Hongxi Luo

Education

University of Virginia – Charlottesville, VA
Ph.D. in Chemical Engineering, GPA: 3.79/4.0 Aug 2016 – Mar 2021
University of Missouri – Columbia, MO
B.S. in Chemical Engineering, GPA: 3.91/4.0 Aug 2013 – May 2016
East China University of Science and Technology – Shanghai, China
B.S. in Chemical Engineering, GPA: 85/100 Aug 2011 – Jul 2016

Professional Experience

Princeton University
Postdoctoral Research Associate May 2022 - Present
- Perform process modeling and techno-economic analysis on different thermochemical conversion of biomass coupled with carbon capture and storage to mitigate climate change.

Wuhan Pro-Envi Tech Co., Ltd
R&D Manager Jun 2021 – December 2021
- Perform life-cycle assessment and techno-economic analysis on the full-scale municipal sludge pyrolysis plants to optimize their environmental and economic performance. Lead research efforts to explore the potential utilization pathways of pyrolyzed sludge in the context of low-carbon economy.

Dept. of Chemical Engineering, University of Virginia
Doctoral Research Assistant, thesis advisor Prof. Geoffrey M. Geise Aug 2016 – Mar 2021
Dissertation topic: "Understanding the Structure-Property Relationships in Selective Membranes for Desalination and Ion Separation"
- Studied the relationships between membrane structure and small molecule transport properties in polymeric materials that are relevant for desalination applications.
- Designed materials to enable a study of the dielectric properties of polymers and their influence on the extent of ion exclusion from desalination membrane materials.
- Developing strategies and materials to enable selective ion separations for lithium recovery from water sources and selective lithium transport for flow battery applications.
- Developed a model to qualitatively predict membrane ion sorption behavior based on ion-specific properties and membrane dielectric properties.

CECEP Both (Hubei) Environment Engineering and Technology Co., Ltd.
Principal Investigator May 2015 – Aug 2015
- Led a team of 5 people to optimize an industrial scale (60 ton/day) sludge carbonization process. Proposed a carbonization-activation method to prepare sorbents from the on-site carbonized sludge and studied the sorbent adsorption performance towards model pollutants in wastewater treatment.

Dept. of Chemical Engineering, University of Missouri
Undergraduate Research Assistant mentored by Prof. Sheila Baker Mar 2014 – May 2016
- Prepared a series of nitrogen doped porous carbon sorbents from land waste and studied the effects of nitrogen sources and carbonization temperature on sorbent CO_2 capture performance.

Dept. of Civil & Environmental Engineering, University of Missouri
Undergraduate Research Assistant mentored by Prof. Maria Fidalgo Aug 2014 – May 2016
- Prepared novel Fe_3O_4-based sorbents with a unique 2D layer-by-layer structure and studied the arsenic removal performance of the sorbent.

Key Laboratory for Advanced Materials, East China University of Science and Technology
Undergraduate Research Assistant mentored by Prof. Jinku Liu Sep 2011 – Aug 2013
- Developed a strategy for massive production of Ag loaded Fe-doped ZnO mesocrystal materials via Atmospheric Self-induction Synthesis and studied their photocatalytic performance in a photo-driven dye degradation wastewater treatment application.

