

Feng Jiao, Ph.D.

Professor and Graduate Program Director
Robert Grasselli Development Professor of Chemical and Biomolecular Engineering
Director, Center for Catalytic Science & Technology
University of Delaware
332 Colburn Lab, 150 Academy Street, Newark, DE 19716 USA
Tel: (302) 831-3679, E-mail: jiao@udel.edu
Group website: www.jiaogroup.org

Research Interests

The Jiao group primarily focuses on developing electrochemical devices for solving critical issues in energy storage and sustainable chemical production. Currently, the group is working on two research directions: (1) Electrochemical systems for carbon utilization. Electrochemical reactors and processes that can convert carbon dioxide and carbon monoxide into value-added chemicals are being engineered to achieve orders of magnitude higher current densities than conventional batch systems. (2) Nanostructured materials for energy applications. Novel synthetic methods enable us to prepare nanostructured materials with morphologies and compositions that cannot be accessed using existing approaches. We are actively exploring new nanomaterials as potential electrocatalysts and electrode materials for energy storage and conversion applications. Breakthrough in these directions may help us address global climate changes by providing clean, sustainable, and environmentally friendly fuel and chemical supplies.

Education

Jan. 2004 – Jan. 2008	Ph.D. in Chemistry University of St Andrews, St Andrews, United Kingdom Thesis: Nanomaterials for energy storage and conversion Advisor: Prof. Peter G. Bruce
Sep. 1997 – Jul. 2001	B.S. in Chemistry, Fudan University, Shanghai, China Thesis: Catalytic oxidation of phenol using nanostructured iron oxides Advisor: Prof. Heyong He

Professional Experience

Sept. 2019 – Present	Robert Grasselli Development Professor of Chemical and Biomolecular Engineering, University of Delaware, Newark, DE, United States
Sept. 2021 – Present	Professor, Graduate Program Director Department of Chemical and Biomolecular Engineering, University of Delaware, Newark, DE, United States
Jul. 2020 – Present	Director, Center for Catalytic Science & Technology University of Delaware, Newark, DE, United States
Sept. 2017 – Sept. 2021	Associate Professor, Department of Chemical and Biomolecular Engineering University of Delaware, Newark, DE, United States
Sept. 2017 – Jun. 2020	Associate Director, Center for Catalytic Science & Technology University of Delaware, Newark, DE, United States
Jun. 2017 – Nov. 2017	Visiting Faculty, SUNCAT Center for Interface Science and Catalysis Stanford University, Stanford, CA, United States (Host: Prof. Jens Norskov)
Aug. 2010 – Sept. 2017	Assistant Professor, Department of Chemical and Biomolecular Engineering, University of Delaware, Newark, DE, United States
Jan. 2008 – Aug. 2010	Postdoctoral Researcher (Supervisor: Dr. Heinz Frei) Lawrence Berkeley National Laboratory, Physical Biosciences Division Berkeley, CA, United States
Sept. 2003 – Jan. 2004	Visiting scholar, School of Chemistry, University of St Andrews St Andrews, United Kingdom
Jul. 2001 – Sept. 2003	Lab assistant, Fudan University, Shanghai, China

Honors and Awards

- 2020 Scialog Fellow, Negative Emissions Science (NES) initiative, sponsored by the RCSA and Alfred P. Sloan Foundation
- 2020 Emerging Investigator, Journal of Materials Chemistry A (RSC)
- 2019 Robert Grasselli Development Professor of Chemical and Biomolecular Engineering (University of Delaware)
- 2017 Class of Influential Researchers, Industrial & Engineering Chemistry Research (ACS)
- 2015 Outstanding Junior Faculty Member, College of Engineering (University of Delaware)
- 2014 National Science Foundation CAREER Award
- 2011 University of Delaware Research Foundation Award
- 2010 American Chemical Society Petroleum Research Foundation NDI Award
- Awards Prior to Employment at the University of Delaware*
- 2008 Material Research Society Graduate Student Award
- 2007 Electrochemical Society Student Research Award of the Battery Division
- 2007 Electrochemical Society Student Travel Award

Editorial Board

- 2021 – Present Renewables (Advisory Board Member)
- 2020 – Present Journal of Materials Chemistry A (Advisory Board Member)
- 2019 – Present Cell Reports Physical Science (Advisory Board Member)
- 2019 – Present Materials Today Sustainability (Editorial Board Member)
- 2018 – Present Trends in Chemistry (Advisory Board Member)
- 2016 – 2020 Scientific Reports (Editorial Board Member)
- 2011 – 2015 Journal of Chemical Engineering & Process Technology (Editorial Board Member)

Publications

Total citations: >14,600; Average citations per paper: 149; H-index: 51; Data source: Google Scholar, September 2022.

