

Mahdi Malmali

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421 Washington Ave. SE, RM#151, Minneapolis MN 55455

EDUCATION

Chemical Engineering, Ph.D.

University of Arkansas, Fayetteville,
Arkansas

Advisor: Prof. Ranil Wickramasinghe

September 2011 – March 2014

GPA: 3.86

Thesis: Concentration and Separation of Sugar Streams in Biofuel Using Membranes

Chemical Engineering, M.S.

Sharif University of Technology, Tehran
Iran

Advisor: Prof. Asghar Dehkordi

September 2007 – June 2010

GPA: 3.92

Thesis: Dehydration of THF Using Zeolites Molecular Sieves

Petrochemical Engineering, B.S.

Razi University, Kermanshah, Iran

September 2003 – September 2007

GPA: 3.71

Advisor: Prof. G. Reza Moradi

Thesis: Biodiesel as an Alternative Fuel

RESEARCH INTEREST

Novel Reaction and Separation Processes for Sustainability and Energy Storage

RESEARCH EXPERIENCE

Postdoctoral Associate

February 2015-present

University of Minnesota, Minneapolis, MN (**ranked 3rd in Chemical Engineering in the US**)

Supervisor: Prof. Ed Cussler (Cussler@umn.edu), Prof. Alon McCormick (McCormick@umn.edu)

Funding: Minnesota's Discovery, Research, and Innovation Economy (MnDRIVE)

Legislative-Citizen Commission on Minnesota Resources (LCCMR)

Ammonia from entirely sustainable sources, as a fertilizer or carbon-free liquid energy

- Optimized reaction to synthesize ammonia at reduced pressure
- Increased conversion of Haber process from 20% to 95%
- Ammonia absorption on alkaline earth halides
- Troubleshoot ammonia pilot plant

Postdoctoral Fellow

August 2014 – December 2014

MAST Center at the University of Arkansas, Fayetteville, AR

Funding: National Science Foundation Industry/University Cooperative Research Center

Supervisor: Prof. Ranil Wickramasinghe (swickram@uark.edu)

Integrated membrane distillation crystallization for high TDS water

- Established direct contact membrane distillation experimental apparatus
- Tested industrially available membranes membrane distillation
- Estimated membrane flux using structural characteristics

Recovery of Fat, Oil and Grease from Poultry Processing Wastewater

- Determined operating conditions
- Studied fouling during ultrafiltration

Research Assistant

September 2011 – April 2014

University of Arkansas, Fayetteville, AR in collaboration with National Renewable Energy Laboratory

Funding: Department of Energy

Supervisor: Prof. Ranil Wickramasinghe (swickram@uark.edu)

Membrane concentration and separation of sugar streams in biofuel

- UV-grafting and polyelectrolyte for surface modification
- Concentrated sugar using nanofiltration and reverse osmosis
- Investigated continuous enzymatic hydrolysis in a submerged membrane reactor

Research Assistant

September 2007 – June 2011

Sharif University of Technology, Tehran, Iran

Dehydration of THF using A-type zeolites

- Measured the kinetics, isotherm and fixed bed adsorption of a new zeolite of organic solvent dehydration
- Simulated adsorption process

PROFESSIONAL EXPERIENCE

Research Scientist

January 2010 – August 2011

Sharif University of Technology - Advanced Materials Industrial Development Co. Tehran, Iran

Continuous production of barium sulfate nanoparticles in a novel spinning disk reactor

- Conducted scale-up studies for a novel spinning disk reactor
- Delivered feasibility study of a 5 tons per year production plant

TEACHING AND MENTORING EXPERIENCE

Teaching

University of Arkansas, Chemical Engineering Department

1. Guest Lecturer

CHEG 5013 - Membrane Separation and Systems Design September 2014 – December 2014

- Designed and presented lecture on “Novel Membranes-based Separation”
- Designed and graded the assessment regarding my section

2. Guest Lecturer and Teaching Assistant

CHEG 3333 - Chemical Engineering Reactions January 2012 – April 2014

- Designed and presented the lectures when the instructor was away (1 semester)
- Prepared the lecture notes and homework assignments (3 semesters)
- Office hours and drill (3 semesters)

Mentoring

University of Arkansas, Chemical Engineering Department

1. Graduate Mentor

Kamyar Sardari (Graduate Student) December 2014 – January 2015

- Membrane distillation for high TDS produced water

Rafael Garcia Candido (Graduate Student) October 2013 – April 2014
- Sugarcane bagasse detoxification with cellulose acetate NF membranes

University of Minnesota, Undergraduate Research Opportunities Program

2. Undergraduate Mentor

Joshua Prince (Freshman) September 2015 – Present
- Catalytic Ammonia Production in Optimized Pressure and Temperature
Garret Johnson (Senior) March 2016 – August 2016
- Summer Project: Simulating Fixed-bed Absorber
Michael Ho (Junior) April 2016 – August 2016
- Summer Project: Mixed Metal Chlorides for Ammonia Separation
Collin Smith (Senior) April 2016-Present
- Summer Project: Ammonia Desorption with Temperature and Pressure Swing

