Joshua Snyder

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Education:

Ph.D. Chemical Engineering, Johns Hopkins University, Graduation date: March 2012
Project: *Nanoporous Metal/Ionic Liquid Composite Electrocatalysts for the Oxygen Reduction Reaction*
Advisor: Dr. Jonah Erlebacher

MS Chemical Engineering, Drexel University 2006
Project: *Nafion Nanofibers and Their Effect on Polymer Electrolyte Membrane Fuel Cell Performance*
Advisor: Dr. Yossef Elabd

BS Chemical Engineering, Drexel University 2006

Professional and Teaching Experience:

- Assistant Professor, Drexel University September 2014-Present
  - Chemical and Biological Engineering
- Director's Postdoctoral Research Fellow, Argonne National Lab September 2012-2014
  - Materials Science Division
  - Advisors: Dr. Vojislav Stamenkovic/Dr. Nenad Markovic
- Postdoctoral Research Associate, Johns Hopkins University June 2012-August 2012
  - Materials Science and Engineering
  - Advisor: Dr. Jonah Erlebacher
- Research Assistant, Johns Hopkins University 2006-2012
  - Research Interests
    - Electrochemistry, Oxygen Reduction, Fuel Cells, Ionic Liquids
  - Thesis title: *Nanoporous Metal/Ionic Liquid Composite Electrocatalysts for the Oxygen Reduction Reaction*
  - Advisor: Dr. Jonah Erlebacher
- Teaching Assistant, Johns Hopkins University 2006-2009
  - Chemical Engineering Senior Design (2007-2008)
  - Kinetics and Phase Transformations (2009)
- Research Assistant, Drexel University 2005-2006
  - Research Interests
    - Electrospinning, Fuel Cells
  - Thesis title: *Nafion Nanofibers and Their Effect on Polymer Electrolyte Membrane Fuel Cell Performance*
  - Advisor: Dr. Yossef Elabd
- Engineering Co-op (3 six month appointments), Teledyne Energy Systems 2002-2005
  - Project: *Metal Oxide/Polymer Composite Separator Membranes for Alkaline Water Electrolyzers*
  - Manager: Michael C. Miller

Awards:

- Director's Postdoctoral Fellowship Award, Argonne National Lab 2012
- Poster Award: 1st Place Solid State Electrochemistry Division, ECS Meeting 2008
- Poster Award: 2nd Place Materials Science Division, AIChE Meeting 2007
- Undergraduate Student Research Award, Drexel University 2006
- Hess Foundation Chemical Engineering Award, Drexel University 2005
- G & M Merritt Award, Drexel University 2004

Publications:

1. Danilovic, N., Subbaraman, R., Chang, K.C., Chang, S.H., Kang, Y., **Snyder, J.**, Paulikas, A., Strmcnik, D., Kim, Y.T., Myers, D., Stamenkovic, V., Markovic, N., *Activity-Stability Trends for the Oxygen Evolution Reaction on Monometallic Oxides in Acidic Environments*, J. Phys. Chem. Lett., **5** (2014) 2474-2478.

2. Li, X., Chen, Q., McCue, I., **Snyder, J.**, Crozier, P., Erlebacher, J., Sieradzki, K., *Dealloying of Noble-Metal Alloy Nanoparticles*, Nano Letters, **14** (2014) 2569-2577.

3. Chen, C., Kang, Y., Huo, Z., Zhu, Z., Huang, W., Xin, H., **Snyder, J.**, Li, D., Herron, J., Mavrikakis, M., Chi, M., More, K., Li, Y., Markovic, N., Somorjai, G., Yang, P., Stamenkovic, V., *Highly Crystalline Multimetallic Nanoframes with Three-Dimensional Electrocatalytic Surfaces*, Science, **343** (2014) 1339-1343.

4. **Snyder, J.**, Markovic, N., Stamenkovic, V., *Single Crystalline Thin Films as a Novel Class of Electrocatalysts*, J. Serb. Chem. Soc., **78** (2013) 1689-1702.

5. **Snyder, J.**, Danilovic, N., Paulikas, A., Tripkovic, D., Strmcnik, D., Markovic, N., Stamenkovic, V., *Thin Film Approach to Single Crystalline Electrochemistry*, J. Phys. Chem. C, **117** (2013) 23790-23796.

