Kara D. Fong

Ph.D. Candidate

(303) 907-4405 | karafong@berkeley.edu | @karafong

Education

University of California, Berkeley — Berkeley, CA
Ph.D. Chemical Engineering, GPA 4.00/4.00 — *2017 - 2022 (expected)*
Working Thesis Title: "Ion Correlations and Transport in Li-Ion Battery Electrolytes"

University of Cambridge — Cambridge, UK
M.Phil. Materials Science and Metallurgy — *2016-2017*
Thesis: "Interpenetrated Electron/Ion Conducting Polymer Networks for Enhanced Supercapacitor Electrodes"

Stanford University — Stanford, CA
B.S. Chemical Engineering with Honors and Distinction, GPA 4.18/4.00 — *2012–2016*
Thesis: "Improving Intrinsic Activity Measurements for Hydrogen Evolution Electrocatalysts with Application to Transition Metal Phosphides"

Research Experience

University of California, Berkeley | Department of Chemical & Biomolecular Engineering — Berkeley, CA
Graduate Student Researcher in Bryan D. McCloskey and Kristin A. Persson Groups — *Oct. 2017 - Present*
- Developing theory for transport phenomena in electrolyte solutions integrating continuum mechanics, nonequilibrium thermodynamics, and statistical mechanics
- Investigating charge transport in low temperature electrolytes and nonaqueous polyelectrolyte solutions for Li-ion batteries using molecular dynamics simulations

University of Cambridge | Department of Materials Science & Metallurgy — Cambridge, UK
Master's Student in the Active and Intelligent Materials Lab — *Oct. 2016 - Aug. 2017*
- Synthesized and characterized polymer-based supercapacitor electrodes based on interpenetrating networks of electrically and ionically conducting polymers

Stanford University | Department of Chemical Engineering — Stanford, CA
Undergraduate Researcher in Thomas F. Jaramillo Research Group — *Apr. 2013 - Jun. 2016*
- Designed a custom electrochemical cell to assess the faradaic efficiency of solar water splitting electrocatalysts
- Developed an improved technique for measuring the electrochemically active surface area of catalyst electrodes

Stanford University | Department of Medicine, Division of Nephrology — Stanford, CA
Research Assistant in Timothy W. Meyer Research Group — *Apr. 2015 - Jun. 2016*
- Constructed a mathematical model in Matlab predicting solute concentrations during kidney dialysis; applied this model to assess the effect of treatment intermittency and non-dialytic clearance on dialysis efficacy

Jülich Research Center — Jülich, Germany
Research Intern in Electrochemical Process Engineering Division — *Jun. 2014 - Sept. 2014*
- Developed and optimized a shutdown procedure to minimize catalyst deactivation in water-gas shift reactors of fuel cell-based auxiliary power units
- Constructed a Matlab/Simulink model of the steady-state and shutdown behavior of a high temperature polymer electrolyte fuel cell

Scholarships & Fellowships

2020 – 2022 Berkeley Fellowship for Graduate Study | University of California, Berkeley
2017 – 2020 National Science Foundation Graduate Research Fellowship
2016 – 2017 Churchill Scholarship
2014 Barry Goldwater Scholarship in Mathematics, Science, and Engineering
2013 Undergraduate Advising and Research (UAR) Major Grant | Stanford University

Awards & Honors

2019, 2020 Outstanding Graduate Student Instructor | University of California, Berkeley
2019 First Place in Materials Engineering and Sciences Division Poster Competition | AIChE
2019 Women in Chemical Engineering (WIC) Travel Award | AIChE
2016 Henry Ford II Scholar | Stanford University *(highest GPA in the College of Engineering)*
2016 Firestone Medal for Excellence in Undergraduate Research | Stanford University
2016 Mason and Marsden Prize in Chemical Engineering | Stanford University
2016 The Deans' Award for Academic Achievement | Stanford University
2016 Frederick Emmons Terman Engineering Scholastic Award | Stanford University
2015 Merck Award for Student Research | Stanford University
2015 Tau Beta Pi Engineering Honor Society
2015 Phi Beta Kappa Honor Society
2015 The Channing Robertson Award in Chemical Engineering | Stanford University
2013 President's Award for Academic Excellence in the Freshman Year | Stanford University
2013 Boothe Prize for Excellence in Writing, Honorable Mention | Stanford University

Teaching Experience

University of California, Berkeley Berkeley, CA

Instructional Improvement Project Graduate Student Assistant *May 2019 - Dec. 2019*

