

Bethany J Klemetsrud

CURRICULUM VITAE

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EDUCATION

Ph.D. Chemical Engineering *December 2016*
Michigan Technological University
Dissertation: *Theoretical and Experimental Investigation of Sustainable Fast Pyrolysis Biofuels from Woody Biomass*
B.S. Chemical Engineering *May 2012*
University of Minnesota Duluth

TEACHING EXPERIENCE

Instructor in Chemical Engineering at University of North Dakota, Grand Forks, ND *August 2017-Present*

- Teach and develop courses and labs in the Department of Chemical Engineering
- Advise 15 undergraduate students
- Provide learning opportunities to the surrounding community through outreach opportunities

Post-Doctoral Researcher at the Sustainable Futures Institute at MTU, Houghton, MI *January 2017-August 2017*

- Mentor undergraduate students (2) in semester-long projects
- Develop life cycle way of thinking, interpretation of data, results and dissemination in presentations and reports
- Facilitate classes within the Sustainable Futures Institute
- Guest lecture for the director of the SFI when needed

GRA at MTU, Houghton, MI *Fall 2012 – Fall 2016*

- Mentor undergraduate students (7) in semester-long projects
 - common laboratory/analytical techniques, safety, planning experiments, interpretation of results, and dissemination in presentations and reports
- Mentor undergraduate enterprise group (6-8 students)
 - investigating alternative energy production with the use of pilot-scale (1kg/hr) fluidized bed pyrolysis reactor
- Assist visiting high-school teachers in developing learning modules/labs

RET PLACE Fellow at MTU, Houghton, MI *May 2016 – August 2017*

- Teach and instruct high school teachers (6) in a six week NSF RET project
 - develop a good understand of LCA and how to perform an LCA using openLCA software
- Mentor an individual high school teacher during the six week RET project on developing good scientific research skills, developing an individual research project
 - Conduct a LCA evaluating a process, product or system within the high school teacher's school district
 - Work one-on-one with the teacher developing lesson plans and performing their research project

- Implement bioenergy and life cycle assessment lesson plans in an 8th grade science course
 - Assess and receive feedback from middle school students to determine if learning objectives were met

GTA at MTU, Houghton, MI *Spring 2014*

- Assist in undergraduate senior design projects for 80 students
- Grade and assess all homework and exams for this capstone design course
- Design and plan review sessions, ensure availability outside of class to assist students in course material
- Work with the professor of the course to write exams and homework
- Update course grades and manage course content using Canvas

**ADDITIONAL
TEACHING
EXPERIENCE**

- **Chemical Engineering Summer Youth Program** *July 2015-2017*
- **Keweenaw Bay Ojibway Community College
Engineering Exploration Day** *June 2017*
- **Guest Presenter at Rapid River High School** *April 2017*
- **Girls and Engineering Exploration Day** *February 2017*

**RESEARCH
EXPERIENCE**

**Post-Doctoral Research at the Sustainable
Futures Institute, MTU, Houghton, MI** *January 2017 – Current*

- Participate and lead a group of interdisciplinary researchers from several countries in the Pan American Region to develop and assess the overall sustainability of biomass cultivation for future renewable energy use
- Work with Gas Technology Institute to evaluate new technologies being employed for future bioenergy development using life cycle assessment (LCA)
- Work with other graduate and undergraduate students to teach and develop skills necessary to perform a LCA

Ph.D. Research at MTU, Houghton, MI *2012 –2016*

- Propose novel chemical kinetic models for thermal degradation of biomass during pyrolysis
- Understand how biomass composition affects the quality of fast pyrolysis bio-oil using micro-pyrolysis
- Work with the School of Forest Resources and Environmental Science to procure biomass and prepare it for the use of thermochemical conversion
- Evaluate the use of municipal solid waste (MSW) as a feedstock for thermochemical conversion in cooperation with Idaho National Laboratory
- Implement the use of a pilot scale (1 kg/hr) fluidized bed pyrolysis reactor to evaluate the effect of composition at a larger scale.
- Assess and review the sustainability of biofuel platforms within the context of governmental policies across the Pan American region

Undergraduate Research at UMD, Duluth, MN *2010 –2012*

- Grow and maintain algal cultures
- Assess and understand the ability and limitations of using waste water as a growth medium for algae for the production of biodiesel

REU at Washington University, St. Louis, MO

Summer 2011

- Work at Chinese University Hong Kong and Shenzhen Institute of Technology to evaluate the performance and production of solar panels.
- Develop a research proposal for assessing the presence of fullerenes present in the atmosphere from the use of cigarettes with Dr. John Fortner.

