</sup> Meeting of Electrochemical Society, October 2016.

40. “Understanding the Behavior of Metal Oxide Anode Materials in Lithium-Ion Batteries”, STFC Batteries Network Annual Meeting, July 2016.

39. “An Electrochemical Approach for CO<sub>2</sub> Capture from Fossil Fuel Power Plants”, US-UK Fulbright Commission, Endcap Event, Glasgow, Scotland, UK, June 2016.

38. “An Electrochemical Approach for CO<sub>2</sub> Capture from Fossil Fuel Power Plants”, Department of Chemical Engineering, Imperial College London, UK, June 2016.

37. “An Electrochemical Approach for CO<sub>2</sub> Capture from Fossil Fuel Power Plants”, Department of Chemical and Process Engineering, University of Surrey, UK, June 2016.36. “Advanced Carbonate Exchange Membrane Electrochemical Cells to Reduce CO<sub>2</sub> Emissions”, School of Chemical Engineering & Advanced Materials, Newcastle University, UK, May 2016.

35. “Near Room Temperature Electrochemical Methane to Methanol Electrosynthesis”, Department of Chemistry, University of Surrey, UK, May 2016.

34. “Understanding Alkaline Cell Dynamics Leading to Deep Discharge Gassing and Leakage”, Duracell R&D, March 2016.

33. “Importance of Carbonates in the Low Temperature Electrochemical CO<sub>2</sub> Cycle and New Opportunities”, Department of Chemical Engineering, University of South Carolina, February 2016.

32. “Importance of Carbonates in the Low Temperature Electrochemical CO<sub>2</sub> Cycle and New Opportunities”, Department of Chemical & Biological Engineering, Colorado School of Mines, February 2016.

31. “Importance of Carbonates in the Low Temperature Electrochemical CO<sub>2</sub> Cycle and New Opportunities”, National Renewable Energy Laboratory, February 2016.

30. “Low Temperature Electrochemical Upgrading of Methane to Methanol”, AIChE Annual Meeting, Salt Lake City, UT, November 2015.

29. "Metal Oxide Anode Materials for Lithium-Ion Batteries", Department of Chemical Engineering, City College New York, September 2015.
28. "Metal Oxide Anode Materials for Lithium-Ion Batteries", Battery Group, Ford Motor Company, Dearborn, MI, July 2015.
27. "Near Room Temperature Electrochemical Upgrading of Methane to Oxygenate Fuels", DOE Catalysis Science Program Meeting, Annapolis, MD, July 2015.
26. "Understanding the Impact of Particle Size and Distribution for High Activity, High Stability Pt/ITO Fuel Cell Catalysts", Giner Electrochemical Systems, Inc., May 2015.
25. "Carbonates and Low Temperature Electrochemical Systems", Electrochemical Tutorials Session, AIChE National Meeting, November 2014.
24. "Advances, Challenges and Opportunities for Anion Exchange Membrane Electrochemical Cells", Department of Chemical Engineering and Materials Science, Michigan State University, October 2014.
23. "Recent Advances and Promises for Anion Exchange Membrane Fuel Cells" BIT 4<sup>th</sup> Annual New Energy Forum. Qingdao, China. September 2014.
22. "Innovative Catalyst Design for Energy Conversion", Connecticut Quality Improvement Award Partnership, 27<sup>th</sup> Annual Conference on Quality and Innovation, June 2014.
21. "Understanding the Impact of Particle Size and Distribution for High Activity, High Stability Pt/ITO Fuel Cell Catalysts", Workshop for R&D on Fuel Cell and Biofuel Technology, Tokyo University of Science, June 2014.
20. "Purposeful Utilization of Carbonate Anions in AEM-Based Devices", 7<sup>th</sup> Santa Fe Workshop on Materials for Energy Conversion, Bishop's Lodge, Santa Fe, NM, November 2013.
19. "Influence of Designer Catalyst Supports on the Activity and Stability of Pt in PEM Fuel Cells", Department of Chemical Engineering, Texas A&M University, October 2013.
18. "Room Temperature Electrochemical Production of Oxygenates From Methane Enabled by AEMs", Institute of Advanced Studies workshop on Anion-Exchange Membranes for Energy Generation Technologies, University of Surrey, UK, July 2013.
17. "Low Temperature Electrochemical Conversion and Utilization of CO<sub>2</sub>", CO<sub>2</sub>Chem Annual Workshop, Guildford, United Kingdom, July 2013.
16. "Influence of Nitrogen Surface Chemistry in Electric Double Layer Capacitance of Nitrogen Doped Ordered Mesoporous Carbon", L-NESS Laboratories, Como, Italy, May 2013.
15. "The Impact of the Catalyst Support on Platinum ORR Activity for PEM Fuel Cells", Dipartimento di Energia, Politecnico di Milano, May 2013.
14. "Room Temperature Conversion of CH<sub>4</sub> to Fuels through a Carbonate Anion Pathway", Department of Chemical Engineering, Worcester Polytechnic Institute, April 2013.