University of Arkansas, Chemical Engineering Department

3. Undergraduate Mentor

James Cummings (Junior, Senior) March 2012 - August 2013
- Continuous enzymatic hydrolysis of biomass in a submerged membrane reactor

4. High School mentor, Upward Bound Program

Hayden Barnes (high school) May 2014 – July 2014
- Familiarity with surface modification methods for membranes

PUBLICATIONS AND PRESENTATIONS

- **M. Malmali**, A.V. McCormick, E.L. Cussler; Viability of Low-Pressure Ammonia Synthesis, *Science*, (2016), Submitted.
- **M. Malmali**, A.V. McCormick, E.L. Cussler; Low-Pressure Ammonia Synthesis from Stranded Energy, *US Patent*, Pending (2016).
- **M. Malmali**, P. Fyfe, D. Lincicome, K. Sardari, R. Wickramasinghe; Selecting membranes for treating hydraulic fracturing produced waters by membrane distillation, *Separation Science and Technology* (2016), Submitted.
- **M. Malmali**, A. McCormick, E. Cussler; Ammonia synthesis at reduced pressure via reactive separation, *Industrial & Engineering Chemistry Research* 55 (2016), 8922–8932.
- **M. Malmali (corresponding author)**, R. Wickramasinghe; sugar fractionation using surface-modified nanofiltration membranes, *Sep. Purif. Technol.* 166 (2016) 187-195.
- M. Reese, C. Marquart, **M. Malmali**, K. Wagner, E. Buchanan, A. McCormick, E. Cussler; performance of a small scale haber process, *Industrial & Engineering Chemistry Research* 55 (2016) 3742-3750.
- **M. Malmali**, R. Wickramasinghe; Continuous hydrolysis of lignocellulosic biomass via integrated membrane processes in *Integrated Membrane Systems*, Eds: A. Basile, C. Charcosset, John Wiley & Sons, (2016) 61-78 [highlighted on the cover]
- X. Qian, **M. Malmali**, R. Wickramasinghe; Membranes for the removal of fermentation inhibitors from biofuel production in *Membrane Technologies for Biorefining*. Eds: A. Figoli, A. Cassano, A. Basile, Elsevier publications, (2016) 221-242
- **M. Malmali**, J. Stickel, R. Wickramasinghe; Investigation of a submerged membrane reactor for continuous biomass hydrolysis, *Food and Bioprod. Process.* 75 (2015) 345-354
- **M. Malmali**, J. Stickel, R. Wickramasinghe; Sugar concentration and detoxification of clarified biomass hydrolysate by nanofiltration, *Sep. and Purif. Technol.*, 132 (2014) 655-665

In preparation:

- **M. Malmali**, R. Wickramasinghe; Recovery of fat, oil and grease from poultry processing wastewater using ultrafiltration and microfiltration membranes, *in preparation*.

- **M. Malmali**, P. Fyfe, D. Lincicome, R. Wickramasinghe; Treatment of high-TDS produced water using membrane distillation – effect of membrane’s structural parameters, *in preparation*

Selected Presentations:

