



2021 Data: **CBE FACULTY ACTIVITY REPORTS**

January 1, 2021 – December 31, 2022

CONTENTS PER FACULTY MEMBER

- National Awards and Honors Summary / National Media
- National Committee Appointments / Activity
- Publications / Patents
- Grants
- Named and Invited Lectures

FACULTY ACTIVITY REPORTS

1. Aravind Asthagiri p. 2
 2. Bhavik Bakshi p. 3-6
 3. Nicholas Brunelli p. 7-9
 4. Jeffery J. Chalmers p. 10
 5. John Clay p. 11
 6. Stuart Cooper p. 12
 7. Ilham El-Monier p. 13
 8. Liang-Shih Fan p. 14-18
 9. Lisa Hall p. 19-21
 10. Winston Ho p. 22-30
 11. Li-Chiang Lin p. 31-33
 12. Andrew Maxson p. 34
 13. Umit S. Ozkan p. 35-37
 14. Andre Palmer p. 38-40
 15. Joel Paulson p. 41-43
 16. James F. Rathman p. 44-45
 17. Eduardo Reategui p. 46-48
 18. Katelyn Swindle-Reilly, p. 49-51
 19. William Wang p. 52-57
 20. Xiaoxue Wang p. 54
 21. Jessica Winter p. 55-57
 22. David Wood p. 58-59
 23. Barbara Wyslouzil p. 60-61
 24. Shang-Tian Yang p. 62-65
-



Aravind Asthagiri

Associate Professor

Ph.D. Carnegie Mellon University

Catalysis and surface chemistry with a computation and modeling approach

NATIONAL ACTIVITY

Professional Activities

- Organized a symposium “Bridging Surface Science and Catalysis” for Spring 2022.

PUBLICATIONS, SOFTWARE

Books and Chapters

- Currently editing the 2nd edition of “Computational Catalysis” with Mike Janik, Penn State University. Expected publication in 2022.

Refereed Papers

- R. Martin, C.J. Lee, V. Mehar, M. Kim, A. Asthagiri, J.F. Weaver, “Catalytic Oxidation of Methane on IrO₂(110) Films Investigated using Ambient Pressure X-ray Photoelectron Spectroscopy”, *ACS Catalysis*, (in press).
- R. Martin, M. Kim, C.J. Lee, V. Mehar, S. Albertin, U. Hejral, L.R. Merte, A. Asthagiri, J.F. Weaver, “Isothermal Reduction of IrO₂(110) Films by Methane Investigated using In Situ X-ray Photoelectron Spectroscopy”, *ACS Catalysis*, **11** 5004 (2021).
- H. Shang, M. Kim, S.K. Wallentine, D. Kim, D.M. Hofmann, R. Dasgupta, C.J. Murphy, A. Asthagiri, and L. R. Baker, “Ensemble Effects in Cu/Au Ultrasmall Nanoparticles Control the Branching Point for C1 Selectivity During CO₂ Electroreduction”, *Chemical Science*, **12** 9146 (2021).
- S.M. Mueller, D. Kim, S.R. McMillan, S.J. Tjung, J.J. Repicky, S. Gant, E. Lang, F. Bergmann, K.Werner, E. Chowdhury, A. Asthagiri, M.E. Flatte, and J.A. Gupta, “Tunable tunnel barriers in a semiconductor via ionization of individual atoms”, *J. Phys. Cond. Matter B*, **33** 275002 (2021).
- R. Martin, M. Kim, A. Asthagiri, J.F. Weaver, “Alkane Activation and Oxidation on Late Transition-Metal Oxides: Challenges and Opportunities”, *ACS Catalysis*, **11** 4682 (2021).

GRANT SUPPORT

- Alkane Oxidation on Clean and Halogen-Substituted IrO₂(110) Surfaces (PI: Jason Weaver, co-PI: Aravind Asthagiri), DOE-BES 9/1/2021-8/31/2024, \$650,000
- Fundamental Studies of the Multifunctional Electrocatalysis on on Heteratom-doped Carbon (CN_x) Catalysts (PI: Umit Ozkan, co-PIs: Aravind Asthagiri, co-PI: Anne Co), DOE-BES, 8/15/2020-8/14/2022, \$470,000
- SUSCHEM: Surface science studies of the photo physics of copper oxides: toward sustainable CO₂ recycling (PI: Jay Gupta, co-PI Aravind Asthagiri) NSF Chemistry, 8/1/2018-7/30/2022, \$465,000

LECTURES

Keynotes “Low Temperature Selective Alkane Conversion on IrO₂(110)”, Keynote talk at AVS 67th Virtual Symposium, Oct 13th 2021.



Bhavik Bakshi

Professor

Richard M. Morrow Endowed Chair

Ph.D. Massachusetts Institute of Technology

Sustainability science and process systems engineering

UNIVERSITY ACTIVITY

Awards and Honors

- *Clara M. and Peter L. Scott Faculty Award for Excellence in Engineering Education*, 2021. College of Engineering, The Ohio State University

NATIONAL ACTIVITY

National Committee and Conference Service

- Transatlantic civil society dialogues with key policy stakeholders, TRACK-STAR, Collaboration platform between EU and US civil society organizations, Member of working group on “Circular Economy and Biodiversity”, May 2021 – present

Editorial Boards

- International Journal of Sustainable Engineering, January 2021 - present
- ACS Sustainable Chemistry and Engineering, January 2021 - present

Guest Editorships

- ACS Sustainable Chemistry and Engineering, special issue on “Circular Economy of Plastics”, 2021
- Computers and Chemical Engineering special issue in honor of Prof. George Stephanopoulos, guest editor, 2021
- Renewable and Sustainable Energy Reviews virtual special issue on “Advanced Life-Cycle Modeling of Energy and Agroecosystems”, guest editor, 2021

Other Professional Activities

- Chair, Poster session, Computing and Systems Technology division, Area 10A, Process Design, AIChE, 2021
- Chair, 2021-22, Area 10A, Process Design, Computing and Systems Technology division, AIChE.



PUBLICATIONS, SOFTWARE

Refereed Papers

1. C. S. Adjiman, N. V. Sahinidis, D. G. Vlachos, B. Bakshi, C. T. Maravelias, and C. Georgakis. "Process Systems Engineering Perspective on the Design of Materials and Molecules". *Industrial & Engineering Chemistry Research* (Mar. 2021).
2. Y. M. Aleissa and B. R. Bakshi. "Constructed Wetlands as Unit Operations in Chemical Process Design: Benefits and Simulation". *Computers and Chemical Engineering* 153 (Oct. 2021), p. 107454.
3. B. R. Bakshi, D. Shonnard, and D. T. Allen. "ACS Sustainable Chemistry & Engineering Invites Contributions to a Virtual Special Issue on The Circular Economy of Plastics". *ACS Sustainable Chemistry & Engineering* 9.4 (Feb. 2021), pp. 1425–1426.
4. K. D. Boutin, W. J. Mitsch, E. Everham, B. R. Bakshi, and L. Zhang. "An evaluation of corn production within a Wetlaculture TM system at Buckeye Lake, Ohio". *Ecological Engineering* 171 (Nov. 2021), p. 106366.
5. M. Charles and B. R. Bakshi. "Designing Industrial Landscapes for Mitigating Air Pollution with Spatially-Explicit Techno-Ecological Synergy". *AIChE Journal* 67.10 (June 2021).
6. U. Diwekar et al. "A perspective on the role of uncertainty in sustainability science and engineering". *Resources, Conservation and Recycling* 164 (Jan. 2021), p. 105140.
7. T. Ghosh, H. C. Kim, R. D. Kleine, T. J. Wallington, and B. R. Bakshi. "Life Cycle Energy and Climate Change Implications of Carbon Fiber Reinforced Polymers in Automotive Components: Front Subframe Case Study". *Sustainable Materials and Technology* 28 (July 2021), e00263.
8. J. Hu, X. Gu, L.-C. Lin, and B. R. Bakshi. "Toward Sustainable Metal-Organic Frameworks for Post-Combustion Carbon Capture by Life Cycle Assessment and Molecular Simulation". *ACS Sustainable Chemistry and Engineering* 9.36 (Sept. 2021), pp. 12132–12141.
9. K. Lee, S. Khanal, and B. R. Bakshi. "Techno-Ecologically Synergistic Food-Energy-Water Systems Meet Human and Ecosystem Needs". *Energy and Environmental Science* 14.7 (2021), pp. 3700–3716.
10. S. L. Shah, B. R. Bakshi, J. Liu, and C. Georgakis. "Meeting the Challenge of Water Sustainability: The Role of Process Systems Engineering". *AIChE Journal* 67.2 (2021), e17113.
11. U. Shah and B. R. Bakshi. "Toward Nature-Positive Manufacturing by Adapting Industrial Processes to Pollution Uptake by Vegetation". *ACS Sustainable Chemistry and Engineering* 9.49 (Dec. 2021), pp. 16709–16718.
12. V. Thakker and B. R. Bakshi. "Toward Sustainable Circular Economies: A Computational Framework for Assessment and Design". *Journal of Cleaner Production* 295 (2021), p. 126353.
13. V. Thakker and B. R. Bakshi. "Designing Value-chains of Plastic and Paper Carrier Bags for a Sustainable and Circular Economy". *ACS Sustainable Chemistry and Engineering* 9.49 (Nov. 2021), pp. 16687–16698.
14. T. Yazbeck, G. Bohrer, C. Vines, F. De Roo, M. Mauder, and B. Bakshi. "Effects of spatial heterogeneity of leaf density and crown spacing of canopy patches on dry deposition rates". *Agricultural and Forest Meteorology* 306 (2021), p. 108440.

GRANT SUPPORT



1. INFEWS/T1: Impacts of deglobalization on the sustainability of regional food, energy, water systems, National Science Foundation, \$ 2,400,000, PI: Elena Irwin, co-PIs and SP: Bakshi, Bielicki, Martin, Jackson-Smith, Wilson, 2018-2022
2. Including ecosystems in process design and life cycle assessment for environmental sustainability and innovation, National Science Foundation, PI: Bakshi, \$ 360,000, 2018-2022
3. Circular Economy of Plastics, Global Kaiteki Center at Arizona State University, PI: Bakshi, \$135,000, 2019-2022
4. NSF 2026: Convergence around a sustainable world without waste, National Science Foundation, PI: Bakshi, Co-PIs Bilec (Pitt), Irwin (OSU), Isenhour (Maine), Gutowski (MIT), Sekulic (Kentucky), Theis (UIC), Thomas (Georgia Tech), \$ 100,000, 2020-2022
5. NSF 2026:EAGER: Spatio-Temporal Design of Techno-Ecological Synergies for a World without Waste and Resilient Landscapes, National Science Foundation, PI: Bakshi, Co-PIs: Paulson, Bohrer, \$ 299,954, 2021-22
6. EFRI E3P: Sustainable and Circular Engineering for the Elimination of End-of-life Plastics: A Framework for Assessment, Design, and Innovation, National Science Foundation, PI: Bakshi, Co-PIs: Lin, Sintov (OSU), Allen (UT Austin), Savage, Pester (PSU), \$ 2,000,000, 2020-24
7. Fairlife Life Cycle Assessment, Fairlife Co., PI: Bakshi, Co-PIs: Jimenez-Flores (OSU), Chiavetago (OSU), \$ 288,943, 2021-2022
8. Optimal and sustainable of operation of thermal power generation systems: A study in the context of Indian scenario, SERB-VAJRA, Department of Science and Technology, India, PI: Hariprasad Kodamana and Manoj Ramteke of IIT-Delhi, \$ 35,000, 2021-22
9. Analysis and Design for Sustainable Circularity of Barrier Film in Sheet Molding Composites, REMADE Institute Department of Energy, PI: Bakshi, co-PIs: Castro (OSU), Dooley (ASU), Stephanopoulos (ASU), Hanes (NREL), Nahas (Kohler Co.) \$ 902,585, 2021-2023

LECTURES

Keynotes

- Bakshi, B. R., "Toward Net-Positive Chemical Engineering by Designing for Circularity Synergy with Nature and Profitability" Plenary Lecture, The 30th Thai Institute of Chemical Engineering and Applied Chemistry Conference (TICChE2021), May 6, 2021
- G. Stephanopoulos, B. R. Bakshi, G. Basile, "Reinventing the Chemical/Materials Company: Transitioning to a Sustainable Circular Enterprise", plenary talk, Sustainable Engineering Forum, American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA

Invited Lectures – University

- Bakshi, B. R., "Technologies for Sustainable Development: How can Engineering Deliver?" Webinar at the University of Celaya, Mexico, January 22, 2021
- Bakshi, B. R., "Technologies for Sustainable Development: How can Engineering Deliver?" Webinar at the Department of Engineering Science, Oxford University, UK, March 2, 2021



- Bakshi, B. R., "Engineering for Sustainability by Learning from and Seeking Synergies with Nature" Webinar at Environmental Change Initiative, University of Notre Dame, December 1, 2021

Additional Presentations

1. V. Thakker, B.R. Bakshi, "Designing Life-cycle networks for a Sustainable and Circular Economy", American Council for Life Cycle Assessment, virtual conference, September 21-24, 2021
2. Y. Xue, B. R. Bakshi, "Quantifying Absolute Sustainability in LCA with Ecosystem Services and Planetary Boundaries: Comparison, Computation, and Case Study", American Council for Life Cycle Assessment, virtual conference, September 21-24, 2021
3. S. Chun, K. Lee, J. Bielicki, B. R. Bakshi, "A Multi-scale Multi-regional model for LCA of Carbon Emissions from Corn Farming in the U.S. Midwest", American Council for Life Cycle Assessment, virtual conference, September 21-24, 2021
4. Y. Xue, B. R. Bakshi, "Planetary Boundaries, Ecosystem Services, and Life Cycle Assessment – Novel Insight By a Case Study and Computational Framework", American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA
5. M. Charles, B. R. Bakshi, "A Hierarchical Techno-Ecological Decision Procedure for Sustainable Design", American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA
6. V. Thakker, F. Hafsa, K. Dooley, B. R. Bakshi, "Developing Innovation Roadmaps for Plastics Value-Chain Using Sustainable Circular Economy Framework", American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA
7. M. Charles, B. R. Bakshi, "Spatially-Explicit Techno-Ecological Design for Sustainable Manufacturing and Minimized Air Pollution Health Impacts", American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA
8. V. Thakker, B. R. Bakshi, "Systematic Approaches for Discovering Innovations to Enable a Sustainable Circular Economy", American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA
9. U. Shah, J. Paulson, B. R. Bakshi, "Enabling Real-Time Synergies in Techno-Ecological Systems Using Adaptive Nonlinear Model Predictive Control", American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA
10. A. Sen, G. Stephanopoulos, B. R. Bakshi, "Towards a Circular Chemical Industry: Mapping the Flow of Fossil Carbon through Chemical Manufacturing Processes", American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA
11. Y. Aleissa, B. R. Bakshi, "Process Sustainability Metrics Based on the Safe and Just Operating Space for Humanity", American Institute of Chemical Engineers Annual Meeting, November 7-11, 2021, Boston, MA
12. Design for Sustainability and Circularity of Products and Processes, pre-conference workshop at the annual meeting of the American Council for Life Cycle Assessment, September 20, 2021, on-line
13. Taught course on "Engineering for Sustainability" at the Indian Institute of Technology-Delhi, August-October, 2021, on-line.



Nicholas Brunelli

Professor
H.C. "Slip" Slider Professor
Ph.D. California Institute of Technology
Catalytic material design

UNIVERSITY ACTIVITY

Awards and Honors

- 2021 Inaugural Cohort for the Growing Research Opportunities, The Ohio State University

NATIONAL ACTIVITY

Awards and Honors

- 2021 Emerging Investigator, *Energy & Fuels*

National Committee and Conference Service

- AIChE – organized and served as session chair

Editorial Boards

- ACS Catalysis – Early Career Advisory Board
- Organic Reaction Catalysis Society – Advisory Board Member

PUBLICATIONS, SOFTWARE

Books and Chapters

- Book Chapter - "Cooperative catalytic enhancements of reactions catalyzed by mesoporous materials" J.-Y. Chen, A. Kane, N.A. Brunelli

Refereed Papers

1. M. Kasula, A.P. Spanos, **N.A. Brunelli**,* "Investigating the impact of synthesis conditions to increase yield and tin inclusion for Lewis acid nano-Sn-MFI zeolites," (*accepted*).
2. J.-Y. Chen, **N.A. Brunelli**,* "Investigating the impact of microporosity of aminosilica catalysts in coupling reactions for biomass upgrading to fuel," *Energy & Fuels*, 2021, 35, 18, 14885-14893.
3. P. Ranadive, Z. Blanchette, A. Spanos, W. Medlin, **N.A. Brunelli**,* "Scalable synthesis of selective hydrodeoxygenation core@shell Pd@TiO₂ nanocatalysts," *J. Flow Chemistry*, 2021, 11, 393-406.
4. Spanos, A. Parulkar, **N.A. Brunelli**,* "Enhancing hydrophobicity and catalytic activity of nano-Sn-Beta for alcohol ring opening of epoxides through post-synthetic treatment with fluoride," *J. Catalysis*, 2021, 404, 430-439.



GRANT SUPPORT

Elucidating the Impact of Strain from Olefin Metathesis

ACS-PRF-ND - American Chemical Society – Petroleum Research Fund – New Directions

PI: Brunelli

\$110,000

Submitted October 12, 2019

REU Supplement: CAREER: Increasing Catalytic Selectivity of Isomerization of Glucose to Fructose using Paired Lewis Acid Sites

NSF CBET - Catalysis

PI: Brunelli

\$6,000

Submitted April 9th, 2020

Grant # 2029472

Creating Heterogeneous Organic Amines for Glucose Isomerization to Fructose

NSF CBET – Catalysis – National Science Foundation

PI: Brunelli

\$338,290

Submitted December 17th, 2019

Understanding and Controlling Wax-Water Interactions in Pores of Fischer-Tropsch Synthesis Catalysts

NSF CBET – Catalysis – National Science Foundation

PI: David Hibbitts; Co-PI: Brunelli

\$450,000 (total); \$175,000 for co-PI Brunelli

Submitted April 22nd, 2019

Grant #1933054

Enabling the Scalable Synthesis of Uniform Inorganic Nanoparticles

NSF CMMI – Advanced Manufacturing

PI: Jessica Winter; Co-PI: Brunelli; Co-PI: Wyslouzil

\$733,504

Submitted December 1st, 2020

CAREER: Increasing Catalytic Selectivity of Isomerization of Glucose to Fructose using Paired Lewis Acid Sites

NSF CBET – Catalysis – National Science Foundation

PI: Brunelli

\$526,544

Submitted July 20th, 2016

Grant #1653587



LECTURES

Invited Lectures – Conference

- “Molecular design of catalysts on amorphous mesoporous silica supports for glucose isomerization” N.A. Brunelli, ACS Spring 2021 (Presented Virtually).
- “Investigating catalytic site design for Lewis acid zeolites for the epoxide ring opening with alcohols.” N.A. Brunelli, PacifiChem 2021 (Presented virtually).

Additional Presentations

- “Selective Glucose Isomerization to Fructose Using a Heterogeneous Immobilized Tertiary Amine with Tuned Molecular Design.” N.A. Brunelli, Boston, MA. AIChE 2021.



Jeffery J. Chalmers

Professor

Ph.D. Cornell University

Intrinsic magnetization cell separation and Immunomagnetic cell separation, cancer detection, bioengineering

NATIONAL ACTIVITY

Awards and Honors

- Fellow, AIChE

Other Professional Activities

- Academic Editor: PlosOne, Scientific Reports.
- Expert Witness on three ongoing patent disputes.
- NIH and NSF reviewer.

PUBLICATIONS, SOFTWARE

Refereed Papers

1. Chalmers, J.J. The challenges of hydrodynamic forces on cells used in Cellmanufacturing and Therapy, ***Current Issues in Biomedical Engineering***. 2021.
2. González-Fernández, C., Gómez-Pastora, J., Bringas, E., Zborowski, M., Chalmers, J.J., Ortiz, I. Recovery of Magnetic Catalysts: Advanced Design for Process Intensification. ***Industrial & engineering chemistry research*** 60 (46), 16780-16790. 2021.
3. Gómez-Pastora, J, Kim, J., Multane, V., Weigand, M., Walters, N.A., Reategui, E., Palmer, A.F., Yazer, M., Zborowski, Z., Chalmers, J.J. Intrinsically magnetic monocytes subtypes: Non-classical and intermediate monocytes have the strongest magnetic behavior in fresh human blood. ***Experimental Hematology*** Vol. 99, p21–3, 2021
4. Weigand, M.R.H., Gómez-Pastora, J., Kim, J., Kurek, M., Hickey, R., Irwin, D.C., Buehler, P.W., Zborowski, M., Palmer, A., Chalmers, J.J. Magnetophoretic and Spectral Characterization of Oxyhemoglobin to Deoxyhemoglobin: Chemical vs Enzymatic Process, ***PlosOne*** Vol. 16:9, e0257061. 2021.

