

Feng Jiao, Ph.D.

Professor and Graduate Program Director
Robert Grasselli Development Professor of Chemical and Biomolecular Engineering
Director, Center for Catalytic Science & Technology
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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 Nørskov)

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: >13,500; Average citations per paper: 145; H-index: 50; Data source: Google Scholar, May 2022.

*#co-first authorship; *corresponding author(s)*

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

- (1) Rong, X., Overa, S. & Jiao, F.* Emerging Electrochemical Processes to Decarbonize the Chemical Industry. *JACS Au* (in press). doi: 10.1021/jacsau.2c00138
- (2) Wang, J., Cheng, C., Yuan, Q., Yang, H., Meng, F. Q., Zhang, Q. H., Gu, L., Cao, J. L., Li, L. G., Haw, S. C., Shao, Q.*, Zhang, L., Cheng, T., Jiao, F. & Huang, X. Q.* Exceptionally active and stable RuO₂ with interstitial carbon for water oxidation in acid. *Chem* (in press). doi: 10.1016/j.chempr.2022.02.003
- (3) Jeng, E.#, Qi, Z.#, Kashi, A. R., Hunegnaw, S., Huo, Z. Y., Miller, J. S., Aji, L. B. B., Ko, B. H., Shin, H., Ma, S. C., Kuhl, K. P., Jiao, F.* & Biener, J.* Scalable Gas Diffusion Electrode Fabrication for

- Electrochemical CO₂ Reduction Using Physical Vapor Deposition Methods. *ACS Applied Materials & Interfaces* 14, 7731-7740 (2022). doi: 10.1021/acsami.1c17860
- (4) Cui, M. J.#, Yang, C. P.#, Hwang, S.#, Yang, M. H.#, Overa, S.#, Dong, Q., Yao, Y. G., Brozena, A. H., Cullen, D. A., Chi, M. F., Blum, T. F., Morris, D., Finfrook, Z., Wang, X. Z., Zhang, P., Goncharov, V. G., Guo, X. F., Luo, J., Mo, Y. F.* , Jiao, F.* & Hu, L. B.* Multi-principal elemental intermetallic nanoparticles synthesized via a disorder-to-order transition. *Science Advances* 8, eabm4322 (2022). doi: 10.1126/sciadv.abm4322
- (5) Overa, S.#, Ko, B. H.#, Zhao, Y. R.# & Jiao, F.* Electrochemical approaches for CO₂ conversion to chemicals: a journey toward practical applications. *Accounts of Chemical Research* 55, 638-648 (2022). doi: 10.1021/acs.accounts.1c00674
- (6) Ko, B. H., Hasa, B., Shin, H., Zhao, Y. R. & Jiao, F.* Electrochemical reduction of gaseous nitrogen oxides on transition metals at ambient conditions. *Journal of the American Chemical Society* 144, 1258-1266 (2022). doi: 10.1021/jacs.1c10535
- (7) Cabana, J.* , Alaan, T., Crabtree, G. W., Hatzell, M. C., Manthiram, K., Steingart, D. A., Zhenyuk, I., Jiao, F., Vojvodic, A., Yang, J. Y., Balsara, N. P., Persson, K. A., Siegel, D. J., Haynes, C. L., Mauzeroll, J., Shen, M., Venton, B. J., Balke, N., Rodríguez-López, J., Rolison, D. R., Shahbazian-Yassar, R., Srinivasan, V., Chaudhuri, S., Couet, A. & Hattrick-Simpers, J. NGenE 2021: Electrochemistry is Everywhere. *ACS Energy Letters* 7, 368-374 (2021). doi: [10.1021/acseenergylett.1c02608](https://doi.org/10.1021/acseenergylett.1c02608)
- (8) Hansen, K. U. & Jiao, F.* Creating the right environment. *Nature Energy* 6, 1005-1006 (2021). News & Views article. doi: [10.1038/s41560-021-00930-6](https://doi.org/10.1038/s41560-021-00930-6)
- (9) Yang, C. P., Wu, Q. S., Xie, W. Q., Zhang, X., Brozena, A., Zheng, J., Garaga, M. N., Ko, B. H., Mao, Y. M., He, S. M., Gao, Y., Wang, P. B., Tyagi, M., Jiao, F., Briber R., Albertus, P., Wang, C. S., Greenbaum, S., Hu, Y. Y., Isogai, A., Winter, M., Xu, K., Qi, Y.* & Hu, L. B.* Copper-coordinated cellulose ion conductors for solid-state batteries. *Nature* 598, 590-596 (2021). doi: [10.1038/s41586-021-03885-6](https://doi.org/10.1038/s41586-021-03885-6)
- (10) Xia, R.#, Lv, J. J.#,* Ma, X. B.* & Jiao, F.* Enhanced multi-carbon selectivity via CO electroreduction approach. *Journal of Catalysis* 398, 185 (2021). doi: [10.1016/j.jcat.2021.03.034](https://doi.org/10.1016/j.jcat.2021.03.034)
- (11) Shin, H.#, Hansen, K. U.# & Jiao, F.* Techno-economic assessment of low-temperature carbon dioxide electrolysis. *Nature Sustainability* 4, 911-919 (2021). doi: [10.1038/s41893-021-00739-x](https://doi.org/10.1038/s41893-021-00739-x)
- (12) Li, T. Y., Yao, Y. G., Ko, B. H., Huang, Z. N., Dong, Q., Cao, J. L., Chen, W., Li, J. G., Li, S. K., Wang, X. Z., Shahbazian-Yassar, R.* , Jiao, F.* & Hu, L. B.* Carbon-Supported High-Entropy Oxide Nanoparticles as Stable Electrocatalysts for Oxygen Reduction Reactions. *Advanced Functional Materials* 31, 2010561 (2021). doi: [10.1002/adfm.202010561](https://doi.org/10.1002/adfm.202010561)
- (13) Hansen, K. U. & Jiao, F.* Hydrophobicity of CO₂ gas diffusion electrodes. *Joule* 5, 754 (2021). Preview article. doi: [10.1016/j.joule.2021.02.005](https://doi.org/10.1016/j.joule.2021.02.005)
- (14) Xia, R., Tian, D., Kattel, S., Hasa, B., Shin, H., Ma, X. B.* , Chen, J. G.* & Jiao, F.* Electrochemical Reduction of Acetonitrile to ethylamine. *Nature Communications* 12, 1949 (2021). doi: [10.1038/s41467-021-22291-0](https://doi.org/10.1038/s41467-021-22291-0)
- (15) Hasa, B., Jouny, M., Ko, B. H., Xu B. J.* & Jiao, F.* Flow electrolyzer mass spectrometry with a gas diffusion electrode design. *Angewandte Chemie International Edition* 60, 3277-3282 (2021). doi: 10.1002/anie.202013713
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- (17) Ko, B. H., Hasa, B., Shin, H., Jeng, E., Overa, S., Chen, W. & Jiao, F.* The impact of nitrogen oxides on electrochemical carbon dioxide reduction. *Nature Communications* 11, 5856 (2020). doi: 10.1038/s41467-020-19731-8

