

Kevin W. Gao

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Education

University of California, Berkeley

2017 – present

Ph.D. Candidate in Chemical Engineering – 4.0/4.0 GPA

California Institute of Technology

2013 – 2017

B.S. Chemical Engineering – 3.9/4.0 GPA

Experience

Graduate Student, University of California, Berkeley

2017 – present

Advisor: Professor Nitash P. Balsara

- Lab safety coordinator and affiliate at Lawrence Berkeley National Lab
- Studying thermodynamics and ion transport of polymer blends for lithium battery applications via neutron scattering experiments and electrochemical techniques
- First demonstration of a miscible polymer electrolyte blend made up of poly(ethylene oxide), poly(1,3,6-trioxocane), and a lithium salt
- 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

Graduate Student Instructor, University of California, Berkeley

CBE154 – Chemical Engineering Laboratory (Spring Semester 2019-20)

CBE162 – Process Dynamics and Controls (Fall Semester 2018-19)

Teaching Assistant, California Institute of Technology

ChE101 – Chemical Reaction Engineering (Winter Term 2016-17)

ChE9 – Chemical Synthesis and Characterization Engineering Lab (Spring Term 2015-2016)

Ch3a – Introduction to Chemistry Lab (Fall Term 2015-2016, Winter Term 2015-16)

Skills

Programming: MATLAB, Python, C, HTML, CSS

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

Laboratory: DSC, EIS, GPC, NMR, SANS, SAXS, TGA, rheology, glovebox, cell assembly, schlenk line

Languages: English, Mandarin Chinese

Publications

1. X. Yu, X. Jiang, M. Seidler, N. Shah, **K.W. Gao**, S. Chakraborty, I. Villaluenga, N. Balsara. "Ionic separator formed by block copolymer microphase separation: a gateway for alleviating concentration polarization in batteries," *J. Am. Chem. Soc.* 2021. Under review.
2. **K.W. Gao**, X. Yu, R. Darling, J. Newman, N. Balsara. "Increased Donnan exclusion at high salt concentrations," *Soft Matter*. 2021. Under review.
3. 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," *Chem. Mater.* 2021. 33, 13, 4915-4926. DOI: 10.1021/acs.chemmater.1c00339
4. 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 Lett.* 2021. 6, 1886-1891. DOI: 10.1021/acsenerylett.1c00594
5. **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
6. **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
7. 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
8. **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," *J. Polym. Sci.* 2020. 58, 363-371. DOI: 10.1002/pol.20190073
9. 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," *React. Chem. Eng.* 2018. 3, 301-311. DOI: 10.1039/C8RE00032H
10. 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," *Rev. Sci. Instrum.* 2014. 85, 103509. DOI: 10.1063/1.4898176

Activities

- Co-founder of Ultra Seltzer of America | ultraseltzer.org
- Chemical engineering liaison for Berkeley Energy & Resources Collaborative (BERC)
- Member of Tau Beta Pi, AIChE, APS
- Four-year starter for 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