ORCID ID: orcid.org/0000-0002-3335-3203

Google Scholar: <https://scholar.google.com/citations?user=Oi-vLsAAAAAJ>

1. I. E. Stephens, et al. 2022 Roadmap on low temperature electrochemical CO₂ Reduction. *Journal of Physics: Energy* (2022).
2. S. Overa, B. Crandall, B. Shrimant, D. Tian, B. H. Ko, H. Shin, C. Bae and F. Jiao* Enhancing acetate selectivity by coupling anodic oxidation in carbon monoxide electroreduction. *Nature Catalysis* 5, 738-745 (2022). [10.1038/s41929-022-00828-w](https://doi.org/10.1038/s41929-022-00828-w)
3. T. Ji, et al. Microwave-accelerated regeneration of a non-aqueous slurry for energy-efficient carbon sequestration. *Materials Today Sustainability* 19, 100168 (2022). [10.1016/j.mtsust.2022.100168](https://doi.org/10.1016/j.mtsust.2022.100168)
4. H. H. Heenen,* H. Shin, G. Kastlunger, S. Overa, J. A. Gauthier, F. Jiao* and K. Chan. Mechanism for acetate formation in electrochemical CO₂ reduction on Cu: Selectivity with potential, pH, and nanostructuring. *Energy Environmental Science* 15, 3978-3990 (2022). [10.1039/D2EE01485H](https://doi.org/10.1039/D2EE01485H)
5. R. Xia, S. Overa and F. Jiao* Emerging Electrochemical Processes to Decarbonize the Chemical Industry. *JACS Au* 2, 1054 (2022). [10.1021/jacsau.2c00138](https://doi.org/10.1021/jacsau.2c00138)
6. J. Wang, C. Cheng, Q. Yuan, H. Yang, F. Q. Meng, Q. H. Zhang, L. Gu, J. L. Cao, L. G. Li, S. C. Haw, Q. Shao, L. Zhang, T. Cheng, F. Jiao and X. Q. Huang* Exceptionally active and stable RuO₂ with interstitial carbon for water oxidation in acid. *Chem* 8, 1673 (2022). [10.1016/j.chempr.2022.02.003](https://doi.org/10.1016/j.chempr.2022.02.003)
7. S. Overa, B. H. Ko, Y. R. Zhao and F. Jiao* Electrochemical Approaches for CO₂ Conversion to Chemicals: A Journey toward Practical Applications. *Accounts of Chemical Research* 55, 638 (2022). [10.1021/acs.accounts.1c00674](https://doi.org/10.1021/acs.accounts.1c00674)
8. B. H. Ko, B. Hasa, H. Shin, Y. R. Zhao and F. Jiao* Electrochemical Reduction of Gaseous Nitrogen Oxides on Transition Metals at Ambient Conditions. *Journal of the American Chemical Society* 144, 1258 (2022). [10.1021/jacs.1c10535](https://doi.org/10.1021/jacs.1c10535)

9. E. Jeng, Z. Qi, A. R. Kashi, S. Hunegnaw, Z. Y. Huo, J. S. Miller, L. B. B. Aji, B. H. Ko, H. Shin, S. C. Ma, K. P. Kuhl, F. Jiao* and J. Biener* Scalable Gas Diffusion Electrode Fabrication for Electrochemical CO₂ Reduction Using Physical Vapor Deposition Methods. *ACS Applied Materials & Interfaces* 14, 7731 (2022). 10.1021/acsami.1c17860
10. E. C. Hann, S. Overa, M. Harland-Dunaway, A. F. Narvaez, D. N. Le, M. L. Orozco-Cardenas, F. Jiao* and R. E. Jinkerson* A hybrid inorganic-biological artificial photosynthesis system for energy-efficient food production. *Nature Food* 3, 461 (2022). 10.1038/s43016-022-00530-x
11. M. J. Cui, C. P. Yang, S. Hwang, M. H. Yang, S. Overa, Q. Dong, Y. G. Yao, A. H. Brozena, D. A. Cullen, M. F. Chi, T. F. Blum, D. Morris, Z. Finrock, X. Z. Wang, P. Zhang, V. G. Goncharov, X. F. Guo, J. Luo, Y. F. Mo,* F. Jiao* and L. B. Hu* Multi-principal elemental intermetallic nanoparticles synthesized via a disorder-to-order transition. *Science Advances* 8 (2022). 10.1126/sciadv.abm4322
12. N. Biswas, Z. H. Xie, R. Xia, S. Overa, F. Jiao* and J. G. Chen* Tandem Electrocatalytic-Thermocatalytic Reaction Scheme for CO₂ Conversion to C₃ Oxygenates. *ACS Energy Letters*, 2904 (2022). 10.1021/acseenergylett.2c01454
13. P. Yang, Q. S. Wu, W. Q. Xie, X. Zhang, A. Brozena, J. Zheng, M. N. Garaga, B. H. Ko, Y. M. Mao, S. M. He, Y. Gao, P. B. Wang, M. Tyagi, F. Jiao, R. Briber, P. Albertus, C. S. Wang, S. Greenbaum, Y. Y. Hu, A. Isogai, M. Winter, K. Xu, Y. Qi and L. B. Hu* Copper-coordinated cellulose ion conductors for solid-state batteries. *Nature* 598, 590 (2021). 10.1038/s41586-021-03885-6
14. R. Xia, D. Tian, S. Kattel, B. Hasa, H. Shin, X. B. Ma,* J. G. G. Chen* and F. Jiao* Electrochemical reduction of acetonitrile to ethylamine. *Nature Communications* 12, 1949 (2021). 10.1038/s41467-021-22291-0
15. R. Xia, J. J. Lv, X. B. Ma and F. Jiao* Enhanced multi-carbon selectivity via CO electroreduction approach. *Journal of Catalysis* 398, 185 (2021). 10.1016/j.jcat.2021.03.034
16. H. Shin, K. U. Hansen and F. Jiao* Techno-economic assessment of low-temperature carbon dioxide electrolysis. *Nature Sustainability* 4, 911 (2021). 10.1038/s41893-021-00739-x
17. S. Overa, T. G. Feric, A. H. A. Park* and F. Jiao* Tandem and Hybrid Processes for Carbon Dioxide Utilization. *Joule* 5, 8 (2021). 10.1016/j.joule.2020.12.004
18. T. Y. Li, Y. G. Yao, B. H. Ko, Z. N. Huang, Q. Dong, J. L. Gao, W. Chen, J. G. Li, S. K. Li, X. Z. Wang, R. Shahbazian-Yassar, F. Jiao* and L. B. Hu* Carbon-Supported High-Entropy Oxide Nanoparticles as Stable Electrocatalysts for Oxygen Reduction Reactions. *Advanced Functional Materials* 31, 2010561 (2021). 10.1002/adfm.202010561
19. B. Hasa, M. Jouny, B. H. Ko, B. J. Xu* and F. Jiao* Flow Electrolyzer Mass Spectrometry with a Gas-Diffusion Electrode Design. *Angewandte Chemie-International Edition* 60, 3277 (2021). 10.1002/anie.202013713
20. K. U. Hansen and F. Jiao* Hydrophobicity of CO₂ gas diffusion electrodes. *Joule* 5, 754 (2021). 10.1016/j.joule.2021.02.005
21. K. U. Hansen and F. Jiao* Creating the right environment. *Nature Energy* 6, 1005 (2021). 10.1038/s41560-021-00930-6
22. Y. R. Zhao, X. Z. Chang, A. S. Malkani, X. Yang, L. Thompson, F. Jiao* and B. J. Xu* Speciation of Cu Surfaces During the Electrochemical CO Reduction Reaction. *Journal of the American Chemical Society* 142, 9735 (2020). 10.1021/jacs.0c02354
23. C. P. Yang, B. H. Ko, S. Hwang, Z. Y. Liu, Y. G. Yao, W. Luc, M. J. Cui, A. S. Malkani, T. Y. Li, X. Z. Wang, J. Q. Dai, B. J. Xu, G. F. Wang, D. Su, F. Jiao* and L. B. Hu* Overcoming immiscibility toward bimetallic catalyst library. *Science Advances* 6, eaaz6844 (2020). 10.1126/sciadv.aaz6844
24. R. Xia, S. Zhang, X. B. Ma* and F. Jiao* Surface-functionalized palladium catalysts for electrochemical CO₂ reduction. *Journal of Materials Chemistry A* 8, 15884 (2020). 10.1039/d0ta03427d
25. B. H. Ko and F. Jiao* Well-Defined Model CO₂ Electroreduction Catalyst. *Chem* 6, 1506 (2020). 10.1016/j.chempr.2020.06.006
26. B. H. Ko, B. Hasa, H. Shin, E. Jeng, S. Overa, W. Chen and F. Jiao* The impact of nitrogen oxides on electrochemical carbon dioxide reduction. *Nature Communications* 11, 5856 (2020). 10.1038/s41467-020-19731-8
27. F. Jiao* In/In₂O_{3-x} heterostructure: in situ reconstructed active species of In₂O₃ for CO₂ electroreduction. *Science Bulletin* 65, 1514 (2020). 10.1016/j.scib.2020.06.010

