Feng Jiao, Ph.D.

Associate Professor of Chemical and Biomolecular Engineering
Associate Director, Center for Catalytic Science & Technology
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Research Interests

The Jiao laboratory combines catalysis, materials science and electrochemistry, and by doing so is able to address the most exciting and critical scientific challenges that occur in the field of energy conversion and storage. Breakthrough in this field is crucial to tackle energy related challenges by providing the society with clean, sustainable, and environmentally friendly energy solutions. Current research interests include heterogeneous catalysis, electrochemistry, nanomaterials, and reactor design.

Education

2004.1 – 2008.1	Ph.D. in Chemistry, University of St Andrews, St Andrews, United Kingdom Thesis: Nanomaterials for energy storage and conversion Advisor: Prof. Peter G. Bruce
1997.9 – 2001.7	B.S. in Chemistry, Fudan University, Shanghai, China Thesis: Catalytic oxidation of phenol using nanostructured iron oxides Advisor: Prof. Heyong He

Professional Experience

2017.9 – Present	Associate Professor, Department of Chemical and Biomolecular Engineering University of Delaware, Newark, DE, United States
2017.9 – Present	Associate Director, Center for Catalytic Science & Technology University of Delaware, Newark, DE, United States
2017.6 – 2017.11	Visiting Faculty, SUNCAT Center for Interface Science and Catalysis Stanford University, Stanford, CA, United States (Host: Prof. Jens Norskov)
2010.8 – 2017.9	Assistant Professor, Department of Chemical and Biomolecular Engineering, University of Delaware, Newark, DE, United States
2008.1 – 2010.8	Postdoctoral Researcher (Supervisor: Dr. Heinz Frei) Lawrence Berkeley National Laboratory, Physical Biosciences Division Berkeley, CA, United States
2003.9 – 2004.1	Visiting scholar, School of Chemistry, University of St Andrews St Andrews, United Kingdom

Honors and Awards

2017 Class of Influential Researchers, Industrial & Engineering Chemistry Research

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

2018 – Present Trends in Chemistry (Cell Press, Editorial Board member)
2016 – Present Scientific Reports (Nature Publishing Group)
2011 – 2015 Journal of Chemical Engineering & Process Technology

Publications

*Total citations: **7268**, Average citations per paper: **~110**, H-index: **36**, Data source: Google Scholar, 1/2019*

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

ORCID ID: orcid.org/0000-0002-3335-3203
Google Scholar: scholar.google.com/citations?user=Oi-vLsAAAAAJ&hl=en

(66) Zhu, W. L., Kattel, S., **Jiao, F.***, Chen, J. G.* Shape-Controlled CO_2 Electrochemical Reduction on Nanosized Pd Hydride Cubes and Octahedra. *Advanced Energy Materials* 1802840 (**2019**). doi: 10.1002/aenm.201802840
(65) Sriramagiri, G. M.*, Luc, W., **Jiao, F.**, Ayers, K. E., Dobson, K. D., & Hegedus, S. Computation and assessment of solar electrolyzer field performance: comparing coupling strategies. *Sustainable Energy & Fuels* (**in press**). doi:10.1039/C8SE00399H
(64) Zhu, W. L., Tackett, B. M., Chen, J. G.* & **Jiao, F.*** Bimetallic electrocatalysts for CO_2 reduction. *Topics in Current Chemistry* 376, 41 (**2018**). doi:10.1007/s41061-018-0220-5
(63) **Jiao, F.*** & Xu, B. J.* Electrochemical ammonia synthesis and ammonia fuel cells. *Advanced Materials* 1805173 (**2018**). doi:10.1002/adma.201805173 [Research News Article]
(62) Lv, J. J., Jouny, M., Luc, W., Zhu, W. L., Zhu, J. J., & **Jiao, F.*** A highly porous copper electrocatalyst for carbon dioxide reduction. *Advanced Materials* 30, 1803111 (**2018**). doi: 10.1002/adma.201803111
(61) Jouny, M., Luc, W., & **Jiao, F.*** High-rate electroreduction of carbon monoxide to multi-carbon products. *Nature Catalysis* 1, 748-755 (**2018**). doi:10.1038/s41929-018-0133-2 [Selected as Cover Story]
(60) Luc, W., Jouny, M., Rosen, J., & **Jiao, F.*** Carbon Dioxide Splitting using an Electro-Thermochemical Hybrid Looping Strategy. *Energy & Environmental Science* 11, 2928-2934 (**2018**). doi:10.1039/C8EE00532J

(59) Luc, W., Jiang, Z., Chen, J. G.*, & **Jiao, F.*** Role of Surface Oxophilicity in Copper-catalyzed Water Dissociation. *ACS Catalysis* 8, 9327-9333 (**2018**). doi:10.1021/acscatal.8b01710