13. "Catalytic advances and electrolyte stability for carbonate exchange membrane fuel cells", Department of Chemistry and Chemical Biology, Northeastern University, January 2013.
12. "Unconventional catalyst support materials for PEMFCs", Department of Chemical and Nuclear Engineering, University of New Mexico, December 2012.
11. "Electrochemical room temperature activation of CH<sub>4</sub> through a carbonate anion pathway", Department of Chemistry, University of New Hampshire, September 2012.
10. "Room temperature activation of CH<sub>4</sub> to syngas through a carbonate anion pathway", 243rd ACS National Meeting, March 2012
9. "Promises and challenges of tungsten carbide electrocatalyst supports for PEMFCs", 243rd ACS National Meeting, March 2012
8. "Design of Novel Electrode Materials for Room Temperature Carbonate Fuel Cells", University of Surrey, UK, August 2011.
7. "Advanced Electrocatalyst Supports for PEM Fuel Cells", Department of Chemical Engineering, Brigham Young University, November 2010.
6. "Advanced Electrocatalyst Supports for PEM Fuel Cells", Department of Chemical and Biological Engineering, Illinois Institute of Technology, November 2010.
5. "Novel Electrocatalysts for Oxygen Reduction in PEM Fuel Cells", Department of Chemical Engineering, Tennessee Tech University, March 2008.
4. "Cobalt-Palladium Electrocatalysts for Oxygen Reduction in Acid Media", Department of Chemical Engineering, Texas A&M University, February 2008.
3. "Glass Based Electrodes and Electrolytes for Micro Direct Methanol Fuel Cells", Department of Chemical, Materials and Biomolecular Engineering, University of Connecticut, February 2008.
2. "Development and Characterization of New Materials for Micro Direct Methanol Fuel Cells", Department of Chemical Engineering, University of South Alabama, November 2007.
1. "Development and Characterization of Cobalt-Palladium Electrocatalysts for Oxygen Reduction in Acid Media", Hydrogen and Fuel Cell Materials Group, Argonne National Lab, May 2006.

## **CONFERENCE PRESENTATIONS**

---

85. "Composite Metal Oxide/Nanocarbon Materials As High Performance Anodes for Next-Generation Automotive Li-Ion Batteries", AIChE National Meeting, San Francisco, CA, November 2016, Presenting Author: Alessandro Palmieri
84. "Improving Performance in Alkaline Membrane Fuel Cells through Enhanced Water Management", AIChE National Meeting, San Francisco, CA, November 2016, Presenting Author: Travis Omasta
83. "Improvements in the Anion Exchange Membrane Transport of Carbonate and Bicarbonate for Low-Temperature CO<sub>2</sub> Capture and Energy Conversion", AIChE National Meeting, San Francisco, CA, November 2016, Presenting Author: Travis Omasta

82. "Reducing Greenhouse Gasses Using Low Temperature AEM Electrochemical Devices", AIChE National Meeting, San Francisco, CA, November 2016, Presenting Author: Travis Omasta
81. "Influence of Cobalt and Sodium Doping on MnO/CNT Composite Anode Materials for Li-Ion Batteries", AIChE National Meeting, San Francisco, CA, November 2016, Presenting Author: Alessandro Palmieri
80. "Influence of Cobalt and Sodium Doping on MnO/CNT Composite Anode Materials for Li-Ion Batteries", The Electrochemical Society, Honolulu, HI, October 2016, Presenting Author: William Mustain
79. "Metal Oxide Nanocrystals Supported on Carbon Nanotubes As Bifunctional Electrocatalysts in Reversible Alkaline Membrane Fuel Cells", The Electrochemical Society, Honolulu, HI, October 2016, Presenting Author: Hui Xu
78. "Improving Performance in Alkaline Membrane Fuel Cells through Enhanced Water Management", The Electrochemical Society, Honolulu, HI, October 2016, Presenting Author: William Mustain
77. "Improvements in the Anion Exchange Membrane Transport of Carbonate and Bicarbonate for Low-Temperature CO<sub>2</sub> Capture and Energy Conversion", The Electrochemical Society, Honolulu, HI, October 2016. Presenting Author: William Mustain
76. "High Performance and Target Modeling for MnO and NiO Anodes for Li-Ion Batteries", The Electrochemical Society, San Diego, CA, June 2016. Presenting Author: Mohan Karulkar
75. "Activity and Microstructure of Ultra-Low Iridium Loading Catalyst for PEM Electrolyzer MEA", The Electrochemical Society, San Diego, CA, June 2016. Presenting Author: Radenka Maric
74. "Metal Oxides Supported on Carbon Nanotubes As Bifunctional Electrocatalysts for Reversible Alkaline Membrane Fuel Cells", The Electrochemical Society, San Diego, CA, May 2016. Presenting Author: Shuai Zhao
73. "Low Temperature Electrochemical Upgrading of Methane to Methanol", AIChE Annual Meeting, Salt Lake City, UT, November 2015. Presenting Author: William Mustain
72. "Reaction Dependent Transport of Carbonate and Bicarbonate through Anion Exchange Membranes in Electrolysis and Fuel Cell Operations", The Electrochemical Society, October 2015. Presenting Author: William Mustain
71. "Determining the Electrochemically Active Area of IrO<sub>x</sub> Powder Catalysts in an Operating Proton Exchange Membrane Electrolyzer", The Electrochemical Society, October 2015. Presenting Author: Shuai Zhao
70. "Ultra-Low Pt Loading Catalyst Layers for PEMFC Using Reactive Spray Deposition Technology". The Electrochemical Society, October 2015. Presenting Author: Radenka Maric
69. "Metal Oxide Anode Materials for Lithium-Ion Batteries", The Electrochemical Society, Chicago, IL, May 2015. Presenting Author: William Mustain
68. "In Situ Oxygen Gradient Generation, Control and Model inside a Microfluidic Habitat", The Electrochemical Society, Chicago, IL, May 2015. Presenting Author: William Mustain

