

# Kara D. Fong

PH.D. CANDIDATE

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## Education

### University of California, Berkeley

PH.D. CHEMICAL ENGINEERING, GPA 4.00/4.00

Berkeley, CA

2017 - 2022 (expected)

Working Thesis Title: "Ion Correlations and Transport in Li-Ion Battery Electrolytes"

### University of Cambridge

M.PHIL. MATERIALS SCIENCE AND METALLURGY

Cambridge, UK

2016-2017

Thesis: "Interpenetrated Electron/Ion Conducting Polymer Networks for Enhanced Supercapacitor Electrodes"

### Stanford University

B.S. CHEMICAL ENGINEERING WITH HONORS AND DISTINCTION, GPA 4.18/4.00

Stanford, CA

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

2014 RISE Scholarship | Deutscher Akademischer Austausch Dienst

2013 Undergraduate Advising and Research (UAR) Major Grant | Stanford University

## Awards & Honors

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2021	MIT Rising Star in Chemical Engineering
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 ( <i>highest GPA in the College of Engineering</i> )
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

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### University of California, Berkeley

Berkeley, CA

#### CERTIFICATE IN TEACHING AND LEARNING IN HIGHER EDUCATION

Apr. 2021

#### 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

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### Peer Reviewer

- Chemistry of Materials (2), Macromolecules (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
- Rachael Lee, Undergraduate in Materials Science and Engineering

Aug. 2019 - May 2021

May 2021 - 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 - May 2021

## Community Education Partnerships

Virtual

### VOLUNTEER TUTOR

Dec. 2020 - Present

- Provide weekly math tutoring to high school student experiencing homelessness / 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, Jun. 2021

- Evaluated middle and high school students on project design, use of scientific method, and communication skills

## 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

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20. J. Self, H. K. Bergstrom, **K. D. Fong**, B. D. McCloskey, K. A. Persson. "A Theoretical Model for Computing Freezing Point Depression of Lithium-Ion Battery Electrolytes." *Submitted*.
19. T. Hou, **K. D. Fong**, J. Wang, K. A. Persson. "The Solvation Structure, Transport Properties and Reduction Behavior of Carbonate-Based Electrolytes of Lithium-Ion Batteries." *Submitted*.
18. A. J. Ringsby, **K. D. Fong**, J. Self, H. K. Bergstrom, B. D. McCloskey, K. A. Persson. "Transport Phenomena in Low Temperature Lithium-Ion Battery Electrolytes." *Journal of the Electrochemical Society*, 2021.
17. H. K. Bergstrom, **K. D. Fong**, B. D. McCloskey. "Interfacial Effects on Transport Coefficient Measurements in Li-ion Battery Electrolytes." *Journal of the Electrochemical Society*, 2021, 168: 060543.
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: Non-Equilibrium 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 Redissociation 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<sub>6</sub> and LiBF<sub>4</sub>/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. "Multi-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

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23. "The Onsager Framework for Transport Phenomena in Electrolyte Solutions." *Stanford University, hosted by Tom Markland* (virtual), August 2021. (Oral, [Invited](#))
22. "The Onsager Framework for Transport Phenomena in Electrolyte Solutions." *Drexel University, hosted by Maureen Tang* (virtual), July 2021. (Oral, [Invited](#))
21. "The Onsager Framework for Transport Phenomena in Electrolyte Solutions." *University of Cambridge, hosted by Clare Grey* (virtual), May 2021. (Oral, [Invited](#))
20. "Ion Correlations in Li-Ion Battery Electrolytes." *Women Excelling in Computational Molecular Engineering Seminar Series* (virtual), April 2021. (Oral, [Invited](#))
19. "Onsager Transport Coefficients: Theoretical Development and Application to Polyelectrolyte Solutions." *Lawrence Berkeley National Laboratory Electrochemistry Seminar* (virtual), March 2021. (Oral)
18. "Molecular Dynamics Characterization of Onsager Transport Coefficients and Transference Number in Polyelectrolyte Solutions." *American Institute of Chemical Engineers* (virtual), November 2020. (Oral)
17. "Theory of Irreversible Thermodynamics and Non-Equilibrium Statistical Mechanics for Transport Phenomena in Electrolyte Solutions." *American Institute of Chemical Engineers* (virtual), November 2020. (Oral)
16. "Transport Phenomena in Electrolyte Solutions: Non-Equilibrium Thermodynamics and Statistical Mechanics." *Battery Modeling Webinar Series* (virtual), October 2020. (Oral, [Invited](#))
15. "Modifications to a Graduate Pedagogy Course to Promote Active Learning and Inclusive Teaching." *American Society for Engineering Education* (virtual), June 2020. (Oral)
14. "Transport Phenomena in Electrolyte Solutions: Ion Correlation Analysis using Green-Kubo Relations." *Lawrence Berkeley National Laboratory, hosted by Gerd Ceder* (virtual), April 2020. (Oral, [Invited](#))
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 Inter-*

*national 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)