GRANT SUPPORT

1. Fractionation of aged RBC based on hemoglobin content, NHLBI, Chalmers and Palmer, 01/01/2017 - 12/31/2022, \$2,742,232.
2. A scalable platform to selectively purify engineered extracellular vesicles via self-cleaving tags, NIGMS, Wood and Chalmers, 07/01/2019 - 04/30/2021 \$390,873.00,
3. Development of single cell magnetophoresis to analyze and isolate glioma cancer stem cells, NCI, Venere and Chalmers, 03/11/2020 - 02/28/2023, \$384,630.00



John Clay

Professor of Practice
Ph.D. The Ohio State University
Unit Operations

UNIVERSITY ACTIVITY

AICHE Student Chapter

- Advisor for the student AIChE Chapter for 2021.
- Oversaw the chapter's hosting of the 2021 national conference held in Columbus, Ohio.

NATIONAL ACTIVITY

Other Professional Activities

- American Society of Engineering Educators reviewer.



Stuart Cooper

Professor

Ph.D. Princeton University

Polymer physics, block polymers, isomers, polyurethanes, biomaterials

NATIONAL ACTIVITY

Awards and Honors

- Elected Fellow, National Academy of Inventors, 2021
- Elected Fellow of Sigma Xi, the Scientific Research Honor Society, 2021

Committee and Conference Service; Other Professional Activities

- Advisory Board, Department of Chemical and Biomedical Engineering, Florida State University.
- Board of Directors, Ohio State Sigma Xi local chapter.

Editorial Boards

- Editorial Advisory Board, Journal of Biomedical Materials Research
- Editorial Advisory Board, Experimental Biology and Medicine
- Editorial Board, Regenerative Engineering and Translational Medicine
- Editor in Chief, Journal of Biomaterials Science, Polymer Edition



Ilham El-Monier

Assistant Professor of Practice

Ph.D. Texas A&M University

Fluid mechanics and petrophysics; fracturing and image analysis; reservoir engineering, characterization and formation damage

PUBLICATIONS, SOFTWARE

Refereed Papers

- El-Monier, I. 2022. Insights on formation damage associated with hydraulic fracturing using image analysis and machine learning. *The Canadian Journal of Chemical Engineering*.



Liang-Shih Fan

Distinguished University Professor;

C. John Easton Professor

Ph.D. West Virginia University

Particle science and technology, clean energy and environmental systems, electrical capacitance volume tomography, and fluidization and multiphase flows

NATIONAL ACTIVITY

Awards and Honors

- Distinguished Researcher Award from the ACS Division of Energy and Fuels, February 1, 2021.

National Committee and Conference Service

- Member, NSF Engineering Division program proposal review panels, February 22, and 23, 2021; June 7 and 8, 2021.
- Member, Scientific Advisory Committee, UK–China International Particle Technology Forum VIII (PTF 8)", July 10-12, 2021 in Dali, China
- Session Chair, Session on Plenary Lecture 3 – 13th International Circulating Fluidized Bed Conference (CFB-13) (organized by UBC, Vancouver, Canada), (virtual conference), 2021.
- Presidential Science Award Selection Committee, Taiwan, 2021.
- Inaugural Award Selection Committee (40th Anniversary Celebration) for Outstanding Achievement Award and Rising Star Award, Chinese American Chemical Society, June 2021.

Editorial Boards

- Editor-in-Chief, Powder Technology.
- Representative of AIChE on the Engineering Committee of the American Association for Advancement of Science (AAAS) (February 17, 2017 – date).
- Editorial Board member, Journal of the Taiwan Institute of Chemical Engineers (Taiwan, 2021 to date).
- Editorial Advisory Board, eFluids (March 2001 to date).
- Editorial Advisory Board, Particuology (2003 – date).
- Editorial Advisory Board, Advanced Powder Technology (2006 – date).
- Editorial Advisory Board, Encyclopedia of Chemical Processing, Dekker (2001-date).
- Editorial Advisory Board, Multiphase Science and Technology – A Quarterly (2008- date).
- Editorial Board Member, Springer Book Series - Biofuels and Biorefineries by Springer (Editor-in-Chief, Zhen Fang, 2012 – date; Waste and Biomass Valorization(Springer publisher), (2014-date).



- Review Editor, *Frontier in Fossil Fuel Engineering* (2014 – date).
- Reviewer for articles in journals such as *Particuology*, *Journal of CO₂ Utilization*, *International Journal of Hydrogen Technology*, *Nature Communications* and others.

Other Professional Activities

- Invitee to the Canadian Academy of Engineering and Western University Canada's Symposium on Challenges and Opportunity – Global Conference on Engineering Education, June 15, 2021.
- OSU Committees: graduate representative for PhD final oral defense of Hantian Gao (Physics), April 13, 2021.
- Member, BEWEL (Buckeye Engineering Women in Executive Leadership) Leadership in Innovation award selection committee, February 2021.
- Member, OSU President and Provost Advisory Committee (PPAC), October 1996 – date.

PUBLICATIONS, SOFTWARE

Books and Chapters

1. “Dynamics of Multiphase Flows”, Chao Zhu, L.-S. Fan and Zhao Yu, Cambridge University Press, 594 pages (2021).
2. “The Role of Chemical Looping in Industrial Gas Separation”, Vedant Shah, Kalyani Jangam, Anuj Joshi, Pinak Mohapatra, Eric Falascino, Liang-Shih Fan, Chapter 5, in *Sustainable Separation Engineering*, edited by G. Szekely, John Wiley 2021
3. “Review of book – Essentials of Fluidization Technology”, Wiley-VCH, published in 2020, Edited by John R. Grace, Xiaotao Bi, and Naoko Ellis, *University of British Columbia, Canadian Journal of Chemical Engineering* (in press, 2022)

Refereed Papers

1. Hwang, S., Pan, J., & Fan, L. S. (2021). A machine learning-based interaction force model for non-spherical and irregular particles in low Reynolds number incompressible flows. *Powder Technology*, 392, 632-638.
2. Hwang, S., Pan, J., Sunny, A. A., & Fan, L. S. (2022). A machine learning-based particle-particle collision model for non-spherical particles with arbitrary shape. *Chemical Engineering Science*, 117439.
3. Hwang, S., Pottimurthy, Y., Chen, Y. Y., Xu, D., Falascino, E., Tong, A., & Fan, L. S. (2022). Characteristics of Gas–Solid Mixture Flows through a Packed Moving Bed of Coarse Particles. *Industrial & Engineering Chemistry Research*.
4. Baser, D. S., Cheng, Z., Fan, J. A., & Fan, L. S. (2021). Codoping Mg-Mn Based Oxygen Carrier with Lithium and Tungsten for Enhanced C₂ Yield in a Chemical Looping Oxidative Coupling of Methane System. *ACS Sustainable Chemistry & Engineering*, 9(7), 2651-2660.
5. Shah, V., Cheng, Z., Baser, D. S., Fan, J. A., & Fan, L. S. (2021). Highly selective production of syngas from chemical looping reforming of methane with CO₂ utilization on MgO-supported calcium ferrite redox materials. *Applied Energy*, 282, 116111.



- Shah, V., Cheng, Z., Mohapatra, P., & Fan, L. S. (2021). Enhanced methane conversion using Ni-doped calcium ferrite oxygen carriers in chemical looping partial oxidation systems with CO₂ utilization. *Reaction Chemistry & Engineering*, 6(10), 1928-1939.
- Jangam, K. V., Joshi, A. S., Chen, Y. Y., Mahalingam, S., Sunny, A. A., & Fan, L. S. (2021). Synergistic decomposition of H₂S into H₂ by Ni₃S₂ over ZrO₂ support via a sulfur looping scheme with CO₂ enabled carrier regeneration. *Chemical Engineering Journal*, 426, 131815.
- Joshi, A., Shah, V., Mohapatra, P., Kumar, S., Joshi, R. K., Kathe, M., ... & Fan, L. S. (2021). Chemical looping-A perspective on the next-gen technology for efficient fossil fuel utilization. *Advances in Applied Energy*, 3, 100044.
- Jangam, K., Chen, Y. Y., Qin, L., & Fan, L. S. (2021). Mo-Doped FeS Mediated H₂ Production from H₂S via an In Situ Cyclic Sulfur Looping Scheme. *ACS Sustainable Chemistry & Engineering*, 9(33), 11204-11211.
- Jangam, K., Chen, Y. Y., Qin, L., & Fan, L. S. (2021). Perspectives on reactiveseperation and removal of hydrogen sulfide. *Chemical Engineering Science: X*, 11, 100105
- Chen, Y. Y., Guo, M., Kim, M., Liu, Y., Qin, L., Hsieh, T. L., & Fan, L. S. (2021). Predictive screening and validation on chemical looping oxygen carrier activation by tuning electronic structures via transition metal dopants. *Chemical Engineering Journal*, 406, 126729.
- Qin, L., Chen, Y. Y., Guo, M., Liu, Y., A. Fan, J., & Fan, L. S. (2021). Driving Towards Highly Selective and Coking-Resistant Natural Gas Reforming Through a Hybrid Oxygen Carrier Design. *ChemCatChem*, 13(2), 617-626.
- Xu, D., Tong, A., & Fan, L. S. (2021). State of Scale-Up Development in Chemical Looping Technology for Biomass Conversions: A Review and Perspectives. *Waste and Biomass Valorization*, 1-21.
- Joshi, R., Pottimurthy, Y., Shah, V., Mohapatra, P., Kumar, S., Jones, O., ... & Fan, L. S. (2021). Coal-Direct Chemical Looping Process with In Situ Sulfur Capture for Energy Generation Using Ca-Cu Oxygen Carriers. *Industrial & Engineering Chemistry Research*, 60(30), 11231-11240.
- Zhang, Y., Wang, D., Pottimurthy, Y., Kong, F., Hsieh, T. L., Sakadjian, B., ... & Fan, L. S. (2021). Coal direct chemical looping process: 250 kW pilot-scale testing for power generation and carbon capture. *Applied Energy*, 282, 116065.
- Pottimurthy, Y., Wang, D., Park, C., Patil, S., Tong, A., & Fan, L. S. (2022). Three-dimensional dynamic characterization of square-nosed slugging phenomena in a fluidized bed. *Particuology*, 67, 35-46.
- Kong, F., Tene Youmbi, D., Tong, A., & Fan, L. S. (2021). Simulation of a moving bed chemical looping system for electricity production from coal via chemical looping water splitting. *The Canadian Journal of Chemical Engineering*, 99(7), 1520-1534.
- Pan, J., Chen, Y. Y., & Fan, L. S. (2021). Second-order unconditional positive preserving schemes for non-equilibrium reactive flows with mass and mole balance. *Journal of Computational Physics*, 441, 110477.

Proceeding Publications

- Hwang, S., Pan, J., & Fan, L. S. (2021, November). Machine Learning Based Interaction Force Model for Non-Spherical Particles in Incompressible Flows. In 2021 AIChE Annual Meeting. AIChE.



2. Mohapatra, P. (2021). Low-Temperature Chemical Looping Driven NO_x Decomposition with Natural Gas Utilization. In 2021 AIChE Annual Meeting. AIChE
3. Mohapatra, P. (2022). Low-Temperature Chemical Looping Driven NO_x Decomposition with Natural Gas Utilization. ACS.
4. "Metal Derivative Reaction Engineering: A Gateway to Novel Energy Conversion Technology" (ID: 3597830) ACS Fall meeting, ENFL Symposium (Chinese American Chemical Society 40th formation Celebration), Atlanta, GA, August 22, 2021.
5. R Luis G. Velazquez-Vargas and Thomas J. Flynn, The Babcock & Wilcox Company Yitao Zhang, Dikai Xu, Dawei Wang, Andrew Tong and Liang- Shih Fan, The Ohio State University Bartev B. Sakadjian, Ntre Tech LLC, "Recent Updates on the Iron-Based Coal Direct Chemical Looping Process Demonstration Testing and Techno Economic Analysis", International Technical Conference on Clean Coal & Fuel Systems. Clearwater FL, Technical Paper 123, July 28, 2021.
6. Soohwan Hwang, Jianhua Pan and L.-S. Fan, "Machine Learning Based Interaction Force and Collision models for Irregular Shaped Particles in Gas- Solid Flows", 2021 NETL Workshop on Multiphase Flow Science, August 3-5, 2021.

ENTREPRENEURIAL

Licensing

- Fan has been working on commercializing his chemical looping technology with industrial partners, and successfully licensed the technology to Babcock & Wilcox.

GRANT SUPPORT

1. Title: Biomass gasification for chemicals production using chemical looping techniques; Sponsor: Department of Energy; Amount: 1,500,000; Period: 10/01/2016 – 09/30/2021 (PI)
2. Title: Unsupervised learning-based interaction force model for nonspherical particles in incompressible flows; Sponsor: Department of Energy; Amount: 500,000; Period: 08/01/2020 – 07/31/2023 (PI)
3. Title: EFRI DChem: One-step conversion of CH₄ and CO₂ to liquid fuels with the use of a multi-functional pseudo catalytic system; Sponsor: National Science Foundation; Amount: 2,000,000; Period: 09/15/2020 - 08/31/2024 (PI)
4. Title: Advanced low-emission residential fluid-bed biomass combustor; Sponsor: Ntre Tech LLC; Amount: \$1,000,000; Period: 10/01/2020- 09/30/2023 (PI)
5. Title: SBIR (Phase I) | Pulsed fluidized bed design for high-temperature, solids to sCO₂, heat exchange for concentrated solar applications; Sponsor: Ntre Tech LLC; Amount: \$35,063; Period: 06/28/2021-06/27/2022 (PI)
6. Title: Asynchronous merit review; Sponsor: Oak Ridge Associated Universities; Amount: \$5,108; Period: 12/07/2020- 01/31/2021 (PI)



LECTURES

Keynotes and Plenaries

1. Keynote, Professor John Grace's induction ceremony to Hall of Fame of the Department of Chemical Engineering, University of British Columbia, January 29, 2021.
2. Plenary Lecture, 2nd International Conference on Energy and Environment (ICEE) "Chemical Looping Technology", Xuzhou, China, July 24-25, 2021 (July 24th 8:30-9:10pm).
3. Plenary Lecture, The 2nd National Conference on Chemical Looping & International Forum (2nd NCCL), Kunming, China, August 18-20, 2021
4. Plenary Lecture, 18th International Conference on Carbon Dioxide Utilization (ICCDU2021), KAIST, Korean, July 18, 2021.
5. Keynote Lecture, 40th Chinese-American Chemical Society (CACS) Anniversary Celebration Symposium, ACS meeting, August 24, 2021.
6. Plenary Lecture, 3rd International Symposium on Computational Particle Technology (CPT 2021), Suzhou, China, 17 - 21 November 2021.
7. Keynote Lecture, Industrial Technology Research Institute's Advanced Research Meeting, December 8-11, 2021, Taiwan.
8. Plenary Lecture, "Overview of Carbon Capture Utilization and Storage (CCUS)" Industrial Technology Research Institute (ITRI), Taiwan, August 24, 2021.

Invited Lectures – University

- Guest Lecturer, Senior Process Design Course, Department of Chemical Engineering, Tuskegee University, March 22, 2021.



Lisa Hall

Associate Professor;

Ph.D. University of Illinois at Urbana-Champaign

Theory and simulation of polymeric materials

NATIONAL ACTIVITY

Awards and Honors

- 2021 Owens Corning Early Career Award from the Materials Engineering and Sciences Division (MESD) of the American Institute of Chemical Engineers (AIChE)

National Committee and Conference Service

- (Planned, recently accepted nomination) APS DPOLY (American Physical Society Division of Polymer Physics) Program Chair for 2025 March Meeting

Editorial Boards

- Editorial Advisory Board for *Macromolecules*, January 2019-present.
- Editorial Advisory Board for *ACS Macro Letters*, January 2021-present.
- Member of Rose-Hulman Institute of Technology Department of Chemical Engineering external advisory board, 2012-present.
- Ohio Supercomputer Center's Supercomputer Users Group Vice-Chair, October 2017-present.

Other Professional Activities

- Additional service/teaching/outreach collaborations via STEAM Factory included facilitating storytelling in science (see BETHA grant above), coordinating interdisciplinary postdoc programming (see OSEP grant above), and helping coordinate Racial Justice Pathways program (see "1. activities to increase diversity and inclusion" in service section below).
- Racial Justice Pathways program, Grant from OSU Racial Justice Seed Grant program:
Title: *Addressing Structural Racism in the Academy through a Pilot Certificate Program: Building Faculty and Staff Capacity for Enacting Racial Equity at All Levels*
Contact-PIs and Community Partner Representatives: Maurice Stevens (Comparative Studies), Zoë Plakias (Agricultural, Environmental and Development Economics), Richard Kinsley (Ohio Campus Compact), Stephanie Dodd (Ohio Campus Compact), Clayton Hurd (Campus Compact)
Key Personnel: Lisa Hall (STEAM Factory, Chemical and Biomolecular Engineering), Glennon Sweeney (Kirwan Institute), Charlene Brenner (STEAM Factory), Kip Holley (Kirwan Institute)
Budget: \$50,000.



PUBLICATIONS, SOFTWARE

Refereed Papers

1. Priyanka M. Ketkar, Kuan-Hsuan Shen, Mengdi Fan, Lisa M. Hall, and Thomas H. Epps, III, "Quantifying the Effects of Monomer Segment Distributions on Ion Transport in Tapered Block Polymer Electrolytes", *Macromolecules*, 54, 7590-7602, **2021**.
2. Nicholas T. Liesen, Meng Wang, Mehrnoosh Taghavimehr, Jae Sang Lee, Reza Montazami, Lisa M. Hall, and Matthew D. Green, "The Influence of Spacer Composition on Thermomechanical Properties, Crystallinity, and Morphology in Ionene Segmented Copolymers", *Soft Matter*, 17, 5508–5523, **2021**. (This was a collaborative effort with synthesis, characterization, and modeling split across three groups; Nicholas Liesen is in the Hall group; the first three authors are co-first authors and the last three authors are corresponding authors.)
3. Kuan-Hsuan Shen, Mengdi Fan, and Lisa M. Hall, "Molecular Dynamics Simulations of Ion-Containing Polymers Using Generic Coarse-Grained Models", *Macromolecules*, 54, 2031–2052, **2021**. (Invited perspective, featured on the front cover of the issue, ACS Editor's Choice article for February 13, 2021)

GRANT SUPPORT

- *PI*: Reza Montazami, Iowa State U; co-PIs: Lisa Hall; Matthew Green, Arizona State U
Sponsor: Army Research Office (ARO)
Title: Design, Synthesis, and Characterization of Phase Change Materials Based on Nanoparticle-doped Block Ionene Polymers
Award Period: August 1, 2018 – original end date July 31, 2021; extended until fall 2022
Award Amount: \$70,000 (this is the OSU portion)
- *PI at U Delaware*: Thomas Epps, III; *PI at OSU*: Lisa Hall
Sponsor: Department of Energy, BES Materials Chemistry
Title: Modulating Phase Separation and Constituent Density Profiles in Nanostructured Polymer Electrolytes – Joint Experiment and Theory Effort in Tunable Hierarchical Assembly
Award Period: August 15, 2018 – August 14, 2021
Award Amount: \$342,000 (this is the OSU portion)
- *PI*: Lisa Hall; *co-PI*: Mukta Tripathy, Indian Institute of Technology-Bombay, for student Felipe Pacci Evaristo
Sponsor: IIT-Bombay-Ohio State Frontier Science and Engineering Research Center (internal award)
Title: Modeling Polymer-Grafted Nanoparticle Phase Behavior
Award Period: January 1, 2020 – December 31, 2021
Award Amount: \$24,000 (this is the OSU portion)
- *PI*: Lisa Hall; *co-PIs*: Charlene Brenner, Katherine O'Brien, Jason Cervenc, Courtney Price
Sponsor: Battelle Endowment (internal award)
Title: The Scientist Nextdoor: Making STEM Accessible Through Storytelling
Award Period: July 1, 2020 – June 30, 2022
Total Award Amount: \$44,321
- *PI*: Lisa Hall; *Collaborators*: Sathya Gopalakrishnan, Charlene Brenner, Jeremy Brooks, Andre Carrel, Atar Herziger



Sponsor: Ohio State Energy Partners

Title: STEAM Interdisciplinary Outreach and Research Program in Sustainable Urban Systems (note this funds a postdoctoral scholar at STEAM Factory, an interdisciplinary research group which Hall directs, Hall does not direct the urban systems research)

Award Period: July 1, 2020 – original end date June 30, 2021; extended to June 30, 2022

Total Award Amount: \$ 48,350

- *PI:* Lisa Hall; *Collaborator:* William Wang
Sponsor: ACS Petroleum Research Fund: New Directions
Title: Modeling Polymers with End-on and Side-on Liquid Crystal Moieties: Effects of Sequence on Phase Behavior and Thermomechanical Response
Award Period: September 1, 2021 – August 31, 2023
Total Award Amount: \$110,000
- *PI:* Lisa Hall
Sponsor: Air Force Research Lab, Summer Faculty Fellowship Program
Title: Molecular Dynamics Simulations of Hairy Nanoparticle Assemblies
Award Period: May 3, 2021 – June 25, 2021
Award Amount: \$20,500
- *PI at U Delaware:* Thomas Epps, III; *PI at OSU:* Lisa Hall
Sponsor: Department of Energy, BES Materials Chemistry
Title: Elucidating and Controlling Ion Mobility at the Nanoscale in Block Polymer Electrolytes – Joint Experiment and Modeling Effort in Manipulating Ion Conduction (renewal of prior award)
Award Period: August 15, 2021 – August 14, 2024
Award Amount: \$342,000 (this is the OSU portion)
- *PI:* Yiyang Wu co-*PIs:* Lisa Hall, Jung Hyun Kim
Sponsor: Ohio State's President's Research Excellence Program (internal award)
Title: Next-Generation Liquid Electrolytes for Extreme Li-ion Batteries
Award Period: July 01, 2021 – June 30, 2022
Award Amount: \$16,666 (this is the Hall portion)

LECTURES

Invited Lectures – Conference

1. Lisa M. Hall, "Generic Coarse-Grained Modeling of Ion-Containing Polymers", American Institute of Chemical Engineers Annual Meeting, Boston, MA, November 7-11, 2021.
2. Lisa M. Hall, "Structure and Properties of Polymer-Grafted Nanoparticle Monolayers from Coarse-Grained Simulations", American Chemical Society Fall Meeting, Atlanta, GA and online, August 25, 2021.
3. Lisa M. Hall, "Molecular Dynamics Simulations of Polymer-Grafted Nanoparticle Monolayers", American Physical Society March Meeting, online, March 16, 2021.