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33. M. Jouny, J. J. Lv, T. Cheng, B. H. Ko, J. J. Zhu, W. A. Goddard* and F. Jiao* Formation of carbon-nitrogen bonds in carbon monoxide electrolysis. *Nature Chemistry* 11, 846 (2019). [10.1038/s41557-019-0312-z](https://doi.org/10.1038/s41557-019-0312-z)
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39. W. Luc, M. Jouny, J. Rosen and F. Jiao* Carbon dioxide splitting using an electro-thermochemical hybrid looping strategy. *Energy & Environmental Science* 11, 2928 (2018). [10.1039/c8ee00532j](https://doi.org/10.1039/c8ee00532j)
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43. M. Dunwell, W. Luc, Y. S. Yan, F. Jiao* and B. J. Xu* Understanding Surface-Mediated Electrochemical Reactions: CO₂ Reduction and Beyond. *ACS Catalysis* 8, 8121 (2018). [10.1021/acscatal.8b02181](https://doi.org/10.1021/acscatal.8b02181)
44. G. M. Sriramagiri, N. Ahmed, W. Luc, K. D. Dobson, S. S. Hegedus* and F. Jiao* Toward a Practical Solar-Driven CO₂ Flow Cell Electrolyzer: Design and Optimization. *ACS Sustainable Chemistry & Engineering* 5, 10959 (2017). [10.1021/acssuschemeng.7b02853](https://doi.org/10.1021/acssuschemeng.7b02853)
45. G. M. Sriramagiri,* N. Ahmed, W. Luc, K. Dobson, S. S. Hegedus, F. Jiao and R. W. Birkmire. Design and Implementation of High Voltage Photovoltaic Electrolysis System for Solar Fuel Production from CO₂ MRS *Advances* 2, 3359 (2017). [10.1557/adv.2017.446](https://doi.org/10.1557/adv.2017.446)
46. W. Luc, J. Rosen and F. Jiao* An Ir-based anode for a practical CO₂ electrolyzer. *Catalysis Today* 288, 79 (2017). [10.1016/j.cattod.2016.06.011](https://doi.org/10.1016/j.cattod.2016.06.011)
47. W. Luc and F. Jiao* Nanoporous Metals as Electrocatalysts: State-of-the-Art, Opportunities, and Challenges. *ACS Catalysis* 7, 5856 (2017). [10.1021/acscatal.7b01803](https://doi.org/10.1021/acscatal.7b01803)
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49. G. S. Hutchings, W. Luc, Q. Lu, Y. Zhou, D. G. Vlachos and F. Jiao* Nanoporous Cu-Al-Co Alloys for Selective Furfural Hydrodeoxygenation to 2-Methylfuran. *Industrial & Engineering Chemistry Research* 56, 3866 (2017). [10.1021/acs.iecr.7b00316](https://doi.org/10.1021/acs.iecr.7b00316)