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- (19) Ko, B. H. & Jiao, F.* Well-defined model CO₂ electroreduction catalyst. **Chem** 6, 1506-1507 (2020). Preview article. doi: 10.1016/j.chempr.2020.06.006
- (20) Jiao, F.* In/In₂O_{3-x} heterostructure: in situ reconstructed active species of In₂O₃ for CO₂ electroreduction. **Science Bulletin** 65, 1514-1515 (2020). Research Highlight. doi: 10.1016/j.scib.2020.06.010
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The economic model described in this report can be downloaded use this link. [WoS Highly Cited Paper]
- (39) Sriramagiri, G. M., Ahmed, N., Luc, W., Dobson, K. D., Hegedus, S. S., & Jiao, F.* Toward a Practical Solar-Driven CO₂ Flow Cell Electrolyzer: Design and Optimization. *ACS Sustainable Chemistry & Engineering* 5, 10959-10966 (2017). doi:10.1021/acssuschemeng.7b02853
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- (41) Hutchings, G. S., Luc, W., Lu, Q., Zhou, Y., Vlachos, D. G., & Jiao, F.* Nanoporous Cu–Al–Co Alloys for Selective Furfural Hydrodeoxygenation to 2-Methylfuran. *Industrial & Engineering Chemistry Research* 56, 3866-3872 (2017). doi:10.1021/acs.iecr.7b00316 [Invited contribution to the I&EC Research special issue for the 2017 Class of Influential Researchers]
- (42) Dunwell, M., Lu, Q., Heyes, J. M., Rosen, J., Chen, J. G., Yan, Y. S.*, Jiao, F.* & Xu B. J.* The Central Role of Bicarbonate in the Electrochemical Reduction of Carbon Dioxide on Gold. *Journal of the American Chemical Society* 139, 3774-3783 (2017). doi:10.1021/jacs.6b13287 [WoS Highly Cited Paper]
- (43) Luc, W., Collins, C., Wang, S. W., Xin, H. L., He, K., Kang, Y. J. & Jiao, F.* Ag-Sn bimetallic catalyst with a core-shell structure for CO₂ reduction. *Journal of the American Chemical Society* 139, 1885-1893 (2017). doi:10.1021/jacs.6b10435 [WoS Highly Cited Paper]
- (44) Luc, W., Rosen, J. & Jiao, F.* An Ir-based anode for a practical CO₂ electrolyzer. *Catalysis Today* 288, 79-84 (2017). doi:10.1016/j.cattod.2016.06.011 [Invited contribution]
- (45) Zhang, Y., Luc, W., Hutchings, G. S. & Jiao, F.* Photoelectrochemical carbon dioxide reduction using a nanoporous Ag cathode. *ACS Applied Materials & Interfaces* 8, 24652-24658 (2016). doi:10.1021/acsaami.6b09095
- (46) Luc, W. & Jiao, F.* Synthesis of nanoporous metals, oxides, carbides, and sulfides: beyond nanocasting. *Accounts of Chemical Research* 49, 1351-1358 (2016). doi:10.1021/acs.accounts.6b00109 [open access] [Invited contribution]
- (47) Lu, Q.#, Chen, C.-J.#, Luc, W., Chen, J. G., Bhan, A.* & Jiao, F.* Ordered mesoporous metal carbides with enhanced anisole hydrodeoxygenation selectivity. *ACS Catalysis* 6, 3506-3514 (2016). doi:10.1021/acscatal.6b00303
- (48) Lu, Q., & Jiao, F.* Electrochemical CO₂ reduction: electrocatalyst, reaction mechanism, and process engineering. *Nano Energy* 29, 439-456 (2016). doi: 10.1016/j.nanoen.2016.04.009 [Invited review article]