Invited Lectures – University



1. Lisa M. Hall, "Coarse-Grained Modeling of Ion Transport through Block Copolymers", Caltech Chemical Physics seminar series, November 30, 2021.
2. Lisa M. Hall, "Coarse-Grained Modeling of Ion Transport through Block Copolymers", University of Illinois at Urbana-Champaign Chemical and Biomolecular Engineering seminar series, November 16, 2021.
3. Lisa M. Hall, "Coarse-Grained Modeling of Ion Transport through Block Copolymers", University of Kentucky Chemical and Materials Engineering seminar series, September 1, 2021.



W.S. Winston Ho

Distinguished Professor

Ph.D. University of Illinois at Urbana- Champaign

Molecular and chemical membrane separations: hydrogen purification, CO₂ capture, water desalination, wastewater metal recovery

NATIONAL ACTIVITY

Awards and Honors

- The research of our group including Yang Han ('18 PhD) on facilitated transport membranes for CO₂ capture was highlighted and recognized in the Chemical Engineering magazine in its issue of January 1, 2021.

National Committee and Conference Service

1. Session Chair, Membranes for Electrochemical Conversions and Applications I, Session No. 488, AIChE Annual Meeting, Boston, MA, November 7 – 11, 2021.
2. Session Chair, Membranes for Electrochemical Conversions and Applications II, Session No. 535, AIChE Annual Meeting, Boston, MA, November 7 – 11, 2021.

Editorial Boards

1. Invited Editor, Separation Engineering Section, Current Opinion in Chemical Engineering, 2011-now.
2. Invited Member, Editorial Board, Separation Engineering Section, Current Opinion in Chemical Engineering, 2011-now.
3. Invited Member, Editorial Board, Energy & Environmental Engineering Section, Current Opinion in Chemical Engineering, 2011-now.
4. Invited Member, Editorial Board, Journal of Membrane Science, 2004-now.
5. Invited Member, Editorial Board, Membrane Science and Technology, 2003-now.
6. Invited Member, Editorial Board, Membranes, 2020-now.
7. Invited Member, Awards Committee, North American Membrane Society, 2006-now.
8. Invited Member, Clarence G. Gerhold Award Committee, Separations Division, AIChE, 2008-now.
9. Invited member of the Executive Board of Program Committee, AIChE, 2012-now; Second Vice Chair, 2013, First Vice Chair, 2014, Chair, 2015, Immediate Past Chair, 2016.
10. Honorary International Chair Professor, Tianjin Polytechnic University, Tianjin, China, 2017-now.
11. Invited Visiting Professor, Beijing University of Chemical Technology, Beijing, China, 2017-now.



12. Honorary Professor, Tianjin University, Tianjin, China, 2015-now.
13. Invited Guest Distinguished Chair Professor, Department of Chemical Engineering, National Taiwan University, Taipei, Taiwan, 2010-now.
14. Invited Chief Science Advisor, Center for Membrane and Water Science and Technology, Zhejiang University of Technology, Hangzhou, Zhejiang, China, 2016-now.
15. Honorary Faculty, Indian Institute of Technology Guwahati, Guwahati, India, 2020-2022.

PUBLICATIONS, SOFTWARE

Books and Chapters

- W. S. W. Ho, "Foreword", in A. K. Pabby, S. R. Wickramasinghe, K. K. Sirkar, and A.-M. Sastre, eds., Hollow Fiber Membrane Contactors: Module Fabrication, Design and Operation, and Potential Applications, CRC Press, Taylor & Francis Group, Boca Raton, FL, p. vii, in print (2021). (invited)

Refereed Papers

1. K. K. Chen, Y. Han, Z. Tong, M. Gasda, and W. S. W. Ho, "Membrane Processes for CO₂ Removal and Fuel Utilization Enhancement for Solid Oxide Fuel Cells", J. Membr. Sci., doi:10.1016/j.memsci.2020.118846, published online (12/10/2020), [620, 118846](#) (2021).
2. K. K. Chen, Y. Han, Z. Zhang, and W. S. W. Ho, "Enhancing Membrane Performance for CO₂ Capture from Flue Gas with Ultrahigh MW Polyvinylamine", J. Membr. Sci., doi:10.1016/j.memsci.2021.119215, [628, 119215](#) (2021).
3. Y. Han and W. S. W. Ho, "Polymeric Membranes for CO₂ Separation and Capture", J. Membr. Sci., doi:10.1016/j.memsci.2021.119244, [628, 119244](#) (2021). (invited)
4. Y. Han and W. S. W. Ho, "Facilitated Transport Membranes for H₂ Purification from Coal-Derived Syngas: A Techno-Economic Analysis", J. Membr. Sci., doi:10.1016/j.memsci.2021.119549, [636, 119549](#) (2021). (invited)
5. Z. Zhang, S. Rao, Y. Han, R. Pang, and W. S. W. Ho, "CO₂-Selective Membranes Containing Amino Acid Salts for CO₂/N₂ Separation", J. Membr. Sci., doi:10.1016/j.memsci.2021.119696, [638, 119696](#) (2021).
6. T.-Y. Chen, X. Deng, L.-C. Lin, and W. S. W. Ho, "New Sterically Hindered Polyvinylamine-Containing Membranes for CO₂ Capture from Flue Gas", J. Membr. Sci., doi:10.1016/j.memsci.2021.120195, published online (12/24/2021).
7. Y. Han and W. S. W. Ho, "Mitigated Carrier Saturation of Facilitated Transport Membranes for Decarbonizing Dilute CO₂ Sources: An Experimental and Techno-Economic Study", J. Membr. Sci. Lett., in press (2021). (invited)

Technical Papers

1. Y. Han, Y. Yang, and W. S. W. Ho, "Recent Progress in the Engineering of Polymeric Membranes for CO₂ Capture from Flue Gas", Membranes, [10](#), 365 (2020), doi:10.3390/membranes10110365, Project No. DE-



- FE0031731, Office of Scientific and Technical Information Report, OSTI ID: 1762005, U.S. Department of Energy, Washington, DC, January 24, 2021.
2. X. Deng, C. Zou, Y. Han, L.-C. Lin, and W. S. W. Ho, "Computational Evaluation of Carriers in Facilitated Transport Membranes for Postcombustion Carbon Capture", The Journal of Physical Chemistry C, **124**, 25322–25330 (2020), doi:10.1021/acs.jpcc.0c07627, Project No. DE-FE0031731, Office of Scientific and Technical Information Report, OSTI ID: 1762006, U.S. Department of Energy, Washington, DC, January 24, 2021.
 3. W. S. W. Ho, Yang Han, and Li-Chiang Lin, "Transformational Membranes and Process for CO₂ Capture from Flue Gas", Project No. DE-FE0031731, Quarterly Progress Report for October 1, 2020 – December 31, 2020, National Energy Technology Laboratory Report, U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, January 25, 2021.
 4. Y. Yang, Y. Han, R. Pang, and W. S. W. Ho, "Amine-Containing Membranes with Functionalized Multi-Walled Carbon Nanotubes for CO₂/H₂ Separation", Membranes, **10** (11), 333 (2020), doi:10.3390/membranes10110333, Project No. DE-FE0031635, Office of Scientific and Technical Information Report, OSTI ID: 1762493, U.S. Department of Energy, Washington, DC, January 26, 2021.
 5. W. S. W. Ho and Y. Han, "Transformational Membranes for Pre-Combustion Carbon Capture", Project No. DE-FE0031635, Quarterly Progress Report for October 1, 2020 – December 31, 2020, National Energy Technology Laboratory Report, U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, January 26, 2021.
 6. W. S. W. Ho and Y. Han, "Transformational Membranes for Pre-Combustion Carbon Capture", Project No. OER-CDO-D-19-13, Quarterly Progress Report for October 1, 2020 – December 31, 2020, Ohio Office of Energy Report, Ohio Development Services Agency, Columbus, OH, January 26, 2021.
 7. W. S. W. Ho and Y. Han, "Transformational Membranes and Process for CO₂ Capture from Flue Gas", Project No. OER-CDO-D-19-12, Quarterly Progress Report for October 1, 2020 – December 31, 2020, Ohio Office of Energy Report, Ohio Development Services Agency, Columbus, OH, January 29, 2021.
 8. K. K. Chen, Y. Han, Z. Zhang and W. S. W. Ho, "Enhancing Membrane Performance for CO₂ Capture from Flue Gas with Ultrahigh MW Polyvinylamine", Journal of Membrane Science, **628**, 119215 (2021), doi:10.1016/j.memsci.2021.119215, Project No. DE-FE0031731, Office of Scientific and Technical Information Report, OSTI ID: 1778640, U.S. Department of Energy, Washington, DC, April 20, 2021.
 9. Y. Han and W. S. W. Ho, "Polymeric Membranes for CO₂ Separation and Capture", Journal of Membrane Science, **628**, 119244 (2021), doi:10.1016/j.memsci.2021.119244, Project No. DE-FE0031731, Office of Fossil Energy Report, OSTI ID: 1778643, U.S. Department of Energy, Office of Fossil Energy, Washington, DC, April 20, 2021.
 10. W. S. W. Ho, Yang Han, and Li-Chiang Lin, "Transformational Membranes and Process for CO₂ Capture from Flue Gas", Project No. DE-FE0031731, Quarterly Progress Report for January 1, 2021 – March 31, 2021, National Energy Technology Laboratory Report, U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, April 20, 2021.
 11. Y. Han and W. S. W. Ho, "Polymeric Membranes for CO₂ Separation and Capture", Journal of Membrane Science, **628**, 119244 (2021), doi:10.1016/j.memsci.2021.119244, Project No. DE-FE0031635, Office of Scientific and Technical Information Report, OSTI ID: 1778644, U.S. Department of Energy, Washington, DC, April 20, 2021.



12. W. S. W. Ho and Y. Han, "Transformational Membranes for Pre-Combustion Carbon Capture", Project No. DE-FE0031635, Quarterly Progress Report for January 1, 2021 – March 31, 2021, [National Energy Technology Laboratory Report](#), U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, April 26, 2021.
13. W. S. W. Ho and Y. Han, "Transformational Membranes for Pre-Combustion Carbon Capture", Project No. OER-CDO-D-19-13, Quarterly Progress Report for January 1, 2021 – March 31, 2021, [Ohio Office of Energy Report](#), Ohio Development Services Agency, Columbus, OH, April 26, 2021.
14. W. S. W. Ho and Y. Han, "Transformational Membranes and Process for CO₂ Capture from Flue Gas", Project No. OER-CDO-D-19-12, Quarterly Progress Report for January 1, 2021 – March 31, 2021, [Ohio Office of Energy Report](#), Ohio Development Services Agency, Columbus, OH, April 30, 2021.
15. W. S. W. Ho, Yang Han, and Li-Chiang Lin, "Transformational Membranes and Process for CO₂ Capture from Flue Gas", Project No. DE-FE0031731, Quarterly Progress Report for April 1, 2021 – June 30, 2021, [National Energy Technology Laboratory Report](#), U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, July 19, 2021.
16. W. S. W. Ho and Y. Han, "Transformational Membranes for Pre-Combustion Carbon Capture", Project No. DE-FE0031635, Quarterly Progress Report for April 1, 2021 – June 30, 2021, [National Energy Technology Laboratory Report](#), U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, July 23, 2021.
17. Y. Han and W. S. W. Ho, "Facilitated Transport Membranes for H₂ Purification from Coal-Derived Syngas: A Techno-Economic Analysis", [Journal of Membrane Science](#), **636**, 119549 (2021), [doi:10.1016/j.memsci.2021.119549](https://doi.org/10.1016/j.memsci.2021.119549), Project No. DE-FE0031635, [Office of Scientific and Technical Information Report](#), OSTI ID: 1809252, U.S. Department of Energy, Washington, DC, July 23, 2021.
18. W. S. W. Ho and Y. Han, "Transformational Membranes for Pre-Combustion Carbon Capture", Project No. OER-CDO-D-19-13, Quarterly Progress Report for April 1, 2021 – June 30, 2021, [Ohio Office of Energy Report](#), Ohio Development Services Agency, Columbus, OH, July 23, 2021.
19. W. S. W. Ho and Y. Han, "Transformational Membranes and Process for CO₂ Capture from Flue Gas", Project No. OER-CDO-D-19-12, Quarterly Progress Report for April 1, 2021 – June 30, 2021, [Ohio Office of Energy Report](#), Ohio Development Services Agency, Columbus, OH, July 30, 2021.
20. Z. Zhang, S. Rao, Y. Han, R. Pang, and W. S. W. Ho, "CO₂-Selective Membranes Containing Amino Acid Salts for CO₂/N₂ Separation", [Journal of Membrane Science](#), **638**, 119696 (2021), [doi:10.1016/j.memsci.2021.119696](https://doi.org/10.1016/j.memsci.2021.119696), Project No. DE-FE0031731, [Office of Scientific and Technical Information Report](#), OSTI ID: 1827070, U.S. Department of Energy, Washington, DC, October 24, 2021.
21. W. S. W. Ho, Yang Han, and Li-Chiang Lin, "Transformational Membranes and Process for CO₂ Capture from Flue Gas", Project No. DE-FE0031731, Quarterly Progress Report for July 1, 2021 – September 30, 2021, [National Energy Technology Laboratory Report](#), U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, October 25, 2021.
22. W. S. W. Ho and Y. Han, "Transformational Membranes for Pre-Combustion Carbon Capture", Project No. DE-FE0031635, Quarterly Progress Report for July 1, 2021 – September 30, 2021, [National Energy Technology Laboratory Report](#), U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, October 26, 2021.



23. W. S. W. Ho and Y. Han, "Transformational Membranes for Pre-Combustion Carbon Capture", Project No. OER-CDO-D-19-13, Quarterly Progress Report for July 1, 2021 – September 30, Ohio Office of Energy Report, Ohio Development Services Agency, Columbus, OH, October 26, 2021.
24. W. S. W. Ho and Y. Han, "Transformational Membranes and Process for CO₂ Capture from Flue Gas", Project No. OER-CDO-D-19-12, Quarterly Progress Report for July 1, 2021 – September 30, 2021, Ohio Office of Energy Report, Ohio Development Services Agency, Columbus, OH, October 30, 2021.

ENTREPRENEURIAL

Patents

- W. S. W. Ho, V. Vakharia, and W. Salim, "Borate-Containing Membranes for Gas Separation", U. S. Patent 11,000,810 (May 11, 2021).

Technology Licensing

- Licensed two OSU membrane technologies for CO₂ capture to (1) Carbon Upcycling Technologies Inc. (Calgary, Alberta, Canada for the OSU Gen I membrane) and (2) Gas Technology Institute (Des Plaines, IL, USA for the OSU Gen II membrane).

Start-Up

The carbon-capturing membrane technology developed by Winston Ho, **Yang Han** ('18 PhD) and group is being demonstrated at engineering scale (1 MW_e at ~20 tonne/day CO₂) commercial-size 8"-diameter modules for flue gas CO₂ capture from fossil fuel-burning power plants, supported by \$15M in funding.

This technology can capture CO₂ at a lower cost than ever before. It could help decarbonize flue gas from not only coal- and/or natural gas-fired power plants, but also industrial sources such as cement, pulp and paper, and refining and petrochemical industries, while providing the 95% pure captured CO₂ to the oil, chemical and food industries, meeting growing demand.

INDUSTRY

Collaborated with Shiguang Li and Howard Meyer of Gas Technology Institute membranes for CO₂ capture. This led to two projects: (1) a subcontract funding of \$209,933 (01/01/2019 – 03/31/2021) to OSU, W.S. Winston Ho, OSU PI and Yang Han, OSU Co-PI; Subcontract from Gas Technology Institute (GTI), Department of Energy, National Energy Technology Laboratory (NETL): Bench-scale Development of an Advanced Graphene Oxide-based Membrane Process for Post-combustion CO₂ Capture and (2) \$13,000,000 (04/01/2021 – 03/31/2025), Yang Han, OSU PI and W.S. Winston Ho, OSU Co-PI with Gas Technology Institute (*GTI, Des Plaines, IL*), Wyoming Integrated Test Center (ITC, Cheyenne, WY), and *Trimeric Corporation (Buda, TX)*;

Collaborated with Liyuan Deng of Norwegian University of Science and Technology (NTNU) and Luca Ansaloni of SINTEF Industry on facilitated transport membranes for hydrogen purification. This resulted in a subcontract funding of \$17,670 (05/01/2019 – 12/31/2021), W.S. Winston Ho, OSU PI; Subcontract from the Norwegian University of Science and Technology, Norway Research Council: Collaboration Agreement on Researcher Visits for Nanocomposite Facilitated Transport Membranes for H₂ purification.

Other activities with Honeywell UOP LLC (Des Plaines, IL, USA), Baker Hughes Company (Sugar Land, TX, USA), SINTEF Industry (Oslo, Norway), and StimWell Services, Ltd. (Great Yarmouth, United Kingdom).