Publications

- Cheng, F. and **Luo, H**., Evaluating the minimum fuel selling price of algae-derived biofuel from hydrothermal liquefaction, Bioresource Technology Reports, 2022, 17, 100901.
- **H. Luo,** F. Cheng, B. Yu, L. Hu, J. Zhang, X. Qu, H. Yang, Z. Luo, Full-scale municipal sludge pyrolysis in China: Design fundamentals, environmental and economic assessments, and future perspectives. Science of the Total Environment, 795, 148832.
- K. Chang, **H. Luo**, S. Lin, W.-A.S. Agata, G.M. Geise, Functional group incorporation influences water and salt transport in charged desalination membrane materials. *Journal of Membrane Science*, 630, 119298.
- **H. Luo**, F. Cheng, L. Huelsenbeck, N. Smith, "Comparison between conventional solvothermal and aqueous solution-based production of UiO-66-NH_2: Life cycle assessment, techno-economic assessment, and implications for CO_2 capture and storage." *Journal of Environmental Chemical Engineering* 9.2 (2021): 105159.
- K. Chang, **H. Luo**, G.M. Geise, Interplay of external salt concentration, relative permittivity, and state of water in hydrated polymers, *Macromolecules*, 54.2 (2021): 637-646.
- L. Yoon, M. Alpert, **H. Luo**, M. Schapowal, E. Holmgren, G.M. Geise, C. Paolucci, J. Choi, "The impact of cation and anion paring in ionic salts on surface defect passivation in cesium lead bromide nanocrystals", *Journal of Materials Chemistry C*, 9.3 (2021): 991-999.
- L. Huelsenbeck, **H. Luo**, P. Verma, J. Dane, R. Ho, E. Beyer, H. Hall, G.M. Geise, G. Giri, "A generalized approach for rapid aqueous MOF synthesis by controlling solution pH", *Crystal Growth & Design*, 20.10 (2020): 6787-6795
- F. Cheng, **H. Luo,** L.M. Colosi, Slow pyrolysis as a platform for negative emission technology: An integration of machine learning models, life cycle assessment, and economic analysis, *Energy Conversion and Management*, 223, 113528.
- **H. Luo**, WAS. Agata, G.M. Geise, Connecting the ion separation factor to the sorption and diffusion selectivity of ion exchange membranes, *Industrial & Engineering Chemistry Research*, 59 (32), 14189–14206.
- Y. Ji, **H. Luo**, G.M. Geise, Effects of Fixed Charge Group Physicochemistry on Anion Exchange Membrane Permselectivity and Ion Transport, *Physical Chemistry Chemical Physics*, 22 (14), 7283-7293.
- P.M. McCormack, **H. Luo**, G.M. Geise, G.M. Koenig, Conductivity, Permeability, and Stability Properties of Chemically Tailored Poly(phenylene oxide) Membranes for Li^+ Conductive Non-Aqueous Redox Flow Battery Separators, *Journal of Power Sources*, 460, 228107.
- Q. Zhang, Y.-X. Deng, **H. Luo**, C.-Y. Shi, G.M. Geise, B.L. Feringa, H. Tian, D.-H. Qu, Assembling a natural small molecule into a supramolecular network with high structural order and dynamic functions, *Journal of the American Chemical Society*, 141, 12804-12814. [**Selected for the Cover of the Issue**]
- **H. Luo**, K. Chang, K. Bahati, G.M. Geise, Functional group configuration influences salt transport in desalination membrane materials, *Journal of Membrane Science*, 590, 117295.
- **H. Luo**, K. Chang, K. Bahati, G.M. Geise, Engineering selective desalination membranes via molecular control of polymer functional groups, *Environmental Science & Technology Letters*, 6, 462-466. [**Selected as an ACS Editors' Choice® Article, Selected as one of the five winners of the *Environmental Science & Technology Letters* 2019 Best Paper Award**]
- K. Chang, **H. Luo**, G.M. Geise, Water content, relative permittivity, and ion sorption properties of polymers for membrane desalination, *Journal of Membrane Science*, 574, 24-32.
- Y. Ji, **H. Luo**, G.M. Geise, Specific co-ion sorption and diffusion properties influence membrane permselectivity, *Journal of Membrane Science*, 563, 492-504.
- **H. Luo**, J. Aboki, Y. Ji, R. Guo, G.M. Geise, Water and salt transport properties of triptycene-containing sulfonated polysulfone materials for desalination membrane applications, *ACS Applied Materials & Interfaces*, 10, 4102-4112.
- **H. Luo**, F. Cheng, W. Hu, J. Wang, S. Xiang, M Fidalgo de Cortalezzi, 2D-Fe_3O_4 Nanosheets for Effective Arsenic Removal, *Journal of Contemporary Water Research & Education*, 160 (1), 132-143.
- F. Cheng, **H. Luo**, L. Hu, B. Yu, Z. Luo, MF de Cortalezzi, Sludge carbonization and activation: From hazardous waste to functional materials for water treatment, *Journal of Environmental Chemical Engineering*, 4 (4), 4574-4586
- Q. Zhang, JK. Liu, JD. Wang, **HX. Luo**, Y. Lu, XH. Yang, Atmospheric Self-induction Synthesis and Enhanced Visible Light Photocatalytic Performance of Fe^{3+} Doped Ag-ZnO Mesocrystals, *Industrial & Engineering Chemistry Research*, 53 (34), 13236-13246.

