

Qinyu Zhu

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Education

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| Brigham Young University <i>Full Scholarship</i> Dissertation: Morphogenetic Engineering of Synthetic Protocell Systems | Ph.D Chemical Engineering <i>Advisor: Dr. Douglas R. Tree</i> | Sep. 2018 – June 2023 <i>Provo, Utah</i> |
| University of Utah <i>Full Scholarship</i> Thesis: Halloysite Nanotube and Other Clay Mineral Composite Solid Polymer Electrolytes for Li Batteries | M.S. Metallurgical Engineering <i>Advisor: Dr. Jan D. Miller</i> | Sep. 2015 – Aug. 2018 <i>Salt Lake City, Utah</i> |
| Central South University | B.S. Materials Sci. and Eng. | Sep. 2011 – June 2015 <i>Changsha, China</i> |

Selected Work Experience

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| Postdoctoral Research Associate <i>Oak Ridge National Laboratory</i> <i>Fast and Cooperative Ion Transport in Polymer-Based Electrolytes</i> <ul style="list-style-type: none">* Construct multi-scale theories to understand the mechanisms of ion hopping in single ion conductors* Model the charge transfer parallel at the polymer/ceramic nanoparticle interfaces* Use data analysis techniques and machine learning algorithms to interpret experimental data and discover materials with high ionic conductivity | July 2023 – Present <i>Oak Ridge, Tennessee</i> |
| Graduate Research Assistant <i>Brigham Young University</i> <i>Morphogenetic Control of Synthetic Protocell</i> <ul style="list-style-type: none">* Developed a GPU-accelerated code to model reaction-diffusion process of protocell system.* Investigated the possible mechanisms for global and local shape change of synthetic protocell systems.* Applied phase field approach and extended the capability of the code to model the catalytically driven motion of colloidal particles.* Collaborated with experimental scientists to interpret the experimental observations and compile ideas into journal publications.* Programmed data analysis scripts to perform routine data processing and visualization. | Sep. 2018 – May 2023 <i>Provo, Utah</i> |
| Graduate Research Assistant <i>University of Utah</i> <i>UTAG Project: High-Conductivity Solid Polymer Electrolyte for Next Generation Lithium Batteries</i> <ul style="list-style-type: none">* Invented the natural clay-mineral-based solid polymer electrolyte, which enhanced the ionic conductivity to 10^{-4} S·cm⁻¹ at room temperature.* Optimized the composition and preparation procedure for the solid polymer electrolyte.* Resolve technical issues for producing lab-scale pouch cells.* Resulted in a conference poster, a journal publication, and a PVC patent. <i>US Gypsum Company Project</i> <ul style="list-style-type: none">* Investigated the surface chemistry of gypsum and the crystallization mechanism with specific additives.* Established both experimental and MD simulation methods to study the surface interactions.* Recommended the optimal chemical components based on the interpretation of combined results from experiments and simulations. | Aug. 2015 – May 2018 <i>Salt Lake City, Utah</i> |
| Graduate Teaching Assistant <i>Brigham Young University</i> <ul style="list-style-type: none">* Numerical Methods, Winter 2023* Energy Engineering, Fall 2021 and Fall 2022 | Aug. 2019 – Apr. 2023 <i>Provo, Utah</i> |

- * Ch.En. Problem Solving, Winter 2022
- * Heat & Mass Transfer, Winter 2021
- * Colloids & Surface Science, Spring 2020
- * Transport Phenomena, Fall 2019 and 2020

