# David W. Gardner Curriculum Vitae

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# Education

Ph.D. candidate in chemical engineering, UC Berkeley Fall 2016 – present

B.S. chemical engineering, Iowa State University 2016

# Selected Research Papers

1. David W. Gardner, et al., “Deviatoric-stress Raman spectroscopy and X-ray diffraction reveals slip planes in calcium-aluminum-silicate-hydrate” *In review*
2. David W. Gardner, Hossain Fahad, Xiang Gao, Ali Javey, Carlo Carraro, Roya Maboudian, “Improved hydrogen/hydrogen sulfide adsorption selectivity on Pd with ZIF-8 membrane”, *Journal of The Electrochemical Society*, **2020**, 167, 147503.
3. David W. Gardner, Jiaqi Li, Saeed Masoumi, Paulo Monteiro, Mohammad Qomi, Carlo Carraro, Roya Maboudian, “Silicate Bond Characteristics in Calcium-silicate-hydrates Determined by High Pressure Raman Spectroscopy” *J. Phys. Chem. C*, **2020**, 124, 33, 18335-18345
4. David W. Gardner, Xiang Gao, Hossain Fahad, An-Ting Yang, Sam He, Ali Javey, Carlo Carraro, Roya Maboudian, “Metal-organic framework based field-effect chemical sensors” *Chemistry – A European Journal*, **2019**, 25 (57), pp. 13176-13183.
	1. See video at: [youtu.be/DH-\_AFxETZw](https://youtu.be/DH-_AFxETZw)
5. David W. Gardner, Xiang Gao, Hossain Fahad, An-Ting Yang, Sam He, Ali Javey, Carlo Carraro, Roya Maboudian, “Scalable ultra-low power chemical sensing with metal-organic frameworks” *IEEE International Conference on Solid-State Sensors, Actuators and Microsystems & Eurosensors XXXIII*, **2019**, pp. 1215-1218.
6. Lunet Luna\*, David W. Gardner\*, Velemir Radmilovic, Roya Maboudian, Carlo Carraro, “Atomic-Scale electronic characterization of defects in silicon carbide nanowires by electron energy-loss spectroscopy,” *J. Phys. Chem. C*, **2018**, 122 (22), pp. 12047-12051
	1. See video at: [youtube.com/watch?v=fZPeZRRjiH0](https://www.youtube.com/watch?v=fZPeZRRjiH0)
7. Thomas C. Hoff, David W. Gardner, Rajeeva Thalikartne, Jaun Proano-Raviles, Robert C. Brown, and Jean-Philippe Tessonnier, “Elucidating the effect of desilication on aluminum-rich ZSM-5 zeolite and its consequences on biomass catalytic fast pyrolysis”, *App. Cat. A*, **2017**, 529 (5), pp. 68-78
8. David W. Gardner\*, Jiajie Huo\*, Thomas C. Hoff\*, Robert L. Johnson, Brent H. Shanks, and Jean-Philippe Tessonnier, “Insights into the hydrothermal stability of ZSM-5 under relevant biomass conversion reaction conditions,” *ACS Catalysis*, **2015**, 5 (7), pp 4418-4422

\*indicates equal contribution.

# Awards and Honors

1. First place presentation, Environmental Sensors, American Institute of Chemical Engineers (AIChE) Annual Meeting 2020, “Effects of Alkane Dielectrics in Chemically-Sensitive Field-Effect Transistors Functionalized with Metal-Organic Frameworks”
	1. Watch at: <https://www.youtu.be/ltM_dPEThVw>
2. Outstanding graduate student award, Intro to Chemical Engineering, UC Berkeley, Dec. 2016, Aug. 2019 *Awarded for outstanding teaching*
3. DoE Science Graduate Student Research (SCGSR) Jul. 2019 – Jun. 2020. Mentor: Dr. Martin Kunz. *Fellowship for graduate study at DoE facility*
4. Best poster, “Improved adsorption selectivity on Pd nanoparticles with ZIF-8 membrane”, Berkeley Sensors and Actuators Center, Mar. 07 2019 *Recognized by engineering firms for translational research*
5. Teaching Effectiveness Award, Essay: “View from the corner office: changing student attitudes about thermodynamics,” UC Berkeley, Apr. 2017. <http://bit.ly/dwgf16tea> *Awarded for creatively addressing a teaching challenge*
6. Honorable mention, NSF Graduate Research Fellowship Program (GRFP), 2017. *Nationally competitive fellowship*