GRANT SUPPORT

1. \$13,000,000 (04/01/2021 – 03/31/2025), Yang Han, OSU PI and W.S. Winston Ho, OSU Co-PI with Gas Technology Institute (GTI, Des Plaines, IL), Wyoming Integrated Test Center (ITC, Cheyenne, WY), and Trimeric Corporation (Buda, TX); Department of Energy, National Energy Technology Laboratory (NETL): *Engineering Scale Design and Testing of Transformational Membrane Technology for CO₂ Capture*; \$4,000,000 to OSU. OSURF Project/Grant No. GR122714.
2. \$799,988 (10/01/2018 – 02/28/2022), W.S. Winston Ho, PI and Yang Han, Co-PI; Department of Energy, National Energy Technology Laboratory (NETL): Transformational Membranes for Pre-Combustion Carbon Capture. OSURF Project No. 60065059, GR109316.
3. \$2,999,988 (07/01/2019 – 12/31/2022), W.S. Winston Ho, PI, Yang Han, Co-PI, and Li-Chiang Lin, Co-PI; Department of Energy, National Energy Technology Laboratory (NETL): AOI 1C: Novel Transformational Membranes and Process for CO₂ Capture from Flue Gas. OSURF Project No. 60068211, GR115660.
4. \$218,031 (03/01/2013 – 11/30/2022), W.S. Winston Ho, PI; Bloom Energy Corporation: Carbon Dioxide Removal for Solid Oxide Fuel Cell Systems. OSURF Project No. 60037842, GR101340.
5. \$950,104 (10/01/2014 – 11/30/2022), W.S. Winston Ho, PI; Bloom Energy Corporation: Carbon Dioxide Removal for Solid Oxide Fuel Cell Systems – Phase IV: Quaternary Ammonium Hydroxide and Fluoride Membranes. OSURF Project No. 60047812, GR101343.
6. \$467,122 (08/01/2019 – 07/31/2022), Thaddeus (Teddy) Ezeji, PI, W.S. Winston Ho, Co-PI, Victor Ujor, Co-PI, and Ajay Shah, Co-PI; National Institute of Food and Agriculture, U. S. Department of Agriculture: Development of a Separation System for Efficient Fermentation of Mixed Substrates and *in situ* Recovery of Hydrophobic Bulk Chemicals; \$72,898 to Ho. OSURF Project No. 60068016, GR115606.
7. \$150,000 (10/01/2019 – 09/30/2021), W.S. Winston Ho, PI and Yang Han, Co-PI; Ohio Development Services Agency: Transformational Membranes for Pre-Combustion Carbon Capture. OSURF Project No. 60070422, GR117749.
8. \$500,000 (10/01/2019 – 06/30/2022), W.S. Winston Ho, PI and Yang Han, Co-PI; Ohio Development Services Agency: Novel Transformational Membranes and Process for CO₂ Capture from Flue Gas. OSURF Project No. 60070421, GR116842.
9. \$324,828 (10/01/2017 – 11/30/2022), W.S. Winston Ho, PI; Bloom Energy Corporation: Carbon Dioxide Removal for Solid Oxide Fuel Cell Systems – New CO₂-Selective Membranes. OSURF Project No. 60062277, GR101342.
10. \$209,933 (01/01/2019 – 03/31/2021), W.S. Winston Ho, OSU PI and Yang Han, OSU Co-PI; Subcontract from Gas Technology Institute (GTI), Department of Energy, National Energy Technology Laboratory (NETL): Bench-scale Development of an Advanced Graphene Oxide-based Membrane Process for Post-combustion CO₂ Capture.
11. \$17,670 (05/01/2019 – 12/31/2021), W.S. Winston Ho, OSU PI; Subcontract from the Norwegian University of Science and Technology, Norway Research Council: Collaboration Agreement on Researcher Visits for Nanocomposite Facilitated Transport Membranes for H₂ purification.

LECTURES



Invited Lectures – Conference

1. Yang Han, Kai Chen, Witopo Salim, Dongzhu Wu, and **W.S. Winston Ho**, Invited Lecture, “New Amine-Based Membrane and Process for CO₂ Capture from Flue Gas”, Paper No. 179, Clearwater Clean Energy Conference, Clearwater, FL, online, July 25 – 29, 2021.
2. Yang Han, Kai Chen, Witopo Salim, Dongzhu Wu, and **W.S. Winston Ho**, Invited Lecture, “New Facilitated Transport Membrane and Process for CO₂ Capture from Flue Gas”, Paper on Topic Area: 06 Macromolecular, Pacifichem 2021, Honolulu, Hawaii, online, December 16 – 21, 2021.

Invited Lectures – University

1. Yang Han, Xuepeng Deng, Li-Chiang Lin, and **W.S. Winston Ho**, “Facilitated Transport Membranes for H₂ Purification from Coal-Derived Syngas”, Invited Online Seminar, Tianjin University, Tianjin, China, online on May 25, 2021.
2. Ruizhi Pang, Kai Chen, Yang Han, Yutong Yang, and **W.S. Winston Ho**, “Highly Permeable Matrimid Substrates with Bicontinuous Structure for a CO₂-Selective Composite Membrane”, Invited Online Seminar, Tianjin University, Tianjin, China, online on May 26, 2021.
3. Kai Chen, Yang Han, Zhien Zhang, and **W.S. Winston Ho**, “Enhancing Membrane Performance for Flue Gas CO₂ Capture with Ultrahigh MW Polyvinylamine”, Invited Online Seminar, Tianjin University, Tianjin, China, online on May 27, 2021.
4. **W.S. Winston Ho**, “New Amine-Containing Membranes for H₂ Purification and CO₂ Capture”, Invited Seminar, Stony Brook University, Stony Brook, NY, on November 29, 2021.

Additional Presentations

1. **W.S. Winston Ho**, “OSU Membrane Research”, Professor Ruilan Guo Online Seminar Visit, online format, Columbus, OH, January 28, 2021.
2. **W.S. Winston Ho** and Yang Han, “OSU Membrane Research”, METSS Corporation Teleconference, online format, Columbus, OH, February 5, 2021.
3. **W.S. Winston Ho** and Yang Han, “OSU Membrane Research”, Honeywell UOP Teleconference, online format, Columbus, OH, February 22, 2021.
4. **W.S. Winston Ho**, “OSU Membrane Research”, Professor Kate Stebe Online Seminar Visit, online format, Columbus, OH, February 25, 2021.
5. **W.S. Winston Ho** and Yang Han, “OSU Membrane Research”, Baker Hughes Company Teleconference, online format, Columbus, OH, April 7, 2021.
6. **W.S. Winston Ho** and Yang Han, “OSU Membrane Research”, SINTEF Industry & StimWell Services, Ltd. Teleconference, online format, Columbus, OH, May 3, 2021.
7. **W.S. Winston Ho** and Yang Han, “OSU Membrane Research”, ALVANCE Aluminium Group Teleconference, online format, Columbus, OH, May 28, 2021.
8. **W.S. Winston Ho** and Yang Han, “OSU Membrane Research”, Chevron Technology Company Teleconference, online format, Columbus, OH, June 15, 2021.



9. Shiguang Li, Yang Han, and **W.S. Winston Ho**, “Engineering Scale Design and Testing of Transformational Membrane Technology for CO₂ Capture”, DOE-NETL Project DE-FE0031946, Carbon Management and Natural Gas & Oil Research Project Review Meeting, NETL, Pittsburgh, PA, August 13, 2021.
10. **W.S. Winston Ho** and Yang Han, “Transformational Membranes for Pre-combustion Carbon Capture”, DOE-NETL Project DE-FE0031635, Carbon Management and Natural Gas & Oil Research Project Review Meeting, NETL, Pittsburgh, PA, August 16, 2021.
11. **W.S. Winston Ho**, Yang Han, and Li-Chiang Lin, “Novel Transformational Membranes and Process for CO₂ Capture from Flue Gas”, DOE-NETL Project DE-FE0031731, Carbon Management and Natural Gas & Oil Research Project Review Meeting, NETL, Pittsburgh, PA, August 17, 2021.
12. Yang Han, Yutong Yang, Ruizhi Pang, and **W.S. Winston Ho**, “Upscaling of Facilitated Transport Membranes for Hydrogen Purification from Coal-Derived Syngas”, Oral Presentation, Paper No. 8a, The Annual Meeting of North American Membrane Society, Estes Park, CO, August 29 - September 2, 2021.
13. Xuepeng Andrew Deng, Changlong Zou, Yang Han, Li-Chiang Lin, and **W.S. Winston Ho**, “A Theoretical Methodology of Mobile Carrier Evaluation in Facilitated Transport Membranes”, Oral Presentation, Paper No. 10c, The Annual Meeting of North American Membrane Society, Estes Park, CO, August 29 - September 2, 2021.
14. Yang Han and **W.S. Winston Ho**, “Facilitated Transport Membranes for H₂ Purification from Coal-Derived Syngas: A Techno-Economic Analysis”, Oral Presentation, Paper No. 21c, The Annual Meeting of North American Membrane Society, Estes Park, CO, August 29 - September 2, 2021.
15. Yutong Yang, Yang Han, Ruizhi Pang, and **W.S. Winston Ho**, “Membranes Containing Amines and Amino-Functionalized Multi-Walled Carbon Nanotubes for CO₂/H₂ Separation”, Poster Presentation, Poster Paper No. C1, The Annual Meeting of North American Membrane Society, Estes Park, CO, August 29 - September 2, 2021.
16. Xuepeng Andrew Deng, Changlong Zou, Yang Han, Li-Chiang Lin, and **W.S. Winston Ho**, “A Theoretical Methodology of Mobile Carrier Evaluation in Facilitated Transport Membranes”, Poster Presentation, Poster Paper No. C14, The Annual Meeting of North American Membrane Society, Estes Park, CO, August 29 - September 2, 2021.
17. Yang Han, Yutong Yang, Ruizhi Pang, and **W.S. Winston Ho**, “Techno-Economic Analysis of Facilitated Transport Membranes for H₂ Purification from Coal-Derived Syngas”, Poster Presentation, Poster Paper No. C15-1, The Annual Meeting of North American Membrane Society, Estes Park, CO, August 29 - September 2, 2021.
18. Yang Han, Yutong Yang, Ruizhi Pang, Xuepeng Andrew Deng, Li-Chiang Lin, and **W.S. Winston Ho**, “Scale-up of Facilitated Transport Membranes for Hydrogen Purification from Coal-Derived Syngas”, Poster Presentation, Poster Paper No. C15-2, The Annual Meeting of North American Membrane Society, Estes Park, CO, August 29 - September 2, 2021.
19. Ruizhi Pang, Kai Chen, Yang Han, Yutong Yang, and **W.S. Winston Ho**, “Highly Permeable Matrimid Substrates for Composite Membranes in CO₂/N₂ Separation”, Poster Presentation, Poster Paper No. C19, The Annual Meeting of North American Membrane Society, Estes Park, CO, August 29 - September 2, 2021.



20. **W.S. Winston Ho** and Yang Han, "OSU Membrane Research", Shell International Trading and Shipping Company Limited Teleconference, online format, Columbus, OH, November 5, 2021.
21. Yutong Yang, Yang Han, Ruizhi Pang, and **W.S. Winston Ho**, "Amine-Containing Membranes with Functionalized Multi-Walled Carbon Nanotubes for CO₂/H₂ Separation", Oral Presentation, Paper No. 377g, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
22. Yang Han and **W.S. Winston Ho**, "Facilitated Transport Membranes for H₂ Purification from Coal-Derived Syngas: A Techno-Economic Analysis", Oral Presentation, Paper No. 514f, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
23. Ruizhi Pang, Yang Han, and **W.S. Winston Ho**, "CO₂-CO Energy Conversion Cycle Enabled by a CO₂-Selective Membrane", Oral Presentation, Paper No. 535f, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
24. Ruizhi Pang, Kai Chen, Yang Han, Yutong Yang, and **W.S. Winston Ho**, "Highly Permeable Matrimid Substrates with Bicontinuous Structure for a CO₂-Selective Composite Membrane", Oral Presentation, Paper No. 578e, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
25. Yang Han, Yutong Yang, Ruizhi Pang, and **W.S. Winston Ho**, "Upscaling of Facilitated Transport Membranes for Hydrogen Purification from Coal-Derived Syngas", Oral Presentation, Paper No. 579f, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
26. Yang Han and **W.S. Winston Ho**, "Novel Facilitated Transport Membrane and Process for Post-Combustion Carbon Capture", Poster Presentation, Poster Paper No. 4en, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
27. Yutong Yang, Ruizhi Pang, Yang Han, and **W.S. Winston Ho**, "Membranes Containing Amines and Amino-Functionalized Multi-Walled Carbon Nanotubes for CO₂/H₂ Separation", Poster Presentation, Poster Paper No. 355c, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
28. Ruizhi Pang, Kai Chen, Yang Han, Yutong Yang, and **W.S. Winston Ho**, "Fabrication of Highly Permeable Matrimid Substrates for a CO₂-Selective Composite Membrane", Poster Presentation, Poster Paper No. 355e, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
29. Ruizhi Pang, Yang Han, and **W.S. Winston Ho**, "CO₂ Utilization via Solid Oxide Fuel Cells Enabled by a CO₂-Selective Membrane", Poster Presentation, Poster Paper No. 355f, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
30. Yang Han, Yutong Yang, Ruizhi Pang, and **W.S. Winston Ho**, "Scale-up of Facilitated Transport Membranes for Hydrogen Purification from Coal-Derived Syngas", Poster Presentation, Poster Paper No. 355i, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
31. Yang Han and **W.S. Winston Ho**, "Techno-Economic Analysis of Facilitated Transport Membranes for H₂ Purification from Coal-Derived Syngas", Poster Presentation, Poster Paper No. 355j, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.
32. Ruizhi Pang, Kai Chen, Yang Han, Yutong Yang, and **W.S. Winston Ho**, "Highly Permeable Matrimid Substrates with Bicontinuous Structure for a CO₂-Selective Composite Membrane", Poster Presentation, Poster Paper No. 578e, AIChE 2021 Annual Meeting, Boston, MA, November 7-11, 2021.



33. **W.S. Winston Ho** and Yang Han, “Transformational Membranes for Pre-Combustion Carbon Capture”, DE-FE0031635 Project Close-out Review Meeting, U.S. Department of Energy, National Energy Technologies Laboratory, Pittsburgh, PA, online, December 2, 2021.



Li-Chiang Lin

Umit S. Ozkan Professor

Ph.D. University of California-Berkeley

Molecular simulations and quantum chemical calculations with atomic-level understandings

UNIVERSITY ACTIVITY

Awards and Honors

- Alumni Award for Distinguished Teaching, The Ohio State University, USA
(The highest teaching honor at The Ohio State University)

NATIONAL ACTIVITY

Awards and Honors

1. I&EC Research 2021 Class of Influential Researchers - The Americas
2. World's Top 2% of Scientists List, Elsevier
3. AIChE (American Institute of Chemical Engineers) Futures
4. Yushan Young Scholar Award, Ministry of Education, Taiwan

Editorial Boards

- Early Career Editorial Board Member, Separation and Purification Technology (Elsevier, 2021 – present)

PUBLICATIONS, SOFTWARE

Refereed Papers

1. Yang, C.-T.; Deng, X.; Lin, L.-C.* In Silico Screening of Zeolites for Highly Selective Adsorption of Central C-C Bonds Toward More Effective Alkane Cracking, Ind. Eng. Chem. Res., 60, 15174-15183 2021. *** Featured in "I&EC Research 2021 Class of Influential Researchers - The Americas."
2. Datar, A.; Witman, M.; Lin, L.-C.* Monte Carlo Simulations for Water Adsorption in Porous Materials: Best Practices and New Insights, AIChE J., 67, e17447, 2021. *** Featured in the "2021 AIChE Futures" issue.
3. Hung, T.-H.; Lyu, Q.; Lin, L.-C.* & Kang, K.-Y.*, Transport-Relevant Pore Limiting Diameter for Molecular Separations in Metal-Organic Framework Membranes, J. Phys. Chem. C, 125, 20416-20425, 2021.
4. Hu, J.; Gu, X.; Lin, L.-C.*; Bakshi, B.*, Toward Sustainable Metal-Organic Frameworks for Post-Combustion Carbon Capture by Life Cycle Assessment and Molecular Simulation, ACS Sustain. Chem. Eng., 9, 12132-12141, 2021.



5. Kan, M.-Y.; Lyu, Q.; Chu, Y.-H.; Hsu, C.-C.; Lu, K.-L.; Lin, L.-C.*; Kang, D.-Y.* , Suppressing Defect Formation in Metal-organic Framework Membranes via Plasma-assisted Synthesis for Gas Separations, *ACS Appl. Mater. Interfaces*, 13, 41904-41915, 2021.
6. Guo, J.-C.; Zou, C.; Chen, J.-J.*; Lin, L.-C.* & Kang, K.-Y.* , NaP1 Zeolite Membranes with High Selectivity for Water-alcohol Pervaporation, *J. Membr. Sci.*, 639, 119762, 2021.
7. Hung, T.-H.; Deng, X.; Lyu, Q.; Lin, L.-C.* & Kang, K.-Y.* , Coulombic Effect on Permeation of CO₂ in Metal-organic Framework Membranes, *J. Membr. Sci.*, 639, 119742, 2021.
8. An, H.; Cho, K.Y.; Lyu, Q.; Chiou, D.-S.; Nam, K.J.; Kang, K.-Y.* , Lin, L.-C.* & Lee, J.S.* , Facile Defect Engineering of Zeolitic Imidazolate Frameworks Towards Enhanced C₃H₆/C₃H₈ Separation Performance, *Adv. Funct. Mater.*, 32, 2105577, 2021.
9. Hsieh, Y.-H.; Zou, C.; Chen, J.-J.*; Lin, L.-C.* & Kang, D.-Y.* , Pillared-bilayer Metal-organic Framework Membranes for Dehydration of Isopropanol, *Microporous Mesoporous Mat.*, 326, 111344, 2021.
10. Shin, J.H.; Kan, M.-Y.; Oh, J.-W.; Yu, H.J.; Kim, J.-H., Lin, L.-C.; Kang, D.-Y.; Lee, J. S.* Solubility Selectivity-Enhanced SIFSIX-3-Ni-Containing Mixed Matrix Membranes for Improved CO₂/CH₄ Separation Efficiency, *J. Membr. Sci.*, 633, 119390, 2021.
11. Liu, Y.; Lyu, Q.; Wang, Z.; Sun, Y.; Li, C.; Sun, S.; Lin, L.-C.* & Hu, S.* A Flame-retardant Post-synthetically Functionalized COF Sponge as Absorbent for Spilled Oil Recovery, *J. Mater. Sci.*, 56, 13031-13042, 2021.
12. Cho, E.H. & Lin, L.-C.* Nanoporous Materials Recognition via 3D Convolutional Neural Networks: Prediction of Adsorption Properties, *J. Phys. Chem. Lett.*, 12, 2279-2285, 2021.
13. Datar, A.; Witman, M. & Lin, L.-C.* Improving Computational Assessment of Porous Materials for Water Adsorption Applications via Flat Histogram Methods, *J. Phys. Chem. C*, 125, 4253-4266, 2021.
14. Chiou, D.-S.; Yu, H. J.; Hung, T.-H.; Lyu, Q.; Chang, C.-K.; Lee, J. S.*; Lin, L.-C.* & Kang, D.-Y.* Highly CO₂ Selective Metal-Organic Framework Membranes with Favorable Coulombic Effect, *Adv. Funct. Mater.*, 31, 2006924, 2021.

Accepted in 2021:

15. Deng, X.; Han, Y.*; Lin, L.-C.*; Ho, W.S.W.* , Computational Prediction of Water Sorption in Facilitated Transport Membranes, *J. Phys. Chem. C*, DOI:10.1021/acs.jpcc.1c09259, in press, 2022.
16. Fu, M.; Deng, X.; Wang, S.-Q; Yang, F.; Lin, L.-C.*; Zaworotko, M.J.*; Dong, Y.* , Scalable Robust Nano-porous Zr-based MOF adsorbent with High-Capacity for Sustainable Water Purification, *Sep. Purif. Technol.*, 288, 120620, 2022.
17. Hung, T.-H.; Xu, Z.-H.; Kang, K.-Y.; Lin, L.-C.* , Chemistry-encoded Convolutional Neural Networks for Predicting Gaseous Adsorption in Porous Materials, *J. Phys. Chem. C*, 126, 2813-2822, 2022.
18. Wang, X.; Lyu, Q.; Tong, T.; Sun, K.; Lin, L.-C.; Tang, C.Y.; Yang, F.; Guiver, M.D.*; Quan, X.*; Dong, Y.* , Robust Ultrathin Nanoporous MOF Membrane with Intra-crystalline Defects for Fast Water Transport, *Nature Communications*, 13, 266, 2022.
19. Chen, T.-Y.; Deng, X.; Lin, L.-C., Ho, W.S.W.* , New Sterically Hindered Polyvinylamine-containing Membranes for CO₂ Capture from Flue Gas, *J. Membr. Sci.*, 645, 120195, 2022.