PROFESSIONAL DEVELOPMENT

AGEP (Alliance for Graduate Education and the Professoriate)

Enrollment in Center for Teaching and Learning Courses and Seminars

Alice T. Clark Mentorship Program at the University of North Dakota

PEER-REVIEWED PUBLICATIONS

1. Winjobi, O., Tavakoli, H., **Klemetsrud, B.**, Handler, R., Marker, T., Roberts, M., & Shonnard, D. (2018). Carbon Footprint Analysis of Gasoline and Diesel from Forest Residues and Algae using Integrated Hydrolysis and Hydroconversion Plus Fischer–Tropsch (IH2 Plus cool GTL). *ACS Sustainable Chemistry & Engineering*, 6(8), 10766-10777.
2. Ukaew, S., Schoenborn, J., **Klemetsrud, B.**, & Shonnard, D. R. (2018). Effects of torrefaction temperature and acid pretreatment on the yield and quality of fast pyrolysis bio-oil from rice straw. *Journal of Analytical and Applied Pyrolysis*, 129, 112-122.
3. **Klemetsrud, B.**, Klinger, J., Ziv, E. B., & Shonnard, D. (2017). A kinetic study of the fast micro-pyrolysis of hybrid poplar. *Journal of Analytical and Applied Pyrolysis*, 128, 353-362.
4. **Klemetsrud, B.**, Eatherton, D. and Shonnard, D., (2017) Effects of Lignin Content and Temperature on the Properties of Hybrid Poplar Bio-Oil, Char, and Gas Obtained by Fast Pyrolysis. *Energy & Fuels*, 31(3), pp.2879-2886
5. **Klemetsrud, B.**, Ukaew, S., Shonnard, D., Thompson, V., Thompson, D., Klinger, J., Liu, L., Eatherton, D., Puengprasert, P., (2016) Characterization of Products from Fast Micro-Pyrolysis of Municipal Solid Waste (MSW), *ACS Sustainable Chemistry & Engineering*, 4(10), pp.5415-5423
6. Klinger, J., **Klemetsrud, B.**, Bar-Ziv, E. and Shonnard, D., (2014) Temperature dependence of aspen torrefaction kinetics. *Journal of Analytical and Applied Pyrolysis*, 110, pp.424-429.
7. Shonnard, D., **Klemetsrud, B.**, Sacramento-Rivero, J., Navarro-Pineda, F., Hilbert, J., Handler, R., Supper, N., Donovan, R., (2015). An Analysis of Environmental Life Cycle Assessments of Liquid Transportation Biofuels in the Pan American Region. *Environmental Management*, December 2015, Volume 56, [Issue 6](#), pp 1356–1376.

IN PREPARATION

1. Garcia, C., **Klemetsrud, B.**, Vazquez, C., Eastmond, A., Pishke, E., Knowlton, J., Mata, E., Aspects of Sustainable Production of Palm Oil in the Municipality of Teapa in Tabasco, Mexico: Evaluating the Current and Future Use of Palm Oil, in preparation.

