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

Staff Battery Scientist, Blue Current 2024 – present
Senior Battery Scientist, Blue Current 2023 – 2024
Battery Scientist, Blue Current 2022 – 2023

- Developing solid state silicon anode materials, binders, solvents, formulations, and slurry processes; characterizing materials, assembling full cells, and analyzing cell performance
- Led anode active material testing engagement with major automobile manufacturer, improving cell resistance by >40% through iterative design of experiment in 3 months. This work resulted in a multiyear joint research agreement with >$5 million of funding.
- Led formulation and process development projects that increased energy density 2x in company baseline anode while maintaining cell resistance and cycle life
- Mentored intern on thermal safety project involving DSC testing of company batteries

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
- 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 >50%

Undergraduate Research Fellow, California Institute of Technology 2014 – 2015
Advisor: Professor Brian M. Stoltz

- Synthesized and characterized intermediates for the total synthesis of jorumycin

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/acsenergylett.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

- Cofounder, ISTAR Services LLC
- Assistant Coach, Born to Run CA Track Club
- Member, Tau Beta Pi; AIChE; APS
- Four-year starter, Caltech's Men's Soccer Team

Awards and Honors

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