GRANT SUPPORT

1. Title: EFRI E3P: Sustainable and Circular Engineering for the Elimination of End-of-life Plastics: A Framework for Assessment, Design, and Innovation

Sponsor: National Science Foundation

PI: Bhavik Bakshi; Co-PI: Li-Chiang Lin and others

Starting Date - End Date: 10/1/2020 to 9/30/2024

Amount of Award: \$2,000,000

2. Title: Novel transformational membranes and process for CO₂ capture from flue gas

Sponsor: DOE-NETL

Role: Co-PI

Starting Date - End Date: 7/1/2019 to 6/30/2022

Amount of Award: \$3,750,000

LECTURES

Invited Lectures – Conference

1. Lin, L.-C., Computational Study of Nanoporous Materials for Energy-Related Applications, Department of Chemical and Biomolecular Engineering, NTU-KAIST workshop, 2021.
2. Lin, L.-C., Computational Study of Porous Materials for Water Adsorption Applications, 2021 International Symposium on Porous Materials (ISPM), Japan, 2021.
3. Lin, L.-C., Computational Materials Discovery for Reverse Osmosis Desalination and Water Harvesting, 2021 KICe Annual Meeting, South Korea, 2021.

Invited Lectures – University

1. Lin, L.-C., Computational Study of Nanoporous Materials for Energy-Related Applications, Institute of Polymer Science and Engineering, National Taiwan University, Taiwan, 2021.
2. Lin, L.-C., Computational Study of Nanoporous Materials for Energy-Related Applications, Department of Chemistry, National Taiwan University, Taiwan, 2021.
3. Lin, L.-C., Computational Study of Nanoporous Materials for Energy-Related Applications, Department of Chemical and Biomolecular Engineering, KAIST, Korea, 2021.
4. Lin, L.-C., Computational Study of Nanoporous Materials for Energy-Related Applications, Department of Chemical and Biomolecular Engineering, Sogang University, Korea, 2021.
5. Lin, L.-C., Computational Material Discovery and Design, School of Environmental Science & Technology, Dalian University of Technology, China, 2021.



Andrew Maxson

Assistant Professor of Practice
Ph.D. The Ohio State University
Unit Operations

NATIONAL ACTIVITY

PUBLICATIONS, SOFTWARE

Proceeding Publications

- Maxson, A. (2021, July), *Operation and Student Perceptions of a Large-scale, In-person Unit Operations Laboratory Course During the Covid-19 Pandemic* Paper presented at 2021 ASEE Virtual Annual Conference Content Access, Virtual Conference. <https://peer.asee.org/37545>

UNIVERSITY ACTIVITIES

Outreach and Engagement

- Mentored one URM high school intern in Unit Ops Lab in SU21
- Provided Unit Ops Lab tour for ~25 students from Metro High School
- Provided internship experiences for three high school students in the Unit Ops Lab in SU21
- Hosted workshop on “Financial Responsibility” at AIChE Regional Conference
- Provided Unit Ops Lab tour for College of Engineering Buckeye Block Party attendees

Department, College and University Committees

- Member of CBE Curriculum Working Group
- Member of CBE Interview Committee for new Laboratory Supervisor and Building Coordinator positions
- Committee Chair: Safety Committee, Wellness Committee
- Committee Member: AIChE Student Chapter Advisory Committee, Curriculum Committee
- Member of College of Engineering Mental Health Roundtable

Additional Activities

- Designed and oversaw construction of new PHX experiment in Unit Ops Lab in SU21. New experiment has been operated ~50 times by ~100 students so far.



Umit S. Ozkan

College of Engineering Distinguished Professor;
Department Chair

Ph.D. Iowa State University

Heterogeneous and electro-catalysis, kinetics, and catalytic materials

UNIVERSITY ACTIVITY

Awards and Honors

- 2021 - named Distinguished University Professor, The Ohio State University
- 2021 - College of Engineering Faculty Mentoring Award, The Ohio State University

NATIONAL ACTIVITY

National Committee and Conference Service

1. Center for Environmentally Beneficial Catalysis (CEBC) – University of Kansas, Scientific Advisory Board (2021-present)
2. ACS National Award Selection Committee
3. ACS Energy and Fuels Division Program Committee
4. ACS Energy and Fuels Division Alternative Councilor
5. ACS Energy and Fuels Division, Executive Committee
6. North American Catalysis Society, Board of Directors
7. NSF Engineering Research Center: Center for Innovative and Strategic Transformation of Alkane Resources (CISTAR) Scientific Advisory Board (2018-present)

Editorial Boards

1. *Catalysis Letters*, Scientific Advisory Board, (2007-present)
2. *Topics in Catalysis*, Editorial Board (2007-present)
3. *The Royal Society of Chemistry, Catalysis Book Series*, Editorial Advisory Board (2007-present)
4. *Catalysis Today*, Editorial Board (2005-present)
5. *Catalysts*, Editorial Board (2010-present)
6. *Catalysis Reviews, Science and Engineering* (2012-present)



7. *Applied Catalysis B*, Environmental (2012-present)
8. *Journal of Molecular Catalysis*, Editorial Board (2004-present)
9. *ACS Catalysis*, Editorial Advisory Board (2016-present)
10. *ACS Applied Energy Materials*, Editorial Advisory Board (2018-present)
11. *Nature Sustainability*, Editorial Board (2020-present)
12. *Journal of Catalysis*, Editorial Board (2020-present)

PUBLICATIONS, SOFTWARE

Refereed Papers

1. Kim, J., Ferree, M., Gunduz, S., Millet, J.-M., M., Aouine, M., Co, A.C., Ozkan, U.S., "Exsolution of Nanoparticles on A-site-deficient ferrite perovskites: Its effect on co-electrolysis of CO₂ and H₂O," *Journal of Materials Chemistry A*. In press.
2. Jain, D., Hightower, H., Basu, D., Gustin, V., Zhang, Q., Co, A.C., Asthagiri, A., Ozkan, U.S., "Highly Active Nitrogen – doped Carbon Nanostructures as Electrocatalysts for Bromine Evolution Reaction: A Combined Experimental and DFT Study," Submitted to *Journal of Catalysis*
3. Gunduz, S., Deka, D.J., Ferree, M., Kim, J., Miller, J.-M., Co, A.C., Ozkan, U.S., "Composite Cathodes with Oxide and Nitride Phases for High-temperature Electrocatalytic NH₃ Production from N₂ and H₂O," Accepted *ECS Advances*.
4. Deka, D.J., Kim, J., Gunduz, S., Jain, D., Shi, Y., Miller, J.T., Co, A.C., Ozkan, U.S., "Coke formation during high-temperature CO₂ electrolysis over AFeO₃ (A = La/Sr) cathode: Effect of A-site metal segregation", *Applied Catalysis B: Environmental*. **283** 119642 (2021)
5. Deka, D.J., Kim, J., Gunduz, S., Aouine, M., Miller, J., Millet, J.-M., Co, A.C., Ozkan, U.S., "Investigation of Hetero-phases Grown In-situ on a Ni-doped (La,Sr)FeO₃ Cathode and the Resultant Activity Enhancement in CO₂ Reduction", *Applied Catalysis B: Environmental*, **286**, 119917 (2021).
6. Gunduz, S., Deka, J., Kim, J., Wilson, M., Warren, M., Ozkan, U.S., "Incident-angle Dependent Operando XAS Cell Design: Investigation of the Electrochemical Cells Under Operating Conditions at Various Incidence Angles", *RSC Advances*, **11**, 6456-6463 (2021).
7. Ailawar, S., Hunoor, A., Rudzinski, B., Celik, G., Burel, L., Millet, J.-M., Miller, J.T., Edmiston, P.L., Ozkan, U.S., "On the Dual Role of the Reactant during Aqueous Phase Hydrodechlorination of Trichloroethylene (HDC of TCE) using Pd supported on Swellable Organically Modified Silica (SOMS)" *Applied Catalysis B: Environmental*. **291**, 120060 (2021).
8. Ailawar, S., Hunoor, A., Khalifa, Y., Miller, J.T., Edmiston, P.L., Ozkan, U.S., "Elucidating the role of ethanol in aqueous phase hydrodechlorination of trichloroethylene over Pd catalysts supported on swellable organically modified silica (SOMS)". *Applied Catalysis B*, **282**, 119819 (2021).

Technical Papers



- Synergy between oxide and nitride phases of a novel composite cathode for high-temperature electrocatalytic NH_3 , NSF, Annual Report
- Fundamental studies of the multifunctional electrocatalysis on heteroatom-doped carbon (CN_x) catalysts. USDOE-BES, Annual report

GRANT SUPPORT

- *Fundamental studies of the multifunctional electrocatalysis on heteroatom-doped carbon (CN_x) catalysts.* DOE-BES. PI: Umit Ozkan, co-PIs: Aravind Asthagiri, co-PI: Anne Co. 08/14/2020-08/15/2022.
- Synergy between oxide and nitride phases of a novel composite cathode for high-temperature electrocatalytic NH_3 , National Science Foundation, P.I.: Umit Ozkan, Co-PI: Anne Co. \$490,360, (2019-2022).
- In-situ and operando XAFS studies to design electrode catalysts for electrocatalytic processes involving H_2O reduction: CO_2 and H_2O co-electrolysis and electrocatalytic NH_3 production from N_2 and H_2O , Argonne National Laboratory (2020). 24 shifts of beamtime granted.

LECTURES

Keynotes

1. "Production of syngas with controllable H_2/CO ratio by high temperature co-electrolysis of CO_2 and H_2O ," National Conference on Catalysis of Turkey, Keynote Lecture, (virtual) September 2021.

Invited Lectures – Conference

2. "Catalytic Treatment of Water Contaminated with Chlorinated Hydrocarbons," Michigan State University, (virtual), February 2021.
3. "Catalytic Treatment of Water Contaminated with Chlorinated Hydrocarbons," University of California, Irvine, (virtual), March 2021.
4. "Catalytic Treatment of Water Contaminated with Chlorinated Hydrocarbons," Columbia University, (virtual), March 2021.
5. "Energy, Environment and Catalysis," Case Western University (virtual), July 2021.

Invited Lectures – University

1. "Production of syngas with controllable H_2/CO ratio by high temperature co-electrolysis of CO_2 and H_2O ," National Conference on Catalysis of Turkey, Keynote Lecture, (virtual) September 2021.
2. "Catalytic Treatment of Water Contaminated with Chlorinated Hydrocarbons," Michigan State University, (virtual), February 2021.
3. "Catalytic Treatment of Water Contaminated with Chlorinated Hydrocarbons," University of California, Irvine, (virtual), March 2021.



4. "Catalytic Treatment of Water Contaminated with Chlorinated Hydrocarbons," Columbia University, (virtual), March 2021.
5. "Energy, Environment and Catalysis," Case Western University (virtual), July 2021.



Andre F. Palmer

Professor

Associate Dean for Research, College of Engineering

Fenburr Ohio Eminent Scholar in Nanotechnology: Molecular Self-Assembly

Ph.D. The Johns Hopkins University

Biomaterials for transfusion medicine, tissue engineering

UNIVERSITY ACTIVITY

Awards and Honors

- 2021 College of Engineering Lumley Interdisciplinary Research Award, The Ohio State University
- Appointed associate dean for research in The Ohio State University College of Engineering leading and growing research operations currently at \$138M.

NATIONAL ACTIVITY

Awards and Honors

- 2021 *Biotechnology and Bioengineering* 2021 Gaden Award

National Committee and Conference Service

- Member, National Institutes of Health Bioengineering, Technology, and Surgical Sciences study section, 2018-present

PUBLICATIONS

Refereed Papers

1. S. Moses, J. Adorno, A. Palmer, and J. Song, "Vessel on a chip models for studying microvascular physiology, transport, and function in vitro," *American Journal of Physiology-Cell Physiology* Jan 1;320(1):C92-C105. doi: 10.1152/ajpcell.00355.2020. (2021)
2. I. S. Pires, A. F. Palmer, "Selective protein purification via tangential flow filtration – exploiting protein-protein complexes to enable size-based separations," *Journal of Membrane Science* Jan 15. doi: 10.1016/j.memsci.2020.118712. (2021)
3. C. R. Muller, A. Lucas, V. Courelli, A. T. Williams, F. Dos Santos, C. Cuddington, S. Moses, A. F. Palmer, E. Kistler, P. Cabrales, "Resuscitation from hemorrhagic shock after traumatic brain injury with polymerized hemoglobin," *Scientific Reports* Jan 28;11(1):2509. doi: 10.1038/s41598-021-81717-3. (2021)
4. C. R. Muller, A. T. Williams, A. M. Eaker, F. Dos Santos, A. F. Palmer, P. Cabrales, "Highfat high sucrose diet-induced dyslipidemia in guinea pigs," *Journal of Applied Physiology* Mar 11. doi: 10.1152/jappphysiol.00013.2021. (2021)
5. S. Pires, K. Govender, C. Munoz, A. T. Williams, Q. T. O'Boyle, C. Savla, P. Cabrales, A. F. Palmer, "Purification and analysis of a protein cocktail capable of scavenging cell-free hemoglobin, heme and



- iron," *Transfusion* Apr 4. doi: 10.1111/trf.16393. (2021)
6. C. Savla, A. F. Palmer, "The structural stability and biophysical properties of the mega- protein erythrocrurin are regulated by polyethylene glycol surface coverage," *Biomacromolecules* doi: 10.1021/acs.biomac.1c00196. (2021)
 7. J. Zhang, L. T. H. Nguyen, R. Hickey, N. Walters, X. Wang, K. Kwak, L. Lee, A. F. Palmer,
 8. E. Reátegui, "Immunomagnetic sequential ultrafiltration (iSUF) platform for enrichment and purification of extracellular vesicles from biofluids," *Scientific Reports* Apr 13;11(1):8034. doi: 10.1038/s41598-021-86910-y. (2021)
 9. A. Belcher, A. T. Williams, A. F. Palmer, P. Cabrales, "Polymerized albumin restores impaired hemodynamics in endotoxemia and polymicrobial sepsis," *Scientific Reports* May 25;11(1):10834. doi: 10.1038/s41598-021-90431-z. (2021)
 10. J. Gomez-Pastora, J. Kim, V. Multanen, M. Weigand, N. A. Walters, E. Reategui, A. F. Palmer, M. Yazer, M. Zborowski, J. J. Chalmers, "Intrinsically magnetic susceptibility in human blood and its impact on cell separation: Non-classical and intermediate monocytes have the strongest magnetic behavior in fresh human blood," *Experimental Hematology* May 17; S0301- 472X(21)00194-6. doi: 10.1016/j.exphem.2021.05.003. (2021)
 11. M. R. H. Weigand, J. Gómez-Pastora, J. Kim, M. T. Kurek, R. J. Hickey, D. C. Irwin, P. W. Buehler, M. Zborowski, A. F. Palmer, J. J. Chalmers, "Magnetophoretic and spectral characterization of oxyhemoglobin to deoxyhemoglobin: chemical vs enzymatic process," *PLOS ONE* Sep 3;16(9):e0257061. doi: 10.1371/journal.pone.0257061. (2021)
 12. C. T. Cuddington, S. Wolfe, A. F. Palmer, "Biophysical properties of tense quaternary state polymerized human hemoglobins bracketed between 500 kDa and 0.2 μ m in size," *Biotechnology Progress* Oct 8:e3219. doi: 10.1002/btpr.3219. (2021)
 13. Y. G. Lee, J. L. Kim, B. F. Reader, A. F. Palmer, J. Ma, S. M. Black, B. A. Whitson, "A rat lung transplantation model for warm ischemia/reperfusion injury: optimizations to improve outcomes," *Journal of Visualized Experiments* Oct 28;(176). doi: 10.3791/62445. (2021)

GRANT SUPPORT

- | | |
|-----------|---|
| 2016-2021 | Title: Polymerized hemoglobins for facilitated oxygen transport in hepatic bioreactors (contact PI: Palmer, A.F., co-PI: Berthiaume, F.) no cost extension
Agency: National Institutes of Health
Grant: R01EB021926-01A1
Amount: \$1,392,552 |
| 2016-2021 | Title: Attenuating the oxidative and myocardial side-effects of acellular hemoglobin (contact PI: Palmer, A.F., co-PI: Cabrales, P.) no cost extension
Agency: National Institutes of Health
Grant: R01HL126945-01A1
Amount: \$1,507,222 |
| 2017-2022 | Title: Fractionation of aged RBCs based on hemoglobin content (contact PI: Chalmers, J.J, co-PI: Palmer, A.F., co-PI: Zborowski, M.) no cost extension
Agency: National Institutes of Health |



- Grant: R01HL131720-01A1
Amount: \$2,670,860
- 2017-2022 Title: PEGylated megahemoglobin for use as a red blood cell substitute (contact PI: Palmer, A.F., co-PI: Cabrales, P., co-PI: Kaumaya, P.) no cost extension
Agency: National Institutes of Health
Grant: R01HL138116-01
Amount: \$2,875,118
- 2018-2023 Title: Next generation polymerized hemoglobins for use in transfusion medicine (PI: Palmer, A.F., co-PI: Cabrales, P.) no cost extension
Agency: U.S. Army Medical Research and Materiel Command
Grant: W81XWH1810059
Amount: \$2,460,698
- 2020-2023 Title: Hemoglobin, Heme, and Iron Scavenging for Improved Burn Injury Outcomes (PI: Berthiaume, F., co-PI: Palmer, A.F.)
Agency: Department of Defense Office of Congressionally Directed Medical Research Programs
Grant: W81XWH2010194
Amount: \$500,000
- 2021-2025 Title: Engineering a novel biomaterial for oxygen transport applications (PI: Palmer, A.F., co-PI: Wood, D.W., co-PI: Buehler, P.W.)
Agency: National Institutes of Health
Grant: R01HL156526-01
Amount: \$2,700,000
- 2021-2025 Title: Bioengineering a Dual Function Protein Construct to Detoxify Heme and Hemoglobin (PI: Palmer, A.F., co-PI: Cabrales, P., co-PI: Buehler, P.W., co-PI: Irwin, D.)
Agency: National Institutes of Health
Grant: R01HL159862-01
Amount: \$2,645,665
- 2021-2025 Title: Aerosolized therapy for hemoglobin toxicity in the treatment of hemolytic diseases (PI: Irwin, D.C., co-PI: Palmer, A.F., co-PI: Buehler, P.W.)
Agency: National Institutes of Health
Grant: R01HL158076-01A1
Amount: \$2,519,147
- 2022-2025 Title: Bioengineering a novel therapeutic protein complex to minimize the effects of medical device induced hemolysis (PI: Buehler, P.W., co-PI: Palmer, A.F., co-PI: Irwin, D.C., co-PI: Cabrales, P.)
Agency: National Institutes of Health
Grant: R01HL162120
Amount: \$2,629,980



LECTURES

Invited Lectures – Conference

- A. Palmer, “Engineering simple purification systems to generate a novel dual-functioning therapeutic complex for treatment of hemolytic conditions: the apohemoglobin-haptoglobin complex,” **Biotechnology and Bioengineering Awards**, Fall ACS Annual Meeting, Boston, MA, August 2021

Invited Lectures – University

- Palmer, “Apoemoglobin-haptoglobin is a novel dual-functioning therapeutic complex for treatment of hemolytic conditions,” Department of Chemical Engineering, University of Arkansas, Fayetteville, AR, November 2021

Joel Paulson

Assistant Professor

Ph.D. Massachusetts Institute of Technology

Stochastic mathematical optimization problems that can be applied to chemical and biological systems

NATIONAL ACTIVITY

National Committee and Conference Service

- IEEE Control Systems Society (CSS) Technical Committee (TC) on Process Control - Liaison for Early Career Researchers, 2021-date. Organized and founded the “Process Control, Optimization, and Data Analytics Young Researcher Online Seminar Series,” whose goal is to provide a platform for a diverse set of early-career researchers to share their work with the process control community.
- Machine Learning and Model Predictive Control workshop - Organized by Ali Mesbah and Joel A. Paulson. *IFAC Symposium on Advanced Control of Chemical Processes*, June 2021. Code available: https://github.com/joelpaulson/ADCHEM_ML_MPC_Workshop_2021
- Chair for Session on Advances in Process Control I and II, Fall Annual Meeting, 2021
- Chair for Session on Applied Artificial Intelligence, Big Data, and Data Analytics Methods for Next-Gen Manufacturing Efficiency, Fall Annual Meeting, 2021
- Co-chair for Session on Predictive Control and Optimization, Fall Annual Meeting, 2021
- Co-chair for Session on Advances in Computational Methods and Numerical Analysis, Fall Annual Meeting, 2021
- Elected as Program Coordinator – Applied Mathematics and Numerical Analysis (Area 10d), CAST Division – AIChE, 2024
- Lead Organizer of an Invited Session, “Recent Advances in Model Predictive Control for Uncertain Systems”, American Control Conference (ACC), 2021

Editorial Boards

- Associate Editor for the 2022 American Control Conference (ACC)
- Associate Editor for the 2022 European Control Conference (ECC)
- Member, IEEE CSS Technical Committee on Process Control, 2020-date



- Member, IEEE CSS Technical Committee on Robust and Complex Systems, 2021-date
- Member, IFAC Technical Committee on Chemical Process Control, 2018-date
- Member, IFAC Technical Committee on Control Design, 2020-date
- Member, IFAC Technical Committee on Distributed Parameter Systems, 2020-date

Review Panels

- Reviewer (x2), National Science Foundation (NSF), 2021
- Reviewer (x2), President Research Excellence Seed Funding Program, OSU, 2021
- Reviewer, Joint National Natural Science Foundation of China and Israel Science Foundation Research Grant Program, 2021



PUBLICATIONS, SOFTWARE

Refereed Papers

1. A.D. Bonzanini, **J.A. Paulson**, G. Makrygiorgos, and A. Mesbah. Fast approximate learning-based multistage nonlinear model predictive control using Gaussian processes and deep neural networks. *Computers & Chemical Engineering*, 145:107174, 2021.
2. F. Sorourifar, N. Choksi, and **J.A. Paulson**. Computationally efficient integrated design and predictive control of flexible energy systems using multi-fidelity simulation-based Bayesian optimization. *Optimal Control Applications and Methods*, 2021.
3. **J.A. Paulson**, G. Makrygiorgos, and A. Mesbah. Adversarially robust Bayesian optimization for efficient auto-tuning of generic control structures under uncertainty. *AIChE Journal*, 2021
<https://doi.org/10.1002/aic.17591>.
4. **J.A. Paulson** and C. Lu. COBALT: COstrained Bayesian optimizATIOn of computatiOnally expensive grey-box models exploiting derivaTive information. *Computers & Chemical Engineering*, 2021 (accepted).
5. J. O'Leary, **J.A. Paulson**, and A. Mesbah. Stochastic Physics-Informed Neural Networks (SPINN): A Moment-Matching Framework for Learning Hidden Physics within Stochastic Differential Equations. Submitted to *Journal of Computational Physics*, 2021.

