

Kevin W. Gao

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Education

University of California, Berkeley 2017 – 2022

Ph.D. Chemical Engineering – 4.0/4.0 GPA

California Institute of Technology 2013 – 2017

B.S. Chemical Engineering – 3.9/4.0 GPA

Experience

Senior Battery Scientist, Blue Current 2023 – present

Battery Scientist, Blue Current 2022 – 2023

- Developing solid state silicon anode materials and processes, and characterizing anode formulations
- Assembling solid state full cells, performing electrochemical testing, and analyzing data
- Developed higher energy density Si active material anodes with improved charge rate capability
- Improved resistance in baseline anode formulations utilizing new solvent and slurry processing

Ph.D. Student, University of California, Berkeley 2017 – 2022

Advisor: Professor Nitash P. Balsara

- First demonstration of a miscible polymer blend electrolyte (two distinct polymers and a lithium salt) via neutron scattering experiments
- Quantified transport parameters and uncertainty propagation in poly(ethylene oxide) electrolytes via electrochemical techniques
- Synthesized hybrid organic-inorganic block copolymer electrolytes, characterized their ion transport properties, and determined their structure via x-ray scattering experiments
- Developed a new thermodynamic model for the swelling of charged polymeric gels in ionic solutions, adding enthalpic and elastic contributions to the classic expression for Donnan equilibrium

Summer Undergraduate Research Fellow, Massachusetts Institute of Technology 2016

Advisor: Professor Klavs F. Jensen

- Developed a reaction optimization strategy via on-demand synthesis in microliter droplets
- Implemented a MINLP algorithm that reduced experiments needed for optimization by 57%

Undergraduate Research Fellow, California Institute of Technology 2014 – 2015

Advisor: Professor Brian M. Stoltz

- Synthesized and characterized intermediates for the total synthesis of jorumycin

Intern, Los Alamos National Laboratory: P-24 Plasma Physics 2012 – 2013

Advisor: Dr. Thomas P. Intrator

- Adapted design and constructed a fiber optic-positioning trigger to detect flux rope light emission

Skills

Programming: MATLAB, Python, C, HTML, CSS

Software: Microsoft Office, EC-Lab, Igor, ChemDraw, MestReNova, Arbin

Laboratory: CV, DSC, EIS, GPC, NMR, PSD, SANS, SAXS, SEM, TGA, cell assembly, glovebox, rheology