# Technical Experience

1. Maboudian Research Group at UC Berkeley, Chemical and Biomolecular Engineering. Ph.D. candidate. Raman spectroscopy, X-ray photoelectron spectroscopy, Metal-organic frameworks, cement, safety officer. Jan. 2017 – present
2. Beamline 12.2.2 – Diffraction Under Non-Ambient Conditions, Advanced Light Source Synchrotron, Lawrence Berkeley National Lab. High-pressure axial diffraction, deviatoric stress radial diffraction, Python for data analysis. Oct. 2018 – Oct. 2020
3. Beamline 7.3.3 – Small-angle X-ray scatting. Advanced Light Source Synchrotron, Lawrence Berkeley National Lab. Feb. 2020.
4. Tessonnier Research Group at Iowa State University, Chemical and Biological Engineering. Undergraduate research assistant. Zeolite synthesis, porosimetry. Jan. 2013 – May 2016
5. Bemis Company, Inc. R&D co-op, Neenah WI. Statistical process control, polymers, packaging, coextruded films. Jan. 2015 – Aug. 2015

# Proposals

1. **Accepted** - “Optimization of novel carbon fiber reinforced cement-based materials using multi-scale experimental and computational techniques”, Energy & Biosciences Institute, Carbon Sequestration in Building Materials, December 2020
2. Submitted - “Microheater-based Platform for Combustible Gas Sensing”, National Science Foundation (NSF), Partnership for Innovation (PFI), July 2020.
3. **Funded** - “Metal-organic framework chemical-sensitive field effect transistor for highly selective gas sensing”, National Science Foundation (NSF), Electronics, Photonics and Magnetic Devices (EPMD), Award 1903188
	1. Read more: bit.ly/3oYEWtN
4. **Funded** – “Fundamental Investigation of Preferred Orientation Mechanism in Concrete”, National Science Foundation (NSF), Ceramics, Award 1935604
	1. Read more: bit.ly/3oVDs3u
5. **Accepted** – “Role of water for facilitating preferred orientation in calcium silicate hydrates under deviatoric stress”, Beamline 12.2.2, Advanced Light Source, Lawrence Berkeley National Lab. ALS-10532. Fall 2019. *Highly competitive synchrotron radiation source*
6. **Accepted** – “Metal-organic framework field-effect transistors”, Molecular Foundry, Lawrence Berkeley National Lab. Jan. 2020, Jan. 2019, Jan. 2018. *Access to state-of-the-art scientific equipment at DoE facility*

# Teaching Experience

1. Intro to chemical engineering, UC Berkeley, Spring 2019. Instructor: Dr. S. Ciston. Reviews: [bit.ly/2XaNDXC](https://bit.ly/2XaNDXC)
2. Graduate kinetics and reaction engineering, UC Berkeley, Fall 2018. Instructor: Prof. A. Katz. Reviews: [bit.ly/2Y9bSCw](https://bit.ly/2Y9bSCw)
3. Graduate kinetics and reaction engineering, UC Berkeley, Fall 2017. Instructor: Prof. E. Iglesia. Reviews: [bit.ly/dwgf17cbe244](http://bit.ly/dwgf17cbe244)
4. Graduate student instructor teaching conference, UC Berkeley, Fall 2017, Spring 2018, Fall 2018, Fall 2019, Fall 2020 (virtual). Reviews: [bit.ly/dwg\_gsi\_f17](http://bit.ly/dwggsiwx), [bit.ly/dwg\_gsi\_s18](http://bit.ly/dwg_gsi_s18), [bit.ly/32Op9pv](https://bit.ly/32Op9pv)
5. Intro to chemical engineering, UC Berkeley, Fall 2016. Instructor: Dr. M. Went. Reviews: [bit.ly/dwgf16cbe40](http://bit.ly/dwgf16cbe40)s

