

# Abigail S. Engelberth

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## PROFESSIONAL POSITIONS HELD

*Assistant Professor*, Purdue University, November 2011 to Present W. Lafayette, IN  
Joint appointment in Agricultural & Biological Engineering and Environmental & Ecological Engineering  
Group Leader in the Laboratory of Renewable Resources Engineering (LORRE)

*Postdoctoral Research Associate* University of Maine, September 2009 to October 2011 Orono, ME  
Department of Chemical & Biological Engineering and the Forest Bioproducts Research Institute  
*Major Project*: Develop an AspenPlus® model to compare three pathways for chemical upgrading of a  
hemi-cellulose rich extract into longer chain alcohols.

## EDUCATION

**Doctor of Philosophy** in Chemical Engineering. University of Arkansas 2009  
*Dissertation*: Pressurized hot water extraction of natural products, including silymarins from *Silybum marianum* and saponins from *Panax quinquefolium*, with subsequent separation using fast centrifugal partition chromatography and verification with high performance liquid chromatography  
Advisors: Dr. Ed Clausen, Chemical Engineering and Dr. D. Julie Carrier, Biological & Agricultural Engineering

**Master of Engineering** in Chemical Engineering. Iowa State University 2006  
*Research Project*: Extraction and verification of proteins in switchgrass

**Bachelor of Science** in Chemical Engineering. Iowa State University 2004

## PUBLICATIONS

1. Redcorn, R., **Engelberth, A.S.** Opportunities to Improve the Conversion of Food Waste to Lactate: Fine Tuning Secondary Factors. *Waste Management & Research*. 2017. 35(11): 1112-1120.
2. Zhang, X., Eren, N., Kreke, T. Mosier, N., **Engelberth, A.S.** Kilaz, G. IL Reactor Production of Concentrated Hydrochloride Catalyzed 5-(Chloromethyl) Furfural Production from Forage Chopped Corn Stover. *BioEnergy Research*. 2017. 10(4): 1018-1024..
3. Brace, E., **Engelberth, A.S.** Enhancing Silymarin Fractionation using the Conductor-like Screening Model for Real Solvents. *Journal of Chromatography A*. 2017. 1487: 187-193.
4. Zhang, H., Brace, E., **Engelberth, A.S.** Selection of a Non-Aqueous Two-Phase Solvent System for Fractionation of Xylo-oligosaccharide Prebiotics using the Conductor-Like Screening Model for Real Solvents. *Journal of Liquid Chromatography and Related Technologies*. 2016. 39(14): 666-673.
5. Aghazadeh, M., **Engelberth, A. S.** Techno-economic analysis for incorporating a liquid-liquid extraction system to remove acetic acid into a proposed commercial scale biorefinery. *Biotechnology Progress* 2016. 32(4): 971-977.
6. Aghazadeh, M., Ladisch, M. R., **Engelberth, A. S.** Acetic acid removal from corn stover hydrolysate using ethyl acetate and the impact on *Saccharomyces cerevisiae* bioethanol fermentation. *Biotechnology Progress* 2016. 32(4): 929-937.
7. RedCorn, R., **Engelberth, A.S.** Identifying conditions to optimize lactic acid production from food waste co-digested with primary sludge, *Biochemical Engineering Journal*, 2016. 105 (Part A): 205-213.
8. Ladisch, M.R., Ximenes, E., **Engelberth, A.S.**, Mosier, N.S. Biological Engineering and the Emerging Cellulose Ethanol Industry, *Chemical Engineering Progress* 2014. 10(11): 59-62.
9. Abbott, J.A.; Medina-Boliviari, F., Martin, E.M., **Engelberth, A.S.**, Villagarcia, H., Clausen, E.C., Carrier, D.J. Purification of resveratrol, arachidin-1 and arachidin-3 from hairy root cultures of peanut

(*Arachis hypogaea*) and determination of their antioxidant activity and cytotoxicity, *Biotechnology Progress*, 2010. 26(5): 1344-1351.