PROFESSIONAL PRESENTATIONS

1. **Klemetsrud, B.**, Garcia, C., Vazquez, C., Eastmond, A., Pishke, E., Knowlton, J., Mata, E., Shonnard, DR., (2018). International Congress on Sustainability Science & Engineering, Cincinnati, OH “Aspects of Sustainable Production of Palm Oil in the Municipality of Teapa in Tabasco, Mexico: Evaluating the Current and Future Use of Palm Oil” Poster
2. **Klemetsrud, B.**, Klinger, J. Bar Ziv E, Shonnard, D., (2017) Annual Conference of the American Institute of Chemical Engineers, Minneapolis, MN “Kinetic Study of the Fast Micro-Pyrolysis of Hybrid Poplar”
3. **Klemetsrud, B.**, Garcia, C., Vazquez, C., Eastmond, A., Pishke, E., Knowlton, J., Mata, E., Shonnard, DR., (2017). Annual Conference of the American Institute of Chemical Engineers, Minneapolis, MN “Aspects of Sustainable Production of Palm Oil in the Municipality of Teapa in Tabasco, Mexico: Evaluating the Current and Future Use of Palm Oil” Poster
4. **Klemetsrud, B.**, Eatherton, D., Shonnard, D., (2016). Annual Conference of the American Institute of Chemical Engineers, San Francisco, CA. “The Effect of Temperature and Lignin Content of Hybrid Poplar on the Properties of Hybrid Poplar Bio-Oil, Char and Gas via Fast Pyrolysis”
5. **Klemetsrud, B.**, Klinger, J., Shonnard, D., (2016). Graduate Research Colloquium at Michigan Tech, Houghton, MI. “Effect of lignin content of hybrid poplar on the quality of fast pyrolysis bio-oil.”
6. **Klemetsrud, B.**, Klinger, J., Shonnard, D., (2016). Annual Conference of the American Institute of Chemical Engineers, Salt Lake City, UT. “Effect of lignin content of hybrid poplar on the quality of fast pyrolysis bio-oil.”
7. Thompson, V., Ray, A., Stevens, D., Daubaras, D., Hoover, A., Emerson, R., Ukaew, S., **Klemetsrud, B.**, Klinger, J., Eatherton, D., Shonnard, D., (2016). Annual Conference of the American Institute of Chemical Engineers, Salt Lake City, UT. “Assessment of Municipal Solid Waste for Biochemical and Thermochemical Conversion Pathways”
8. **Klemetsrud, B.**, Klinger, J., Steinhurst, A., Shonnard, D., Bar-Ziv, E. (2015). Graduate Research Colloquium at Michigan Tech, Houghton, MI. “Effect of Hybrid Poplar Lignin Content on Pyrolysis Bio-oil Properties.” Poster
9. Klinger, J., **Klemetsrud, B.**, Perelman, M., Bar-Ziv, E., Shonnard, D. (2014). Annual Conference of the American Institute of Chemical Engineers, Atlanta, GA. “Effects of Torrefaction Severity on the Product Distribution of Two-Stage Pyrolysis.”
10. **Klemetsrud, B.**, Klinger, J., Steinhurst, A., Shonnard, D., Bar-Ziv, E. (2014). Annual Conference of the American Institute of Chemical Engineers, Atlanta, GA. “Effect of Hybrid Poplar Lignin Content on Pyrolysis Bio-oil Properties.” Poster
11. **Klemetsrud, B.**, Klinger, J., Shonnard, D., Meldrum, J., Bregni, L., Pelloso, T., Peterson, Z., Seitter, R., Vickers, E. (2014). Annual Conference of the American Institute of Chemical Engineers, Atlanta, GA. “Use of a Pilot Scale Fluid Bed Pyrolysis Reactor in Undergraduate Engineering Education.” Poster
12. Klinger, J., **Klemetsrud, B.**, Bar-Ziv, E., Shonnard, D. (2014). Annual Chemical Engineering Research Forum at Michigan Tech, Houghton, MI. “Temperature Dependence of Aspen Torrefaction Reaction Kinetics.”
13. **Klemetsrud, B.**, Klinger, J., Bar-Ziv, E., Shonnard, D. (2014). Annual Chemical Engineering Research Forum at Michigan Tech, Houghton, MI. “Enhanced Pyrolysis Oil Properties Through Pretreatment of Aspen With Controlled Torrefaction.” Poster

14. **Klemetsrud, B**, Klinger, J., Bar-Ziv, E., Shonnard, D. (2014). Graduate Research Colloquium at Michigan Tech, Houghton, MI. “Enhanced Pyrolysis Oil Properties Through Pretreatment of Aspen With Controlled Torrefaction.” Poster
15. **Klemetsrud, B**, Klinger, J., Bar-Ziv, E., Shonnard, D. (2014). RCN Pan-American Biofuels & Bioenergy Sustainability Conference, Recife, Brazil. “Enhanced Pyrolysis Oil Properties Through Pretreatment of Aspen With Controlled Torrefaction.” Poster
16. Klinger, J., **Klemetsrud, B.**, Bar-Ziv, E., Shonnard, D. (2013). Annual Conference of the American Institute of Chemical Engineers, San Francisco, CA. “Temperature Dependence of Aspen Torrefaction Reaction Kinetics.”
17. Klinger, J., **Klemetsrud, B.**, Shonnard, D., Mayer, A. (2013). Sustainable Energy Pathways Grantees Conference, Washington D.C. “Sustainable Forest Based Biofuel Pathways to Hydrocarbon Transportations Fuels: Biomass Production, Torrefaction, Pyrolysis, Catalytic Upgrading and Combustion.” Poster
18. **Klemetsrud, B**, Klinger, J., Bar-Ziv, E., Shonnard, D. (2013). Annual Conference of the American Institute of Chemical Engineers, San Francisco, CA. “Enhanced Pyrolysis Oil Properties Through Pretreatment of Aspen With Controlled Torrefaction.” Poster

SERVICE

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| PowerON! Coordinator | <i>2017 – present</i> |
| Jodsaas Center Liaison | <i>2017 – present</i> |
| AISES Adviser | <i>2018 – present</i> |
| Diversity Council | <i>2016-2017</i> |
| Mentor for MiCUP project | <i>Summer 2017</i> |
| Husky FAN Food Pantry Volunteer | <i>Spring 2017</i> |
| Graduate Student Government | <i>2014 - 2016</i> |
| University Senate Liaison | <i>2014 - 2015</i> |
| Graduate Dean Search Committee | <i>2015 - 2016</i> |
| Tutor for the Center of Diversity and Inclusion | <i>2013 - 2015</i> |
| Work with MTU international families and students at the Canterbury House to create an inclusive community | <i>2013 - present</i> |

PROFESSIONAL SOCIETIES

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| American Institute of Chemical Engineers | <i>2008 – Current</i> |
| Omega Chi Epsilon | <i>2010 – Current</i> |
| Tau Beta Pi | <i>2010 – Current</i> |
| American Indians in Science and Engineering Society | <i>2018 – Current</i> |