Proceeding Publications

1. K.J. Chan, **J.A. Paulson (co-first author)**, and A. Mesbah. Deep learning-based nonlinear model predictive control with offset-free tracking for embedded applications. In *Proceedings of the American Control Conference*, 3466–3472, New Orleans, 2021.
2. N. Choksi and **J.A. Paulson**. Simulation-based integrated design and control with embedded mixed-integer MPC using constrained Bayesian optimization. In *Proceedings of the American Control Conference*, 2114–2120, New Orleans, 2021.
3. D. Krishnamoorthy, **J.A. Paulson (co-first author)**, and A. Mesbah. An adaptive correction scheme for achieving offset-free asymptotic performance in deep learning-based economic MPC. In *Proceedings of the IFAC Symposium on Advanced Control of Chemical Processes*, 1–6, Virtual, 2021.
4. F. Sorourifar, G. Makrygiorgos, A. Mesbah, and **J.A. Paulson**. A data-driven automatic tuning method for MPC under uncertainty using constrained Bayesian optimization. In *Proceedings of the IFAC Symposium on Advanced Control of Chemical Processes*, 1–8, Virtual, 2021.
5. **J.A. Paulson**, K. Shao, and A. Mesbah. Probabilistically robust Bayesian optimization for data-driven tuning of arbitrary control structures with Gaussian process emulators. In *Proceedings of the Conference on Decision and Control*, Austin, Texas, 2021.
6. Kudva, F. Sorourifar, and **J.A. Paulson**. Efficient robust global optimization for simulation-based problems using decomposed Gaussian processes: Application to MPC calibration. *American Control Conference*, 2022 (accepted).

INDUSTRY

- Collaboration with Mitsubishi Electric Research Laboratories (MERL) on the development of novel Bayesian optimization (BO) algorithm for optimally tuning controllers for HVAC systems.

GRANT SUPPORT



- EFRI DChem: One-step conversion of CH₄ and CO₂ to liquid fuels with the use of a multi-functional pseudo catalytic system (preliminary proposal), NSF, Liang-Shih Fan (PI), Vicky Doan-Nguyen (co-PI), Andrew Tong (co-PI), and Joel Paulson (co-PI), 09/15/20–08/31/24, \$2,000,000.
- NSF2026: EAGER: Spatio-Temporal Design of Techno-Ecological Synergies for a World without Waste and Resilient Landscapes, NSF, Bhavik Bakshi (PI), Joel Paulson (co-PI), and Gil Bohrer (co-PI), 01/01/21–12/31/22, \$299,943

LECTURES

Invited Lectures – Conference

- **J.A. Paulson.** Accelerating multiscale process design with Bayesian optimization: Progress, challenges, and opportunities. *AIChE Virtual Process Development Symposium*, June 2021

Invited Lectures – University

- **J.A. Paulson.** Advances in learning-based model predictive control and its application to biochemical systems. *The University of British Columbia*, February 2021.

Additional Presentations

1. **J.A. Paulson**, K. Shao, and A. Mesbah. Robust data-driven design of generic control structures with probabilistic guarantees using Gaussian process emulators. *AIChE Annual Meeting*, 2021. Abstract 176h.
2. D. Krishnamoorthy, A. Mesbah, and **J.A. Paulson**. Deep learning-based approximate economic model predictive control with offset-free asymptotic performance guarantees using a modifier-adaptation scheme. *AIChE Annual Meeting*, 2021. Abstract 644c.
3. J. O’Leary, **J.A. Paulson**, and A. Mesbah. Physics-constrained deep learning of unmodeled physics in systems governed by stochastic differential equations. *AIChE Annual Meeting*, 2021. Abstract 182d.
4. U. Shah, **J.A. Paulson**, and B.R. Bakshi. Enabling real-time synergies in techno-ecological systems using adaptive nonlinear model predictive control. *AIChE Annual Meeting*, 2021. Abstract 434b.
5. F. Sorourifar, N. Choksi, and **J.A. Paulson**. Integrated design and model predictive control of multiscale systems using a multi-fidelity Bayesian optimization approach. *AIChE Annual Meeting*, 2021. Abstract 485a.
6. C. Lu and **J.A. Paulson**. A novel constrained Bayesian optimization method for computationally expensive grey-box models with composite objective and constraint functions. *AIChE Annual Meeting*, 2021. Abstract 558a.



James F. Rathman

Professor

Ph.D. University of Oklahoma

Molecular informatics and modeling complex chemical and biological phenomena

PUBLICATIONS, SOFTWARE

Refereed Papers

1. *Computational Toxicology* (2021) 19, 100175. <https://doi.org/10.1016/j.comtox.2021.100175>
2. Yang C, Cronin MTD, Arvidson KB, Bienfait B, Enoch SJ, Heldreth B, Hobocienski B, Muldoon-Jacobs K, Lan Y, Madden JC, Magdziarz T, Marusczyk J, Mostrag A, Nelms M, Neagu D, Przybylak K, Rathman JF, Park J, Richarz A-N, Richard AM, Ribeiro JV, Sacher O, Schwab C, Vitcheva V, Volarath P, Worth AP.
3. "COSMOS Next Generation – a public knowledge base leveraging chemical and biological data to support the regulatory assessment of chemicals"
4. *Food and Chemical Toxicology* (2021) 152, 112202. <https://doi.org/10.1016/j.fct.2021.112202>
5. Gentry R, Rodricks J, Clewell H, Greene T, Chappell G, Lea I, Borghoff S, Yang C, Rathman J, Ribeiro J, Hobocienski B, Mostrag A,
6. "Response to the Office of Environmental Health Hazard Assessment on comments related to Gentry et al. (2021)"
7. *Food and Chemical Toxicology* (2021) 151, 112097. <https://doi.org/10.1016/j.fct.2021.112097>
8. Gentry R, Greene T, Chappell G, Lea I, Borghoff S, Yang C, Rathman J, Ribeiro J, Hobocienski B, Mostrag A, Rodricks J, Clewell H.
9. "Integration of evidence to evaluate the potential for neurobehavioral effects following exposure to USFDA-approved food colors."
10. *Front. Toxicol.* (2021) 24. <https://doi.org/10.3389/ftox.2021.688321>
11. Batke M., Afrapoli FM, Kellner R, Rathman JF, Yang C, Cronin MTD, Escher SE.
12. "Threshold of Toxicological Concern – An Update for Non-Genotoxic Carcinogens"
13. *Front. Toxicol* (2021) 23. <https://doi.org/10.3389/ftox.2021.626543>
14. Yamada T, Kurimoto J, Hirose A., Yang C, Rathman J.
15. "Development of a New Threshold of Toxicological Concern Database of Non-cancer Toxicity Endpoints for Industrial Chemicals"
16. *Chemical Research in Toxicology*, 2021, 34, 189-216. <https://doi.org/10.1021/acs.chemrestox.0c00264>
A.M. Richard, R. Huang, S. Waidyanatha, P. Shinn, B. J. Collins, I. Thillainadarajah, C. J. Grulke, A.J. Williams, R.R. Lougee, R.S. Judson, K.A. Houck, M. Shobair, C. Yang, J.F. Rathman, A. Yasgar, S.C. Fitzpatrick, A. Simeonov, R.S. Thomas, K.M. Crofton, R.S. Paules, J.R. Bucher, C.P. Austin, R.J. Kavok, R.R. Tice.
"The Tox21 10K Compound Library: Collaborative Chemistry Advancing Toxicology"
17. *Chemical Research in Toxicology*, 2021, 34, 601-615. <https://doi.org/10.1021/acs.chemrestox.0c00423>
J.F. Rathman, C. Yang, J. V. Ribeiro, A. Mostrag, S. Thakkar, W. Tong, B. Hobocienski, O. Sacher, T. Magdziarz, B. Bienfait
"Development of a Battery of In Silico Prediction Tools for Drug-Induced Liver Injury from the Vantage Point of Translational Safety Assessment"
18. *Chemical Research in Toxicology*, 2021, 34, 616-633. <https://doi.org/10.1021/acs.chemrestox.0c00429>
C. Yang, J.F. Rathman, T. Magdziarz, A. Mostrag, S. Kulkarni, T.S. Barton-Maclaren



“Do Similar Structures Have Similar No Observed Adverse Effect Level (NOAEL) Values? Exploring Chemoinformatics Approaches for Estimating NOAEL Bounds and Uncertainties”

19. *Chemical Research in Toxicology*, 2021, 34, 641-655. <https://doi.org/10.1021/acs.chemrestox.0c00465>

J.W. Firman, C. B. Pestana, J.F. Rathman, M. Vinken, C. Yang, M.T.D. Cronin

“A Robust, Mechanistically Based In Silico Structural Profiler for Hepatic Cholestasis”

LECTURES

Invited Lectures – University

- *In Silico Methods in Toxicology*, Department of Pharmacological and Biomolecular Sciences at the Università degli Studi di Milano Statale (UniMi, University of Milan), Milan, Italy (Nov 2020 – Feb 2021)



Eduardo Reategui

Assistant Professor

Ph.D. University of Minnesota

Microtechnologies, biomaterials, spectroscopy, immunoengineering, circulating biomarkers

UNIVERSITY ACTIVITY

Awards and Honors

- 2021 Lumley Research Award, College of Engineering, The Ohio State University

PUBLICATIONS, SOFTWARE

Books and Chapters

- Capture and selective release of viable circulating tumor cells, Xilal Y. Rima, Jingjing Zhang, Eduardo Reátegui. (Book Chapter), *Microfluidic Systems for Cancer Diagnosis*, In Press (2022)

Refereed Papers

1. J.C. Jones, B.Mateescu, R.Alexander, M.Asghari, A.Boomgarden, L.Bouchareychas, J.Y.An, A.Cayota, H.-C.Chang, A.Charest, D.T. Chiu, R. J. Coffey, S.Das, P.DeHoff, A.deMello, C.D'Souza-Schorey, D. Elashoff, K.R.Eliato, J.L. Franklin, D.J. Galas, M.B.Gerstein, I.H. Ghiran, D.B. Go, S.Gould, James N.Higginbotham, Florian Hladik, Tony Jun Huang, X.Huo, D.K. Jeppesen, B.Y. S. Kim, S.Kim, K. M. Kim, Y.Kim, R.R. Kitchen,E.L. LaPlante,C.B.Lebrilla, L. J.Lee, K.M. Lennon, G.Li, Feng Li, T.Li, T.Liu, Z. Liu, A.L. Maddox, K.McCarthy, N.Maniya, Y.Meng, A.Milosavjevic, B.H.Min, J.Nolan, M.E. Paulaitis, T.A.Phu, R.Raffai, E.Reátegui, M.E. Roth, D.A. Routenberg, J.Rozowsky, S.Senapati, S.Shachar, H.Sharma, A.K. Sood, S.Stavrakis, A.Stürchler, T.Jovanovic-Talisman, M.Tewari, J.P.Tosar, A.K. Tucker-Schwartz, A.Turchinovich, N.Valkov, K.V.Keuren-Jensen, K.C. Vickers, L.Vojtech, Wyatt N. Vreeland, C.Wang, K.Wang, Z. Y.Wang, J.A. Welsh, K.W. Witwer, D. T.W. Wong, Y.-H.Xie, M.P. Zaborowski, C.Zhang, Q.Zhang, A.M. Zivkovic, L.C.Laurent, Extracellular RNA Communication Consortium, Phase 2 (ERCC2): New NIH Common Fund Programs to Develop New Analytical Tools to Characterize exRNA Carriers and Cargo, *iScience*, in press, 2021.
2. 2.K.Kienle, S.Eickhoff, K.Knöpper, E.Reátegui, M.Mihlan, M.Gunzer, R.Baumeister, T.K. Tarrant, R.N. Germain, D.Irimia, W.Kastenmüller, T.Lämmermann, Neutrophils self-limit swarming to contain bacterial growth in vivo. *Science*. 372, 6548, eabe7729, 2021.
3. 3.J.Zhang, L.TH Nguyen, R.Hickey, N.Walters, X.Wang, K.J.Kwak, L. J.Lee, A.F. Palmer, E.Reátegui, Immunomagnetic Sequential Ultrafiltration (iSUF) Platform for Enrichment and Purification of Extracellular Vesicles from Biofluids. *Scientific Reports*. 11,8034,2021.



4. 4.S.N.Tessier, L.D.Bookstaver, C.Angpraseuth, C.J.Stannard, B.Marques, U.K.Ho, A.Muzikansky, B.Aldikacti, E.Reátegui, D.C.Rabe, M.Toner, S.L.Stott, Isolation of intact extracellular vesicles from cryopreserved samples. *Plos One*. 16(5): e0251290, 2021.
5. 5.N.Walters, J.Zhang, X.Y. Rima, L.T. H. Nguyen, R.N. G, T.Lämmermann,E.Reátegui,Analyzing Inter-Leukocyte Communication and Migration in vitro: Neutrophils Play an Essential Role in Monocyte Activation during Swarming. *Frontiers in Immunology*. 12,1550,2021.
6. 6.J.Gómez-Pastora, J.Kim, V.Multanen, M.Weigand, N.Walters, E.Reátegui, A.F.Palmer, M.H.Yazer, M.Zborowski, J.J.Chalmers, Intrinsically magnetic susceptibility in human blood and its potential impact on cell separation: nonclassic and intermediate monocytes have the strongest magnetic behavior in fresh human blood. *Experimental Hematology*, in press, 2021.

GRANT SUPPORT

OSU Translational Therapeutic Seed Award

\$25,000

12/21/2021 - 11/30/2022

Seed Grant Ramaswamy (Contact PI), **Reátegui** (Co-PI)

Title: Targeting Tyrosine Kinase Pathways to Overcome Drug Resistance and Dormancy in Invasive Lobular Carcinoma of the Breast

National Institutes of Health/National Center for Advancing Translational Sciences (NCATS)

\$1,740,000

9/10/21-6/30/23

UH3TR002884 (Phase 2) **Reátegui** (Contact-PI), Kim (Co-PI)

Title: Microfluidics Array-Based Sorting, Isolation, and RNA Analysis in Single Extracellular Vesicles

National Institutes of Health/National Center for Advancing Translational Sciences (NCATS)

\$1,800,000

12/21/20-6/30/23

U18TR003807 **Reátegui** (Contact-PI), Pancholi/Lee (Co-PIs)

Title: Multi-parametric Integrated Molecular Detection of SARS-CoV-2 from Biofluids by Adapting Single Extracellular Vesicle Characterization Technologies

National Institutes of Health/National Center for Advancing Translational Sciences (NCATS)

\$842,000

9/10/19-6/30/22



UG3TR002884 (Phase 1) **Reátegui** (Contact-PI), Kim (Co-PI)
Title: Microfluidics Array-Based Sorting, Isolation, and RNA Analysis in Single Extracellular Vesicles

Chan Zuckerberg Initiative (CZI)
\$350,000
9/1/20-8/30/22
Reátegui (Contact-PI), Lammermann (Co-PI)
Title: Decoding Inflammation through Immune Cell Behavior

OSU Leukemia Research Program
Seed Grant **Reátegui** (Contact-PI), Lee (Co-PI)
\$30,000
3/1/20-12/30/21
Title: EV Microarray for PD-L1/PD-1 Quantification from Blood of Non-Small Cell Lung Cancer (NSCLC) Patients under Anti-PD-L1/PD-1 Immunotherapy

LECTURES

Invited Lectures – Conference

1. “*Molecular Characterization of Extracellular Vesicles for Liquid Biopsy Applications*,” Hub for Extracellular Vesicle Investigations (HEVI), Annual Symposium, Auckland, New Zealand (Virtual), November **2021**.
2. “*Bulk and In-situ Molecular Profiling of Extracellular Vesicles for Liquid Biopsy Applications*,” Encuentro Científico Internacional de Invierno, Lima, Perú (Virtual), July **2021**.
3. “*Molecular Characterization of Single Extracellular Vesicles: In situ RNA Profiling*,” National Institutes of Health (NIH), National Center for Advancing Translational Sciences (NCATS), Annual Investigator’s Meeting, Virtual Meeting, May **2021**.
4. “*Microfluidic Characterization of Circulating Tumor Biomarkers for Liquid Biopsies*,” Encuentro Científico Internacional de Verano, Lima, Perú (Virtual), January **2021**



Katelyn Swindle-Reilly

Assistant Professor

Ph.D. Washington University in St. Louis

Polymeric biomaterials, biomimetics and drug delivery systems

NATIONAL ACTIVITY

National Committee and Conference Service

- Society for Biomaterials: Elected Chair, Ophthalmic Biomaterials Special Interest Group (2021-23)
- Controlled Release Society: Elected Communications Chair, Ocular Delivery Group (2021-23)
- Society for Biomaterials: Annual Meeting Panel Organizer (2021-Current).
- Interviewer, Georgia Tech Stamps President's Scholars Program (2021)
- Society for Biomaterials: Elected Program Chair, Ophthalmic Biomaterials Special Interest Group (2019-21)
- NIH: Early Career Grant Reviewer. National Eye Institute (2019-Current).
- NSF, SBIR Grants Review Panel

Editorial Boards

2021 - Present. Abstract Reviewer, *Society for Biomaterials Annual Meeting*

2017 - 2021. Abstract Reviewer, *Biomedical Engineering Society Annual Meeting*

2020 - Present. Review Editor, *Frontiers in Medicine (Ophthalmology)*, (Journal)
Reviewer

2019. Abstract Reviewer, *Biofabrication Meeting*

2021 - Present. Journal Reviewer, *Bioengineering & Translational Medicine*, (Journal)

2021 - Present. Journal Reviewer, *Carbohydrate Polymers*, (Journal)

2021 - Present. Journal Reviewer, *Drug Delivery and Translational Research*, (Journal)

2021 - Present. Journal Reviewer, *Nature – Communications Materials*, (Journal)

2021 - Present. Journal Reviewer, *Small Methods*, (Journal)

2020 - Present. Journal Reviewer, *PLOS One*, (Journal)

2020 - Present. Journal Reviewer, *Journal of the Mechanical Behavior of Biomedical Materials*, (Journal)

2020 - Present. Journal Reviewer, *Acta Ophthalmologica*, (Journal)

2020 - Present. Journal Reviewer, *Journal of Controlled Release*, (Journal)

2020 - Present. Journal Reviewer, *Advanced Healthcare Materials*, (Journal)

2020 - Present. Journal Reviewer, *Journal of Biomechanics*, (Journal)

2020 - Present. Journal Reviewer, *Macromolecular Bioscience*, (Journal)

2019 - Present. Journal Reviewer, *Pharmaceutics*, (Journal)

2019 - Present. Journal Reviewer, *European Journal of Pharmaceutics and Biopharmaceutics*, (Journal)

2019 - Present. Journal Reviewer, *Clinical and Experimental Ophthalmology*, (Journal)

2018 - Present. Journal Reviewer, *Current Eye Research*, (Journal)

2018 - Present. Journal Reviewer, *Drug Discovery Today*, (Journal)

2018 - Present. Journal Reviewer, *Materials Horizons*, (Journal)



2016 - Present. Journal Reviewer, *Journal of Biomedical Materials Research A*, (Journal)
2016 - Present. Journal Reviewer, *Molecules*, (Journal)
2015 - Present. Journal Reviewer, *Polymers*, (Journal)
2015 - Present. Journal Reviewer, *International Journal of Molecular Sciences*, (Journal)
2014 - Present. Journal Reviewer, *RSC Advances*, (Journal)
2014 - Present. Journal Reviewer, *New Journal of Chemistry*, (Journal)
2014 - Present. Journal Reviewer, *Journal of Materials Chemistry B*, (Journal)

PUBLICATIONS, SOFTWARE

Refereed Papers

1. Luo, R.H., Tram, N.K., Reilly, M.A., **Swindle-Reilly, K.E.**, Vitreous Biomechanics in Disease and Ocular Transport. *Current Eye Research*. In Revision.
2. Maxwell, C.M., Soltisz, A.M., Rich, W.W., Choi, A., Reilly, M.A., **Swindle-Reilly, K.E.**, Tunable Alginate Hydrogels as Injectable Drug Delivery Vehicles for Optic Neuropathy. *Journal of Biomedical Materials Research: Part A*. In Revision.
3. Allyn, M.M., Luo, R.H., Hellwarth, E.B., **Swindle-Reilly, K.E.**, Considerations for Polymers used in Ocular Drug Delivery. *Frontiers in Medicine*. In Press.
4. Tram, N.K., McLean, R., **Swindle-Reilly, K.E.**, Glutathione Improves the Antioxidant Activity of Vitamin C in Human Lens and Retinal Epithelial Cells: Implications for Vitreous Substitutes. *Current Eye Research*, 2021; 46(4):470-481.
5. Tram, N.K., Maxwell, C.J., **Swindle-Reilly, K.E.**, Macro- and Microscale Properties of the Vitreous Humor to Inform Substitute Design and Intravitreal Biotransport. *Current Eye Research*, 2021; 46(4):429-444.