10. **Engelberth, A.S.**; Carrier, D.J.; Clausen, E.C. Ginseng saponins from *Panax notoginseng* root: a comparison of ultrasonic and pressurized hot water extraction techniques and subsequent separation with centrifugal partition chromatography, *Separation and Purification Technology* 2010. 72(1): 1-6.
11. Uppagalunda, N.; **Engelberth, A.S.**; Ravindranath, S.V.; Clausen, E.C.; Lay, J.O.; Gidden, J.; Carrier, D.J. Switchgrass water extracts: extraction, separation and biological activity of rutin and quercitrin. *Journal of Agricultural and Food Chemistry* 2009. 57(17): 7760-7770.
12. Duan, L.; Wallace, S.N.; **Engelberth, A.S.**; Lovelady, J.K.; Clausen, E.C.; King, J.W.; Carrier, D.J. Extraction of co-products from biomass: example of thermal degradation of silymarin compounds in subcritical water. *Applied Biochemistry and Biotechnology*. 2009. 158(1): 362-373
13. **Engelberth, A.S.**; Carrier, D.J.; Clausen, E.C. Separation of silymarins from milk thistle (*Silybum marianum L.*) extracted with pressurized hot water using fast centrifugal partition chromatography. *Journal of Liquid Chromatography & Related Technology*. 2008. 31(19): 3001-3011.

#### BOOK CHAPTERS

1. Ladisch, M., Ximenes, E., Mosier, N., **Engelberth, A.S.**, Solomon, K., Binkley, R. Bioprocess Engineering. Chapter 2 in *Industrial Microbiology*. Wiley. 2018.
2. **Engelberth, A.S.**, vanWalsum, G.P. Adding value to the integrated forest biorefinery with co-products from a hemicellulose-rich pre-pulping extract. Chapter 13 in *Biorefinery Co-Products: Phytochemicals, Primary Metabolites and Value-added Biomass Processing*. Wiley. March 2012.

#### FUNDING

##### *External Funding Secured (\$301,566)*

- A.S. Engelberth (PI), **\$994**. Grow Plastics. *Electrodialytic Removal of Lactic Acid from Pickle Juice*. (01/20/2017 – 06/30/2018)
- A.S. Engelberth (PI), **\$75,000**. Showalter Trust. *Biologically Mediated Concentration and Recovery Metals*. (08/01/2016 – 12/31/2017)
- A.S. Engelberth (PI) **\$50,922**. Indiana Soybean Alliance. *Exploration into the use of high oleic acid soybean oil to clean sour methane gas*. (08/01/2016-03/31/2018)
- A.S. Engelberth (Advisor) **\$132,000**. Environmental Protection Agency Science to Achieve Results Fellowship (STAR) for PhD student Raymond RedCorn (06/03/2016-05/31/2019)
- A.S. Engelberth (PI) **\$42,650**. Indiana Corn Marketing Council. *Recovery and Purification of Lutein and Zeaxanthin from DDGS* (08/01/2013 –07/31/2015)

##### *Internal Funding Secured (\$113,000)*

- A.S. Engelberth (PI), **\$4,000**. Purdue Office of International Programs. *Exploratory SAIL Grant; Biological Engineering Labs Abroad* (June 2017)
- A.S. Engelberth (PI), **\$62,000**. Purdue Doctoral Fellowship for graduate student Emma Brace (08/01/2014-07/31/2016)
- A.S. Engelberth (PI), **\$8,000**. Purdue Research Foundation; Summer Faculty Grant. *Effect of Real-Time Solvent Mixing on centrifugal partition chromatography separations* (05/19/2014-07/11/2014)
- A.S. Engelberth (PI), **\$39,000**. College of Agriculture ARP. *Solvent Selection for the Recovery of Acetic Acid Post-Hydrolysis to Decrease the Concentration of Inhibitory Products in Ethanol Production* (06/01/2014 –05/31/2016)

