Megan E. Witzke

Education

University of Illinois at Urbana-Champaign, *Urbana, Illinois*
Ph.D. Chemical and Biomolecular Engineering — Expected Dec. 2018
Advisor: David Flaherty
National Science Foundation Graduate Research Fellow
TechnipFMC Fellow

Case Western Reserve University, *Cleveland, Ohio*
Bachelor of Science, Chemical Engineering — May 2013

Research

University of Illinois at Urbana-Champaign, *Urbana, Illinois*
Graduate Researcher — August 2013-present

- Perform kinetic and mechanistic analysis of reaction networks involved in catalytic upgrading of biomass and heavy crude oils to high value chemicals
- Characterize catalyst properties *in situ* to identify active sites and design highly selective materials
- Develop combination of techniques and analytical tools to identify surface species and reactive intermediates using transient *operando* FTIR coupled with methods for singular value decomposition

Case Western Reserve University, *Cleveland, Ohio*
Undergraduate Researcher — June 2009-August 2013

- Studied electrochemical systems using a plasma-liquid interaction replacing a solid electrode with a microplasma cathode
- Collaborated with the University of Notre Dame and Université libre de Bruxelles
- Received Monroe J. Bahnsen Award for Distinguished Research, 2013

University of Botswana, *Gaborone, Botswana*
NSF-IRES Researcher — May-June 2012

- Researched sustainable energy options available in sub-Saharan Africa
- Surveyed energy needs and financial constraints in small villages outside of Gaborone

Teaching and Mentoring Experience

Small Group Instructor for Graduate Academy for Teaching Assistants — 2016-2018

- Train incoming graduate students in effective teaching strategies in engineering courses
- Lead discussions on importance of student involvement and inclusion, and student-teacher interaction

Teaching Assistant for 'Mass Transfer Operations' and 'Momentum and Heat Transfer' — 2015-2016

- Led guest lectures on conductive and convective heat transfer, diffusion coefficients, and flash distillation
- Reviewed lecture materials and problem sets in discussion sections and office hours
- Prepared and graded exam problems and problem sets
- Named to the *List of Teachers Ranked as Excellent by Their Students*, 2016

Illinois Scholars Undergraduate Research Mentor — 2014-2016

- Trained undergraduate researchers in lab safety protocols, presentation and technical writing skills
- Developed and managed undergraduate research projects

Skills and Techniques

- Design of high pressure plug flow reactor and *in situ* infrared cell
- Synthesis of supported metal and metal phosphide catalysts
- Transmission electron microscopy
- FTIR and ATR spectroscopy
- Mass spectrometry
- X-Ray diffraction
- *In situ* X-ray absorption spectroscopy
- Gas adsorption surface analysis
- Gas chromatography
- Temperature programmed reduction/desorption

Publications

1. M. Cordon, J. Harris, J. C. Vega-Vila, J. Bates, S. Kaur, M. Gupta, **M. Witzke**, E. Wegener, J. Miller, D. W. Flaherty, D. D. Hibbitts, R. Gounder, "The dominant role of entropy in stabilizing sugar isomerization transition states within hydrophobic zeolite pores," *J. Am. Chem. Soc.* (in review)
2. **M. Witzke**, A. Almithn, C. L. Coonrod, D. D. Hibbitts, and D. W. Flaherty, "Mechanisms and active sites for C-O bond rupture within 2-methyltetrahydrofuran over Ni, $Ni_{12}P_5$, and Ni_2P catalysts," *ACS Catalysis*, Vol. 8, 7141 (2018).
3. C. De Vos, J. Baneton, **M. Witzke**, J. Dille, S. Godet, M. Gordon, R. M. Sankaran, and F. Reniers, "A comparative study of the reduction of silver and gold salts in water by a cathodic microplasma electrode," *J. Phys. D: Appl. Phys*, Vol. 50, 105206 (2017).
4. **M. Witzke**, P. J. Dietrich, M. Ibrahim, K. Al-Bardan, M. Triezenberg, and D. W. Flaherty, "Spectroscopic evidence for origins of size and support effects on selectivity of Cu nanoparticle dehydrogenation catalysts," *Chem. Commun.*, Vol. 53, 597 (2017).
5. P. Rumbach, **M. Witzke**, R. M. Sankaran, and D. B. Go, "Decoupling interfacial reactions between plasmas and liquids: Charge transfer vs. plasma neutral reactions," *J. Am. Chem. Soc.*, Vol. 135, 16264 (2013).
6. **M. Witzke**, P. Rumbach, D. B. Go, and R. M. Sankaran, "Evidence for the electrolysis of water by atmospheric-pressure plasmas formed at the surface of aqueous solutions," *J. Phys. D: App. Phys.*, Vol. 45, 442001 (2012).
7. C. Richmonds, **M. Witzke**, B. Bartling, S. W. Lee, J. Wainright, C. C. Liu, and R. M. Sankaran, "Electron transfer reactions at the plasma-liquid interface," *J. Am. Chem. Soc.*, Vol. 133, 17582 (2011).

Oral Presentations

1. "Mechanistic and spectroscopic evidence for reactive intermediate structures during C-O bond rupture in small oxygenates on metal phosphide clusters," American Institute of Chemical Engineers, (*Minneapolis, Minnesota*) 2017
2. "Mechanistic and spectroscopic evidence for active site identity and reactive intermediate structures during hydrogenolysis of small oxygenates," North American Catalysis Society Meeting, (*Denver, Colorado*) 2017
3. "Mechanistic and spectroscopic evidence for active site identity and reactive intermediate structures during C-O bond rupture in small oxygenates," American Chemical Society, (*San Francisco, California*) 2017
4. "Factors that Control Selectivity between hindered and unhindered C-O bond rupture on Ni_xP clusters," Catalysis Club of Chicago Spring Symposium, (*Naperville, Illinois*) 2016
5. "Factors that control selectivity during hydrodeoxygenation on Ni_xP_y clusters," American Chemical Society, (*San Diego, California*) 2016
6. "Controlling ethanol dehydrogenation selectivity on Cu catalysts," American Institute of Chemical Engineers, (*Salt Lake City, Utah*) 2015
7. "Atmospheric plasma charge transfer reactions," American Vacuum Society International Symposium, (*Nashville, Tennessee*) 2011

Leadership and Outreach Experiences

Laboratory Manager, Flaherty Research Group 2015-present

- Manage lab member responsibilities and communication with facilities and services

Girls' Adventures in Mathematics, Engineering, and Science Camp 2014-2018

- Led hands on demonstration of nanoparticle synthesis with practical application for treating hazardous waste for high school aged girls

Society of Women Engineers 2009-2018

- Served as Logistics Coordinator and Director for the 2016 and 2017 weSTEM Conferences, respectively, a student developed conference for personal development for graduate students
- Selected as University of Illinois Engineering Council's *Society Member of the Month*, 2017

Honors

- Hanratty Travel Award, UIUC 2015 and 2017
- ACS Catalysis Science and Technology Division Travel Award 2016 and 2017
- AIChE Women's Initiative Committee Travel Award 2015
- Diebold Community Foundation Scholarship 2012