67. "Near-Room Temperature Conversion of Methane to Methanol", The Electrochemical Society, Chicago, IL, May 2015. Presenting Author: William Mustain
66. "Design, fabrication, and performance of synthetic microbial habitat systems", ACS National Meeting, Dallas, TX, November 2014. Presenting Author: Leslie Shor
65. "Importance of Conductivity and Structure in the Capacity Retention of NiO Anodes in Li Batteries", AIChE National Meeting, Atlanta, GA, November 2014. Presenting Author: William Mustain
64. "In Situ Oxygen Gradient Generation and Control inside a Microfluidic Habitat", AIChE National Meeting, Atlanta, GA, November 2014. Presenting Author: Andrea Kadilak
63. "Carbonates and Low Temperature Alkaline Electrochemical Systems", AIChE National Meeting, Atlanta, GA, November 2014. Presenting Author: William Mustain
62. "Understanding Pt Particle Growth and Distribution on ITO: Impact on ORR Activity and Stability", AIChE National Meeting, Atlanta, GA, November 2014. Presenting Author: Ying Liu
61. "Structural and Electrochemical Properties of Pt Supported on Sn-doped Indium Oxide", AIChE National Meeting, Atlanta, GA, November 2014. Presenting Author: Shuai Zhao
60. "Understanding the Growth of Pt Nanoparticles by Galvanic Displacement on ITO Nanocubes for ORR", The Electrochemical Society, Cancun, Mexico, October 2014. Presenting Author: William Mustain
59. "Identical-location TEM Studies on Conductivity vs. Structure in Metal Oxide Anodes", The Electrochemical Society, Orlando, FL, May 2014. Presenting Author: William Mustain
58. "Developing Quantifiable Assessments in Advance of an ABET Visit", AIChE Annual Meeting, San Francisco, November 2013. Presenting Author: Daniel Burkey
57. "Exploring the Activity and Stability Limits for Pt/ITO ORR Electrocatalysts", The Electrochemical Society, San Francisco, October 2013. Presenting Author: William Mustain.
56. "One Step Direct Deposition of Durable Cathodes for High Temperature Proton Exchange Membrane Fuel Cells", The Electrochemical Society, San Francisco, October 2013. Presenting Author: Haoran Yu.
55. "High Stability, High Activity Pt/ITO Oxygen Reduction Electrocatalysts", The Electrochemical Society, Toronto, May 2013. Presenting Author: Ying Liu.
54. "Hydrogen Evolution on Combustion Catalyzed Electrodes with Low Loadings for PEM Electrolyzers", The Electrochemical Society, Toronto, May 2013. Presenting Author: Justin Roller.
53. "Evaluation of Tungsten Carbide and Tungsten Oxide as Pt Supports for Oxygen Reduction Reaction", The Electrochemical Society, Toronto, May 2013. Presenting Author: Ying Liu.
52. "Effect of Morphology on the Li<sup>+</sup> Diffusion Coefficient for Nickel Oxide Anodes in Li-Ion Batteries", The Electrochemical Society, Toronto, May 2013. Presenting Author: Neil Spinner.
51. "Influence of Nitrogen Surface Chemistry in Electric Double Layer Capacitance of Nitrogen Doped Ordered Mesoporous Carbon", The Electrochemical Society, Toronto, May 2013. Presenting Author: William Mustain

50. "Electrochemical Methane Activation and Conversion to Oxygenates at Room Temperature", The Electrochemical Society, Toronto, May 2013. Presenting Author: Neil Spinner
49. "Effect of surface chemistry in electric double layer capacitance of nitrogen doped ordered mesoporous carbon" AIChE National Meeting, Pittsburgh, October 2012. Presenting Author: S. Shrestha
48. "Influence of chemistry and structure of nitrogen doped mesoporous carbon support on the ORR activity of platinum for fuel cell applications" AIChE National Meeting, Pittsburgh, October 2012. Presenting Author: S. Shrestha
47. "Oxygenate production using a carbonate anion electrochemical cell at room temperature", AIChE National Meeting, Pittsburgh, October 2012. Presenting Author: N. Spinner
46. "Catalytic advances and electrolyte stability for carbonate exchange membrane fuel cells", AIChE National Meeting, Pittsburgh, October 2012. Presenting Author: S. Shrestha
45. "Evaluating the contribution of direct vs. indirect carbonate production in anion exchange membrane fuel cells", AIChE National Meeting, Pittsburgh, October 2012. Presenting Author: N. Spinner
44. "Non-carbon electrocatalyst supports for PEM fuel cells", AIChE National Meeting, Pittsburgh, October 2012. Presenting Author: Y. Liu
43. "Microstructure and durability of non-carbon supported cathode prepared by a direct dry deposition technique", The Electrochemical Society, Honolulu, October 2012. Presenting Author: W.E. Mustain
42. "Influence of Chemistry and structure on the ORR activity of Pt supported on N-doped mesoporous carbon", The Electrochemical Society, Honolulu, October 2012. Presenting Author: S. Shrestha
41. "Room temperature electrochemical synthesis of oxygenates through a carbonate anion pathway", The Electrochemical Society, Honolulu, October 2012. Presenting Author: N. Spinner
40. "Catalytic advances and electrolyte stability for carbonate exchange membrane fuel cells", The Electrochemical Society, Honolulu, October 2012. Presenting Author: W.E. Mustain
39. "Evaluating the Direct vs. Indirect carbonate production in anion exchange membrane fuel cells", The Electrochemical Society, Honolulu, October 2012. Presenting Author: W.E. Mustain
38. "Room temperature activation of CH<sub>4</sub> to syngas through a carbonate anion pathway", 243rd ACS National Meeting, March 2012. Presenting Author: W.E. Mustain
37. "Promises and challenges of tungsten carbide electrocatalyst supports for PEMFCs", 243rd ACS National Meeting, March 2012. Presenting Author: W.E. Mustain
36. "Electrochemical Investigation of Carbonate Selective Catalyst for Room Temperature Carbonate Fuel Cells", The Electrochemical Society, Boston, October 2011. Presenting Author: J.A. Vega
35. "Addition and Influence of Zirconia to Transition Metal Oxide Electrocatalysts in Alkaline Media", The Electrochemical Society, Boston, October 2011. Presenting Author: N.S. Spinner
34. "Non-Carbon Supports for Energy Applications", The Electrochemical Society, Boston, October 2011. Presenting Author: Y. Liu

