Beichen Liu

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Education

2019 - 2024 **University of Wisconsin-Madison**, Madison, WI
PhD in Chemical and Biological Engineering
Advisor: **Prof. Matthew A. Gebbie**
Thesis Title: Understanding How Collective Assembly Influences Electrocatalytic Reactivity

2015 - 2019 **Carnegie Mellon University**, Pittsburgh, PA
B.S. in Chemical Engineering, Additional Major in Biomedical Engineering, University Honors
Thesis Advisor: **Prof. Alan J. Russell**
Honors Thesis Title: Solid-Phase Polymer Synthesis Using Surface-Initiated Atom Transfer Radical Polymerization Technique in Flow Reactor

Research Experience

2024 - Present **Postdoctoral Researcher**, California Institute of Technology
Division of Chemistry and Chemical Engineering
Advisor: **Prof. Kimberly See**
Synthesize and develop *M*PS_3-based all solid-state electrochemical cells for electrocatalytic reactions; characterize and develop fundamental understanding of the solid-solid interface

2019 - 2024 **Graduate Student Researcher**, University of Wisconsin-Madison
Department of Chemical and Biological Engineering
Advisor: **Prof. Matthew A. Gebbie**
Investigate the effect of collectivity and assembly at electrocatalytic interfaces, using CO_2 electroreduction to study electric double layer formation

2018 - 2019 **Undergraduate Honors Thesis Researcher**, Carnegie Mellon University
Department of Chemical Engineering
Advisor: **Prof. Alan J. Russell**
Evaluated a Protein-ATRP on Reversible Immobilization Supports (PARIS) flow reactor system for controlling living polymerization

Summer 2018 **Undergraduate Researcher**, Johns Hopkins University
Department of Chemistry
Advisor: **Prof. Howard D. Fairbrother**
Developed biodegradable polymer nanocomposites for controlled release of nutrients for agricultural applications and pollution mitigation

2016 - 2019 **Undergraduate Researcher**, University of Pittsburgh
Department of Neurobiology
Advisor: **Prof. Claire E.J. Cheetham**
Developed Arduino-controlled olfactometer-microscope system for controlled odor release; prepared and processed olfactory bulb tissue for fluorescence microscopy

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Publications and Manuscripts in Preparation

7. Guo W, **Liu B**, Anderson SR, Johnstone SG, Gebbie MA. Deciphering the Role of Aromatic Cations in Electrochemical CO_2 Reduction: Interfacial Ion Assembly Governs Reaction Pathways. **J. Mat. Chem. A** (2024).
6. **Liu B**, Guo W, Anderson SR, Johnstone SG, Wu S, Herrington MC, Gebbie MA. Exploring how cation entropy influences electric double layer formation and electrochemical reactivity. **Soft Matter** (2024).
5. Gebbie MA, **Liu B**, Guo W, Anderson SR, Johnstone SG. Linking Electric Double Layer Formation to Electrocatalytic Activity. **ACS Catalysis** (2023).
4. Guo W, **Liu B**, Gebbie MA. Suppressing Co-Ion Generation *via* Cationic Proton Donors to Amplify Driving Forces for Electrochemical CO_2 Reduction. **J. Phys. Chem. C** (2023).
3. **Liu B**, Guo W, Gebbie MA. Tuning Ionic Screening to Accelerate Electrochemical CO_2 Reduction in Ionic Liquid Electrolytes. ***ACS Catalysis*** (2022).
2. Huang JS, Kunkhyen T, Rangel AN, Brechbill TR, Gregory JD, Winson-Bushby ED, **Liu B**, Avon JT, Muggleton RJ, Cheetham CEJ. Immature olfactory sensory neurons provide behaviorally useful sensory input to the olfactory bulb. ***Nat. Comm.*** (2022).
1. Sigmon LR, Adisa I, **Liu B**, Elmer WH, White JC, Dimkpa CO, Fairbrother DH. Biodegradable polymer nanocomposites provide effective delivery and reduced runoff of phosphorus during plant growth. ***ACS Agric. Sci. Technol.*** (2021).

Honors and Awards

2024	**First Place, Research Exhibition, UW Madison Engineering EXPO**
2023	**Women in Chemical Engineering (WIC) Travel Award** (AIChE Fall Meeting)
2021	**Fenton-May Graduate Fellow,** University of Wisconsin – Madison One fellowship awarded out of all graduate students in the Chemical and Biological Engineering Department
2021	**Ragatz Teaching Assistant Award**
2019	**Osher Life Learning Competition** Awarded for work on a low-cost artificial lung developed in collaboration with ALung Technologies
2016 – 2019	**Carnegie Mellon University College of Engineering Dean's List**

Oral Presentations

3. Exploring how collective ionic assembly influences electrochemical carbon dioxide upgrading. AIChE Annual Meeting, Orlando, FL (Nov. 2023).
2. Exploring how collective ionic assembly influences electrochemical carbon dioxide upgrading. *Gordon Research Seminar: Fundamental and Applied Electrochemistry in Analytical, Nanoscale and Energy*, Ventura, CA (Sept. 2022).
1. Solid-phase polymer synthesis using surface-initiated atom transfer radical polymerization technique in flow reactor. *Meeting of the Minds*, Carnegie Mellon University, Pittsburgh, PA (May 2019).