- Professional Preparation: Teaching Chemical Engineering (CBE 375, a pedagogy course for graduate students)
- Collaborated with course instructor to redesign class content with greater emphasis on inclusive teaching and active learning strategies

Graduate Student Instructor *Jan. 2019 - May 2020*

- Transport Processes (CBE 150A; Spring 2019, 2020)
- Received Outstanding Graduate Student Instructor award (2019, 2020)

Guest Lecturer *Aug. 2019 - Apr 2021*

- Professional Preparation: Teaching Chemical Engineering (CBE 375; 2019, 2020)
- Principles of Electrochemical Processes (CBE 176; Spring 2021)

Stanford University Stanford, CA

Teaching Assistant *Mar. 2015 - Jun. 2016*

- Introduction to Chemical Engineering (ChemEng 20; Spring 2015, 2016)
- An Exploration of Art Materials: The Intersection of Art and Science (ChemEng 12SC, Stanford Sophomore College Program; Sept 2015)

Undergraduate Tutor *Sept. 2014 - Jun. 2015*

- Organic chemistry tutor, Center for Teaching and Learning

Service & Outreach

Peer Reviewer

- Chemistry of Materials (2), Energy & Environmental Materials (1), Wiley-VCH book proposal (1) *Aug. 2018 - Present*

Research Mentor | UC Berkeley Berkeley, CA

- Alexandra Ringsby, Undergraduate in Chemical and Biomolecular Engineering *Aug. 2019 - Present*

Graduate Student Advisory Committee | UC Berkeley Dept. of Chemical Engineering Berkeley, CA

- Led the creation of an Undergraduate Research Portal compiling available positions and resources for undergraduates interested in research *May 2020 - Present*

Remote Teaching Committee | UC Berkeley Dept. of Chemical Engineering Berkeley, CA

- Supported the transition to virtual education during COVID-19, including compiling and distributing best practices for remote teaching *Jun. 2020 - Present*

Community Education Partnerships Virtual

Volunteer tutor *Dec. 2020 - Present*

- Provide weekly math tutoring to high school student experiencing housing insecurity

Society of Hispanic Professional Engineers, Bay Area Chapter — Virtual

VOLUNTEER MENTOR — *Nov. 2020 - May 2021*

- Mentored two female undergraduates on the graduate school application process

Society of Women Engineers SWE++ Tech Day — Virtual

VOLUNTEER FACILITATOR — *Nov. 2020*

- Facilitated virtual workshops and panels for middle school girls to encourage participation in STEM

GOLD Science Fair — Berkeley, CA

VOLUNTEER JUDGE — *Jan. 2020*

- Evaluated ten high school students on communication and use of scientific method

Berkeley Energy & Resources Collaborative — Berkeley, CA

MENTOR — *Mar. 2018 - Sept. 2018*

- Provided one-on-one mentoring to freshman engineering student on course selection, career planning, and getting involved with undergraduate research

Tau Beta Pi Engineering Honor Society — Stanford, CA

PEER ADVISING CHAIR — *Apr. 2015 - Jun. 2016*

- Led mentorship program for Stanford undergraduate engineering students by organizing advising events and tutoring sessions