33. "High Surface Area Tungsten Carbide and Its Evaluation as an Electrocatalyst Support", The Electrochemical Society, Boston, October 2011. Presenting Author: Y. Liu
32. "Effect of Nickel Oxide Synthesis Conditions on its Electrochemical Behavior in Alkaline Media", The Electrochemical Society, Montreal, May 2011. Presenting Author: N.S. Spinner
31. "High Selectivity Cathode Catalysts Enabling Room Temperature Carbonate Fuel Cells", The Electrochemical Society, Montreal, May 2011. Presenting Author: J.A. Vega
30. "Low Temperature Synthesis of Calcium Ruthenate Perovskites and Pyrochlores", AIChE, Salt Lake City, November 2010. Presenting Author: J.A. Vega
29. "Novel Approach to CO<sub>2</sub> Utilization for Power Generation Using an Electrochemical Reactor", AIChE, Salt Lake City, November 2010. Presenting Author: J.A. Vega
28. "Novel Properties of Surface Modified Ordered Mesoporous Carbon Supports for Electrochemical Applications", AIChE, Salt Lake City, Accepted for November 2010. Presenting Author: S. Shrestha
27. "Stability and ORR Activity of Nitrogen Functionalized Mesoporous Carbon Supports", AIChE, Salt Lake City, November 2010. Presenting Author: S. Shrestha
26. "Effect of Carbonate on Oxygen Reduction, Hydrogen Oxidation and Anion Exchange Membrane Chemical Stability", *The Electrochemical Society*, Vancouver, October 2010. Presenting Author: J.A. Vega
25. "Surface Modified Ordered Mesoporous Carbon Supports for Electrochemical Applications", *The Electrochemical Society*, Las Vegas, October 2010. Presenting Author: S. Shrestha
24. "Promising Alternative for a CO<sub>2</sub> Tolerant Anion Exchange Membrane Fuel Cell", *The Electrochemical Society*, Vancouver, Canada, April 2010. Presenting Author: J.A. Vega
23. "Nitrogen Functionalized Mesoporous Carbon for PEM Fuel Cells", *The Electrochemical Society*, Vancouver, Canada, April 2010. Presenting Author: S. Shrestha
22. "Performance of a Direct Borohydride Fuel Cell Stack", *The Electrochemical Society*, Vienna, Austria, October 2009. Presenting Author: W.E. Mustain
21. "Effect of Carbon Dioxide on the Reduction of O<sub>2</sub> in Anion Exchange Membrane Fuel Cells, *The Electrochemical Society*, Vienna, Austria, October 2009. Presenting Author: S. Prakash
20. "Pt/N/C and Pd/N/C Oxygen Reduction Catalysts for PEM Fuel Cells", *The Electrochemical Society*, San Francisco, May 2009. Presenting Author: W.E. Mustain
19. "Deposition of Pt<sub>x</sub>Ru<sub>1-x</sub> Catalysts for Methanol Oxidation In Micro Direct Methanol Fuel Cells", *AIChE*, Philadelphia, November 2008. Presenting Author: W.E. Mustain
18. "Micro Direct Methanol Fuel Cells", *AIChE*, Philadelphia, November 2008. Presenting Author: W.E. Mustain
17. "Glass-Based MEA for Micro Direct Methanol Fuel Cells" *The Electrochemical Society*, Honolulu, October 2008. Presenting Author: W.E. Mustain
16. "Phosphonium and Ammonium Based Membranes for Carbonate and Alkaline DMFC", *The Electrochemical Society*, Phoenix, May 2008. Presenting Author: J.A. Vega