6. **Snyder, J.**, Livi, K., Erlebacher, J., *Oxygen Reduction Reaction Performance of [MTBD][beti]-Encapsulated Nanoporous NiPt Alloy Nanoparticles*, Advanced Functional Materials, **23** (2013) 5494-5501.

7. **Snyder, J.**, McCue, I., Livi, K., Erlebacher, J., *Structure/Processing/Properties Relationships in Nanoporous Nanoparticles as Applied to Catalysis of the Cathodic Oxygen Reduction Reaction*, Journal of the American Chemical Society, **134** (2012) 8633-8645.

8. McCue, I., **Snyder, J.**, Li, X., Chen, Q., Sieradzki, K., Erlebacher, E., *Apparent Inverse Gibbs-Thomson Effect in Dealloyed Nanoporous Nanoparticles*, Physical Review Letters, **108** (2012) 225503.

9. **Snyder, J.**, Fujita, T., Chen, M.W., Erlebacher, J., *Oxygen Reduction in Nanoporous Metal/Ionic Liquid Composite Electrocatalysts*, Nature Materials, **9** (2010) 904-907.

10. Kertis, F., **Snyder, J.**, Govada, L., Khurshid, S., Chayen, N., Erlebacher, J., *Structure/Processing Relationships in the Fabrication of Nanoporous Gold*, JOM, **62** (2010) 50-56.

11. Rahmathullah, A., **Snyder, J.**, Elabd, Y., Palmese, G., *Nanoporous and Proton Conductive Hydrophobic-Hydrophilic Copolymer Thermoset Membranes*, J. Polymer Sci. B, **48** (2010) 1245-1255.

12. **Snyder, J.**, Erlebacher, J., *Kinetics of Crystal Etching Limited by Terrace Dissolution*, J. Electrochem. Soc., **157** (2010) C125-C130.

13. **Snyder, J.**, Erlebacher, J., *Electrochemical Measurement of the Surface Alloying Kinetics of Underpotentially Deposited Ag on Au(111)*, Langmuir, **25** (2009) 9596-9604.

14. **Snyder, J.**, Elabd, Y., *Nafion Nanofibers and Their Effect on Polymer Electrolyte Membrane Fuel Cell Performance*, J. Power Sources, **186** (2009) 385-392.

15. **Snyder, J.**, Livi, K., Erlebacher, J., *Dealloying Silver/Gold Alloys in Neutral Silver Nitrate Solution: Porosity Evolution, Surface Composition and Surface Oxides*, J. Electrochem. Soc., **155** (2008) C464-C473.

16. **Snyder, J.**, Dalton, A., Erlebacher, J., *Stabalized Nanoporous Metals by Dealloying Ternary Alloy Precursors*, Adv. Mat., **20** (2008) 4883-4886.

17. Zeis, R., Lei, T., Sieradzki, K., **Snyder, J.**, Erlebacher, J., *Catalytic Reduction of Oxygen and Hydrogen Peroxide by Nanoporous Gold*, J. of Catalysis, **253** (2008) 132-138.

18. Chen, H., **Snyder, J.**, Elabd, Y., *Electrospinning and Solution Properties of Nafion and Poly(acrylic acid)*, Macromolecules, **41** (2008) 128-135.

Proceedings:

1. Dong, B., Chen, H., **Snyder, J.**, Elabd, Y., *Super Proton Conductive Nafion Nanofibers: Discovery, Fabrication, Properties, and Fuel Cell Performance*, ECS Transactions, 41(1) (2011) 1503-1506.

2. Erlebacher, J., **Snyder, J.**, *The Active Surface Area of Nanoporous Metals during Oxygen Reduction*, ECS Transactions, 41(1) (2011) 1021-1030.

3. Erlebacher, J.**, Snyder, J.**, *Dealloyed Nanoporous Metals for PEM Fuel Cell Catalysis*, ECS Transactions, 25(1) (2009) 603-612.

Posters:

1. Snyder, J., Erlebacher, J. *Nanoporous Metal/Ionic Liquid Composite Electrocatalysts for the Oxygen Reduction Reaction*. Fall MRS Meeting, Boston, MA, November 29, 2010.
2. Snyder, J., Erlebacher, J. *Electrochemical Measurement of the Surface Alloying Kinetics of Underpotentially Deposited Ag on Au(111)*. Gordon Research Conference: Thin Film and Crystal Growth Mechanisms, New London, New Hampshire, July 2009.