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60. G. S. Hutchings, Y. Zhang, J. Li, B. T. Yonemoto, X. G. Zhou, K. K. Zhu* and F. Jiao* In Situ Formation of Cobalt Oxide Nanocubanes as Efficient Oxygen Evolution Catalysts. *Journal of the American Chemical Society* 137, 4223 (2015). 10.1021/jacs.5b01006
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64. J. Rosen, G. S. Hutchings and F. Jiao* Synthesis, structure, and photocatalytic properties of ordered mesoporous metal-doped Co₃O₄. *Journal of Catalysis* 310, 2 (2014). 10.1016/j.jcat.2013.05.003
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79. V. B. R. Boppana, H. Schmidt, F. Jiao, D. J. Doren and R. F. Lobo* Structure Analysis and Photocatalytic Properties of Spinel Zinc Gallium Oxonitrides. *Chemistry-a European Journal* 17, 12417 (2011). 10.1002/chem.201101196
80. V. B. R. Boppana and F. Jiao* Nanostructured MnO₂: an efficient and robust water oxidation catalyst. *Chemical Communications* 47, 8973 (2011). 10.1039/c1cc12258d
81. F. Jiao and H. Frei* Nanostructured manganese oxide clusters supported on mesoporous silica as efficient oxygen-evolving catalysts. *Chemical Communications* 46, 2920 (2010). 10.1039/b921820c
82. F. Jiao and H. Frei* Nanostructured cobalt and manganese oxide clusters as efficient water oxidation catalysts. *Energy & Environmental Science* 3, 1018 (2010). 10.1039/c002074e
83. Y. Ren, A. R. Armstrong, F. Jiao and P. G. Bruce* Influence of Size on the Rate of Mesoporous Electrodes for Lithium Batteries. *Journal of the American Chemical Society* 132, 996 (2010). 10.1021/ja905488x
84. F. Jiao and H. Frei* Nanostructured Cobalt Oxide Clusters in Mesoporous Silica as Efficient Oxygen-Evolving Catalysts. *Angewandte Chemie-International Edition* 48, 1841 (2009). 10.1002/anie.200805534
85. Y. Ren, A. R. Armstrong, F. Jiao and P. G. Bruce* Influence of Size on the Rate of Mesoporous Electrodes for Lithium Batteries. *Journal of the American Chemical Society* 132, 996 (2010). 10.1021/ja905488x
86. Y. Ren, F. Jiao and P. G. Bruce* Tailoring the pore size/wall thickness of mesoporous transition metal oxides. *Microporous and Mesoporous Materials* 121, 90 (2009). 10.1016/j.micromeso.2009.01.008
87. F. Jiao, A. H. Hill, A. Harrison, A. Berko, A. V. Chadwick and P. G. Bruce* Synthesis of ordered mesoporous NiO with crystalline walls and a bimodal pore size distribution. *Journal of the American Chemical Society* 130, 5262 (2008). 10.1021/ja710849r
88. F. Jiao, J. L. Bao, A. H. Hill and P. G. Bruce* Synthesis of Ordered Mesoporous Li-Mn-O Spinel as a Positive Electrode for Rechargeable Lithium Batteries. *Angewandte Chemie-International Edition* 47, 9711 (2008). 10.1002/anie.200803431
89. H. Hill,* F. Jiao, P. G. Bruce, A. Harrison, W. Kockelmann and C. Ritter. Neutron diffraction study of mesoporous and bulk hematite, alpha-Fe₂O₃. *Chemistry of Materials* 20, 4891 (2008). 10.1021/cm800009s
90. K. M. Shaju, F. Jiao, A. Debart and P. G. Bruce* Mesoporous and nanowire Co₃O₄ as negative electrodes for rechargeable lithium batteries. *Physical Chemistry Chemical Physics* 9, 1837 (2007). 10.1039/b617519h
91. F. Jiao, A. Harrison, A. H. Hill and P. G. Bruce* Mesoporous Mn₂O₃ and Mn₃O₄ with crystalline walls. *Advanced Materials* 19, 4063 (2007). 10.1002/adma.200700336
92. F. Jiao, A. Harrison and P. G. Bruce* Ordered three-dimensional arrays of monodispersed Mn₃O₄ nanoparticles with a core-shell structure and spin-glass behavior. *Angewandte Chemie-International Edition* 46, 3946 (2007). 10.1002/anie.200700087

93. F. Jiao and P. G. Bruce* Mesoporous crystalline beta-MnO₂- a reversible positive electrode for rechargeable lithium batteries. *Advanced Materials* 19, 657 (2007). 10.1002/adma.200602499
94. F. Jiao, J. L. Bao and P. G. Bruce* Factors influencing the rate of Fe₂O₃ conversion reaction. *Electrochemical and Solid State Letters* 10, A264 (2007). 10.1149/1.2783268
95. F. Jiao, J. C. Jumas, M. Womes, A. V. Chadwick, A. Harrison and P. G. Bruce* Synthesis of ordered mesoporous Fe₃O₄ and gamma-Fe₂O₃ with crystalline walls using post-template reduction/oxidation. *Journal of the American Chemical Society* 128, 12905 (2006). 10.1021/ja063662i
96. F. Jiao, A. Harrison, J. C. Jumas, A. V. Chadwick, W. Kockelmann and P. G. Bruce* Ordered mesoporous Fe₂O₃ with crystalline walls. *Journal of the American Chemical Society* 128, 5468 (2006). 10.1021/ja0584774
97. F. Jiao, K. M. Shaju and P. G. Bruce* Synthesis of nanowire and mesoporous low-temperature LiCoO₂ by a post-templating reaction. *Angewandte Chemie-International Edition* 44, 6550 (2005). 10.1002/anie.200501663
98. F. Jiao and P. G. Bruce* Two- and three-dimensional mesoporous iron oxides with microporous walls. *Angewandte Chemie-International Edition* 43, 5958 (2004). 10.1002/anie.200460826
99. Jiao, F., Yue, B.*, Zhu, K. K., Zhao, D. Y. & He, H. Y.* α -Fe₂O₃ nanowires: Confined synthesis and catalytic hydroxylation of phenol. *Chemistry Letters* 32, 770-771 (2003). doi:10.1246/cl.2003.770

Patents

- (1) Jiao, F., Jouny, M., & Lv, J. J. Electrochemical generation of valuable chemicals from carbon dioxide and carbon monoxide. US Patent (pending).
- (2) Jiao, F., Lu, Q., Hutchings, G. S., & Chen, J. G. Electrocatalyst for hydrogen evolution and oxidation reactions. US Patent: US9994961 B2 (2018).
- (3) Frei, H. M. & Jiao, F. Nanostructured transition metal oxides useful for water oxidation catalysis. US Patent: US8613900 B2 (2013).