15. "Development and Electrochemical Characterization of a Glass-Based Micro DMFC - Li Ion Power Source" *The Electrochemical Society*, Honolulu, October 2008. Presenting Author: S. Prakash
14. "Hybrid Micro DMFC-Li Ion Power Source for Wireless Devices" *The Electrochemical Society*, Honolulu October 2008. Presenting Author: W.E. Mustain
13. "Micro DMFC-Lithium Ion Hybrid Power Source for Low Power Applications", *The Electrochemical Society*, Washington D.C., October 2007. Presenting Author: W.E. Mustain
12. "Inorganic Glass Proton Exchange Membranes", *The Electrochemical Society*, Washington D.C., October 2007. Presenting Author: S. Prakash
11. "CO<sub>2</sub> Vent for Closed Direct Methanol Fuel Cells", *The Electrochemical Society*, Washington D.C., October 2007. Presenting Author: S. Prakash
10. "Thin-Film Pt and PtRu Glass Composite Catalyst Layers for Micro Direct Methanol Fuel Cells", *AICHE*, Washington D.C., November 2007. Presenting Author: W.E. Mustain
9. "A Hybrid Fuel Cell - Thin-Film Lithium Ion Power Source", *AICHE*, Washington D.C., November 2007. Presenting Author: W.E. Mustain
8. "Physical and Electrochemical Characterization of Thin-Film Electrodes on Proton-Conducting Glass Membranes for Micro DMFC Applications", *The Electrochemical Society*, Chicago, IL, May 2007. Presenting Author: W.E. Mustain
7. "Cobalt-Palladium Electrocatalysts for the Oxygen Reduction Reaction", *The Electrochemical Society*, Chicago, IL, May 2007. Presenting Author: W.E. Mustain
6. "Thermal Imaging for In-Situ Combinatorial Characterization of Fuel Cell Catalyst Arrays", *The Electrochemical Society*, Chicago, IL, May 2007. Presenting Author: K. Kepler
5. "The Asymmetric Electrode Technique in a Polymer Electrolyte Membrane Fuel Cell", *The Electrochemical Society*, Quebec City, Canada, May 2005. Presenting Author: W.E. Mustain
4. "Low Temperature Electrodeposition of CoPd<sub>x</sub> Alloys in a Mixed Ligand System", *The Electrochemical Society*, Quebec City, Canada, May 2005. Presenting Author: W.E. Mustain
3. "Development of the Asymmetric Electrode Technique in a Polymer Electrolyte Membrane Fuel Cell: Application to Methanol Oxidation", Quebec City, Canada, May 2005. Presenting Author: W.E. Mustain
2. "Using the Asymmetric Electrode Technique to Elucidate Methanol Oxidation Electrokinetics on Pt and PtRu (50:50) in a DMFC, The Electrochemical Society, Quebec City, Canada, May 2005. Presenting Author: W.E. Mustain
1. "One Dimensional, Diffusion-Controlled Kinetic Model for Oxygen Reduction", *The Electrochemical Society*, Orlando, FL, October 2003. Presenting Author: W.E. Mustain

## CONFERENCE BOOKS EDITED

---

Electrochemical Synthesis of Fuels 3, ECS Transactions Vol. 66, no. 3, Eds: X. D. Zhou, G. Brisard, M. B. Mogensen, W. E. Mustain, J. A. Staser, T. M. Gur, M. C. Williams, 2015.

Oxygen Reduction Reactions, ECS Transactions Vol. 64, no. 36. Eds: P. J. Kulesza, R. A. Mantz, V. Di Noto, W. E. Mustain, S. Mukerjee, P. E. Gannon, X. D. Zhou, H. Xu, Y. Shao-Horn, M. Shao, 2014

Nanotechnology (General), ECS Transactions Vol. 64, no. 47. Eds: O.M. Leonte and W.E. Mustain, 2014.

Energy-Water Nexus 2, ECS Transactions Vol. 64, no. 46. Eds: E. D. Wachsman, C. Hensman, S. P. Nunes, R. Kosteci, G. G. Botte, P. M. Natishan, B. R. Stoner, S. D. Minteer, W. E. Mustain, N. Wu, 2014.

Nanotechnology (General), ECS Transactions Vol. 63, no. 36. Eds: W.E. Mustain, O.M. Leonte and J.W. Fergus, 2014.

The Energy-Water Nexus, ECS Transactions Vol. 58, no. 35. Eds: E. D. Wachsman, J. Burgess, M. T. Carter, C. Hensman, B. Y. Liaw, S. D. Minteer, W. E. Mustain, P. M. Natishan, B. R. Stoner 2013.

Nanotechnology (General), ECS Transactions Vol. 58, no. 47. Eds: O.M. Leonte and W.E. Mustain, 2013.

Electrochemical Synthesis of Fuels 2, ECS Transactions Vol. 58, no. 2, Eds: X. D. Zhou, G. Brisard, M. Mogensen, W. E. Mustain, J. Staser, M. C. Williams, 2013.

Nanotechnology (General), ECS Transactions Vol 53, no. 22. Eds: W.E. Mustain, F. Chen and O.M. Leonte, 2013.

Nanotechnology (General), ECS Transactions Vol. 50, no. 22. Eds: O.M. Leonte, W.E. Mustain, 2012.

Nanotechnology (General) ECS Transactions Vol. 45, no. 25, Eds: F. Chem, O.M. Leonte, W.E. Mustain, 2012.

Nanostructured Materials for Energy Conversion and Storage, ECS Transaction Vol. 35, no. 34. Eds: K. Zaghbi, C. Julien, W. Chiu, W. Mustain, V. Ramani, W. Van Schalkwijk, B. Liaw. Electrochemical Society, 2011.

Nanotechnology (General), ECS Transaction Vol 35, no. 10. Eds: W. Mustain and E. Traversa. Electrochemical Society, 2011.

Electrode Processes Relevant to Fuel Cell Technology, ECS Transactions Vol. 28, no. 23. Eds: V. Birss, P. Kulesza, W. Mustain, K. Ota and D. Wilkinson. Electrochemical Society, 2010.

## INVITED BOOK CHAPTERS

---

S. Shrestha and W.E. Mustain, "Promises and Challenges of Unconventional Electrocatalyst Supports" in: Electrocatalysis and Fuel Cells: A Non and Low Platinum Approach, M. Shao (editor), Springer, 2013.