(58) Dunwell, M.[#], Luc, W.[#], Yan, Y. S.*, **Jiao, F.***, & Xu, B. J.* Understanding Surface-Mediated Electrochemical Reactions: CO_2 Reduction and Beyond. *ACS Catalysis* 8, 8121-8129 (**2018**). doi:10.1021/acscatal.8b02181

(57) Sun, X. Q., Mi, Y. L.*, **Jiao, F.***, & Xu, X. X.* Activating Layered Perovskite Compound Sr_2TiO_4 via La/N Codoping for Visible Light Photocatalytic Water Splitting. *ACS Catalysis* 8, 3209-3221 (**2018**). doi:10.1021/acscatal.8b00369

(56) Jouny, M., Luc, W., & **Jiao, F.*** General Techno-Economic Analysis of CO_2 Electrolysis Systems. *Industrial & Engineering Chemistry Research* 57, 2165-2177 (**2018**). doi:10.1021/acs.iecr.7b03514

(55) Sriramagiri, G. M., Ahmed, N., Luc, W., Dobson, K. D., Hegedus, S. S., & **Jiao, F.*** Toward a Practical Solar-Driven CO_2 Flow Cell Electrolyzer: Design and Optimization. *ACS Sustainable Chemistry & Engineering* 5, 10959-10966 (**2017**). doi:10.1021/acssuschemeng.7b02853

(54) Luc, W., & **Jiao, F.*** Nanoporous Metals as Electrocatalysts: State-of-the-Art, Opportunities, and Challenges. *ACS Catalysis* 7, 5856-5861 (**2017**). doi:10.1021/acscatal.7b01803 [Invited Perspective]

(53) 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]

(52) 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]

(51) 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 CO_2 reduction. *Journal of the American Chemical Society* 139, 1885-1893 (**2017**). doi:10.1021/jacs.6b10435 [WoS Highly Cited Paper]

(50) Luc, W., Rosen, J. & **Jiao, F.*** An Ir-based anode for a practical CO_2 electrolyzer. *Catalysis Today* 288, 79-84, (**2017**). doi:10.1016/j.cattod.2016.06.011 [Invited contribution]

(49) 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/acsami.6b09095

(48) 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

(46) Lu, Q., & **Jiao, F.*** Electrochemical CO_2 reduction: electrocatalyst, reaction mechanism, and process engineering. *Nano Energy* 29, 439-456 (**2016**). doi: 10.1016/j.nanoen.2016.04.009
[Invited review article]

(45) Rosen, J., Hutchings, G. S., Lu, Q., Forest, R. V., Moore, A., & **Jiao, F.*** Electrodeposited Zn dendrites with enhanced CO selectivity for electrocatalytic CO_2 reduction. *ACS Catalysis* 5, 4586-4591 (**2015**). doi:10.1021/acscatal.5b00922

(44) Rosen, J.[#], Hutchings, G. S.[#], Lu, Q., Rivera, S., Zhou, Y., Vlachos, D. G., & **Jiao, F.*** Mechanistic Insights into the Electrochemical Reduction of CO_2 to CO on Nanostructured Ag Surfaces. *ACS Catalysis* 5, 4293-4299 (**2015**). doi:10.1021/acscatal.5b00840

(43) 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

(42) Hutchings, G. S.[#], Zhang, Y.[#], Li, J., Yonemoto, B. T., Zhou, X., Zhu, K.*, & **Jiao, F.*** In situ Formation of Cobalt Oxide Nanocubanes as Efficient Oxygen Evolution Catalysts. *Journal of the American Chemical Society* 137, 4223-4229 (**2015**). doi:10.1021/jacs.5b01006
[WoS Highly Cited Paper]

(41) 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]

(40) 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]

(39) Yonemoto, B. T., Guo, Q., Hutchings, G. S., Yoo, W. C., Snyder, M. A.*, & **Jiao, F.*** Structural evolution in ordered mesoporous TiO_2 anatase electrodes. *Chemical Communications* 50, 8997-8999 (**2014**). doi:10.1039/C4CC04033C

(38) Yonemoto, B. T., Hutchings, G. S., & **Jiao, F.*** A General Synthetic Approach for Ordered Mesoporous Metal Sulfides. *Journal of the American Chemical Society* 136, 8895-8898 (**2014**). doi:10.1021/ja504407e

(37) 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

(36) Lu, Q., Hutchings, G. S., Zhou, Y., Xin, H., Zheng, H., & **Jiao, F.*** Nanostructured flexible Mg-modified $LiMnPO_4$ matrix as high-rate cathode materials for Li-ion batteries. *Journal of Materials Chemistry A* 2, 6368-6373 (**2014**). doi:10.1039/C4TA00654B
[RSC Most Accessed Article for 2014]