Book Chapters

- (1) Yonemoto, B. T., Hutchings, G. S., & Jiao, F. The Need for a Storage Revolution for a Green Energy Economy. In *Green Energy Economies*, Chapter 11, 232-252 (2014). ISBN: 978-1-4128-5375-0

Teaching

Introduction to Engineering (EGGG 101)
Chemical Engineering Thermodynamics I (CHEG 231)
Chemical Engineering Thermodynamics II (CHEG 325)
Chemical Engineering Kinetics (CHEG 332)
Chemical Engineering Laboratory I (CHEG 345)
Chemical Engineering Laboratory II (CHEG 445)
Electrochemical Energy Engineering (CHEG632)
Special Topics in Energy (CHEG 614)
Electrochemical Processes (CHEG850)

Presentations at International/National Conferences and Workshops (2015 - Present)

1. "Carbon dioxide electrolysis for sustainable chemical production", invited speaker, International Young Scientists Salon on Photo & Electro Catalytic Carbon Dioxide Reduction Reaction (2022)
2. "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited speaker, 9th Irsee Symposium Meeting, Irsee, Germany (2022)
3. "A TANDEM ELECTROLYSIS PROCESS FOR MULTI-CARBON CHEMICAL PRODUCTION FROM CARBON DIOXIDE", oral presentation, DOE/NETL CO₂ Capture Technology Project Review Meeting, Pittsburgh, PA (2022)
4. "Electrochemical Reduction of Gaseous Nitrogen Oxides on Transition Metals at Ambient Conditions", the 27th North American Catalysis Society Meeting, New York, NY (2022)
5. "Electrocatalysis for Carbon Dioxide Utilization", invited speaker, KAUST Conference - Carbon Capture and Utilization, King Abdullah University of Science and Technology, Saudi Arabia (2022)

6. "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited speaker, NOW CHAINS, Annual Dutch Chemistry Conference (2021)
7. "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited speaker, APS-CPS symposium on Energy and Sustainability (2021)
8. Scialog Negative Emissions Science Workshop, Research Corporation for Science Advancement and Alfred P. Sloan Foundation (2021)
9. "A TANDEM ELECTROLYSIS PROCESS FOR MULTI-CARBON CHEMICAL PRODUCTION FROM CARBON DIOXIDE", oral presentation, DOE/NETL CO₂ Capture Technology Project Review Virtual Meeting (2021)
10. "Carbon dioxide electrolysis for sustainable chemical production", invited talk, NanoFe Fall Meeting (2021)
11. "Carbon dioxide electrolysis for sustainable chemical production", oral presentation, ECS Fall National Meeting (2021)
12. "Carbon dioxide electrolysis for sustainable chemical production", oral presentation, ACS Fall National Meeting (2021)
13. "Carbon dioxide electrolysis for sustainable chemical production", invited keynote speaker, 15th International Conference on Materials Chemistry, Dublin (2021)
14. Panelist, Next Generation Electrochemistry Workshop, Department of Chemistry, University of Illinois at Chicago (2021)
15. "Carbon dioxide electrolysis for sustainable chemical production", invited speaker, Nature Sustainability Workshop Series - Catalysis: an enabling science for a sustainable future, Springer Nature Publishing Group (2021)
16. Special guest moderator, Microfluidics & Energy Symposium (2021)
17. "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", Keynote speaker, International Symposium on Electrocatalysis and Electrosynthesis, Chinese Chemical Society (2021)
18. "Carbon dioxide electrolysis for chemical production", oral presentation, ACS Spring National Meeting (2021)
19. "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", Keynote speaker, Competitive Energy Systems Symposium, AIChE (2021)
20. "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited seminar, School of Materials Science & Engineering, Nanyang Technological University, Singapore (2021)
21. "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited seminar, Department of Chemical and Biomolecular Engineering, KAIST, South Korea (2021)
22. "A TANDEM ELECTROLYSIS PROCESS FOR MULTI-CARBON CHEMICAL PRODUCTION FROM CARBON DIOXIDE", oral presentation, DOE/NETL CO₂ Capture Technology Project Review Virtual Meeting (2020)
23. "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited seminar, Department of Chemical Engineering, University of Illinois at Chicago (2020)
24. "Carbon Dioxide Electrolysis for Sustainable Chemical Production", invited talk, nanoFe Fall Meeting (2020)
25. "Electrochemical CO₂ conversion to valuable chemicals", virtual presentation, AIChE Annual Meeting (2020)
26. Scialog Negative Emissions Science Workshop, Research Corporation for Science Advancement and Alfred P. Sloan Foundation (2020)
27. "Electrochemical CO₂ reduction – challenges and opportunities", invited talk, Monthly Invited Talk Series (MITs), ACS Energy and Fuels Division (2020)
28. "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO₂ Capture Technology Project Review Virtual Meeting (2020)
29. Reactive CO₂ Capture Workshop, DOE/NREL, Golden, CO (2020)
30. African School of Catalysis, course instructor, Kigali, Rwanda (2020)
31. "Formation of Carbon-Nitrogen Bonds in Carbon Monoxide Electroreduction", invited talk, AIChE Annual Meeting, Orlando, FL (2019).
32. "Electrochemical CO₂ conversion to valuable chemicals", oral presentation, AIChE Annual Meeting, Orlando, FL (2019).
33. "Carbon Utilization using Electrochemical Approaches", oral presentation, ACS National Meeting, Orlando, FL (2019).
34. "Two-dimensional copper nanosheets for electrochemical reduction of carbon monoxide to acetate", invited talk, ACS National Meeting, San Diego, CA (2019).