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- (51) Zhou, Y.#, Lu, Q.#, Zhuang, Z., Hutchings, G. S., Kattel, S., Yan, Y. S., Chen, J. G.*, Xiao, J. Q.*, & Jiao, F.* Oxygen Reduction at Very Low Overpotential on Nanoporous Ag Catalysts. *Advanced Energy Materials* 5, 1500149 (2015). doi:10.1002/aenm.201500149
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- (53) Lu, Q., Hutchings, G. S., Yu, W., Zhou, Y., Forest, R. V., Tao, R., Rosen, J., Yonemoto, B. T., Cao, Z., Zheng, H., Xiao, J. Q., Jiao, F.*, & Chen, J. G.* Highly porous non-precious bimetallic electrocatalysts for efficient hydrogen evolution. *Nature Communications* 6:6567 (2015). doi:10.1038/ncomms7567 [WoS Highly Cited Paper]
- (54) Lu, Q., Rosen, J., & Jiao, F.* Nanostructured Metallic Electrocatalysts for Carbon Dioxide Reduction. *ChemCatChem* 7, 38-47 (2015). doi:10.1002/cctc.201402669 [Invited review article] [WoS Highly Cited Paper]
- (55) Yonemoto, B. T., Guo, Q., Hutchings, G. S., Yoo, W. C., Snyder, M. A.*, & Jiao, F.* Structural evolution in ordered mesoporous TiO₂ anatase electrodes. *Chemical Communications* 50, 8997-8999 (2014). doi:10.1039/C4CC04033C
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- (57) Hutchings, G. S., Rosen, J., Smiley, D. L., Goward, G. R., Bruce, P. G., & Jiao, F.* Environmental In Situ X-ray Absorption Spectroscopy Evaluation of Electrode Materials for Rechargeable Lithium-Oxygen Batteries. *Journal of Physical Chemistry C* 118, 12617-12624 (2014). doi:10.1021/jp5017399
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- (60) Hill, A. H., Jacobsen, H.*, Stewart, J. R., Jiao, F., Jensen, N. P., Holm, S. L., Mutka, H., Seydel, T., Harrison, A., & Lefmann, K. Magnetic properties of nano-scale hematite, α -Fe₂O₃ studied by time-of-flight inelastic neutron spectroscopy. *Journal of Chemical Physics* 140, 044709 (2014). doi:10.1063/1.4862235
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- (63) Rosen, J., Hutchings, G. S., & Jiao, F.* Synthesis, structure, and photocatalytic properties of ordered mesoporous metal-doped Co₃O₄. *Journal of Catalysis* 310, 2-9 (2014). doi:10.1016/j.jcat.2013.05.003 [Invited contribution]

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- (74) Boppana, V. B. R. & Jiao, F.* Nanostructured MnO₂: an efficient and robust water oxidation catalyst. **Chemical Communications** 47, 8973-8975 (2011). doi:10.1039/C1CC12258