ENTREPRENEURIAL

Technology Licensing

- Vitranu, Inc.

Start-Up

- Founder (2019), Chief Technology Officer of Vitranu, Inc., a startup company to commercialize ocular drug delivery technologies developed at The Ohio State University.

GRANT SUPPORT

1. Department of Defense. (\$902,737 Total; \$100,000 Lab) 5/2015-3/2022. Torsional Indirect Traumatic Optic Neuropathy (TITON): Animal Model for Diagnostics, Drug Delivery, and Therapeutics for Central Nervous System Injury. Research Grant. PI: Reilly, Matthew. Role: Co-PI. Co-I: Racine, Julie; Cebulla, Colleen; Abdel-Rahman, Mohammad. Explanation of Role: I developed and characterized a hydrogel drug delivery system and therapeutic approach for optic neuropathy.
2. Ohio Third Frontier Technology Validation and Start-up Fund. (\$150,000) 6/2020-5/2021. Bi-layered Capsule for Sustainable Delivery. Research Grant. PI: Sears, Robin. Role: Co-I. Co-I: Beasecker, Brad; Ohr,



Matthew. Explanation of Role: I served as Chief Technology Officer providing technical and scientific assistance scaling up production and evaluating drug release.

3. Ohio State University Institute for Materials Research Kickstart Facility Grant – “Material Characterization of Redox-Responsive Nanoparticles” – PI: Katelyn E. Swindle-Reilly – \$2,500 (11/16/20-11/15/21)
4. Ohio State University President’s Research Excellence Accelerator Grant. (\$50,000) 7/2021-6/2022. Local antioxidant release to prevent cataract after vitrectomy. Role: PI. Co-I: Cebulla, Colleen; Chandler, Heather; Miller, Eric.
5. DOD Vision Translational Research Program – MR130235 – “Torsional Indirect Traumatic Optic Neuropathy (TITON): Animal Model for Diagnostics, Drug Delivery, and Therapeutics for Central Nervous System Injury” – PI: Matthew A. Reilly; Role: Co-PI – \$902,737 (03/29/19- 03/28/21)
6. Oregon Lions Sight and Hearing Foundation, Inc. (\$15,000 Total) 6/2019-5/2022. A Multiscale Investigation of Ocular Tissue Properties and Biomechanical Response. Research Grant. Role: MPI. MPI: Roberts, Cynthia; Reilly, Matthew; Swindle-Reilly, Katelyn; Liu, Jun.
7. Ohio Lions Eye Research Foundation Disaster Relief Grant – “Ocular Drug Delivery” – PI:Katelyn E. Swindle-Reilly – \$20,000 (09/15/20-09/14/21)
8. Barbara L. Crow Investigator-Concept Grant, Lions VisionGift – “Multiscale investigation of ocular tissue properties and biomechanical response” – PIs: Cynthia J. Roberts, Jun Liu, Matthew A. Reilly, Katelyn E. Swindle-Reilly – \$15,000 (06/01/19-05/31/22)

LECTURES

Invited Lectures

1. *Translating Polymer Engineering to Treatment of Ocular Diseases*, Department of Chemical Engineering, McMaster University, Hamilton, Canada, March 2021.
2. *How a Tiny Capsule Can Treat Age-Related Macular Degeneration*, Pitch X Ohio, Columbus, Ohio, December 2021. [*tweeted by Lt. Gov. Jon Husted]
3. *Ocular Tunable Extended Release Capsule*, SHOWOH/O, Columbus, Ohio, April 2021.
4. *Translating Polymers to Treatment of Ocular Diseases*, Biological Sciences Scholars, The Ohio State University, Columbus, Ohio, November 2021.
5. *Using Polymers to Study and Treat Ocular Diseases*, Molecular Biophysics Training Program, The Ohio State University, Columbus, Ohio, September 2021.
6. *Translating Polymer Design and Processing to Treatment of Ocular Diseases*, OSU Materials Week, Columbus, Ohio, April 2021.



William Wang

Assistant Professor

Ph.D. University of Wisconsin-Madison

Design of novel dynamic materials and systems based on colloidal and interfacial phenomena

NATIONAL ACTIVITY

Awards and Honors

- Royal Society of Chemistry, *Journal of Materials Chemistry A* Emerging Investigator

National Committee and Conference Service

- Session co-chair of 'Carbon Nanomaterials: Synthesis, Functionalization, Assembly, and Applications I' at 2021 AIChE conference
- Cancelled due to COVID: Discussion leader at 2021 Gordon Research Conference (GRC) on liquid crystals.

Editorial

- Guest editor for journal of *Frontiers in Bioengineering and Biotechnology*, with Prof. Chenxuan Wang and Prof. Lei Liu. The Hierarchical Organization of Supramolecular Systems - From Fundamentals to Biomedical Applications. *Frontiers in Bioengineering and Biotechnology* 2021, 9, 754980.

PUBLICATIONS, SOFTWARE

Books and Chapters

- Rather, A. M.; Xu, Y.; Dupont, R. L.; Wang, X. Polymeric Membranes in Wastewater Treatment. *In Title: Nanoscale Engineering of Biomaterials: Properties and Applications*; Pandey, L., Hasan, A. Eds; Springer Nature; In press. Accepted in 2021.

Refereed Papers

1. Xu, Y.; Chang, Y.; Yao, Y.; Zhang, M.; Dupont, R. L.; Rather, A. M.; Bao, X.; Wang, X., Modularizable Liquid Crystal-Based Open Surfaces Enable Programmable Chemical Transport and Feeding Using Liquid Droplets. *Advanced Materials* Accepted.
2. Rather, A. M.; Xu, Y.; Chang, Y.; Dupont, R. L.; Borbora, A.; Kara, U. I.; Fang, J.-C.; Mamtani, R.; Zhang, M.; Yao, Y.; Adera, S.; Bao, X.; Manna, U.; Wang, X., Stimuli-Responsive Liquid Crystal-Infused Porous Surfaces for Manipulation of Underwater Gas Bubble Transport and Adhesion. *Advanced Materials* In Press, Accepted in December, 2021.
3. Borbora, A.; Dupont, R. L.; Yang, X.; Wang, X.; Manna, U., Dually Reactive Multilayer Coatings Enable Orthogonal Manipulation of Underwater Superoleophobicity and Oil Adhesion via Post-Functionalization. *Materials Horizons* In Press, Accepted in December, 2021.



4. Lou, Z.; Wang, Q.; Zhou, X.; Kara, U. I.; Mamtani, R. S.; Lv, H.; Zhang, M.; Yang, Z.; Li, Y.; Wang, C.; Adera, S.; Wang, X., An Angle-Insensitive Electromagnetic Absorber Enabling a Wideband Absorption. *Journal of Materials Science and Technology* 2022, 113, 33-39. Accepted in November, 2021.
5. Lou, Z.; Wang, Q.; Kara, U. I.; Mamtani, R. S.; Zhou, X.; Bian, H.; Yang, Z.; Li, Y.; Lv, H.; Adera, S.; Wang, X., Biomass-Derived Carbon Heterostructures Enable Environmentally Adaptive Wideband Electromagnetic Wave Absorbers. *Nano-Micro Letters* 2022, 14, 11. Published in December, 2021.
6. Zhang, W.; Liu, M.; Dupont, R. L.; Huang, K.; Yu, L.; Liu, S.; Wang, X.; Wang, C., Conservation and Identity Selection of Cationic Residues Flanking the Hydrophobic Regions in Intermediate Filament Superfamily. *Frontiers in Chemistry* 2021, 9, 752630.
7. Wang, C.; Liu, L.; Wang, X. Editorial: The Hierarchical Organization of Supramolecular Systems - From Fundamentals to Biomedical Applications. *Frontiers in Bioengineering and Biotechnology* 2021, 9, 754980.
8. Xu, Y.; Rather, A. M.; Yao, Y.; Fang, J.-C.; Mamtani, R. S.; Bennett, R. K. A.; Atta, R. G.; Adera, S.; Tkalec, U.; Wang, X., Liquid Crystal-Based Open Surface Microfluidics Manipulate Liquid Mobility and Chemical Composition On Demand. *Science Advances* 2021, 7, eabi7607.
9. Xu, Y.; Dupont, R. L.; Yao, Y.; Zhang, M.; Fang, J.-C.; Wang, X., Random Liquid Crystalline Copolymers Consisting of Prolate and Oblate Liquid Crystal Monomers. *Macromolecules* 2021, 54, 5376-5387.
10. Lv, H.; Zhou, X.; Wu, G.; Kara, U. I.; Wang, X. Engineering Defects in 2D g-C₃N₄ for Wideband, Efficient Electromagnetic Absorption at Elevated Temperature. *Journal of Materials Chemistry A*, 2021, 9, 19710-19718.
11. Wang, C.; Biok, N. A.; Nayani, K.; Wang, X.; Yeon, H.; Ma, C.-K. D.; Gellman, S. H.; Abbott, N. L., Cationic Side Chain Identity Directs Hydrophobically-Driven Self-Assembly of Amphiphilic β -Peptides in Aqueous Solution. *Langmuir* 2021, 37, 3288-3298.

GRANT SUPPORT

1. Design of low-cost thermoelectric materials based on MXene/Carbon composites. Sponsor: OSU Sustainability Institute. PI: Wang, X. Start Date: 7/1/2020; End Date: 6/30/2021. Budget: \$25,000
2. Design of Low-Cost Thermoelectric Materials Based on MXene Composites. Sponsor: OSU Institute for Materials Research Kickstart Facility Grant. PI: Wang, X. Start Date: 4/15/2021; End Date: 4/14/2022. Budget: \$2,500
3. Sustainable Materials and Zero Waste. Sponsor: OSU Sustainability Institute, OSU Wexner Medical Center QLC, OSU Facilities Operations and Development (FOD; by Mark Conselyea). PI and co-PIs: Linda Gabel, Jay Sayre, Nate Ames, William Wang et al. Start Date: 3/1/2022; End Date: 3/1/2023. Accepted in December 2021. Budget: \$175,000 (\$75,000 from SI, \$75,000 from Wexner, \$25,000 from FOD) – Most of the funding will be distributed to William Wang's group.

LECTURES



Invited Lectures – University

- Department seminar talk at University of Memphis, Tennessee – 2/19/2021.

Additional Presentations

- Two presentations at 2021 AIChE conference.



Xiaoxue Wang

Assistant Professor

Ph.D. Massachusetts Institute of Technology

Material synthesis, molecular engineering, electronics, optoelectronics, soft materials using computational methods

NATIONAL ACTIVITY

Awards and Honors

- Oak Ridge Associated Universities (ORAU) Consortium: *Ralph E. Powe Junior Faculty Enhancement Award*

PUBLICATIONS, SOFTWARE

Refereed Papers

- Accepted in 2021: Li, B., Sun, H., Shu, H., **Wang, X.*** Applying Neuromorphic Computing Simulation in Band Gap Prediction and Chemical Reaction Classification. **ACS Omega** 2022, 7, 1, 168–175.

GRANT SUPPORT

1. OSU President's Research Excellence (PRE) Accelerator Award
2. Exploratory Materials Research Grant within The Ohio State University Materials Research Seed Grant Program (MRS GP)



Jessica Winter

Professor

Ph.D. University of Texas at Austin

Nanotechnology for cancer imaging, cancer cell migration and energy storage

NATIONAL ACTIVITY

Awards and Honors

1. Fellow, American Institute of Chemical Engineers, 2021
2. Fellow, Biomedical Engineering Society, 2021
3. Fellow, Royal Society of Chemistry, 2021

Media

- The Compass, BBC Podcast: Jul 7, 2021 featured guest discussing how gold nanoparticles are applied in healthcare.

National Committee and Conference Service

- American Institute of Chemical Engineers (AIChE)
 - Chair- Chemical Engineering Technical Operating Council (CTOC)
 - Chair- CTOC IDEAL Implementation Task Force (Inclusion, Diversity, Equity, Anti-Racism and Learning)
 - CTOC Liaison – Political Affairs and Information Committee (PAIC)
 - CTOC Liaison- Nanoscale Science and Engineering Forum
 - Member- CTOC Survey Taskforce
 - Member- Cross-Operating Council IDEAL Implementation Taskforce
- BME Unite

Editorial Boards

- Journal of Biomaterials Chemistry B (RSC)- Associate Editor (07/2018-)
- Frontiers in Neuro-engineering (Frontiers)- Associate Editor (03/2008-)
- Journal of Materials Chemistry- Executive Board (08/2018-01/2020)
- Journal of Nanoengineering and Nanosystems- Editorial Board (01/2009-)

PUBLICATIONS, SOFTWARE

Books and Chapters



- Jessica O. Winter, Shreyas Rao, Eds., [Biomaterial Based Approaches to Study the Tumour Microenvironment](#), in Biomaterials Science Series, Royal Society of Chemistry, Anticipated 2022, ISBN 9781839162848.]

Refereed Papers

1. K.H. Lee, B.A. Noesges, C. McPherson[†], L.J. Brillson, J.O. Winter. Oxidation of Quantum Dots Encapsulated in Block Copolymer Micelles as a Function of Polymer Terminal Charge, *in review at Nanoscale*.
2. E. Jergens, J.O. Winter, Nanoparticles caged with DNA nanostructures (2022), **Current Opinion in Biotechnology**, 74: 278-284. [<https://doi.org/10.1016/j.copbio.2021.12.010>] (published online 2021)
3. K.H. Lee, F.N. Khan, L. Cosby, G. Yang[†], J.O. Winter, Polymer Concentration Maximizes Encapsulation Efficiency in Electrohydrodynamic Mixing Nanoprecipitation, **Frontiers in Nanotechnology** (2021), 3: 719210. [<https://doi.org/10.3389/fnano.2021.719710>]
4. Q. Fan, A. Dehankar, T. Porter[†], J.O. Winter (2021), Effect of Micelle Encapsulation on Toxicity of CdSe/ZnS and Mn-doped ZnSe Quantum Dots, **Coatings**, 11: 895. [<https://doi.org/10.3390/coatings11080895>]

Additional Presentations

1. E. Jergens, J. Winter, "DNA-cages Polymer Micelles for Cell and Tissue Labeling," American Institute of Chemical Engineers, Boston, MA (November 9th, 2021).
2. F. N. Khan, X. Gu, J. Scaglione, N. Brunelli, A. Palmer, J. Winter, "Mixing dynamics characterization of jet mixing reactors for rapid nanoparticle synthesis," American Institute of Chemical Engineers Annual Meeting, Virtual (November 16, 2021)
3. F. N. Khan, X. Gu, J. Scaglione, N. Brunelli, A. Palmer, J. Winter, "Application of jet mixing reactors for controlled, rapid nanoparticle synthesis.," American Chemical Society Indiana Section, Virtual (August 24, 2021)
4. S.A. Fernandes-Junior, E. Jergens, J.J. Otero, J. Winter, "DNA-cage Polymer Micelles for Cell and Tissue Labeling," Biomedical Engineering Society, Orlando, FL (October 7, 2021).
5. Richard Luo, Faiz N. Khan, Jessica O. Winter, Katelyn E. Swindle-Reilly. "Microfluidic Synthesis of Polydopamine Nanoparticles for Ocular Drug Delivery." Controlled Release Society, Virtual, July 2021.

ENTREPRENEURIAL

Start-Up

Core Quantum Technologies, Winter's start-up company, has begun sales of two products: the MultiDot (Quantum dot flow cytometry reagents) and the MagDot (magnetic quantum dots for cell separations and flow cytometry analysis). Winter continues to consult for CQT on a limited basis, and last year the company was awarded a \$100k TCEP addition to its Phase II SBIR to collaborate with Nanocomposix (San Diego, CA) on product development. The Phase II SBIR also provided funding for Chalmers collaborator Maciej Zrbowski (Cleveland Clinic) to develop a magnetic separation device for CQT.

GRANT SUPPORT



1. CINT, DOE, "DNA Nanotechnology-Molecular Shuttle Hybrids for Reversible Cargo Capture and Release," (PI: Jessica Winter, coPIs: Carlos Castro, George Bachand (Sandia)), Tool use and time, 07/01/2021-06/30/2022.
2. NSF, CMMI-2111412, AM, "Scalable Nanomanufacturing of Uniform Inorganic Nanoparticles Using Jet Mixing Reactors," (PI: Jessica Winter, coPIs: Nicholas Brunelli, Barbara Wyslouzil), \$733,504, 03/2021-02/2024\
3. NSF, DMR- 2011876, Materials Research Science and Engineering Center, "Center for Emergent Materials: an NSF MRSEC," (PI: Chris Hammel), \$18M, 09/01/2020-08/30/2026.
4. DOE, DE-SC0017270, "Reciprocal Energy Exchange in Hierarchical DNA Origami-Nanoparticle Composites," (PI: Jessica Winter, coPIs: Carlos Castro, Ezekiel Johnston-Halperin, Michael Poirier), \$1.35M, 03/15/2020-03/14/2023.

LECTURES

Keynotes

- "Nanoparticles in Cancer Diagnostics," **Istanbul Technical University** Molecular Biology and Genetics Student Conference, October 2, 2021. (Keynote)

Invited Lecture – Conference

- "Importance of Basic Research," **PitchX**, Dec 6, 2021, Jobs Ohio, https://www.youtube.com/watch?v=roO_xmJb0pQ [*tweeted by Lt. Gov. Jon Husted]



David Wood

Professor

Ph.D. Rensselaer Polytechnic Institute

Biotechnology development through protein engineering

NATIONAL ACTIVITY

National Committee and Conference Service

- **Area Coordinator**, ACS BIOT 2022, Integrated and Continuous Biomanufacturing
- **Session Chair**, ACS BIOT 2021, Downstream Processing of Non-Antibody Modalities.

ENTREPRENEURIAL

Start-Up

Protein Capture Science LLC, founded by David Wood and Izabella Gierach, reached a milestone in the past year, launching its first commercial product last summer. The company now has revenues and at least one repeat customer (who increased their second order by a factor of 10 above their first). Initial customer feedback is positive, and the company is currently engaged with researchers at several large and small companies that are using the technology. Overall, the growth looks good, and there is quite a lot of excitement about the product. The company also registered a trademark on its resin.