35. "CO₂ electrolysis: state-of-the-art, techno-economic analysis, and challenges", invited speaker, CIFAR Ion Selective Membranes in CO₂ Electrolysis, Pittsburgh, PA (2019).
36. "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO₂ Capture Technology Project Review Meeting, Pittsburgh, PA (2019).
37. "Electrochemical CO conversion to valuable chemicals", invited talk, ACS National Meeting, Orlando, FL (2019).
38. "Carbon utilization using electrochemical approaches", invited talk, ACS National Meeting, Orlando, FL (2019).
39. "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO₂ Capture Technology Project Review Meeting, Pittsburgh, PA (2018).
40. "Electrochemical CO₂ Conversion to Valuable Chemicals", invited talk, AIChE Annual Meeting, Pittsburgh, PA (2018).
41. "Bimetallic catalyst with a core-shell structure for CO₂ reduction", invited talk, ACS National Meeting, Boston, MA (2018).
42. "Electrochemical CO₂ conversion to valuable chemicals", invited talk, ACS National Meeting, Boston, MA (2018).
43. "Electrochemical carbon dioxide conversion to alcohols", invited talk, ACS National Meeting, New Orleans, LA (2018).
44. "Ag-Sn Bimetallic Catalyst with a Core-Shell Structure for CO₂ Reduction", oral presentation, AIChE Annual Meeting, Minneapolis, MN (2017).
45. "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO₂ Capture Technology Project Review Meeting, Pittsburgh, PA (2017).
46. "Ultra-Thin Electrocatalysts for Carbon Dioxide Reduction", oral presentation, 25th North American Catalysis Society Meeting, Denver, CO (2017).
47. "Nanostructured Materials as Advanced Electrocatalysts", oral presentation, 25th North American Catalysis Society Meeting, Denver, CO (2017).
48. "Nanoporous materials: synthesis and electrocatalytic properties", invited keynote presentation, ACS National Meeting, Washington, DC (2017)
49. "Mesoporous metal sulfides and carbides", oral presentation, MESD, AIChE annual meeting, San Francisco, CA (2016).
50. "Novel Nanostructured Materials for Energy Applications", invited keynote presentation, Division of Energy and Fuels, ACS National Meeting, Philadelphia, PA (2016).
51. "Electrochemical Conversion of Carbon Dioxide", invited speaker, Solar Fuels Generation: PV and Electrolysis Workshop, Newark, DE (2016).
52. "Nanostructured Catalysts for Solar Fuel Production", invited speaker, Catalysis for Artificial Photosynthesis, KAUST Catalysis Center Symposium, Saudi Arabia (2016).
53. "Nanostructured Metals: Advanced Electrocatalysts for Carbon Dioxide Reduction", oral presentation, AIChE Annual Meeting, Salt Lake City, UT (2015).
54. "Cobalt oxide nanocubes for photocatalytic water oxidation", oral presentation, Division of Catalysis Science and Technology, ACS National Meeting, Boston, MA (2015).
55. "Nanostructured metals for electrochemical carbon dioxide reduction", oral presentation, Division of Energy and Fuels, ACS National Meeting, Boston, MA (2015).
56. "Nanoporous Bimetallic Catalyst for Hydrogen Evolution", oral presentation, Division of Energy and Fuels, ACS National Meeting, Boston, MA (2015).
57. "In Situ/Operando XAS studies of electrochemical systems", invited speaker, Division of Energy and Fuels, ACS National Meeting, Denver, CO (2015).
58. "Nanoporous materials for energy applications", invited speaker, Division of Catalysis Science and Technology, ACS National Meeting, Denver, CO (2015).
59. "Synthesis of mesoporous metal sulfides", oral presentation, Division of Inorganic Chemistry, ACS National Meeting, Denver, CO (2015).

Invited Seminars at Academic Institutes, National Laboratories, and Industries (2015 - Present)

1. "Electrocatalysis for Carbon Dioxide Utilization", invited virtual seminar, Department of Electrical and Computer Engineering, University of Houston, TX (scheduled in 2023)
2. "Electrocatalysis for Carbon Dioxide Utilization", invited seminar, Department of Chemical Engineering, Iowa State University, IA (scheduled in 2023)
3. "Electrocatalysis for Carbon Dioxide Utilization", invited seminar, Department of Energy, Environmental & Chemical Engineering, Washington University in St. Louis, MO (2022)
4. "Electrocatalysis for Carbon Dioxide Utilization", invited seminar, Department of Chemical and Environmental Engineering, University of Cincinnati, OH (2022)
5. "Recent Advances in Carbon Dioxide Electrocatalysis", invited seminar, Dalian Institute of Chemical Physics, Dalian, China (2022)
6. "Recent Advances in Carbon Dioxide Electrocatalysis", invited seminar, Huazhong University of Science & Technology, Wuhan, China (2022)
7. "Recent Advances in Carbon Dioxide Electrocatalysis", invited seminar, School of Chemical Engineering, Tianjin University, Tianjin, China (2022)
8. "Recent Advances in Carbon Dioxide Electrocatalysis", invited seminar, Department of Chemistry, Fudan University, Shanghai, China (2022)
9. "Electrocatalysis for Carbon Dioxide Utilization", invited seminar, NSF Center for Integrated Catalysis, UCLA (2022)
10. "Recent Advances in Carbon Dioxide Electrocatalysis", invited seminar, Southern University of Science and Technology, Shenzhen, China (2022)
11. "Tandem Electrolysis Process for Multi-Carbon Chemical Production from Carbon Dioxide", invited speaker, Indo-US Scoping Workshop on Carbon Utilization and Conversion, organized by Department of Science & Technology, India and Department of Energy, USA (2022)
12. "Electrochemical carbon dioxide conversion to valuable chemicals", invited virtual seminar, School of Materials Science and Engineering, Nanyang Technological University, Singapore (2021)
13. "Electrochemical carbon dioxide conversion to valuable chemicals", invited virtual seminar, Department of Chemical and Biomolecular Engineering, KAIST, South Korea (2021)
14. "Electrochemical Carbon Dioxide Conversion to Valuable Chemicals", invited seminar, Department of Chemistry, University of Massachusetts, Amherst, MA (2020).
15. "Electrochemical Carbon Dioxide Conversion to Valuable Chemicals", invited seminar, Department of Chemistry & Biochemistry, University of California, Santa Cruz, CA (2019).
16. "Electrifying chemical production", invited seminar, Air Liquide, Newark, DE (2019).
17. "Electrochemical Conversion of CO₂ and CO to C₂₊ chemicals", invited seminar, Center for Functional Nanomaterials, Brookhaven National Laboratory, NY (2019).
18. "High-rate CO₂ and CO electrolysis to C₂₊ products", invited seminar, School of Chemical Engineering, Tianjin University, Tianjin, China (2019).
19. "High-rate CO₂ and CO electrolysis to C₂₊ products", invited seminar, Department of Chemistry, University of Virginia, VA (2019).
20. "High-rate CO₂ and CO electrolysis to C₂₊ products", invited seminar, Department of Electrical and Computer Engineering, University of Toronto, Canada (2018).
21. "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, Department of Chemical and Environmental Engineering, University of California, Riverside, CA (2018).
22. "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, Joint Center for Artificial Photosynthesis, Caltech, Pasadena, CA (2018).
23. "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, College of Chemistry & Biochemistry, University of California, Los Angeles, CA (2018).
24. "Electrochemical CO₂ Conversion to Valuable Chemicals", invited seminar, Delaware State University, Dover, DE (2018).
25. "Electrochemical CO₂ conversion to valuable chemicals", invited seminar, School of Chemical Science and Engineering, Tongji University, Shanghai, China (2018).
26. "Electrochemical Carbon Dioxide Conversion to Valuable Chemicals", invited seminar, Lawrence Berkeley National Laboratory, Berkeley, CA (2017).