3. Snyder, J., Erlebacher, J. *Kinetics of Crystal Etching Limited by Terrace Dissolution*. Gordon Research Conference: Thin Film and Crystal Growth Mechanisms, New London, New Hampshire, July 2009.

4. Snyder, J., Erlebacher, J. *Electrochemical Measurement of the Surface Alloying Kinetics of Underpotentially Deposited Ag on Au(111).* Fall ECS Meeting, Honolulu, Hawaii, October 12, 2008.
   Awarded 1st place in the Solid State Electrochemistry Division at Fall ECS, Oct. 2008.

5. Snyder, J., Erlebacher, J. *Electrochemical Characterization of Nanoporous Gold Made by Dealloying Silver/Gold Alloys in Neutral Silver Nitrate Solution*. Gordon Research Conference: Corrosion, New London, New Hampshire, July 2008.

6. Snyder, J., Elabd, Y. *Nafion® Nanofibers and Their Effect on Polymer Electrolyte Membrane Fuel Cell Performance.* Fall Meeting of the American Institute of Chemical Engineers, Salt Lake City, Utah, November 7, 2007.
   Awarded 2nd place in the Materials Science Division at Fall AIChE Meeting, Nov. 2007.

Presentations:

"*" denotes an invited presentation. Presenting authors are underlined.

1. Snyder, J., Kang, Y., Li, D., Strmcnik, D., Markovic, N., Stamenkovic, V., *Advanced Electrocatalysts for Fuel Cells*, Spring ECS Meeting, Orlando, FL, May 14, 2014.

2. Markovic, N., Stamenkovic, V., Snyder, J., *The Role of Well-Defined Surfaces in Electrocatalysis*, Spring ECS Meeting, Orlando, FL, May 13, 2014.

3. Snyder, J., Kang, Y., Li, D., Markovic, N., Stamenkovic, V., *Mesostructured Multimetallic Thin Films as Electrocatalysts for Fuel Cells*, Fall ECS Meeting, San Francisco, CA, October 30, 2013.

4. Snyder, J., Stamenkovic, V., Markovic N., *Structural and Compositional Control of Mesostructured Thin Film Electrocatalysts*, Fall ECS Meeting, San Francisco, CA, October 29, 2013.

5. Danilovic, N., Subbaraman, R., Chang, K.C., Chang, S., Kang, Y., Snyder, J., Pauikas, A.P., Strmcnik, D., Stamenkovic, V., Markovic, N., *Activity and Stability Trends for Oxygen Evolution Reaction Electrocatalysts*, Fall ECS Meeting, San Francisco, CA, October 29, 2013.

6. Snyder, J., Markovic, N., Stamenkovic, V., *Design and Synthesis of Advanced Electrocatalysts*, Fall ACS Meeting, Indianapolis, IN, September 10, 2013.

7. Snyder, J., Wang, C., Markovic, N., Stamenkovic, V., *Nanoscale Materials at Electrochemical Interfaces*, Plenary Talk, Fall ACS Meeting, Indianapolis, IN, September 08, 2013.

8. Li, X., McCue, I., Snyder, J., Erlebacher, J., Sieradzki, K., *Dealloying of Nanoparticles*, Fall ECS Meeting, Honolulu, HI, October 11, 2012.

9. *Erlebacher, J., Snyder, J., *Growth and Design of Nanoporous Nanoparticle Catalysts*, ACCGE-West Meeting, Fallen Leaf, CA, June 6, 2012.

10. *Snyder, J., *Nanoporous Metals as Electrocatalytic Materials*. Seminar, Argonne National Lab, Materials Science Division, March 05, 2012.

11. *Snyder, J., *Nanoporous Metals as Electrocatalytic Materials*. Interview Seminar, Drexel University, January 30, 2012.

12. *Snyder, J., *Nanoporous Metals as Electrocatalytic Materials*. Materials Science Seminar, Arizona State University, October 18, 2011.

13. Snyder, J., Erlebacher, J., *The Active Surface Area of Nanoporous Metals During Oxygen Reduction Reaction*. Fall ECS Meeting, Boston, MA, October 11, 2011.