## AWARDS AND HONORS

- Department Nominee, *Exceptional Early Career Teaching Award*. Agricultural & Biological Engineering, College of Engineering, Purdue University. 2018.
- *Outstanding Contribution Award for Excellence in Refereeing*. Bioresources and Bioprocessing. 2016
- *Outstanding Mentor for Graduate Students*, Agricultural & Biological Engineering Graduate Student Association, College of Engineering, 2016
- Department of Agricultural & Biological Engineering *nominee* for Kohl’s Early Career Award, College of Agriculture, 2013, 2014
- *Nominated* for the ‘Mentor Me!’ Award from the Women in High Tech, October 2014
- *Selected as a Fellow* in the Teaching for Tomorrow program at Purdue University, AY 2014-2015
- *Selected as a participant* in the National Effective Teaching Institute in Atlanta, GA June 20-22, 2013
- *Travel Grant Recipient*, Women’s Initiatives Committee, AIChE Annual Meeting Salt Lake City, UT, November 2010
- *Outstanding Graduate Student Research Award*, Department of Chemical Engineering, University of Arkansas, April 2008
- *From Abstract to Contract Poster Competition Winner*, College of Engineering, University of Arkansas, March 2008
- Founder of *Arkansas Chemical Engineering Graduate Students (AChEGS)*, University of Arkansas, September 2006, Served as President Fall 2006 and Spring 2007

## GRADUATE STUDENTS

### *Current Graduate Students*

Raymond Red Corn, PhD (expected graduation ‘18)  
MS Conferred December 2014

Emma Brace, PhD (expected graduation ’19)  
MS Conferred August 2016

Samira Fatemi, PhD (expected graduation ’20)  
MS Conferred August 2017

### *Completed Graduate Students*

He Zhang, MS Conferred August 2014

Jinsha Li, MS Conferred August 2015

Mahdieh Aghazadeh, PhD Conferred May 2016

## UNDERGRADUATE STUDENT PROJECTS

- Charles Daniels, Project: *Enhancing the Resource Potential of Anaerobic Digestion*, Summer Undergraduate Research Fellowship (SURF) 2014
- Emma Barber, Project: *Effect Of Organic Acids and Sugars on Acetic Acid Recovery Using Liquid-Liquid Extraction*, SURF 2013
- Srishti Khurana, Project: *Method Development for Xylan Recovery using Centrifugal Partition Chromatography*, SURF 2012

## PROFESSIONAL MEMBERSHIPS

American Institute of Chemical Engineers (AIChE)  
Society of Biological Engineers (SBE)  
Society of Industrial Microbiology (SIMB)

## TEACHING EXPERIENCE (Purdue University)

<i>ABE 495: Industrial Microbial Biotechnology in Germany</i>	May 2018
<i>ABE 304: Bioprocess Engineering Laboratory</i>	Sp2013–Sp2018
<i>EEE 560: Environmental Impacts of Automotive Systems</i>	Fall 2017
<i>ABE 697: Graduate Professional Development Seminar</i>	2012 – 2017
<i>EEE 595/ABE 591: Bioproducts Engineering</i>	Fall 2016
<i>ABE 696: Graduate Seminar</i>	Sp2014, Sp2015
<i>ABE 590: CPC Nutraceutical Recovery</i>	F2014

<i>EEE 250: Environmental, Ecological, &amp; Engineering Systems</i>	F2012–2014
<i>EEE 290: Introduction to EEE Seminar Purdue University</i>	F2013, F2014
<i>EEE480: Environmental &amp; Ecological Engineering Senior Design</i>	F2013, S2014
<i>EEE 495: Modeling agro-ecosystems with STELLA software</i>	Sp2013
<i>ABE 680: Bioseparations and Bioprocess Engineering</i>	F2012