# Research Presentations

1. David W. Gardner, Hossain M. Fahad, Carlo Carraro, Ali Javey, Roya Maboudian, “Effects of Alkane Dielectrics in Chemically-Sensitive Field-Effect Transistors Functionalized with Metal-Organic Frameworks”, Annual Institue of Chemical Engineers Annual Meeting, Nov. 16 2020.
	1. Watch: <https://bit.ly/3mteRRP>
2. David W. Gardner, Roya Maboudian, Martin Kunz, “Plastic deformations in cement hydrates”, Advanced Light Source 2020 User Meeting, Aug. 25 2020
3. David W. Gardner, Jiaqi Li, Saeed Masoumi, Paulo Monteiro, Mohammad Qomi, Roya Maboudian, Carlo Carraro, “Extracting mechanical and thermal properties of nanocrystalline C-A-S-H using High-pressure Raman spectroscopy”, Gordon Research Conference: Advanced Materials for Sustainable Infrastructure Development, Feb. 23 2020 (Poster)
4. \*David W. Gardner, Xiang Gao, Hossain Fahad, An-Ting Yang, Sam He, Ali Javey, Carlo Carraro, Roya Maboudian, “Metal-organic frameworks for highly selective chemical sensing”, Molecular Foundry Inorganic Facility Meeting, Dec. 19 2019.
5. David W. Gardner, An-Ting Yang, Hossain Fahad, Ali Javey, Carlo Carraro, Roya Maboudian, “Metal-organic frameworks: a highly tunable class of materials for chemical sensing with high selectivity,” Berkeley Sensors and Actuators Conference, Sep. 21 2017, Mar. 03 2018, Mar. 07 2019, Sep. 22 2020 (Posters)
6. David W. Gardner, An-Ting Yang, Hossain Fahad, Ali Javey, Carlo Carraro, Roya Maboudian, “A metal-organic-framework based field-effect chemical sensor,” Berkeley Chemical and Biological Engineering Symposium, May 03 2018
7. \*David W. Gardner, Anna Harley-Trochimczyk, Hu Long, An-Ting Yang, Hossain Fahad, Ali Javey, Carlo Carraro, Roya Maboudian, “Advances in nanomaterials for low-power gas sensing,” Berkeley Sensors and Actuators Center Researcher Seminar, Oct. 05 2018
8. Thomas C. Hoff, David W. Gardner, Kaige Wang, Rajeeva Thalikartne, Robert C. Brown, and Jean-Philippe Tessonnier, “Structure-activity correlations for catalytic fast pyrolysis of biomass,” Iowa Academy of Science, Apr. 23 2015
9. David W. Gardner, Jiajie Huo, Thomas C. Hoff, Robert L. Johnson, Brent H. Shanks, and Jean-Philippe Tessonnier, "Hydrothermal stability of ZSM-5 in relevant biomass conversion conditions,” AIChE Fall Meeting, Nov. 09 2015
10. David W. Gardner, Thomas C. Hoff, and Jean-Philippe Tessonnier, "Mesoporous zeolites for catalytic fast pyrolysis,” AIChE MidAmerica Conference, 4 April 2015. Presentation.

\**Indicates invited talk*

# Miscellaneous

1. Math and science tutor, Oakland Unified School District secondary schools
2. Volunteer, Bay Area Scientists in Schools (BASIS), Fall 2016 – Present
3. Contributing reviewer:
	1. AIP Advances
	2. Physics and Chemistry of Minerals
4. Boston Marathon qualifier at San Francisco ‘17 and Oakland ‘18, ‘19
5. Featured solution to “Riddler” on FiveThirtyEight.com, “Empirical Monte-Carlo chaos tag simulation,” June 2017, [53eig.ht/2t4p2V9](http://53eig.ht/2t4p2V9)