Before joining University of Delaware

- (75) Ren, Y., Armstrong, A. R., Jiao, F. & Bruce, P. G.* Influence of Size on the Rate of Mesoporous Electrodes for Lithium Batteries. **Journal of the American Chemical Society** 132, 996-1004 (2010). doi:10.1021/ja905488x [WoS Highly Cited Paper]
- (76) Jiao, F. & Frei, H.* Nanostructured cobalt and manganese oxide clusters as efficient water oxidation catalysts. **Energy & Environmental Science** 3, 1018-1027 (2010). doi:10.1039/C002074E [WoS Highly Cited Paper]
- (77) Jiao, F. & Frei, H.* Nanostructured manganese oxide clusters supported on mesoporous silica as efficient oxygen-evolving catalysts. **Chemical Communications** 46, 2920-2922 (2010). doi:10.1039/B921820C [WoS Highly Cited Paper]
- (78) Ren, Y., Jiao, F. & Bruce, P. G.* Tailoring the pore size/wall thickness of mesoporous transition metal oxides. **Microporous and Mesoporous Materials** 121, 90-94 (2009). doi:10.1016/j.micromeso.2009.01.008

- (79) Jiao, F. & Frej, H.* Nanostructured Cobalt Oxide Clusters in Mesoporous Silica as Efficient Oxygen-Evolving Catalysts. *Angewandte Chemie International Edition* 48, 1841-1844 (2009). doi:10.1002/anie.200805534 [WoS Highly Cited Paper]
- (80) Jiao, F., Hill, A. H., Harrison, A., Berko, A., Chadwick, A. V., & Bruce, P. G.* Synthesis of ordered mesoporous NiO with crystalline walls and a bimodal pore size distribution. *Journal of the American Chemical Society* 130, 5262-5266 (2008). doi:10.1021/ja710849r [WoS Highly Cited Paper]
- (81) Jiao, F., Bao, J. L., Hill, A. H. & Bruce, P. G.* Synthesis of Ordered Mesoporous Li-Mn-O Spinel as a Positive Electrode for Rechargeable Lithium Batteries. *Angewandte Chemie International Edition* 47, 9711-9716 (2008). doi:10.1002/ange.200803431
- (82) Hill, A. H.* Jiao, F., Bruce, P. G., Harrison, A., Kockelmann, W., & Ritter, C. Neutron diffraction study of mesoporous and bulk hematite, α -Fe₂O₃. *Chemistry of Materials* 20, 4891-4899 (2008). doi:10.1021/cm800009s
- (83) Shaju, K. M., Jiao, F., Debart, A. & Bruce, P. G.* Mesoporous and nanowire Co₃O₄ as negative electrodes for rechargeable lithium batteries. *Physical Chemistry Chemical Physics* 9, 1837-1842 (2007). doi:10.1039/B617519H [WoS Highly Cited Paper]
- (84) Jiao, F., Harrison, A., Hill, A. H. & Bruce, P. G.* Mesoporous Mn₂O₃ and Mn₃O₄ with crystalline walls. *Advanced Materials* 19, 4063 (2007). doi:10.1002/adma.200700336
- (85) Jiao, F., Harrison, A. & Bruce, P. G.* Ordered three-dimensional arrays of monodispersed Mn₃O₄ nanoparticles with a core-shell structure and spin-glass behavior. *Angewandte Chemie International Edition* 46, 3946-3950 (2007). doi:10.1002/ange.200700087
- (86) Jiao, F. & Bruce, P. G.* Mesoporous crystalline β -MnO₂ - a reversible positive electrode for rechargeable lithium batteries. *Advanced Materials* 19, 657 (2007). doi:10.1002/adma.200602499 [WoS Highly Cited Paper]
- (87) Jiao, F., Bao, J. L. & Bruce, P. G.* Factors influencing the rate of Fe₂O₃ conversion reaction. *Electrochemical and Solid State Letters* 10, A264-A266 (2007). doi:10.1149/1.2783268
- (88) Jiao, F., Jumas, J. C., Womes, M., Chadwick, A. V., Harrison, A., & Bruce, P. G.* Synthesis of ordered mesoporous Fe₃O₄ and γ -Fe₂O₃ with crystalline walls using post-template reduction/oxidation. *Journal of the American Chemical Society* 128, 12905-12909 (2006). doi:10.1021/ja063662i [WoS Highly Cited Paper]
- (89) Jiao, F., Harrison, A., Jumas, J. C., Chadwick, A. V., Kockelmann, W., & Bruce, P. G.* Ordered mesoporous Fe₂O₃ with crystalline walls. *Journal of the American Chemical Society* 128, 5468-5474 (2006). doi:10.1021/ja0584774 [WoS Highly Cited Paper]
- (90) Jiao, F., Shaju, K. M. & Bruce, P. G.* Synthesis of nanowire and mesoporous low-temperature LiCoO₂ by a post-templating reaction. *Angewandte Chemie International Edition* 44, 6550-6553 (2005). doi:10.1002/anie.200501663
- (91) Yue, B., Jiang, L., Kong, Z. P., Jiao, F., Lin, X. R., & Jin, S. L.* Synthesis and characterization of sandwich rare earth metal monosubstituted polyoxometalates with γ -SiW₁₀O₃₆⁸⁻ as ligand. *Chemical Journal of Chinese Universities-Chinese* 25, 199-203 (2004).
- (92) Jiao, F. & Bruce, P. G.* Two- and three-dimensional mesoporous iron oxides with microporous walls. *Angewandte Chemie International Edition* 43, 5958-5961 (2004). doi:10.1002/ange.200460826
- (93) 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) "Electrocatalysis for Carbon Dioxide Utilization", invited seminar, NSF Center for Integrated Catalysis, UCLA (2022)
- (2) "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited speaker, NOW CHAINS, Annual Dutch Chemistry Conference (2021)
- (3) "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited speaker, APS-CPS symposium on Energy and Sustainability (2021)
- (4) Scialog Negative Emissions Science Workshop, Research Corporation for Science Advancement and Alfred P. Sloan Foundation (2021)
- (5) "A TANDEM ELECTROLYSIS PROCESS FOR MULTI-CARBON CHEMICAL PRODUCTION FROM CARBON DIOXIDE", oral presentation, DOE/NETL CO₂ Capture Technology Project Review Virtual Meeting (2021)
- (6) "Carbon dioxide electrolysis for sustainable chemical production", invited talk, NanoFe Fall Meeting (2021)
- (7) "Carbon dioxide electrolysis for sustainable chemical production", oral presentation, ECS Fall National Meeting (2021)
- (8) "Carbon dioxide electrolysis for sustainable chemical production", oral presentation, ACS Fall National Meeting (2021)
- (9) "Carbon dioxide electrolysis for sustainable chemical production", invited keynote speaker, 15th International Conference on Materials Chemistry, Dublin (2021)
- (10) Panelist, Next Generation Electrochemistry Workshop, Department of Chemistry, University of Illinois at Chicago (2021)
- (11) "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)
- (12) Special guest moderator, Microfluidics & Energy Symposium (2021)