Languages: English, Mandarin Chinese

Publications

1. N. Shah, L. He, **K.W. Gao**, N. Balsara. "Thermodynamics and phase behavior of poly(ethylene oxide)/poly(methyl methacrylate)/salt blend electrolytes studied by small angle neutron scattering," *Macromolecules*. 2023. 56 (7), 2889-2898. DOI: 10.1021/acs.macromol.2c02533
2. J. Lee*, **K.W. Gao***, N. Shah, C. Kang, R. Snyder, B. Abel, L. He, S. Teixeira, G. Coates, N. Balsara. "Relationship between ion transport and phase behavior in acetal-based polymer blend electrolytes studied by electrochemical characterization and neutron scattering," *Macromolecules*. 2022. 55 (24), 11023-11033. DOI: 10.1021/acs.macromol.2c01724
3. X. Yu, X. Jiang, M. Seidler, N. Shah, **K.W. Gao**, S. Chakraborty, I. Villaluenga, N. Balsara. "Nanostructured ionic separator formed by block copolymer self-assembly: a gateway for alleviating concentration polarization in batteries," *Macromolecules*. 2022. 55 (7), 2789-22796. DOI: 10.1021/acs.macromol.2c00193
4. **K.W. Gao**, D. Halat, C. Fang, A. Mistry, J. Newman, N. Balsara. "The transference number," *Energy & Environmental Materials*. 2022. 5 (2), 366-369. DOI: 10.1002/eem2.12359
5. **K.W. Gao**, X. Yu, R. Darling, J. Newman, N. Balsara. "Increased Donnan exclusion in charged polymer networks at high salt concentrations," *Soft Matter*. 2022. 18 (2), 289-292. DOI: 10.1039/D1SM01511G
6. D. Halat, R. Snyder, S. Sundararaman, Y. Choo, **K.W. Gao**, Z. Hoffman, B. Abel, L. Grundy, M. Galluzzo, M. Gordon, H. Celik, J. Urban, D. Prendergast, G. Coates, N. Balsara, J. Reimer. "Modifying Li⁺ and anion diffusivity in polyacetal electrolytes: a pulse-field-gradient NMR study of ion self-diffusion," *Chemistry of Materials*. 2021. 33, 13, 4915-4926. DOI: 10.1021/acs.chemmater.1c00339
7. R. Snyder, Y. Choo, **K.W. Gao**, D. Halat, S. Sundararaman, B. Abel, L. Grundy, D. Prendergast, J. Reimer, G. Coates, N. Balsara. "Improved Li⁺ transport in polyacetal electrolytes: conductivity and current ratio in a series of polyacetals," *ACS Energy Letters*. 2021. 6, 1886-1891. DOI: 10.1021/acscenergylett.1c00594
8. **K.W. Gao** and N. Balsara. "Electrochemical properties of poly(ethylene oxide) electrolytes above the entanglement threshold," *Solid State Ionics*. 2021. 364. DOI: 10.1016/j.ssi.2021.115609
9. **K.W. Gao**, W. Loo, R. Snyder, B. Abel, Y. Choo, S. Teixeira, A. Lee, B. Garetz, G. Coates, N. Balsara. "Miscible polyether/poly(ether-acetal) electrolyte blends," *Macromolecules*. 2020. 53, 14, 5728-5739. DOI: 10.1021/acs.macromol.0c00747
10. W. Loo, A. Faraone, L. Grundy, **K.W. Gao**, N. Balsara. "Polymer dynamics in block copolymer electrolytes detected by neutron spin echo," *ACS Macro Lett*. 2020. 9, 5, 639-645. DOI: 10.1021/acsmacrolett.0c00236
11. **K.W. Gao**, X. Jiang, Z. Hoffman, G. Sethi, S. Chakraborty, N. Balsara. "Optimizing the monomer structure of polyhedral oligomeric silsesquioxane for ion transport in hybrid organic-inorganic block copolymers," *Journal of Polymer Science*. 2020. 58, 363-371. DOI: 10.1002/pol.20190073
12. L. Baumgartner, C. Coley, B. Reizman, **K.W. Gao**, K. Jensen. "Optimum catalyst selection over continuous and discrete process variables with a single droplet microfluidic reaction platform," *Reaction Chemistry & Engineering*. 2018. 3, 301-311. DOI: 10.1039/C8RE00032H
13. J. Sears, T. Intrator, Y. Feng, H. Swan, J. Klarenbeek, **K.W. Gao**. "Investigating the momentum balance of a plasma pinch: An air-side stereoscopic imaging system for locating probes," *Review of Scientific Instruments*. 2014. 85, 103509. DOI: 10.1063/1.4898176

Activities

- Co-founder of Ultra Seltzer of America | ultraseltzer.org
- Assistant Coach at Born to Run CA Track Club
- Member of Tau Beta Pi, AIChE, APS
- Four-year starter for Caltech's Men's Soccer Team

Awards and Honors

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| 2017 | National Defense Science & Engineering Graduate Fellowship |
| 2014 | Samuel and Berta Spalter Summer Undergraduate Research Fellowship |
| 2013 | US National Chemistry Olympiad Top 20 Study Camp Finalist |
| | LANL Foundation \$20,000 Gold Scholarship |
| | J. Robert Oppenheimer Scholarship in Memory of Nicholas C. Metropolis |
| | National Merit Scholarship |