S. Prakash, W.E. Mustain and P.A. Kohl, "Electrolytes for Long-Life, Ultra-Low-Power Direct Methanol Fuel Cells" in: Micro Fuel Cells: Principles and Applications, T.S. Zhao (editor), Elsevier, 2009.

## PROPOSALS FUNDED

---

“Alkaline Battery Anodes”, \$200,000, Duracell, Active dates: 11/01/2016 – 10/31/2017. PI

“Metal Oxide Anodes as Enablers for Advanced Automotive Li-ion Batteries”, \$120,000 – overhead free through University Research Program, Ford Motor Company, Active dates: 01/01/2016 – 12/31/2018. PI

“i-Corps: Novel flame-based precursors for controlled catalyst structure”, \$50,000, NSF, Active dates: 02/2015-07/2015. Co-PI (50% effort)

“Single Step Manufacturing of Low catalyst Loading Electrolyzer MEAs”, Proton Onsite/DOE Phase II SBIR, \$330,000 to UConn (\$1,000,000 total), Active dates: 7/14 – 07/16. Co-PI (40% effort)

“Conversion of Methane to Methanol in Intermediate Temperature Alkaline Electrochemical Cells”, \$130,000, Gas Technology Institute – Subcontract under ARPA-e Phase II, Active dates: 3/2014 – 3/2015.

DOE Early Career Award, “Room Temperature Electrochemical Upgrading of Methane to Oxygenate Fuels”, \$800,000, US Department of Energy – Office of Basic Energy Sciences, Active dates: 9/2013-8/2018. PI

“GOALI: One Step Direct Deposition of Durable Cathode for High Temperature Proton Exchange Membrane Fuel Cell (PEMFC)”, \$423,204, NSF-CMMI, Active dates: 06/13 – 05/16. Co-PI (30% effort)

“Single Step Manufacturing of Low catalyst Loading Electrolyzer MEAs”, Proton Onsite/DOE Phase I SBIR, \$50,000 to UConn (\$150,000 total), Active dates: 12/12 – 07/13. Co-PI (25% effort)

“CHEG 1200: Introduction to Food Science and Engineering”, University of Connecticut Provost General Enhancement Competition Grant”, \$10,000, Active dates: 05/12 – 05/14. PI

“EFRI-MIKS: Innovations for Next-Generation Biomanufacturing and Microengineering”, National Science Foundation, \$2,000,000, Active dates: 08/11 – 07/14. Co-PI (20% effort)

“Nanostructured Catalyst-Support Systems for Next Generation Electrolyzers”, UConn School of Engineering/Proton OnSite via congressional earmark from US Department of Energy, Office of Energy Efficiency & Renewable Energy, \$50,000, Active dates: 07/11 – 03/12. PI.

“Understanding the Effects of Surface Chemistry and Microstructure on the Activity and Stability of Pt Electrocatalysts on Non-Carbon Supports”, US Department of Energy – Office of Basic Energy Sciences, \$480,000, Active dates: 08/10 – 08/13. PI.

“Functionalized Graphitic Supports for Improved Fuel Cell Catalyst Stability”, Physical Sciences Inc./NASA Phase I STTR, \$100,000, Active dates: 02/11 – 02/12. PI

“EAGER: Electrochemical Reactor for Spontaneous Conversion and CO<sub>2</sub> Capture”, NSF-CBET, \$97,721, Active dates: 01/10 – 06/11. PI.

“Electrochemical Conversion of CO<sub>3</sub><sup>2-</sup> Anions for Power Generation and Removal of Atmospheric CO<sub>2</sub>”, UConn Research Foundation, \$24,112, 01/09 – 12/09. PI.

## **HONORS & AWARDS**

---

2016-2019 United Technologies Professor of Engineering Innovation  
2015-2016 Fulbright Scholar Fellow  
2014 Supramaniam Srinivasan Young Investigator Award  
2014 CQIA Platinum Innovation Prize (Shared with R. Maric, C.B. Carter and J. Roller)  
2013 DOE Early Career Award  
2009 Illinois Institute of Technology Young Alumni Award  
2007 Invited Alumni Speaker for Collens Scholarship Program Benefit Dinner  
2004 Illinois Institute of Technology Outstanding Teaching Assistant of the Year Award  
2004 Hamid Arastoopour Excellence in Education Award  
2002 Illinois Institute of Technology Graduate Research Fellowship  
1998 – 2002 Illinois Institute of Technology Heald Scholar

## **PROFESSIONAL MEMBERSHIPS**

---

Electrochemical Society  
American Chemical Society  
American Institute of Chemical Engineers  
American Society of Mechanical Engineers

## **STUDENTS**

---

### Postdocs

William A. Rigdon, July 2014-June 2015 – Stanley Black&Decker  
Ying Liu – January 2014-April 2015 – Nissan North America

### Graduated Ph.D. Students

Jose A. Vega, Summer 2011 – Senior Scientist, Physical Sciences, Inc.  
Sujan Shrestha, December 2013 – Postdoctoral Researcher, CCNY  
Ying Liu, December 2013 – Fuel Cell Engineer, Nissan North America  
Neil Spinner, December 2013 – Pine Instrument Company  
Shai Zhao, September 2016 – Giner, Inc.