Presentations

- **H. Luo** (Presenting), K. Chang, K. Bahati, G.M. Geise, "Engineering Selective Desalination Membranes by Controlling Functional Group Configuration" (Oral Presentation) North American Membrane Society (NAMS) National Meeting, May 21, 2020 (Invited talk in the Award Session).
- Y. Ji, **H. Luo**, K. Chang, G.M. Geise (Presenting), "Controlling water and ion transport in hydrated polymer membranes via chemical functionality" (Oral Presentation) ACS Fall National Meeting & Exposition (San Diego, CA), August 28, 2019.
- **H. Luo**, K. Chang, T. Xue, W.A. Morris, G.M. Geise (Presenting), "Structure/property relationships in polymers for membrane applications" (Oral Presentation) Tech Connect World (Boston, MA), June 19, 2019.
- Y. Ji, **H. Luo**, K. Chang, G.M. Geise (Presenting), "Ion transport in and permittivity properties of hydrated polymer membranes" (Oral Presentation) Polymers for Fuel Cells, Energy Storage, and Conversion (Pacific Grove, CA), February 26, 2019.
- Y. Ji (Presenting), **H. Luo**, G.M. Geise, "Ion specific effects in charged polymers for membrane applications" (Oral Presentation) AIChE Fall National Meeting (Pittsburgh, PA), November 1, 2018.
- G.M. Geise (Presenting), K.C. Chang, **H. Luo**, "Relative permittivity properties of hydrated polymers for desalination membrane applications" (Poster Presentation) 10th Conference on Broadband Dielectric Spectroscopy and its Applications (Brussels, Belgium), August 29, 2018.
- Y. Ji, **H. Luo**, G.M. Geise (Presenting), "Ion specific effects in charged polymers for electromembrane applications" (Oral Presentation) North American Membrane Society (NAMS) National Meeting (Lexington, KY), June 13, 2018.
- **H. Luo**, K. Chang, Y. Ji, T. Xue, W.A. Morris, G.M. Geise (Presenting), "Structure/property relationships in polymer membranes for water purification and energy applications" (Oral Presentation) North American Membrane Society (NAMS) National Meeting (Lexington, KY), June 11, 2018.
- Y. Ji, **H. Luo**, G.M. Geise (Presenting), "Ion specific effects in charged polymers for membrane applications" (Oral Presentation) 255th ACS National Meeting (New Orleans, LA), March 18, 2018.
- **H. Luo** (Presenting), S.N. Baker, "Additive-Free Synthesis of Ag-TiO_2 Mesocrystals Incorporated with Iron and Nitrogen", University of Missouri-Columbia Annual Undergraduate Research Forum, 2014.

Teaching Experience

Dept. of Chemical Engineering, University of Virginia Fall 2018 & Fall 2019

- Teaching assistant for CHE 3316 "Chemical Thermodynamic and Unit Operation".
- Held office hours each week and graded Aspen Plus projects.

Mathematics Dept., University of Virginia Spring 2018

- Worked as a teaching assistant for APMA 3080 "Linear Algebra".
- Held office hours each week, proctored an exam and graded exams.

Dept. of Chemical Engineering, University of Missouri Spring 2016

- Worked as a grader for CHE 2215 "Mass and Energy Balance".
- Graded homework assignments and course projects.