14. Dong, B., Chen, H., Snyder, J., Elabd, YA., *Super Proton Conductive Nafion Nanofibers: Discovery, Fabrication, Properties, and Fuel Cell Performance*. Fall ECS Meeting, Boston, MA, October 11, 2011.

15. Snyder, J., Erlebacher, J. *Nanoporous Metals as Electrocatalytic Materials*. Thin Film and Crystal Growth Gordon Research Seminar, University of New England, July 16, 2011.

16. *Erlebacher, J., Snyder, J., *Evolution of Nanoporosity During Electrochemical Dealloying: Toward Applications in Energy Technologies*, 3M Corporation, June, 30 2011.

17. *Snyder, J., Erlebacher, J. *Nanoporous Metals as Electrocatalytic Materials*. ACCGE-West Meeting, Fallen Leaf, CA, June 6, 2010.

18. Snyder, J., Erlebacher, J. *Assessment of the Electrocatalytic Properties of Nanoporous Metals Formed by Dealloying*. Spring ECS Meeting, Vancouver, BC, April 25, 2010.

19. *Erlebacher, J., Snyder, J., *A Discussion of the Utility of Dealloyed Nanoporous Metals for Electrocatalysis*, Argonne National Laboratory, 2010.

20. Snyder, J., Erlebacher, J. *Nanoporous Ni-Pt Based Materials for the Oxygen Reduction Reaction*. Fall MRS Meeting, Boston, MA, November 30, 2009.

21. Snyder, J., Erlebacher, J. *Integration and Performance of Supportless Nanoporous Metal Membrane Electrodes into PEM Fuel Cells*. Fall MRS Meeting, Boston, MA, November 30, 2009.

22. Erlebacher, J., Snyder, J. *Activation Barrier for Terrace-limited Dissolution During Nanoporosity Evolution in Dealloying*. Fall MRS Meeting, Boston, MA, November 30, 2009.

23. Erlebacher, J., Snyder, J. *Dealloyed Nanoporous Metals for PEM Fuel Cell Catalysis*. Fall ECS Meeting, Vienna, Austria, October 6, 2009.

24. Snyder, J., Erlebacher, J. *Electrochemical Characterization of Nanoporous Gold Made by Dealloying Silver/Gold Alloys in Neutral Silver Nitrate Solution.* Fall ECS Meeting, Honolulu, Hawaii, October 12, 2008.

25. Erlebacher, J., Snyder, J. *Structure and Properties of Nanoporous Metals Made by Dealloying Ternary Alloys*. Fall Meeting of the Materials Research Society, Boston, MA, November 28, 2007.

26. Chen, H., Snyder, J., Elabd, Y. *Electrospinning Nafion Nanofibers*. Fall Meeting of the American Institute of Chemical Engineers, Salt Lake City, Utah, November 8, 2007.

27. Erlebacher, J., Snyder, J. *Dealloying of Silver/Gold/(Platinum) Alloys*. Fall Meeting of the Electrochemical Society, Washington D.C., October 11, 2007.

28. Schaeffer, H., Chen, H., Snyder, J.D., Rahmathullah, A.M., Palmese, G.R., and Elabd, Y.A. *Electrosensitive Permeability of Polymer-Polymer Nanocomposite Membranes*. Fall National Meeting of the American Chemical Society, Boston, MA, August 22, 2007.

29. *Snyder, J., Erlebacher, J. *Nanoporous Gold: Formation and Applications*. Electrochemistry Workshop, Univeristy of Virginia, July 13, 2007.

Patents:

1. J. Erlebacher, J. Snyder, JHU Provisional Patent Application C11258, "*A General Method to Improve the Performance of Proton Exchange Membrane Fuel Cells*", October 18, 2010.
2. J. Erlebacher, J. Snyder, JHU Provisional Patent Application C10988, "*Composite Nanoporous Catalysts for Fuel Cells*," January 29, 2010.
3. J. Erlebacher, J. Snyder, U.S. Patent Application Number Not Yet Assigned, "*Porous Metal Catalysts for Oxygen Reduction*," October 5, 2009.

Professional Affiliations

- Member
  - Electrochemical Society
  - Materials Research Society