- (13) "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", Keynote speaker, International Symposium on Electrocatalysis and Electrosynthesis, Chinese Chemical Society (2021)
- (14) "Carbon dioxide electrolysis for chemical production", oral presentation, ACS Spring National Meeting (2021)
- (15) "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", Keynote speaker, Competitive Energy Systems Symposium, AIChE (2021)
- (16) "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited seminar, School of Materials Science & Engineering, Nanyang Technological University, Singapore (2021)
- (17) "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited seminar, Department of Chemical and Biomolecular Engineering, KAIST, South Korea (2021)
- (18) "A TANDEM ELECTROLYSIS PROCESS FOR MULTI-CARBON CHEMICAL PRODUCTION FROM CARBON DIOXIDE", oral presentation, DOE/NETL CO₂ Capture Technology Project Review Virtual Meeting (2020)
- (19) "Electrocatalytic Carbon Dioxide Conversion into Valuable Chemicals", invited seminar, Department of Chemical Engineering, University of Illinois at Chicago (2020)
- (20) "Carbon Dioxide Electrolysis for Sustainable Chemical Production", invited talk, nanoFe Fall Meeting (2020)
- (21) "Electrochemical CO₂ conversion to valuable chemicals", virtual presentation, AIChE Annual Meeting (2020)
- (22) Scialog Negative Emissions Science Workshop, Research Corporation for Science Advancement and Alfred P. Sloan Foundation (2020)
- (23) "Electrochemical CO₂ reduction – challenges and opportunities", invited talk, Monthly Invited Talk Series (MITs), ACS Energy and Fuels Division (2020)
- (24) "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO₂ Capture Technology Project Review Virtual Meeting (2020)
- (25) Reactive CO₂ Capture Workshop, DOE/NREL, Golden, CO (2020)
- (26) African School of Catalysis, course instructor, Kigali, Rwanda (2020)
- (27) "Formation of Carbon-Nitrogen Bonds in Carbon Monoxide Electroreduction", invited talk, AIChE Annual Meeting, Orlando, FL (2019).
- (28) "Electrochemical CO₂ conversion to valuable chemicals", oral presentation, AIChE Annual Meeting, Orlando, FL (2019).
- (29) "Carbon Utilization using Electrochemical Approaches", oral presentation, ACS National Meeting, Orlando, FL (2019).
- (30) "Two-dimensional copper nanosheets for electrochemical reduction of carbon monoxide to acetate", invited talk, ACS National Meeting, San Diego, CA (2019).
- (31) "CO₂ electrolysis: state-of-the-art, techno-economic analysis, and challenges", invited speaker, CIFAR Ion Selective Membranes in CO₂ Electrolysis, Pittsburgh, PA (2019).
- (32) "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO₂ Capture Technology Project Review Meeting, Pittsburgh, PA (2019).
- (33) "Electrochemical CO conversion to valuable chemicals", invited talk, ACS National Meeting, Orlando, FL (2019).
- (34) "Carbon utilization using electrochemical approaches", invited talk, ACS National Meeting, Orlando, FL (2019).
- (35) "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO₂ Capture Technology Project Review Meeting, Pittsburgh, PA (2018).
- (36) "Electrochemical CO₂ Conversion to Valuable Chemicals", invited talk, AIChE Annual Meeting, Pittsburgh, PA (2018).