Dept. of Chemical Engineering, University of Missouri Fall 2015

- Worked as a grader for CHE 3235 "Chemical Engineering Principles II".
- Graded homework assignments.

Dept. of Chemistry, **East China University of Science and Technology** Aug 2011– Jul 2013

- Volunteered in helping Instructors during office hours for Inorganic Chemistry I & II, Quantitative Chemical Analysis, Organic Chemistry I & II, and Physical Chemistry I.

Leadership Activities

Reviewer Sept 2019 – Present

- Reviewed for *Industrial & Engineering Chemistry Research*, *ACS Applied Materials & Interfaces*, *Journal of Power Sources*, *AIChE Journal* etc.

Volunteer, Wuhan United (NPO founded during COVID-19 outbreak) Feb 2020 – Mar 2020

- Helped facilitate the distribution of medical supplies received from the United States of America in Wuhan and other areas in Hubei.

Consultant, Wuhan Water Authority Jan 2020 – Feb 2020

- Worked on a consulting panel to make suggestions on medical/municipal wastewater management in Wuhan during the COVID-19 outbreak.

Lab Equipment Management, Geise Research Group, **University of Virginia** Feb 2017 – Present

- Led efforts to setting up new equipment, troubleshoot issues with current equipment, and maintain major equipment, e.g., TGA, RHTGA, air separator, rotary evaporator, water circulation pumps, and oil pumps.

Membrane Development, Geise Research Group, **University of Virginia** Feb 2017 – Present

- Take lead on designing new polymer membranes with co-workers.

Graduate Student Mentor, Geise Research Group, **University of Virginia** May 2017 – Present

- Mentored 2 undergraduate researchers for more than 1 year.

Committee member, "ECUST-Nippon Paint Cup Chemistry Competition", **East China University of Science and Technology** Apr 2013 – May 2013

- Served as a judge in the competition involving more than 200 third-year students majoring in Chemistry and related subjects. Selected the final list based on their performance in the preliminaries.

Organizer, "Chemistry and Life Knowledge Competition", **East China University of Science and Technology** Oct 2012 – Dec 2012

- Planned and organized the competition involving more than 100 second-year students majoring in Chemistry and related subjects.

Technical Skills

- **Polymer Synthesis and Characterization**: Conducting small molecule synthesis (e.g., epoxide functionalization) and separation (e.g., ion-exchange, extraction, precipitation, and recrystallization). Conducting Polymerization (e.g., free radical polymerization, atom transfer radical polymerization (ATRP), condensation polymerization). Conducting and analyzing ^{1}H NMR, FTIR, GPC, DSC and TGA measurements.
- **Membrane Preparation**: Preparing membranes from thermo/photo-initiated crosslinking, solvent evaporation, phase inversion, and spin-coating.
- **Membrane Transport Tests**: Conducting and analyzing results from membrane steady-state salt permeability, kinetic desorption, ion sorption, water content, water flux, and salt rejection measurements.
- **Software**: Microsoft Office, ChemBioOffice, Endnote, Aspen Plus, MATLAB, Origin, and SigmaPlot.
- **Other Instruments**: Analyzing results from XRD, XPS, UV-Vis, AAS, SEM, TEM measurements.

Honors and Awards

- NAMS Student Fellowship Award, The North American Membrane Society, 2020
- Chemical Engineering Teaching Assistant Award, Dept. of Chemical Engineering, 2019
- Harman Scholarship (best performance in the program research exam), Dept. of Chemical Engineering, 2017
- Summa Cum Laude, University of Missouri-Columbia, 2016.
- Honor Scholar, University of Missouri-Columbia, 2016.
- Grant-in-Aid Scholarship for academic excellence, University of Missouri-Columbia, 2015
- Second prize in Chemistry Changes Life-Chemistry & Environment writing competition, East China University of Science and Technology, 2013
- Scholarship for Academic Achievement, East China University of Science and Technology, 2013