### Current Ph.D. Students

Haoran Yu, Expected Graduation Date: May 2017

Travis Omasta, Expected Graduation Date: December 2017

Alessandro Palmieri, Expected Graduation Date: May 2018

Xiong Peng, Expected Graduation Date: May 2018

Ehsan Faegh, Expected Graduation Date: May 2020

#### Graduated Plan B Masters Students

Alessandro Palmieri, May 2014 – Politecnico di Milano

Nicholas Osepowicz, May 2014 – ClearEdge Power

Matteo Bramillo, May 2013 – Politecnico di Milano

Roopnarine Sukhram, May 2012 – UTC Power

Jeffrey Collett, May 2010 – UTC Power

Jonathan O'Neill, May 2010 – UTC Power

#### Graduated Master's (MS) Students

Mark Williams, December 2012 – Production Engineer, Gerber

Gregory Crettol, July 2013 – Professor, US Coast Guard Academy

Monica Dahl – August 2015

Mengchen Liu – May 2016

#### UConn University Scholar Undergraduates

Leah Dwyer (Ph.D. Student, MIT)

Michael Ignatowich (Ph.D. Student, CalTech)

#### UConn Honors Undergraduate Students

Jonathan Klein (UConn Senior)

Ornella Tempo (UConn Senior)

Chad Jens (High School Teacher in Hawaii)

JC Rotchford (PhD Student, University of South Carolina)

John Varkonda (Project Manager at Ashcroft, Inc.)

Abbey Wagstrom (Engineer at Duracell)

Christopher Hawxhurst (Ph.D. Student at Columbia University)

Michael Kek (Engineer at Unilever)

Connor Lewis (UConn Senior)

## **COURSES TAUGHT**

---

CHEG 2103 – Introduction to Chemical Engineering. Fall 2012 - Fall 2014. This course focuses on the implications of material and energy balances. Students also learn about reaction equilibria, elementary kinetics and the construction of process flow diagrams as well as systems-level degree of freedom analysis. Average Student Evaluation: 8.5/10.

CHEG 4995 – Special Topics: Biokinetics Relevant for the Food Industry, Spring 2011, Spring 2012. This course is an introduction to food science and engineering, with a particular focus on extraction of starches from foodstuffs, decomposition to sugars and fermentation. Average student evaluation: 9.2/10

CHEG 3112 – Undergraduate Thermodynamics II. Reactions and Phase Equilibria. Fall 2009, Fall 2010 & Fall 2011. This course focuses on multicomponent chemical systems and understanding the role of

conditions on phase behavior and equilibria. Professor Mustain introduced several new team-building modules into the course where complex problems were attacked in groups. Also, Professor Mustain developed Excel based computational tools, which allow the undergraduate students to manually input information and iterate solutions, which helps them to better understand how process simulators function. Average student evaluation: 9.0/10

CHEG 4995 – Special Topics: Undergraduate Electrochemical Engineering and Energy, Fall 2008, Spring 2010 & Spring 2012. Redox processes, electrochemical kinetics, transport phenomena in electrochemical systems and electrochemical fundamentals applied to energy generation and storage. Professor Mustain introduced a laboratory component to this course to give students hands-on experience with electrochemical systems. Also, several flash videos were developed and introduced to help students visualize phenomena. Average student evaluation: 8.8/10

CHEG 5395/5363 – Special Topics: Graduate Electrochemical Engineering and Energy, Fall 2008, Spring 2010, Spring 2011 & Spring 2012. Redox processes, electrochemical kinetics, transport phenomena in electrochemical systems and electrochemical fundamentals applied to energy generation and storage. Professor Mustain introduced a laboratory component to this course to give students hands-on experience with electrochemical systems. Also, several flash videos were developed and introduced to help students visualize phenomena. Average student evaluation: 9.0/10

ChBE 2110 – Georgia Tech, Thermodynamics I, Summer 2008. Several lectures including overall energy and entropy balances, heat capacity, non-ideal gas phenomena, phase equilibrium and electrochemistry.

ChBE 6130 – Georgia Tech, Electrochemical Engineering, Fall 2007. Several lectures during the fall semester on redox processes, electrochemical kinetics, transport phenomena in electrochemical systems and electrochemical fundamentals applied to fuel cells.

## **NEW AND RE-DESIGNED COURSES**

---

CHEG 3128: Junior Lab – to be offered Spring 2016. Changed the focus of the lab from existing equipment with well-defined outcomes and protocols to open-ended questions where the students have to build and test their own experimental setups and devices to meet specific targets. The students spend a lot of time design and troubleshooting. Also incorporates new project management, reporting and presentation elements.

New Course: CHEG 1200: Introduction to Food Science and Engineering. Contains both lecture and laboratory components.

New Course: CHEG 4995 (Special Topics Course): Biokinetics for the Food Industry – Offered in the Spring '10, '11 and '12 semesters – Contains both lecture and laboratory components.

CHEG 5363: Electrochemical Engineering – Changed the focus of the course toward the research and engineering practice of electrochemistry – added a laboratory part of the course, which was offered for the first time in the Fall '08 semester.

## **UNIVERSITY SERVICE**

---

Associate Department Head – Department of Chemical & Biomolecular Engineering (2103-2016)

Chair, ABET Committee – Department of Chemical & Biomolecular Engineering (2012-Present)

Chair, Operations and Safety Committee – Center for Clean Energy Engineering (2013-2016)

UConn SoE Graduate Committee (2011-2015)

Chair, Graduate Committee – Chemical Engineering Program (2009-2012)

Faculty Advisor for AIChE Student Chapter – ChemE Car Competition (2010-present)

Sustainable Energy Initiative Faculty Search Committee (2008)

## **EXTRAMURAL SERVICE**

---

Associate Editor, Journal of Electrochemical Energy Conversion and Storage

Associate Editor, Journal of Fuel Cell Science and Technology

Treasurer, Energy Technology Division, Electrochemical Society; May 2015-present

Chair, Electrochemical Division, American Institute of Chemical Engineers, Nov. 2016-present

Vice Chair, Electrochemical Division, American Institute of Chemical Engineers, Nov. 2014-Nov. 2016.