- (37) "Bimetallic catalyst with a core-shell structure for CO₂ reduction", invited talk, ACS National Meeting, Boston, MA (2018).
- (38) "Electrochemical CO₂ conversion to valuable chemicals", invited talk, ACS National Meeting, Boston, MA (2018).
- (39) "Electrochemical carbon dioxide conversion to alcohols", invited talk, ACS National Meeting, New Orleans, LA (2018).
- (40) "Ag-Sn Bimetallic Catalyst with a Core-Shell Structure for CO₂ Reduction", oral presentation, AIChE Annual Meeting, Minneapolis, MN (2017).
- (41) "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO₂ Capture Technology Project Review Meeting, Pittsburgh, PA (2017).
- (42) "Ultra-Thin Electrocatalysts for Carbon Dioxide Reduction", oral presentation, 25th North American Catalysis Society Meeting, Denver, CO (2017).
- (43) "Nanostructured Materials as Advanced Electrocatalysts", oral presentation, 25th North American Catalysis Society Meeting, Denver, CO (2017).
- (44) "Nanoporous materials: synthesis and electrocatalytic properties", invited keynote presentation, ACS National Meeting, Washington, DC (2017)
- (45) "Mesoporous metal sulfides and carbides", oral presentation, MESD, AIChE annual meeting, San Francisco, CA (2016).
- (46) "Novel Nanostructured Materials for Energy Applications", invited keynote presentation, Division of Energy and Fuels, ACS National Meeting, Philadelphia, PA (2016).
- (47) "Electrochemical Conversion of Carbon Dioxide", invited speaker, Solar Fuels Generation: PV and Electrolysis Workshop, Newark, DE (2016).
- (48) "Nanostructured Catalysts for Solar Fuel Production", invited speaker, Catalysis for Artificial Photosynthesis, KAUST Catalysis Center Symposium, Saudi Arabia (2016).
- (49) "Nanostructured Metals: Advanced Electrocatalysts for Carbon Dioxide Reduction", oral presentation, AIChE Annual Meeting, Salt Lake City, UT (2015).
- (50) "Cobalt oxide nanocubanes for photocatalytic water oxidation", oral presentation, Division of Catalysis Science and Technology, ACS National Meeting, Boston, MA (2015).
- (51) "Nanostructured metals for electrochemical carbon dioxide reduction", oral presentation, Division of Energy and Fuels, ACS National Meeting, Boston, MA (2015).
- (52) "Nanoporous Bimetallic Catalyst for Hydrogen Evolution", oral presentation, Division of Energy and Fuels, ACS National Meeting, Boston, MA (2015).
- (53) "In Situ/Operando XAS studies of electrochemical systems", invited speaker, Division of Energy and Fuels, ACS National Meeting, Denver, CO (2015).
- (54) "Nanoporous materials for energy applications", invited speaker, Division of Catalysis Science and Technology, ACS National Meeting, Denver, CO (2015).
- (55) "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) "Electrochemical carbon dioxide conversion to valuable chemicals", virtual seminar, School of Materials Science and Engineering, Nanyang Technological University, Singapore (2021)
- (2) "Electrochemical carbon dioxide conversion to valuable chemicals", virtual seminar, Department of Chemical and Biomolecular Engineering, KAIST, South Korea (2021)
- (3) "Electrochemical Carbon Dioxide Conversion to Valuable Chemicals", invited seminar speaker, Department of Chemistry, University of Massachusetts, Amherst, MA (2020).