Poster Presentations

4. Exploring how collective ionic assembly influences electrochemical carbon dioxide upgrading. *Women in Chemical Engineering Keynote Poster Session, AIChE Annual Meeting*, Orlando, FL (Nov. 2023).
3. Exploring how collective ionic assembly influences electrochemical carbon dioxide upgrading. *Gordon Research Conference: Fundamental and Applied Electrochemistry in Analytical, Nanoscale and Energy*, Ventura, CA (Sept. 2022).
2. Ultra low-cost artificial lung. *Meeting of the Minds*, Carnegie Mellon University (May 2019).

1. Biodegradation of calcium phosphate polymer nanocomposites for controlled phosphate release. *Johns Hopkins Summer Research Symposium* and *Center for Sustainable Nanotechnology Summer Symposium*, Johns Hopkins University (Aug. 2018).

Select Proposal Writing Experience

($500k) Co-wrote with PI Gebbie, Tuning Interfacial Ion Assembly to Engineer Electrochemical Reactions for a Sustainable Future, NSF CAREER Program; **Awarded 2022.**

($600k) Co-wrote with PI Gebbie, Bridging Surface Forces and Laser Spectroscopy: Connecting Electron Transfer to Solvation in Confined Interfaces, Beckman Young Investigator **Phase 2 Invited Submission**, 2021.

($110k) Co-wrote with PI Gebbie, Enabling New Electrocatalytic Domains with Petroleum-Derived Carbon Clusters, ACS Petroleum Research Fund; Doctoral New Investigator Program; **Awarded 2021**.

Teaching

2021 Teaching Assistant, UW-Madison, CBE 324, Transport Phenomena Lab, undergraduates
2020 Teaching Assistant, UW-Madison, CBE 540, Polymer Science and Technology, undergraduates and graduates

Mentored Students

2023 - 2024 Rachel Hoetama, UW-Madison (undergraduate researcher, currently UW-Madison)
Summer 2022 Megan Herrington, UW-Madison (REU student, currently PhD at MIT)
2020 - 2022 Suzy Wu, UW-Madison (undergraduate researcher, currently PhD at MIT)
2020 - 2021 Gene Lee, UW-Madison (undergraduate researcher, currently PhD at MIT)

Service and Professional Development

2025 **Planning Committee Member** for Explore Caltech, a public outreach event designed to showcase research conducted on campus and by affiliated organizations with 1,000+ attendees consisting of all age groups
2024 - Present **Postdoctoral Reviewer** for various on-campus undergraduate research grants and competitions
2024 **Participant and Breakout Session Facilitator** for Corrosion in CO_2 Conversion Systems Meeting
2023 **Invited Participant** for the Next Generation Electrochemistry: Electrify All the Things Workshop
2023, 2024 **Lead Volunteer** for Gebbie group Engineering EXPO Booth community outreach event featuring interactive electrolyte mixing game and data visualization with Legos, resulting in an award for Best Research Exhibition
2022 - 2024 **Co-editor** for Chemical Engineering Graduate Students Association (ChEGS) newsletter
2022 **Graduate Student Volunteer** for SLALN Science Immersion Day, University of Wisconsin-Madison
2021 - Present Assisted PI Gebbie in reviewing manuscripts for *Langmuir, JACS, and ACS Catalysis*
2021, 2022 **Graduate Student Panel for Faculty Search**, University of Wisconsin-Madison
2020 - 2024 **Editor and Contributor** for Gebbie group blog: *Interfaces, Sustainable Energy, and Electrochemistry (I.S.E.E.)*

Additional Productivity

Gebbie MA, Cashen RK, **Liu B**, McAlpine JM, *et al*. Diamondoid salts and compositions. WARF Invention Disclosure, University of Wisconsin–Madison, November 2, 2020, 8181/P210105. Invention Disclosure Accepted into WARF portfolio.

Fairbrother DH, Sigmon L, **Liu B**, White J, *et al*. Controlled release and targeted delivery of phosphorus during plant growth. Johns Hopkins Technology Ventures Invention Disclosure, Johns Hopkins University, July 6, 2020, D16465. Invention Disclosure Accepted into Johns Hopkins Technology Ventures portfolio.

Technical Skills

Computer	Aspen PLUS, GAMS, MATLAB, Python, Arduino, Solidworks, Blender, OriginLab
Laboratory	Cyclic voltammetry (CV), chronoamperometry/chronopotentiometry (CA/CP), kinetics analysis, electrochemical impedance spectroscopy (EIS), gas chromatography (GC), nuclear magnetic resonance (NMR), scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), atomic force microscopy (AFM), surface-enhanced Raman spectroscopy (SERS), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), dynamic light scattering (DLS), cleanroom technique, metal evaporation for electrode fabrication, physical vapor deposition, organic and polymer synthesis, electrochemical cell design and 3D printing