El Centro Chicano | Stanford University — Stanford, CA

ENGLISH AS A SECOND LANGUAGE TUTOR — *Sept. 2013 - Jun. 2016*

- Tutored English to Spanish-speaking members of Stanford's janitorial staff

Publications

17. H. K. Bergstrom, **K. D. Fong**, B. D. McCloskey. "Interfacial Effects on Transport Coefficient Measurements in Li-ion Battery Electrolytes." Submitted, 2021. Preprint: https://ecsarxiv.org/b3yjm/
16. **K. D. Fong**, J. Self, B. D. McCloskey, K. A. Persson. "Ion Correlations and Their Impact on Transport in Polymer-Based Electrolytes." *Macromolecules*, 2021, 54, 6: 2575-2591.
    SELECTED AS ACS EDITOR'S CHOICE
    FEATURED ON FRONT COVER OF ISSUE
15. **K. D. Fong**, J. Self, B. D. McCloskey, K. A. Persson. "Onsager Transport Coefficients and Transference Numbers in Polyelectrolyte Solutions and Polymerized Ionic Liquids." *Macromolecules*, 2020, 53, 21: 9503-9512.
14. **K. D. Fong**, H. K. Bergstrom, B. D. McCloskey, K. K. Mandadapu. "Transport Phenomena in Electrolyte Solutions: Nonequilibrium Thermodynamics and Statistical Mechanics." *AIChE Journal*, 2020, 66, 12: e17091.
13. J. Self, N. T. Hahn, **K. D. Fong**, S. A. McClary, K. R. Zavadil, and K. A. Persson. "Ion Pairing and Redissociaton in Low-Permittivity Electrolytes for Multivalent Battery Applications." *J. Phys. Chem. Lett*, 2020, 11, 6: 2046-2052.
12. J. Self, **K. D. Fong**, and K. A. Persson. "Transport in Superconcentrated $LiPF_6$ and $LiBF_4$/Propylene Carbonate Electrolytes." *ACS Energy Letters*, 2019, 4: 2843-2849.
11. J. Self, **K. D. Fong**, E. R. Logan, and K. A. Persson. "Ion Association Constants for Lithium Ion Battery Electrolytes from First Principles Quantum Chemistry." *Journal of the Electrochemical Society*, 2019, 166: A3554-A3558.
10. **K. D. Fong**, J. Self, K. M. Diederichsen, B. M. Wood, B. D. McCloskey, and K. A. Persson. "Ion Transport and the True Transference Number in Nonaqueous Polyelectrolyte Solutions for Lithium-Ion Batteries." *ACS Central Science*, 2019, 5: 1250-1260.
9. K. M. Diederichsen, **K. D. Fong**, R. C. Terrell, K. A. Persson, and B. D. McCloskey. "Investigation of Solvent Type and Salt Addition in High Transference Number Nonaqueous Polyelectrolyte Solutions for Lithium Ion Batteries." *Macromolecules*, 2018, 51: 8761-8771.
8. T. Wang, H.-K. Kim, Y. Liu, W. Li, J. T. Griffiths, Y. Wu, S. Laha, **K. D. Fong**, F. Podjaski, C. Yun, R. V. Kumar, B. V. Lotsch, A. K. Cheetham, and S. K. Smoukov. "Bottom-up Formation of Carbon-Based Structures with Multilevel Hierarchy from MOF–Guest Polyhedra." *Journal of the American Chemical Society*, 2018, 140: 6130-6136.
7. **K. D. Fong**, T. Wang, and S. K. Smoukov. "Mutli-Dimensional Performance Optimization of Conducting Polymer-Based Supercapacitor Electrodes." *Sustainable Energy and Fuels*, 2017, 1: 1857-1874.
6. **K. D. Fong**,* T. Wang,* H.-K. Kim, R. V. Kumar, and S. K. Smoukov. "Semi-Interpenetrating Polymer Networks for Enhanced Supercapacitor Electrodes." *ACS Energy Letters*, 2017, 2: 2014-2020.
5. T. L. Sirich, **K. D. Fong**, B. Larive, G. J. Beck, G. M. Chertow, N. W. Levin, A. S. Kliger, N. S. Plummer, and T. W. Meyer. "Limited Reduction in Uremic Solute Concentrations with Increased Dialysis Frequency and Time in the Frequent Hemodialysis Network Daily Trial." *Kidney International*, 2017, 91: 1186-1192.

4. J. W. F. To, J. W. D. Ng, S. Siahrostami, A. L. Koh, Y. Lee, Z. Chen, **K. D. Fong**, S. Chen, J. He, W.-G. Bae, J. Wilcox, H. Y. Jeong, K. Kim, F. Studt, J. K. Nørskov, T. F. Jaramillo, and Z. Bao. "High-performance Oxygen Reduction and Evolution Carbon Catalysis: From Mechanistic Studies to Device Integration." *Nano Research*, 2016, 10: 1163-1177.
3. F. J. O'Brien, **K. D. Fong**, T. L. Sirich, and T. W. Meyer. "More Dialysis Has Not Proven Much Better." *Seminars in Dialysis*, 2016, 29: 481-490.
2. T.M. Meyer, T.L. Sirich, **K. D. Fong**, N.S. Plummer, T. Shafi, S. Hwan, T. Banerjee, Y. Zhu, N.R. Powe, X. Hai, and T.H. Hostetter. "Kt/V_{urea} and Nonurea Small Solute Levels in the Hemodialysis Study." *Journal of the American Society of Nephrology*, 2016, 27: 3469-3478.
1. J.D. Benck, S.C. Lee, **K. D. Fong**, J. Kibsgaard, R. Sinclair, and T.F. Jaramillo. "Designing Active and Stable Silicon Photocathodes for Solar Hydrogen Evolution Using Molybdenum Sulfide Nanomaterials." *Advanced Energy Materials*, 2014, 4: 1400739.