#### CONFERENCE PRESENTATIONS\*

- **M. Aghazadeh** and A.S. Engelberth. 2015. *Liquid-Liquid Extraction to Remove Saccharomyces cerevisiae Inhibitors: Incorporating with a Commercial Scale Biorefinery*. Presented at the AIChE Annual Meeting in Salt Lake City, UT. November 8-13, 2015.
- **M. Aghazadeh** and A.S. Engelberth. 2014. Techno-economic analysis for recovery of fermentation inhibitors: comparison of conventional bioseparation methods. Invited presentation at the 37<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals San Diego, CA in April 2015.
- **M. Aghazadeh** and **A.S. Engelberth**, 2014 *Solvent Selection for the Recovery of Fermentation Inhibitors; Comparison of Simulated and Laboratory Results for Liquid-Liquid Extraction*. Presented at the AIChE Annual Meeting in Atlanta, GA on November 20, 2014.
- **A.S. Engelberth**, 2014. *Selection of a Non-Aqueous Solvent System for the Separation of Hemicellulose-Based Sugars*. Invited presentation at the 8<sup>th</sup> International Conference on Countercurrent Chromatography in Uxbridge, UK on July 23, 2014.
- **N.S. Mosier**, and A.S. Engelberth, 2013. *Sustainability Metrics for Biofuel Production Process Design*. Presented at the AIChE Annual Meeting in San Francisco, CA on November 4, 2013.
- **A.S. Engelberth**, C. Wheeler and P. van Walsum. 2010. *Comparing Process Models and Economics for Three Scenarios to Upgrade Mixed Culture Fermentation Products to Alcohols*. Invited presentation at the 32<sup>nd</sup> Symposium on Biotechnology for Fuels and Chemicals in Clearwater Beach, FL on April 20, 2010.
- **A.S. Engelberth**, C. Wheeler and P. van Walsum. 2010. *Exploring three pathways to convert a hemicellulose rich pre-pulping extract into alcohols via the MixAlco™ process*. Presented at the AIChE Annual Meeting in Salt Lake City, UT on November 9, 2010.
  - **A.S. Engelberth**, E. Clausen and D.J. Carrier. 2007. *Separation of Milk Thistle Silymarins using Centrifugal Partition Chromatography*, Presented at the AIChE Annual Meeting in Salt Lake City, UT on November 5, 2007.

#### CONFERENCE PAPERS

- **M. Aghazadeh** and A.S. Engelberth. 2015. *Exploration into Liquid-Liquid Extraction Solvents to Remove Saccharomyces cerevisiae Inhibitors*. Presented at the AIChE Annual Meeting in Salt Lake City, UT. November 8-13, 2015.
- **A.S. Engelberth**, C. Wheeler and P. van Walsum. 2010. *Exploring three pathways to convert a hemicellulose rich pre-pulping extract into alcohols via the MixAlco™ process*. Presented at the AIChE Annual Meeting in Salt Lake City, UT. November 7-12, 2010.

#### INVITED SEMINARS

- **A. S. Engelberth**. 2017. *Understanding Resource Potential in Undervalued Process Streams*. Clemson University Chemical Engineering Graduate Seminar Series. Clemson, SC on October 5, 2017.
- **A.S. Engelberth**. 2017. *Recent Trends in Food Waste: Availability, Potential, and Environmental Impact of Resource Misuse*. International High-level Conference on Green Industrial Processes, Jieshou, China; August 2017.
- **A.S. Engelberth**, 2016. *Adding Value to the Bioeconomy: Separating One Product at a Time*. Center for Renewable Carbon, University of Tennessee, Knoxville, TN on October 17, 2016.
- **A.S. Engelberth**, 2013. *Adding Value to the Bioeconomy: One Product at a Time*. Chemical Engineering Graduate Seminar Series, University of Arkansas, Fayetteville, AR on October 23, 2013.

- **A.S. Engelberth** (2011, July 7) Two Sides of a Coin: An integrative approach for maximizing the economic feasibility of biomass utilization. Division of Environmental & Ecological Engineering at Purdue University, West Lafayette, IN.
- **A.S. Engelberth** (2011, June 21) Two Sides of a Coin: An integrative approach for maximizing the economic feasibility of biomass utilization. Department of Biological and Agricultural Engineering at North Carolina State University, Raleigh, NC.
- **A.S. Engelberth** (2011, February 24) Two Sides of a Coin: An integrative approach for maximizing the economic feasibility of biomass utilization. Department of Chemical and Biomolecular Engineering at Clemson University, Clemson, SC.