Secretary, Electrochemical Division American Institute of Chemical Engineers, Nov. 2012-Nov. 2014.

Executive Committee Member-at-Large, Energy Technology Division, Electrochemical Society, May 2012-May 2015.

Member, Individual Membership Committee, Electrochemical Society, May 2014-Present

Member, New Technology Subcommittee, Electrochemical Society, October 2012-October 2014.

Symposia Organizer – Electrochemical Society

Electrochemical Synthesis of Fuels 3 – Chicago, IL – May 2015

Nature-Inspired Electrochemical Systems – Chicago, IL – May 2015

Nanotechnology General Session – Cancun, Mexico – October 2014

Energy Water Nexus – Cancun, Mexico – October 2014

Nanotechnology General Session – Orlando, FL – May 2014

Nanotechnology General Session – Toronto, Ontario, Canada – May 2013

Nanotechnology General Session – San Francisco, CA – October 2013

The Energy-Water Nexus – San Francisco, CA – October 2013

Electrochemical Synthesis of Fuels 2 – San Francisco, CA – October 2013

Nanotechnology General Session – Honolulu, Hawaii – November 2012

Nanotechnology General Session – Seattle, WA – May 2012

Electrochemical Utilization of Solid Fuels – Boston, MA – October 2011

Electrochemical Processes for Fuels – Boston, MA – October 2011

Nanotechnology General Session – Boston, MA – October 2011

Nanostructured Materials for Energy Storage and Conversion – Montreal, Canada – May 2011

Nanotechnology General Session – Montreal, Canada – May 2011

Electrode Processes Relevant to Fuel Cell Technology – Vancouver, Canada – April 2010

Symposium Organizer – American Chemical Society

Electro/Photocatalysis, Catalysis Division – Spring 2012

Symposium Organizer – AIChE

Engineering Sciences and Fundamentals, Fuel Cell Technology II – November 2012

## **JOURNAL REVIEW COMMITMENTS (ABBREVIATED LIST)**

---

Journal of the Electrochemical Society

Journal of the American Chemical Society

Journal of Physical Chemistry

Journal of Power Sources

Electrochemistry Communications

ECS Electrochemistry Letters

Journal of Materials Chemistry A

Applied Catalysis B: Environmental

Electrochimica Acta

Journal of Solid State Electrochemistry

Bioresource Technology

Solid State Ionics

ACS Catalysis

ACS Applied Materials and Interfaces

Industrial & Engineering Chemistry Research

International Journal of Hydrogen Energy

Nature Communications

Nature Materials

Carbon

Elsevier Books

## **PROPOSAL REVIEWER COMMITMENTS (ABBREVIATED LIST)**

---

NSF CBET Catalysis

Department of Energy EFRC Review

Hong Kong Research Grants Council

Netherlands Organization for Scientific Research

AAAS Research Competitiveness Program

SBIR/STTR Program, National Science Foundation

DOE Office of Science Graduate Fellowship Program

CBET Process and Reaction Engineering, National Science Foundation

CBET Energy for Sustainability, National Science Foundation

Partner University Fund

DMR Solid State and Materials Chemistry Program, National Science Foundation

ASC Chemistry Division, National Science Foundation

NASA Postdoctoral Fellowship Program

DOE Early Career Research Program

## **OUTREACH ACTIVITIES**

---

REU Site Mentor (Summer 2012-2014)

Judge for GK-12 Mousetrap Car Competition (Spring 2012)

UConn Mentor Connection (Summer 2011 & 2012)

Joule-Fellows Program Faculty Advisor and Teacher Host (Summer 2009-Present)

daVinci Program Faculty Workshop Leader (Summer 2010, 2014)

Lecturer and Demonstration Leader for Explore Engineering (E<sup>2</sup>) Program (Summers 2009 & 2010)

C2E2 Industrial Outreach Faculty Lecturer (2008-Present)

UConn representative CT Junior Science and Humanities Symposium (2009-2013)

Habitat for Humanity - Construction of new homes in South Atlanta (2007).

6TH Grade Career Day Workshop – Bednarcik Junior High School, Oswego, IL (2006).

## REFERENCES

---

Katherine Ayers  
Vice President of Research and Development  
Proton OnSite  
[KAyers@protononsite.com](mailto:KAyers@protononsite.com)  
203-678-2190

Radenka Maric  
CT Clean Energy Professor of Sustainable Energy  
University of Connecticut  
[maric@engr.uconn.edu](mailto:maric@engr.uconn.edu)  
860-486-1450

Bryan Pivovar  
Hydrogen and Fuel Cell Group Leader  
National Renewable Energy Laboratory  
[bryan.pivovar@nrel.gov](mailto:bryan.pivovar@nrel.gov)  
303-275-3809

John Varcoe  
Professor of Materials Chemistry  
University of Surrey, UK  
[j.varcoe@surrey.ac.uk](mailto:j.varcoe@surrey.ac.uk)  
+44 01483 68 6838