- (4) "Electrochemical Carbon Dioxide Conversion to Valuable Chemicals", invited seminar speaker, Department of Chemistry & Biochemistry, University of California, Santa Cruz, CA (2019).
- (5) "Electrifying chemical production", invited seminar, Air Liquide, Newark, DE (2019).
- (6) "Electrochemical Conversion of CO₂ and CO to C₂₊ chemicals", invited seminar, Center for Functional Nanomaterials, Brookhaven National Laboratory, NY (2019).
- (7) "High-rate CO₂ and CO electrolysis to C₂₊ products", invited seminar, School of Chemical Engineering, Tianjin University, Tianjin, China (2019).
- (8) "High-rate CO₂ and CO electrolysis to C₂₊ products", invited seminar, Department of Chemistry, University of Virginia, VA (2019).
- (9) "High-rate CO₂ and CO electrolysis to C₂₊ products", invited seminar, Department of Electrical and Computer Engineering, University of Toronto, Canada (2018).
- (10) "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, Department of Chemical and Environmental Engineering, University of California, Riverside, CA (2018).
- (11) "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, Joint Center for Artificial Photosynthesis, Caltech, Pasadena, CA (2018).
- (12) "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, College of Chemistry & Biochemistry, University of California, Los Angeles, CA (2018).
- (13) "Electrochemical CO₂ Conversion to Valuable Chemicals", invited seminar, Delaware State University, Dover, DE (2018).
- (14) "Electrochemical CO₂ conversion to valuable chemicals", invited seminar, School of Chemical Science and Engineering, Tongji University, Shanghai, China (2018).
- (15) "Electrochemical Carbon Dioxide Conversion to Valuable Chemicals", invited seminar, Lawrence Berkeley National Laboratory, Berkeley, CA (2017).
- (16) "Nanoporous Materials for Electrochemical Systems", invited seminar, Pacific Northwest National Laboratory, Richland, WA (2017).
- (17) "Electrochemical carbon dioxide conversion", invited seminar speaker, Air Liquide Technical Exchange Seminar, Air Liquide, Newark, DE (2017).
- (18) "Nanoporous materials for electrochemical systems", invited seminar speaker, Department of Chemical and Biological Engineering, Drexel University, Philadelphia, PA (2016).
- (19) "Nanoporous materials for electrochemical systems", invited seminar speaker, Lenfest Center for Sustainable Energy, Columbia University, New York, NY (2015).
- (20) "Nanoporous materials for electrochemical systems", invited seminar speaker, Department of Chemical Engineering, University of Oklahoma, Norman, OK (2015).
- (21) "Advanced Energy Storage Systems", invited seminar speaker, Eastman Chemical Company, Kingsport, TN (2015).
- (22) "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

Agency for Science, Technology and Research (A*STAR), Singapore

Natural Sciences and Engineering Research Council of Canada (NSERC), Canada

Mission Innovation Carbon Capture, Utilization and Storage Experts' Workshop (Electrochemistry and Photochemistry Panelist), Houston, TX (2017)

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.

Contributor to the 2019 National Petroleum Council report - "Meeting the Dual Challenge, A Roadmap to At-Scale Deployment of Carbon Capture, Use and Storage"

National Science Foundation (CBET, SBIR), USA

Department of Energy (BES, SBIR-STTR, ARPA-E), USA

American Chemical Society - Petroleum Research Foundation, USA

National Aeronautics and Space Administration (NASA), USA

Research Grants Council (RGC) of Hong Kong, China

National Research Foundation, Singapore

Reviewer for Journals (selected list)

Accounts of Chemical Research

ACS Applied Materials & Interfaces

ACS Catalysis

ACS Energy Letters

ACS Nano

ACS Sustainable Chemistry & Engineering

Advanced Materials

Advanced Functional Materials

Advanced Energy Materials

AIChE Journal

Angewandte Chemie International Edition

Applied Catalysis B: Environmental

Catalysis Science and Technology

Chem

Chem Catalysis

Chemical Communications

Chemistry of Materials

ChemCatChem

ChemSusChem

Energy and Environmental Science

Energy and Fuels

Industrial & Engineering Chemistry Research

Joule

Journal of Catalysis

Journal of Materials Chemistry A

Journal of the American Chemical Society

Nano Energy

Nature

Nature Catalysis

Nature Chemistry

Nature Communications

Nature Energy

Nature Nanotechnology

Nature Sustainability

Physical Chemistry Chemical Physics

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 (2021)

(3) AIChE Annual Meeting, Symposium Session chair: Electrocatalysis and Photoelectrocatalysis (2020).

(4) American Chemical Society National Meeting, ENFL, Symposium co-organizer: Electrochemistry Enables Catalysis for Energy, Chemicals and Materials (2020).

(5) American Chemical Society National Meeting, ENFL, Symposium co-organizer: Sustainable Energy & Water via Innovative Electrocatalytic, Photocatalytic & Hybrid Catalytic System (2019).

(6) AIChE Annual Meeting, Session chair: Electrocatalysis and Photoelectrocatalysis (2019).

(7) American Chemical Society National Meeting, ENFL, Symposium co-organizer: Sustainable Energy Conversion via Innovative Electrocatalysis & Photocatalysis (2019).

(8) AIChE Annual Meeting, Session chair: Electrocatalysis and Photoelectrocatalysis (2018).