Publications and Patents

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- [11] Nicholas P. Bair, **Qinyu Zhu**, Byron A. Staynings, Douglas R. Tree, and Walter F. Paxton. "Ready, Set, Grow – Catalytically Activated Morphogenesis of Stimuli-Responsive Supramolecular Assemblies". *Langmuir (Accepted)* (2024).
- [10] **Qinyu Zhu** and Douglas R. Tree. "Simulations of morphology control of self-assembled amphiphilic surfactants". *Journal of Polymer Science* (2023).
- [9] Mark N. McDonald, **Qinyu Zhu**, Walter F. Paxton, Cameron K. Peterson, and Douglas R. Tree. "Active Control of Equilibrium, Near-Equilibrium, and Far-from-Equilibrium Colloidal Systems". *Soft Matter* 19 (2023), pp. 1675–1694.
- [8] **Qinyu Zhu**, Timothy R. Scott, and Douglas R. Tree. "Using reactive dissipative particle dynamics to understand local shape manipulation of polymer vesicles". *Soft Matter* 17 (2021), pp. 24–39.
- [7] **Qinyu Zhu**, Xuming Wang, and Jan D. Miller. "Advanced Nanoclay-Based Nanocomposite Solid Polymer Electrolyte for Lithium Iron Phosphate Batteries". *ACS Appl. Mater. Interfaces* (2019).
- [6] Jan D. Miller, Xuming Wang, and **Qinyu Zhu**. "Composite Solid Electrolyte Including Lithium Iron Phosphate". *U.S. Patent 20210210782A1, Pending* (2019).
- [5] Feng Jiang, Yuqian Chen, Shaohua Ju, **Qinyu Zhu**, Libo Zhang, Jinhui Peng, Xuming Wang, and Jan D. Miller. "Ultrasound-assisted leaching of cobalt and lithium from spent lithium-ion batteries". *Ultrason. Sonochem.* (2018).
- [4] Qinguang Tan[†], **Qinyu Zhu**[†], Anqiang Pan, Yaping Wang, Yan Tang, Xiaoping Tan, Shuquan Liang, and Guozhong Cao. "Template-free synthesis of β - $\text{Na}_{0.33}\text{V}_2\text{O}_5$ microspheres as cathode materials for lithium-ion batteries". *CrystEngComm* (2015).
- [3] Yaping Wang, Anqiang Pan, **Qinyu Zhu**, Zhiwei Nie, Yifang Zhang, Yan Tang, Shuquan Liang, and Guozhong Cao. "Facile synthesis of nanorod-assembled multi-shelled Co_3O_4 hollow microspheres for high-performance supercapacitors". *J. Power Sources* (2014).
- [2] Jiang Zhou, Qiang Liang, Anqiang Pan, Xuelin Zhang, **Qinyu Zhu**, Shuquan Liang, and Guozhong Cao. "The general synthesis of Ag nanoparticles anchored on silver vanadium oxides: Towards high performance cathodes for lithium-ion batteries". *J. Mater. Chem. A* (2014).
- [1] Shuquan Liang, Tao Chen, Anqiang Pan, Dawei Liu, **Qinyu Zhu**, and Guozhong Cao. "Synthesis of $\text{Na}_{1.25}\text{V}_3\text{O}_8$ nanobelts with excellent long-term stability for rechargeable lithium-ion batteries". *ACS Appl. Mater. Interfaces* (2013).

† equal contributions

Selected Conference Proceedings

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- [5] Qinyu Zhu et al. "Identifying promising anions for superionic single-ion conducting polymer electrolytes using data-science approaches". APS March Meeting. American Physical Society. Minneapolis, MN, 2024.
- [4] Qinyu Zhu et al. "Enzyme-induced kinetic control over self-assembly of amphiphilic surfactants". APS March Meeting. American Physical Society. Las Vegas, NV, 2023.
- [3] Qinyu Zhu et al. "Understanding Shape Manipulation of Polymer Vesicles: a Reactive Dissipative Particle Dynamics Study". APS March Meeting. American Physical Society. Chicago, IL, 2022.
- [2] Qinyu Zhu et al. "Using Reactive Dissipative Particle Dynamics to Understand Local Shape Manipulation of Polymer Vesicles". APS March Meeting. American Physical Society. Virtual, 2021.
- [1] Qinyu Zhu et al. "Comparison of Selected Clay-Mineral-Based Solid Polymer Electrolytes for Lithium Batteries". SME Annual Conference & Expo: MPD Student Poster Competition. Society of Mining Engineering. Denver, CO, 2017.

Professional Memberships

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| American Physical Society (APS) | 2019 – present |
| Society of Mining Engineering (SME) | 2017 – 2018 |

Awards

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| APS Distinguished Student Program Award | 2023 |
| SME MPD Student Poster Award | 2017 |
| CSU Sapa Scholarship | 2014 |
| CSU First Class Scholarship (Awarded to top 1%) | 2011 – 2014 |

Technical Skills

Computational Skills: Python, CUDA, Matlab, C++, Linux/Unix/Bash, HPC

Lab techniques: SEM, AFM, FTIR, Electrochemical Workstation, Battery Testing System

Last updated: July 15, 2024