#### POSTER PRESENTATIONS

- **Engelberth, A.S.** 2017. ABE Graduate Student Recruitment: A Formal Affair? NACTA (North American Colleges and Teachers of Agriculture), West Lafayette, IN; June 2017
- **Red Corn, R.** and Engelberth, A.S. 2017. Quantifying glycogen in waste activated sludge from municipal wastewater treatment facilities. 39th Symposium on Biotechnology for Fuels and Chemicals, San Francisco, CA; May 2017
- **Brace, E.** and Engelberth A.S. 2017 Molecular modeling of high-oleic soybean oil as a universal solvent for extraction of hydrogen sulfide from natural gas, 39th Symposium on Biotechnology for Fuels and Chemicals, San Francisco, CA; May 2017
- **Fatemi, S.** and Engelberth A.S. 2017 Lignin as a bio-adsorbent for the removal of heavy metals from water, 39th Symposium on Biotechnology for Fuels and Chemicals, San Francisco, CA; May 2017
- **Brace, E.** and Engelberth A.S. 2016. Enhancing silymarin fractionation using the conductor-like screening model for real solvents, 9th International Conference on Countercurrent Chromatography, River Forest, IL; August 2016
- **Red Corn, R.** and Engelberth, A.S. 2016. Improved Optical Purity of Lactic Acid Through Mixed Microbial Fermentation. 38th Symposium on Biotechnology for Fuels and Chemicals, Baltimore, MD; April 2016
- Aghazadeh, M. and **Engelberth, A.S.** 2016. Acetic Acid Removal from Corn Stover Hydrolysate Using Ethyl Acetate and The Impact on *Saccharomyces cerevisiae* Bioethanol Fermentation. 38th Symposium on Biotechnology for Fuels and Chemicals, Baltimore, MD; April 2016
- **M. Aghazadeh** and A.S. Engelberth. 2014. Techno-economic analysis for recovery of fermentation inhibitors: comparison of conventional bioseparation methods. Presented at the 37<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals San Diego, CA in April 2015.
- **R. Red Corn** and A.S. Engelberth. 2015. Identifying conditions to optimize lactic acid production from food waste. Presented at the 37<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals San Diego, CA in April 2015.
- **J. Li** and A.S. Engelberth. 2014. Adding value to corn ethanol production; Quantification and recovery of Lutein and zeaxanthin from DDGS. Presented at the 36<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals in Clearwater Beach, FL in May 2014.
- **R. Red Corn** and A.S. Engelberth. 2014. Enhancing the Resource Potential of Anaerobic Digestion. Presented at the 36<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals in Clearwater Beach, FL in May 2014.
- **H. Zhang** and A.S. Engelberth. 2014. Using Molecular Structure of Predict Purification of Hemicellulose Polymers. Presented at the 36<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals in Clearwater Beach, FL in May 2014.
- **M. Aghazadeh** and A.S. Engelberth. 2014. Solvent selection for the recovery of acetic acid; Comparison of simulated and laboratory results for liquid-liquid extraction. Presented at the 36<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals in Clearwater Beach, FL in May 2014.