GRANT SUPPORT

- Research Grant (Wood, PI w/ Jeff Chalmers) 07/01/2019 - 4/30/2021 NIH (NIGMS) \$390,873

A scalable platform to selectively purify engineered extracellular vesicles via self-cleaving tags

This proposal seeks to develop intein-based methods for purifying engineered exosomes for drug delivery tools.

- Research Contract (Wood, PI) 01/01/2020 - 12/31/2021 EMD Millipore Corp \$150,000

Optimization of Protein A Affinity Ligand

This proposal is a continuation with Millipore to develop a practical platform for protein purification using an optimized Protein A affinity ligand.

- Research Grant (Wood, PI w/ Andre Palmer) 01/15/2021 – 01/14/2025 NIH (NHLBI) R01 \$2,716,911

Engineering a novel biomaterial for oxygen transport applications



This proposal seeks to develop highly structured hemoglobin-based oxygen carriers for basic research in artificial blood design.



- Research Contract (Wood, PI) 10/18/2021- 10/17/2022 Evox Therapeutics Limited \$150,000
Evox intein tuning work

This proposal is a research contract to develop highly controlled inteins for use in exosome-based drug delivery tools.

LECTURES

Keynotes

- Bioprocessing 2021: The 3rd Annual Bioprocessing Virtual Event; Labroots (virtual), April 7, 2021. “A Convenient Self-Cleaving Affinity Tag for Research and Manufacturing Applications”

Invited Lectures

Bioprocessing 2021: The 3rd Annual Bioprocessing Virtual Event

- **Virtual Workshop Series, Cambridge Healthtech Institute**, Introduction to Downstream Process Development, January 26, February 2, February 9, 2021. <https://www.healthtech.com/virtual-workshops-downstream-process>
- **The Chain: Protein Engineering Podcast, Cambridge Healthtech Institute**, Episode 29: “Efficient Chromatography Devices for Purification Requirements”, April 2, 2021. <https://www.healthtech.com/the-chain/efficient-chromatography-devices-for-purification-requirements>

Additional Presentations

Affinity 2021

- International Society of Molecular Recognition, Lisbon (Virtual), June 22-24, 2021. “A practical self-cleaving affinity tag for research to manufacturing scales” oral presentation by David Wood, Izabela Gierach, Joseph Taris, Jackelyn Galiardi, Brian Marshall.



Barbara Wyslouzil

Professor

Ph.D. California Institute of Technology

Aerosol and particle technology

NATIONAL ACTIVITY

National Committee and Conference Service

- Co-organizer of the conference “Molecular Understanding of Atmospheric Aerosols, 2022” to be held May 15 – 20, 2022 ” (<https://web.cvent.com/event/bf038569-85b1-4b68-aedd-9cfef522bb00/summary>) .

Editorial Boards

- Reviewer for Journal of Chemical Physics, Journal of Physical Chemistry, Physical Chemistry Chemical Physics

PUBLICATIONS, SOFTWARE

Books and Chapters

- Barbara Wyslouzil and Ruth Signorell, *Nucleation Studies in Supersonic Flow*, In: *Uniform Supersonic Flows in Chemical Physics / Chemistry Close to Absolute Zero Studied Using the CRESU Method*. Edited By: Bertrand R Rowe, André Canosa (CNRS - University of Rennes 1, France) and Dwayne E Heard (University of Leeds, UK) April 2022. <https://doi.org/10.1142/q0324>

Refereed Papers

1. Tong Sun, Dor Ben-Amotz and Barbara E. Wyslouzil, *The freezing behavior of aqueous n-alcohol nanodroplets*, Phys. Chem. Chem. Phys. 2021, **23**, 9991-10005; <https://doi.org/10.1039/D0CP06131J>
2. Roope Halonen, Valtteri Tikkanen, Bernhard Reischl, Kayane K Dingilian, Barbara E Wyslouzil, Hanna Vehkamäki, *Homogeneous nucleation of carbon dioxide in supersonic nozzles II: molecular dynamics simulations and properties of nucleating clusters*, Phys. Chem. Chem. Phys. 2021, **23**, 4517-4529; <https://doi.org/10.1039/D0CP05653G>
3. Kayane K. Dingilian, Martina Lippe Jakub Kubečka, Jan Krohn, Chenxi Li, Bernhard Reischl, Roope Halonen, Fatemeh Keshavarz, Theo Kurtén, Hanna Vehkamäki, Ruth Signorell, and Barbara E. Wyslouzil, *New Particle Formation from the Vapor Phase: From Barrier Controlled Nucleation to the Collisional Limit*, Phys. Chem. Chem. Lett. 2021, **12**, 19, 4593–4599, <https://doi.org/10.1021/acs.jpcllett.1c00762>
4. Kil Ho Lee, Megan Ireland, Brandon L Miller, Barbara E Wyslouzil, Jessica O Winter. *Synthesis of polymer nanoparticles via electrohydrodynamic emulsification-mediated self-assembly*, Journal of Colloid and Interface Science, 2021, **586**, 445-456; <https://doi.org/10.1016/j.jcis.2020.10.108>



5. Tong Sun and Barbara E. Wyslouzil, *Freezing of Dilute Aqueous-Alcohol Nanodroplets: The Effect of Molecular Structure*, J. Phys. Chem. B 2021, 125, 44, 12329–12343; <https://doi.org/10.1021/acs.jpcc.1c06188>



GRANT SUPPORT

- *Vapor-Liquid-Ice: Exploring water's phase transitions far from equilibrium*. National Science Foundation: **Barbara E. Wyslouzil**, PI; (9/2019-8/22) \$499,999
- *Support for the Conference: Molecular-Level Understanding of Atmospheric Aerosols (MUOAA 2020)*. National Science Foundation, **Cari Dutcher** (U Mn), PI, Barbara Wyslouzil (Collaborator), Margaret Tolber (U Colorado, Collaborator); (2022 – new end date reflects the extension requested due to delaying the conference until May 2022) \$30,000
- *Enabling the Scalable Synthesis of Uniform Inorganic Nanoparticles*, National Science Foundation, Jessica O. Winter (PI), Nicholas Brunelli (co-PI), Barbara Wyslouzil (co-PI, 07/21 – 06/24), \$733,504

LECTURES

Invited Lectures – Conference

- 2021 International Chemical Congress of Pacific Basin (Virtual Congress), Barbara Wyslouzil, *CO₂ - alkane clusters: heterogeneous nucleation and cluster structure*, December, 2021.

Additional Presentations

- Students Tong Sun and Jiaqi Luo made presentations at Physical Chemistry and Spectroscopy session at the ACS Great Lakes Regional Meeting. Tong Sun won a presentation award.
- Jiaqi Luo presented at the American Association for Aerosol Research Annual meeting.



Shang-Tian Yang

Professor

Ph.D. Purdue University

Biochemical, metabolic, tissue engineering and biotechnology

NATIONAL ACTIVITY

National Committee and Conference Service

- Session organizer and co-chair, “Microbiomes and Natural Products in Food, Health, and Bioprocessing” AIChE 2021 annual meeting, Boston, MA, November 7-11, 2021
- Session organizer and chair, “Metabolic Engineering for Food, Feed, and Bioproducts” AIChE 2021 annual meeting, Boston, MA, November 7-11, 2021
- Session organizer and co-chair, “Fermentation and Process Engineering in Food and Bioprocess Industries” AIChE 2021 annual meeting, Boston, MA, November 7-11, 2021
- AIChE Division 15a Foods 2021 program co-chair.

Editorial Boards

- Specialty Chief Editor, Frontiers in Chemical Engineering - Biochemical Engineering
- Associate Editor, Process Biochemistry, Elsevier
- Guest Associate Editor, Frontiers in Bioengineering and Biotechnology – Synthetic Biology
- Topic Editor, "*Development and Application of Clostridia as Microbial Cell-factories for Biofuels and Biochemicals Production*" Frontiers in Bioengineering and Biotechnology
- Associate Editor, International Journal of Biotechnology for Wellness Industries, Life Science Global
- Review Editor, Frontiers in Energy Research - Bioenergy and Biofuels
- Editorial Board Member, Bioresources and Bioprocessing (BRBP), Springer
- Editorial Board Member, Bioengineering, MDPI
- Editorial Board Member, Pharmaceutical Bioprocessing, Future Science Group (FSG), London, UK
- Editorial Advisory Board Member, Recent Patents on Biotechnology, Bentham Science
- Editorial Board Member, Open Biotechnology Journal, Open Biotechnology Letters, Open Biotechnology reviews, Bentham Science
- Editorial Board Member, World Journal of Stem Cells (WJSC), Baishideng Publishing Group (BPG)
- Editorial Advisory Board, Engineering in Life Sciences, Wiley-VCH
- Editorial Board Member, Journal of Tissue Science & Engineering, Journal of Microbial & Biochemical Technology, OMICS Publishing Group Editorial
- Reviewed over 15 proposals for Natural Sciences and Engineering Research Council of Canada, National Science Foundation, U.S. Dept. of Agriculture, Dept. of Energy, Hong Kong Research Grants Council, National Science Council of Taiwan, ACS Petroleum Research Funds, Biotechnology and Biological Sciences Research Council (BBSRC, UK), UAEU-AUA Joint-Research Proposals etc.



- Reviewed over 60 journal papers for Nature Biotechnology, Nature Communication, Scientific Reports, ACS Synthetic Biology, Biotechnology Advances, Biotechnology & Bioengineering, Metabolic Engineering, Bioresource Technology, Biochemical Engineering Journal, Biotechnology Progress, Tissue Engineering, Biomaterials, Process Biochemistry, Applied Microbiology & Biotechnology, Applies & Environmental Microbiology, Enzyme & Microbial Technology, J. Biotechnology, J. Chemical Technol. Biotechnol., J. Food Science, Separation and Purification Technology, Langmuir, Analytical Chemistry, etc.
- External evaluator for tenure & promotion cases for National University of Singapore, Univ of Massachusetts Lowell, etc.
- External MS thesis evaluator/examiner - Bioethanol production by *Saccharomyces cerevisiae* from molasses under high gravity fermentation, Department of Microbiology, Cairo University
- External PhD thesis evaluator/examiner - Fungal conversion of chicken feather waste into agro-industrially useful products, Department of Zoology, Division of Science and Technology, University of Education, Lahore, Pakistan

PUBLICATIONS, SOFTWARE

Books and Chapters

1. T. Bao, W. Jiang, Qurat-ul-Ain Ahmad, ST Yang, Consolidated Bioprocessing for Ethanol and Butanol Production from Lignocellulosic Biomass: Recent Advances in Strain and Process Engineering, in N. Thongchul, A. Kokosis, S. Assabumrungrat (eds). A-Z of Biorefinery, Elsevier (2021), Ch. 13, pp 473–506.
2. Hesham El-Enshasy and Shang-Tian Yang (editors). Probiotics, the Natural Microbiota in Living Organisms: Fundamentals and Applications, CRC Press, Taylor & Francis Group, London, UK (2021), DOI: 10.1201/9781351027540.

Refereed Papers

1. X Pan, M Tang, J You, F Liu, C Sun, T Osire, W Fu, G Yi, T Yang, ST Yang, Z Rao, Regulator RcsB controls prodigiosin synthesis and various cellular processes in *Serratia marcescens* JNB5-1, Appl. Environ. Microbiol., 87(2):e02052-20 (2021).
2. Qurat-ul-Ain Ahmad, M Manzoor, A Chaudhary, ST Yang, H Shim, J I Qazi, Bench-scale fermentation for second generation ethanol and hydrogen production by *Clostridium thermocellum* DSMZ 1313 from sugarcane bagasse, Environ. Progr. Sustainable Energy, 40(2),13516 (2021).
3. H Fu, M Lin, IC Tang, J Wang, ST Yang, Effects of benzyl viologen on increasing NADH availability, acetate assimilation and butyric acid production by *Clostridium tyrobutyricum*, Biotechnol. Bioeng., 118(2):770–783 (2021).
4. X Zou, S Li, P Wang, B Li, Y Feng, ST Yang, Sustainable production and biomedical application of polymalic acid from renewable biomass and food processing wastes, Critical Rev. Biotechnol., 41(2), 216-228 (2021).
5. H Liu, S Liu, T Osire, X Zhang, M Xu, ST Yang, T Yang, Z Rao, Engineering the 2,3-BD pathway in *Bacillus subtilis* by shifting the carbon flux in favor of 2,3-BD synthesis, Biochem. Eng. J., 169, 107969 (2021).
6. G Du, C Zhu, M Xu, ST Yang, C Xue, Energy-efficient butanol production by *Clostridium acetobutylicum* with histidine kinase knockouts to improve strain tolerance and process robustness, Green Chemistry., 23, 2155–2168 (2021).
7. Y Zheng; L Li, Z Jin; P An; ST Yang, Y Fei, G Liu, Characterization of fermented soymilk by



- Schleiferilactobacillus harbinensis* M1, based on the whole-genome sequence and corresponding phenotypes, *LWT-Food Sci. Technol.*, 144, 111237 (2021).
8. Y Sun, L Wang, T Osire, W Fu, G Yi, ST Yang, T Yang, Z Rao, Comparative transcriptome analysis reveals metabolic regulation of prodigiosin in *Serratia marcescens*. *Syst. Microbiol. Biomanuf.* 1, 323–335 (2021).
 9. X Li, Q Zhang, W Wang, ST Yang, A novel inulin-mediated ethanol precipitation method for separating endo-inulinase from inulinases for inulooligosaccharides production from chicory-based inulin, *Front. Bioeng. Biotechnol.*, 9, 679720 (2021).
 10. G Wang, H Wang, Y Chen, X Pei, W Sun, L Liu, F Wang, MU Yaqoob, W Tao, Z Xiao, Y Jin, ST Yang, D Lin, M Wang, Optimization and comparison of the production of galactooligosaccharides using free or immobilized *Aspergillus oryzae* β -galactosidase, followed by purification using silica gel, *Food Chem.*, 362, 130195 (2021).
 11. H Fu, J Hu, X Guo, J Feng, ST Yang, J Wang, Butanol production from *Saccharina japonica* hydrolysate by engineered *Clostridium tyrobutyricum*: The effects of pretreatment method and heat shock protein overexpression, *Bioresour. Technol.*, 335, 129290 (2021).
 12. T Bao, W Hou, X Wu, L Lu, X Zhang, ST Yang, Engineering *Clostridium cellulovorans* for highly selective n-butanol production from cellulose in consolidated bioprocessing, *Biotechnol. Bioeng.*, 118, 2703-2718 (2021).
 13. Y Sun, L Wang, T Osire, W Fu, G Yi, ST Yang, T Yang, Z Rao, Enhanced prodigiosin production in *Serratia marcescens* JNB5-1 by introduction of polynucleotide fragment into *pigN* 3'-UTR and disulfide bonds into O-methyl transferase (PigF), *Appl. Environ. Microbiol.*, AEM00543-21 (2021).
 14. X Chen, R Gui, N Li, Y Wu, J Chen, X Wu, Z Qin, ST Yang, X Li, Production of soluble dietary fibers and *Monascus* pigments from potato pomace in submerged fermentation by *Monascus purpureus*, *Process Biochem.*, 111, 159–166 (2021).
 15. Z Xiao, L Liu, X Pei, W Sun, Y Jin, W Tao, ST Yang, M Wang, A potential probiotic for diarrhea: *Clostridium tyrobutyricum* protects against LPS-induced epithelial dysfunction via IL-22 produced by Th17 cells in the ileum, *Front. Immunol. – Nutri. Immunol.*, 12, 758227 (2021).
 16. G Du, C Zhu, Y Wu, W Kang, M Xu, ST Yang, C Xue, Effects of orphan histidine kinases on clostridial sporulation progression and metabolism, *Biotechnol. Bioeng.*, in press (2021). <https://doi.org/10.1002/bit.27968>
 17. C Cheng, Y Shao, W Li, J Liu, X Liu, Y Zhao, X Li, ST Yang, C Xue, Electricity-enhanced anaerobic, non-photosynthetic mixotrophy by *Clostridium carboxidivorans* with increased carbon efficiency and alcohol production, *Energy Conversion and Management*, in press (2021). <https://doi.org/10.1016/j.enconman.2021.115118>
 18. H Fu, ST Yang, Editorial: Development and application of clostridia as microbial cell-factories for biofuels and biochemicals production, *Front. Bioeng. Biotechnol.*, in press (2022). doi: 10.3389/fbioe.2021.831135
 19. X Pan, M Tang, J You, T Osire, C Sun, W Fu, G Yi, T Yang, ST Yang, Z Rao, PsrA is a novel regulator contributes to antibiotic synthesis, bacterial virulence, cell motility and extracellular polysaccharides production in *Serratia marcescens*, *Nucleic Acids Res.*, in press (2021). <https://doi.org/10.1093/nar/gkab1186>
 20. Y Li, Z Qin, F Zhang, ST Yang, Two-color fluorescent proteins reporting survivin regulation in breast cancer cells for high throughput drug screening, *Biotechnol. Bioeng.*, in press (2021). <https://doi.org/10.1002/bit.28006>

INDUSTRY



- In collaboration with several companies (BML, MillBo, etc.) for development and production of biobased chemicals for commercial applications.
- Consulting with several US and international companies.

GRANT SUPPORT

- Title: Metabolic and process engineering of black yeast for poly(L-malic acid) and malic acid production
Source of Support: USDA AFRI
PI: ST Yang
Total funding requested: \$450,000
Project period: 6/1/2020 – 5/31/2023
- Title: A Novel Integrated Fermentation Process with Engineered Microbial Consortia for Butanol Production from Lignocellulose Sugars without CO₂ Emission
Source of Support: Department of Energy ARPA-E
PI: ST Yang
Total funding requested: \$1,611,940
Project period: 8/5/2021 - 8/4/2024

LECTURES

Distinguished and Named Lectures

- Invited to give the 2022 Probst lectures at Southern Illinois University Edwardsville, IL

Keynotes

- *“Biorefinery for Carboxylic Acids Production from Renewable Biomass: Metabolic and Process Engineering”*
Invited Keynote for the session *Metabolic Engineering for Food, Feed, and Bioproducts* at AIChE 2021 annual meeting, Boston, MA, November 10, 2021.

Invited Lectures – University

1. *“Biofuels from renewable biomass and CO₂ in a circular bioeconomy”* – the Great Lakes Science Boot Camp (GLSBC) for Librarians on OSU’s campus, July 19, 2021. [Virtual conference invited presentation]
2. *“Biofuels and chemicals production from renewable biomass and CO₂ in a circular bioeconomy”* Science Café sponsored by OSU Libraries and Sigma Xi, October 6, 2021. [Virtual meeting invited presentation]
3. *“Biofuels and chemicals production from renewable biomass and CO₂ in a circular bioeconomy”*, School for Engineering of Matter, Transport and Energy, Arizona State University, October 25, 2021. [Virtual, invited seminar]
4. *“Cell-based High-Throughput Screening Using Human Survivin Promoter with Green Fluorescent Protein Reporter for Drug Discovery and Embryotoxicity Assessment”*, First International Two-Day Virtual Conference of Zoology, ZOOLOGICAL EMERGING SCIENTIFIC TRENDS (ZEST 2022), University of Education Lahore, Pakistan, January 18-19, 2022. [Invited Keynote]
5. *“Industrial Biotechnology and Biorefineries in a Circular Bioeconomy”* 2022 Probst lecture, Southern Illinois University Edwardsville, IL, April 27, 2022 [Invited Probst lecture 1]



6. “*Biofuels and chemicals production from renewable biomass and CO₂ in a circular bioeconomy*” 2022 Probst lecture, Southern Illinois University Edwardsville, IL, April 28, 2022 [Invited Probst lecture 2]

Additional Presentations

1. Fengli Zhang, ST Yang, A multiple molecular endpoints HT screening of embryotoxic chemicals based on ESC-EGFP with human gene promoters associated with specific embryonic development pathways, AIChE 2021 annual meeting, Boston, MA, November 7-11, 2021.
2. You Li, Zhen Qin, ST Yang. 3D reporter gene assay for high-throughput drug screening, AIChE 2021 annual meeting, Boston, MA, November 7-11, 2021.
3. Zhen Qin, Jun Feng, You Li, Yin Zheng, ST Yang, Metabolic engineering of *Aureobasidium pullulans* for polyamic acid production through enhancing oxaloacetate conversion, malate transportation, and PMA synthesis, AIChE 2021