27. "Nanoporous Materials for Electrochemical Systems", invited seminar, Pacific Northwest National Laboratory, Richland, WA (2017).
28. "Electrochemical carbon dioxide conversion", invited seminar speaker, Air Liquide Technical Exchange Seminar, Air Liquide, Newark, DE (2017).
29. "Nanoporous materials for electrochemical systems", invited seminar speaker, Department of Chemical and Biological Engineering, Drexel University, Philadelphia, PA (2016).
30. "Nanoporous materials for electrochemical systems", invited seminar speaker, Lenfest Center for Sustainable Energy, Columbia University, New York, NY (2015).
31. "Nanoporous materials for electrochemical systems", invited seminar speaker, Department of Chemical Engineering, University of Oklahoma, Norman, OK (2015).
32. "Advanced Energy Storage Systems", invited seminar speaker, Eastman Chemical Company, Kingsport, TN (2015).
33. "Nanoporous Materials for Energy Storage Systems", invited seminar speaker, Department of Chemistry, University of Connecticut, Storrs, CT (2015).

Reviewer/Panelist/Contributor for national and international organizations/committees

1. Agency for Science, Technology and Research (A*STAR), Singapore
2. Natural Sciences and Engineering Research Council of Canada (NSERC), Canada
3. Mission Innovation Carbon Capture, Utilization and Storage Experts' Workshop (Electrochemistry and Photochemistry Panelist), Houston, TX (2017)
4. Testified before the U.S. Senate Committee on Environment and Public Works at the hearing of the Utilizing Significant Emissions with Innovative Technologies Act (or USE IT Act), 2018.
5. Contributor to the 2019 National Petroleum Council report - "Meeting the Dual Challenge, A Roadmap to At-Scale Deployment of Carbon Capture, Use and Storage"
6. National Science Foundation (CBET, SBIR), USA
7. Department of Energy (BES, SBIR-STTR, ARPA-E), USA
8. American Chemical Society - Petroleum Research Foundation, USA
9. National Aeronautics and Space Administration (NASA), USA
10. Research Grants Council (RGC) of Hong Kong, China
11. National Research Foundation, Singapore

Reviewer for Journals (selected list)

Accounts of Chemical Research	ChemSusChem
ACS Applied Materials & Interfaces	Energy and Environmental Science
ACS Catalysis	Energy and Fuels
ACS Energy Letters	Industrial & Engineering Chemistry Research
ACS Nano	Joule
ACS Sustainable Chemistry & Engineering	Journal of Catalysis
Advanced Materials	Journal of Materials Chemistry A
Advanced Functional Materials	Journal of the American Chemical Society
Advanced Energy Materials	Nano Energy
AIChE Journal	Nature
Angewandte Chemie International Edition	Nature Catalysis
Applied Catalysis B: Environmental	Nature Chemistry
Catalysis Science and Technology	Nature Communications
Chem	Nature Energy
Chem Catalysis	Nature Nanotechnology
Chemical Communications	Nature Sustainability
Chemistry of Materials	Physical Chemistry Chemical Physics
ChemCatChem	Science Advances

Membership in Professional Societies

American Chemical Society
American Institute of Chemical Engineering
The Electrochemical Society

Conference Symposium Organizer/Session Chair

1. Program Chair, Division of Energy & Fuels, American Chemical Society (2023)
2. Symposium organizer, Division of Energy & Fuels, American Chemical Society (2022)
3. The 27th North American Catalysis Society Meeting, Session Chair: Electrocatalytic CO₂ reduction (2022)
4. Symposium organizer, Division of Energy & Fuels, American Chemical Society (2021)
5. AIChE Annual Meeting, Symposium Session chair: Electrocatalysis and Photoelectrocatalysis (2020).
6. American Chemical Society National Meeting, ENFL, Symposium co-organizer: Electrochemistry Enables Catalysis for Energy, Chemicals and Materials (2020).
7. American Chemical Society National Meeting, ENFL, Symposium co-organizer: Sustainable Energy & Water via Innovative Electrocatalytic, Photocatalytic & Hybrid Catalytic System (2019).
8. AIChE Annual Meeting, Session chair: Electrocatalysis and Photoelectrocatalysis (2019).
9. American Chemical Society National Meeting, ENFL, Symposium co-organizer: Sustainable Energy Conversion via Innovative Electrocatalysis & Photocatalysis (2019).
10. AIChE Annual Meeting, Session chair: Electrocatalysis and Photoelectrocatalysis (2018).
11. American Chemical Society National Meeting, ENFL, Symposium co-organizer: Carbon Dioxide Conversion & Artificial Photosynthesis (2018).
12. American Chemical Society National Meeting, ENFL, Symposium co-organizer: Sustainable Energy Conversion via Innovative Electrocatalysis & Photocatalysis (2018).
13. AIChE Annual Meeting, Session co-chair: Electrocatalysis and Photoelectrocatalysis (2017).
14. 25th Biennial North American Meeting of the North American Catalysis Society, Session co-chair: Catalysis Poisoning and Deactivation 1 (2017).
15. 25th Biennial North American Meeting of the North American Catalysis Society, Session co-chair: Environmental: CO₂ conversion 1 (2017).
16. American Chemical Society National Meeting, ENFL, Symposium co-organizer: Innovative Chemistry & Electrocatalysis for Low-Carbon Energy & Fuels: Discovery to Application (2017).
17. American Chemical Society National Meeting, CATL, Symposium co-organizer: Advances in Carbon Dioxide Utilization (2017).
18. 91st American Chemical Society Colloid and Surface Science Symposium, Session co-organizer, New York (2017).
19. American Chemical Society National Meeting, ENFL, Symposium organizer: Innovative Chemistry & Electrocatalysis for Low-Carbon Energy & Fuels: Discovery to Application (2015).
20. American Chemical Society National Meeting, ENFL, Session co-chair: Carbon Dioxide Management: Recent Advances in Carbon Dioxide Capture, Conversion, Utilization and Storage (2014).
21. AIChE Annual Meeting, Session co-chair: Biocomposites (2013).
22. AIChE Annual Meeting, Session co-chair: Structure, Properties and Characterization of Nanocomposites (2012).