- **M. Malmali**, A. McCormick, E. Cussler; Viability of Low Pressure Ammonia Synthesis via Reactive Separation, **the 2016 Annual AIChE Meeting**, San Francisco, CA, US, November 2016.
- **M. Malmali**, M. Reese, C. Marquart, E. Buchanan, K. Wagner, A. McCormick, E. Cussler; Small-Scale Distributed Ammonia Produced: Analysis of Pilot Plant Runs and Routes to Improve the Economics of Scale, **2016 Annual AIChE Meeting**, San Francisco, CA, US, November 2016.
- **M. Malmali**, M. Reese, A. McCormick, E. Cussler; Small-Scale Low Pressure Ammonia Synthesis, **2016 NH3 Fuel Conference**, Los Angeles, CA, US, September 2016.
- **M. Malmali**, K. Wagner, M. Reese, E. Cussler, A. McCormick; Understanding Design Project Ideas in sustainability: Rethinking Ammonia Synthesis, **123rd American Society of Engineering Education Conference**, New Orleans, LA, US, June 2016.
- **M. Malmali**, K. Wagner, E. Cussler; Novel Reaction-Separation Process for Sustainable Small-scale Ammonia Manufacturing, **IPrime 2016 Annual Meeting**, Minneapolis, MN, US, June 2016.
- R. Wickramasinghe, **M. Malmali**; Effect of Membrane Structure on Membranes Performance during Membrane Distillation, **2015 International Chemical Congress of Pacific Basin Societies**, December Honolulu, HI, US, December 2015.
- R. Wickramasinghe, **M. Malmali**; Continuous Enzymatic Hydrolysis of Biomass in a Membrane Reactor, **2015 International Chemical Congress of Pacific Basin Societies**, December, Honolulu, HI, US, December 2015.
- **M. Malmali**, K. Wagner, A. McCormick, E. Cussler; Enhanced Ammonia Production with Combined Reaction-Separation: Kinetics of Reaction and Adsorption, **2015 Annual AIChE Meeting**, Salt Lake City, UT, US, November 2015.
- **M. Malmali**, R. Wickramasinghe; Effect of Membrane Structure on Membranes Performance during Membrane Distillation, **2015 Annual AIChE Meeting**, Salt Lake City, UT, US, November 2015.
- R. Wickramasinghe, **M. Malmali**; Treating Poultry Processing Wastewaters by Ultrafiltration, **The 8th Sino-US Joint Conference of Chemical Engineering**, Shanghai, China, October 2015.
- R. Wickramasinghe, **M. Malmali**, K. Sardari; Effect of Membrane Structure on Membrane Performance during Membrane Distillation, **The 8th Sino-US Joint Conference of Chemical Engineering**, Shanghai, China, October 2015.
- R. Wickramasinghe, J. Stickel, X. Qian, **M. Malmali**; Continuous enzymatic hydrolysis of biomass in a membrane reactor, **37th Symposium on Biotechnology for Fuels and Chemicals**, San Diego, CA, US, April 2015.
- **M. Malmali**, R. Wickramasinghe; Membrane-based separation Processes for TDS in Oil&Gas produced water, **Membrane Science, Engineering and Technology Meeting**, boulder, CO/ Fayetteville, AR/ Newark, NJ, US, October 2013, April 2014, October 2014, April 2015.
- **M. Malmali**, J. Stickel, R. Wickramasinghe; Modified Ultrafiltration Membranes for Fractionation of Sugars, **2014 Annual AIChE Meeting**, Atlanta, GA, US, November 2014.
- **M. Malmali**, J. Stickel, R. Wickramasinghe; Continuous Enzymatic Hydrolysis of Biomass in a Membrane Reactor, **2014 North American Membrane Society Meeting**, Houston, TX, US, June 2014.
- **M. Malmali**, J. Stickel, R. Wickramasinghe; Continuous Enzymatic Hydrolysis of Biomass in a Membrane-Assisted Reactor, **2013 Annual AIChE Meeting**, San Francisco, CA, US, November 2013.
- **M. Malmali**, J. Stickel, R. Wickramasinghe; Sugar Concentration for Continuous Enzymatic Saccharification Using Nanofiltration and Reverse Osmosis Membranes, **2012 Annual AIChE Meeting**, Pittsburgh, PA, US, November 2012.

RELATED EXPERIENCE AND OUTREACH

AIChE 2014 “Advanced Membrane Separations for Sustainability” Session Co-chair

AIChE 2013 Session Proctor

AIChE 2013 Electronic Poster Presentation Kiosk Chair

Habitats for Humanity – 2015 Climate change - how chemical engineers can help to mitigate the impacts?

Mentor for **Upward Bound program** – Class of 2014

GRANT WRITING EXPERIENCE

ARPA-E DE-FOA-0001562: “Renewable Energy to Fuels through Utilization of Energy-Dense Liquids” (RRFUEL) - \$ 4.4 million (in the negotiation stage)

National Science Foundation Industry/University Coop Research Centers: “Membrane Distillation for Treatment of High-TDS Hydraulic Fracturing Wastewater” and “Removal of FOG from Poultry Processing Wastewater” – each \$ 50K (founded)

HONORS AND AWARDS

Ross E. Martin Chair of Emerging Technologies Scholarship, 2014, Fayetteville, AR

Elias Klein Founders' award, NAMS meeting 2014, Houston, TX

Total **\$3000** University of Arkansas travel grant: 2012, 2013 and 2014

Ranked **15th** among more than 5000 participants in Iranian Nationwide graduate entrance exam

National Iranian Petrochemical Company grant awarded for M.S. Project

MEMBERSHIP

American Institute of Chemical Engineering (2012 – present)

North American Membrane Society (2014 – present)

American Society for Engineering Education (2016 – present)

NH₃ Fuel Association (2016 – Present)

SELECTED WORKSHOPS

- **Preparing Future Faculty**, Center for Educational Innovation, 2015
- Teaching with Intention: Facilitating Challenging Classroom Conversations
- An Introduction to Team-Based Idea Generation
- Strategies for Assisting Multilingual Writers: TWW Workshop
- Grant funding for new researchers
- Gamification with Moodle
- Creating Discussions that Work

REVIEWER

AIChE Journal

Desalination

Separation Science and Technology

Bioprocess and Biosystems Engineering

Journal of Environmental Science

REFERENCES

Ed Cussler, PhD
IT Distinguished Professor
Chemical Engineering and Material Science Department
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