Presentations

19. "Ion Correlations in Li-Ion Battery Electrolytes." *Women Excelling in Computational Modeling Engineering Seminar Series* (virtual), April 2021. (Oral, Invited)
18. "Onsager Transport Coefficients: Theoretical Development and Application to Polyelectrolyte Solutions." *Lawrence Berkeley National Laboratory Electrochemistry Seminar* (virtual), March 2021. (Oral)
17. "Molecular Dynamics Characterization of Onsager Transport Coefficients and Transference Number in Polyelectrolyte Solutions." *American Institute of Chemical Engineers* (virtual), November 2020. (Oral)
16. "Theory of Irreversible Thermodynamics and Non-Equilibrium Statistical Mechanics for Transport Phenomena in Electrolyte Solutions." *American Institute of Chemical Engineers* (virtual), November 2020. (Oral)
15. "Transport Phenomena in Electrolyte Solutions: Non-Equilibrium Thermodynamics and Statistical Mechanics." *Battery Modeling Webinar Series* (virtual), October 2020. (Oral, Invited)
14. "Modifications to a Graduate Pedagogy Course to Promote Active Learning and Inclusive Teaching." *American Society for Engineering Education* (virtual), June 2020. (Oral)
13. "Li-Ion Transference Numbers in Nonaqueous Polyelectrolyte Solutions." *Gordon Research Conference on Batteries*, Ventura, CA, February 2020. (Poster)
12. "Transport Phenomena in Electrolyte Solutions: Non-Equilibrium Thermodynamics and Statistical Mechanics." *Berkeley Statistical Mechanics Meeting*, Berkeley, CA, January 2020. (Oral)
11. "Charge Transport in Nonaqueous Polyelectrolyte Solutions for Li-Ion Batteries: Ion-Ion Correlations and the True Transference Number from Molecular Dynamics Simulations." *American Institute of Chemical Engineers*, Orlando, FL, November 2019. (Poster)
    First place in Materials Engineering and Sciences Division Poster Competition
10. "Improving a Graduate Pedagogy Course to Support Inclusive Teaching and Active Learning." *American Institute of Chemical Engineers*, Orlando, FL, November 2019. (Poster)
9. "Molecular Dynamics Simulations of Ion Transport in High Transference Number Polyelectrolytes for Li-Ion Batteries." *American Physical Society*, Boston, MA, March 2019. (Oral)
8. "Interpenetrated Electron/Ion Conducting Polymer Networks for Enhanced Supercapacitor Electrodes." *Annual International Scientific Symposium of the Department of Chemical and Pharmaceutical Engineering*, Sofia University, Malyovitsa, Bulgaria, March 2017. (Oral)
7. "Improving Measurements of Intrinsic Activity and Selectivity for Hydrogen Evolution Electrocatalysts." *David M. Mason Lecture Series Poster Session*, Stanford, CA, May 2016. (Poster)
6. "Improving Electrochemically Active Surface Area Measurements for Fundamental Understanding of Hydrogen Evolution Catalysts." *Vice Provost of Undergraduate Education (VPUE) Chemical Engineering Summer Research Poster Session*, Stanford, CA, September 2015. (Poster)
5. "Improving Electrochemically Active Surface Area Measurements for Fundamental Understanding of Hydrogen Evolution Catalysts." *Stanford SUNCAT Summer Institute*, Stanford, CA, August 2015. (Poster)
4. "Experimental Studies of Shutdown Procedures for Water-Gas Shift Catalysts in High Temperature Polymer Electrolyte Fuel Cell Systems." *American Chemical Society*, Denver, CO, March 2015. (Poster)
3. "Undergraduate Research in Jülich, Germany: Fuel Cell Systems Studies as a Catalyst for Personal Growth and Cultural Exploration." *American Chemical Society*, Denver, CO, March 2015. (Oral)
2. "Quantification of Hydrogen and Oxygen Production: Assessing Selectivity of Electrocatalysts for Solar Water Splitting." *American Institute of Chemical Engineers*, San Francisco, CA, November 2013. (Poster)
1. "Quantification of Hydrogen and Oxygen Production: Assessing Selectivity of Electrocatalysts for Solar Water Splitting." *Vice Provost of Undergraduate Education (VPUE) Chemical Engineering Summer Research Poster Session*, Stanford, CA, September 2013. (Poster)