- M. Aghazadeh and **A.S. Engelberth**. 2013. Solvent Selection and Recovery for Liquid-Liquid Extraction of Acetic Acid and Water. Presented at the 35<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals in Portland, OR on April 29, 2013.
- **M. Aghazadeh** and A.S. Engelberth. 2013. Solvent Selection and Recovery for Liquid-Liquid Extraction of Acetic Acid and Water. Presented at the 2013 Annual Conference of the Institute for Biological Engineering in Raleigh, NC on March 9, 2013.
- **A.S. Engelberth**, C. Wheeler and P. van Walsum. 2010. *Comparing Process Models and Economics for Three Scenarios to Upgrade Mixed Culture Fermentation Products to Alcohols*. Presented at the 32<sup>nd</sup> Symposium on Biotechnology for Fuels and Chemicals in Clearwater Beach, FL on April 19, 2010.
- **A.S. Engelberth**, E. Clausen and D.J. Carrier. 2009. *Ultrasonic versus Pressurized Hot water extraction of ginseng saponins and purification with CPC*, Presented at the 31<sup>st</sup> Symposium on Biotechnology for Fuels and Chemicals in San Francisco, CA on May 4, 2009.
- **A.S. Engelberth**, E. Clausen and D.J. Carrier. 2008. *Purification of Ginsenoside Saponins using Centrifugal Partition Chromatography*, Presented at the 30<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals in New Orleans, LA on May 5, 2008.
- **A.S. Engelberth**, E. Clausen and D.J. Carrier. 2008. *Separation of Milk Thistle Silymarins using Centrifugal Partition Chromatography*. Presented at From Abstract to Contract Graduate Student Research Symposium in Fayetteville, AR in March of 2008.
- **A.S. Engelberth**, E. Clausen and D.J. Carrier. 2007. *Extraction of saponins from Albizia julibrissin using organic solvents*. Presented at American Society of Pharmacognosy Conference in Portland, ME in July of 2007.
- **A.S. Engelberth**, E. Clausen and D.J. Carrier. 2007. *Separation of Milk Thistle Silymarins using Centrifugal Partition Chromatography*. Presented at American Society of Pharmacognosy Conference in Portland, ME in July of 2007.
- **A.S. Engelberth**, E. Clausen and D.J. Carrier. 2007. *Extraction of saponins from Albizia julibrissin using organic solvents*. Presented at the Institute of Biological Engineers Conference in St. Louis, MO in March of 2007.

\* Bold denotes presenter

#### PROFESSIONAL DEVELOPMENT ACTIVITIES

- Poster chair and organizer for the student poster competition at the *4th Symposium on Biotechnology for Fuels and Chemicals*, Clearwater Beach, FL, April 29-May 2, 2018
- Poster chair and organizer for the student poster competition at the *39th Symposium on Biotechnology for Fuels and Chemicals*, San Francisco, CA, May 1-4, 2017
- Session co-chair for ‘Renewable Fuels, Chemicals, and Bio-based Products: Bulk Chemicals and Co-Products’ at the *38<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals*, Baltimore, MD, April 25-28, 2016
- Session co-chair for ‘Extractions in Bioprocessing’ at the AIChE Annual Meeting in Salt Lake City, UT, November 8-13, 2015
- Session co-chair for ‘Renewable Fuels, Chemicals, and Bio-based Products: Bulk Chemicals and Co-Products’ at the *37<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals*, San Diego, CA in April 2015
- Session co-chair for ‘Extractions in Bioprocessing’ at the AIChE Annual Meeting in Atlanta, GA, November 16-21, 2014
- Poster session chair at the *36<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals*, Clearwater Beach, FL in May 2014
- Participated in the Big 10 Women’s Mentoring and Networking Workshop in Milwaukee, Wisconsin April 4-5, 2013
- Participated in the Engaged Interdisciplinary Learning in Sustainability workshop sponsored by the Sustainable Engineering and Ecological Design consortium at the University of California, Santa Cruz in Santa Cruz, CA June 25-28, 2012

- Served as a poster session chair at the 34<sup>th</sup> *Symposium on Biotechnology for Fuels and Chemicals*, New Orleans, LA, May 2012
- Selected to serve as an Editorial Board member for the *Journal of Environmental Engineering and Ecological Science*, December 2011-present
- Selected to participate in the *2011 Advance Future Faculty Workshop in Engineering Mechanics* Northeastern University in Boston, MA. June 1, 2011.
- Selected to attend the *EU-US International Exchange Program in Biorenewables* through Iowa State University hosted at the National Polytechnic Institute of Toulouse in Toulouse, France in April 2005.

#### REVIEW ACTIVITY

- Served on NSF review panels (2012, 2013, 2014, 2015, 2016, 2017)
- Served on USDA review panels (2013, 2014)
- Served as reviewer for the following publications
  - Bioresource Technology
  - BioEnergy Research
  - Energy and Environmental Science
  - Journal of Chromatography A
  - Industrial & Engineering Chemistry Research
  - Separation Science & Technology
  - Journal of Environmental Engineering & Ecological Science
  - Environmental Science & Technology
  - ACS Sustainable Chemistry & Engineering
  - Bioresources and Bioprocessing