Service at University of Delaware

Director of Graduate Program, Chemical & Biomolecular Engineering, (2019 - Present)
Undergraduate student advisor (2010 – Present)
Department Safety Committee (2012 – 2019)
Junior Faculty Advisory Council (2014 – 2017)
Departmental Seminar Series Coordinator (2012 – 2014)

Collaborators (Current & Past)

Chulsung Bae (Rensselaer Polytechnic Institute)
Aditya Bhan (University of Minnesota)
Peter Bruce (University of Oxford)

Karen Chan (Technical University of Denmark)
Jingguang Chen (Columbia University)
Kun Fu (University of Delaware)

William A. Goddard III (Caltech)
Jinlong Gong (Tianjin University)
Liangbing Hu (UMD)
Xiaoqing Huang (Xiamen University)
Robert Jinkerson (UC, Riverside)
Jean-Claude Jumas (University Montpellier)
Yijin Kang (UESTC)
Freddy Kleitz (University of Vienna)
Yuanyue Liu (University of Texas at Austin)
Raul Lobo (University of Delaware)
Qi Lu (Tsinghua University)
Xinbin Ma (Tianjin University)
KC Neyerlin (NREL)
Alissa Park (Columbia University)
Brian Seger (Technical University of Denmark)
Samira Siahrostami (University of Calgary)

Yuyan Shao (PNNL)
Fan Shi (NETL)
Wilson Smith (NREL)
Mark Snyder (Lehigh University)
Dong Su (Institute of Physics, CAS)
Dion Vlachos (University of Delaware)
John Xiao (University of Delaware)
Hongliang Xin (Virginia Tech)
Bingjun Xu (Peking University)
Xiaoxiang Xu (Tongji University)
Yushan Yan (University of Delaware)
Yang Yang (University of Central Florida)
Pierre Yao (University of Delaware)
Haotian Wang (Rice University)
Haimei Zheng (LBNL)
Kake Zhu (ECUST)

Postdoctoral Fellows (Current)

Bjorn Hasa (2019 – Present)
Rong Xia (2021 – Present)

Graduate Students (Current)

Haeun Shin (2019 – Present)
Sean Overa (2019 – Present)
Kentaro Hansen (2020 – Present)
Bradie Crandall (2021 – Present)
Luke Cherniack (2021 – Present)
Ahryeon Lee (2022 – Present)
Matt Naughton (2022 – Present)

Undergraduate Student (Current)

Andy Redder (2022 – Present)

Alumni

Seif Yusuf M.Ch.E (2010 – 2012)
Bryan Yonemoto PhD (2010 – 2015)
Gregory Hutchings PhD (2010 – 2015)
Yan Zhang M.Ch.E (2012 – 2015)
Qi Lu Postdoc (2012 – 2016)
Jonathan Rosen PhD (2011 – 2016)
Andrew Craft M.Ch.E. (2015 – 2017)
Wenlei Zhu Postdoc (2017 – 2018)

Hongjie Tang Postdoc (2017 – 2019)
Jingjing Lyu Visiting grad (2017 – 2019)
Wesley Luc PhD (2014 – 2019)
Matthew Jouny PhD (2015 – 2020)
Emily Jeng M.Ch.E. (2017 – 2020)
Byung Hee (Brian) Ko (2017 – 2022)

Undergraduate Students (Past)

Abdul Fayed (2020 – 2022)
Ruixue Xiong (2021 – 2022)
Wilson Chen (2019)
Sarah DiBenede (2018 – 2019)
Zachary LaDuca (2018)
John Foster (2017)
Jacob Brennan (2017)
Lukas Wieder (2017)

Sean Overa (2017)
Ning Zhao (2017)
Albert Schaeffer (2017)
Charles Collins (2014 – 2017)
Samuel Haas (2016)
Dillon Gashi (2016)
William Barndt (2016)
Richard Sherrer (2015 – 2016)

Kaelan Reed (2014 – 2015)
Alex Moore (2014)
Sean Rivera (2014)
Kevin Abraham (2013)
Jinghan Zhao (2011 – 2013)
Touseef Habib (2011 – 2012)

Hasan Raboui (2011)
Kameron Conforti (2012 – 2013)
Mengguang Wang (2011 – 2013)
Jamie Bakri (2011)
Yuan Wei (2011)

High School Summer Interns (Past)

Lily Giang (2022)
Zimo Liu (2022)
Jeffrey Yao (2022)
Kate Li (2022)
Ashrith Kandula (2021)
Edward Bao (2012 – 2013)