- (9) American Chemical Society National Meeting, ENFL, Symposium co-organizer: Carbon Dioxide Conversion & Artificial Photosynthesis (2018).
- (10) American Chemical Society National Meeting, ENFL, Symposium co-organizer: Sustainable Energy Conversion via Innovative Electrocatalysis & Photocatalysis (2018).
- (11) AIChE Annual Meeting, Session co-chair: Electrocatalysis and Photoelectrocatalysis (2017).
- (12) 25th Biennial North American Meeting of the North American Catalysis Society, Session co-chair: Catalysis Poisoning and Deactivation 1 (2017).
- (13) 25th Biennial North American Meeting of the North American Catalysis Society, Session co-chair: Environmental: CO₂ conversion 1 (2017).
- (14) American Chemical Society National Meeting, ENFL, Symposium co-organizer: Innovative Chemistry & Electrocatalysis for Low-Carbon Energy & Fuels: Discovery to Application (2017).
- (15) American Chemical Society National Meeting, CATL, Symposium co-organizer: Advances in Carbon Dioxide Utilization (2017).
- (16) 91st American Chemical Society Colloid and Surface Science Symposium, Session co-organizer, New York (2017).
- (17) American Chemical Society National Meeting, ENFL, Symposium organizer: Innovative Chemistry & Electrocatalysis for Low-Carbon Energy & Fuels: Discovery to Application (2015).
- (18) American Chemical Society National Meeting, ENFL, Session co-chair: Carbon Dioxide Management: Recent Advances in Carbon Dioxide Capture, Conversion, Utilization and Storage (2014).
- (19) AIChE Annual Meeting, Session co-chair: Biocomposites (2013).
- (20) 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)	Xinbin Ma (Tianjin University)
Aditya Bhan (University of Minnesota)	Alissa Park (Columbia University)
Peter Bruce (University of Oxford)	Yuyan Shao (PNNL)
Karen Chan (Technical University of Denmark)	Mark Snyder (Lehigh University)
Jingguang G. Chen (Columbia University)	Dong Su (Institute of Physics, CAS)
William A. Goddard III (Caltech)	Dion Vlachos (University of Delaware)
Jinlong Gong (Tianjin University)	John Xiao (University of Delaware)
Liangbing Hu (UMD)	Hongliang Xin (Virginia Tech)
Robert Jinkerson (UC, Riverside)	Bingjun Xu (University of Delaware)
Jean-Claude Jumas (University Montpellier)	Xiaoxiang Xu (Tongji University)
Yijin Kang (UESTC)	Yushan Yan (University of Delaware)
Freddy Kleitz (University of Vienna)	Yang Yang (University of Central Florida)
Yuanyue Liu (University of Texas at Austin)	Haimei Zheng (LBNL)
Qi Lu (Tsinghua University)	Kake Zhu (ECUST)

Postdoctoral Fellows (Current)

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

Graduate Students (Current)

Byung Hee (Brian) Ko (2018 – Present)
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)

Abdul Fayed (2020 – Present)
Andy Redder (2022 – Present)

Alumni

Seif Yusuf	M.Ch.E (2010 – 2012)	Wenlei Zhu	Postdoc (2017 – 2018)
Bryan Yonemoto	PhD (2010 – 2015)	Hongjie Tang	Postdoc (2017 – 2019)
Gregory Hutchings	PhD (2010 – 2015)	Jingjing Lyu	Visiting grad (2017 – 2019)
Yan Zhang	M.Ch.E (2012 – 2015)	Wesley Luc	PhD (2014-2019)
Qi Lu	Postdoct (2012 – 2016)	Matthew Jouny	PhD (2015 – 2020)
Jonathan Rosen	PhD (2011 – 2016)	Emily Jeng	M.Ch.E. (2017 – 2020)
Andrew Craft	M.Ch.E. (2015 – 2017)		

Undergraduate Students (Past)

Ruixue Xiong	(2021-2022)	William Barndt	(2016)
Wilson Chen	(2019)	Richard Sherrer	(2015 – 2016)
Sarah DiBenede	(2018 - 2019)	Kaelan Reed	(2014 – 2015)
Zachary LaDuca	(2018)	Alex Moore	(2014)
John Foster	(2017)	Sean Rivera	(2014)
Jacob Brennan	(2017)	Kevin Abraham	(2013)
Lukas Wieder	(2017)	Jinghan Zhao	(2011 – 2013)
Sean Overa	(2017)	Touseef Habib	(2011 – 2012)
Ning Zhao	(2017)	Hasan Raboui	(2011)
Albert Schaeffer	(2017)	Kameron Conforti	(2012 – 2013)
Charles Collins	(2014 – 2017)	Mengguang Wang	(2011 – 2013)
Samuel Haas	(2016)	Jamie Bakri	(2011)
Dillon Gashi	(2016)	Yuan Wei	(2011)

Visiting High School Students (Past)

Ashrith Kandula (2021)
Edward Bao (2012 – 2013)