(35) Lu, Q.[#], Rosen, J.[#], Zhou, Y., Hutchings, G. S., Kimmel, Y. C., Chen, J. G., & **Jiao, F.*** A selective and efficient electrocatalyst for carbon dioxide reduction. *Nature Communications* 5:3242 (**2014**). doi:10.1038/ncomms4242
[WoS Highly Cited Paper]

(34) 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-Fe_2O_3

studied by time-of-fight inelastic neutron spectroscopy. *Journal of Chemical Physics* 140, 044709 (**2014**). doi:10.1063/1.4862235

(33) **Jiao, F.***, Yen, H., Hutchings, G. S., Yonemoto, B. T., Lu, Q., & Kleitz, F.* Synthesis, Structural Characterization, and Electrochemical Performance of Nanocast Mesoporous Cu-/Fe-based Oxides. *Journal of Materials Chemistry A* 2, 3065-3071 (**2014**). doi:10.1039/C3TA14111J

(32) Zhang, Y., Rosen, J., Hutchings, G. S., & **Jiao, F.*** Enhancing photocatalytic oxygen evolution activity of cobalt-based spinel nanoparticles. *Catalysis Today* 225, 171-176 (**2014**). doi:10.1016/j.cattod.2013.08.009
[Invited contribution]

(31) Rosen, J., Hutchings, G. S., & **Jiao, F.*** Synthesis, structure, and photocatalytic properties of ordered mesoporous metal-doped Co_3O_4. *Journal of Catalysis* 310, 2-9 (**2014**). doi:10.1016/j.jcat.2013.05.003
[Invited contribution]

(30) Ren, Y., Ma, Z., Morris, R. E., Liu, Z., **Jiao, F.**, Dai, S., & Bruce, P. G.* A solid with a hierarchical tetramodal micro-meso-macro pore size distribution. *Nature Communications* 4:2015 (**2013**). doi:10.1038/ncomms3015

(29) Deng, W., Wang, X.*, **Jiao, F.**, & Zhu, K.* A platelet-like CeO_2 mesocrystal enclosed by {100} facets: synthesis and catalytic properties. *Journal of Nanoparticle Research* 15, 1-10 (**2013**). doi:10.1007/s11051-013-1944-3

(28) Boppana, V. B. R., **Jiao, F.**, Newby, D., Laverock, J., Smith, K. E., Jumas, J.-C., Hutchings, G. S., & Lobo, R. E.* Analysis of Visible-Light-Active Sn(II)-TiO_2 Photocatalysts. *Physical Chemistry Chemical Physics* 15, 6185-6189 (**2013**). doi:10.1039/C3CP44635B

(27) Rosen, J., Hutchings, G. S., & **Jiao, F.*** Ordered Mesoporous Cobalt Oxide as Highly Efficient Oxygen Evolution Catalyst. *Journal of the American Chemical Society* 135, 4516-4521 (**2013**). doi:10.1021/ja400555q
[WoS Highly Cited Paper]

(26) Hutchings, G. S., Lu, Q., & **Jiao, F.*** Synthesis and Electrochemistry of Nanocrystalline M-TiO_2 (M = Mn, Fe, Co, Ni, Cu) Anatase. *Journal of the Electrochemical Society* 160, A511-A515 (**2013**). doi:10.1149/2.003304jes

(25) Lu, Q.*, Chen, Y., Li, W., Chen, J. G., Xiao, J. Q., & **Jiao, F.*** Ordered Mesoporous Nickel Cobaltite Spinel with Ultra-high Supercapacitance. *Journal of Materials Chemistry A* 1, 2331-2336 (**2013**). doi:10.1039/C2TA00921H

(24) Boppana, V. B. R.[#], Yusuf, S.[#], Hutchings, G. S., & **Jiao, F.*** Nanostructured Alkaline-Cation-Containing δ-MnO_2 for Photocatalytic Water Oxidation. *Advanced Functional Materials* 23, 878-884 (**2013**). doi:10.1002/adfm.201202141

(23) Yusuf, S. & **Jiao, F.*** Effect of the Support on the Photocatalytic Water Oxidation Activity of Cobalt Oxide Nanoclusters. *ACS Catalysis* 2, 2753-2760 (**2012**). doi:10.1021/cs300581k

(22) Yonemoto, B. T., Lin, Z. & **Jiao, F.*** A General Synthetic Method for MPO_4 (M=Co, Fe, Mn) Frameworks Using Deep-Eutectic Solvents. *Chemical Communications* 48, 9132-9134 (**2012**). doi:10.1039/c2cc34020h
[Selected as Cover Story]

(21) Boppana, V. B. R., Schmidt, H., **Jiao, F.**, Doren, D. J. & Lobo, R.* Structure analysis and photocatalytic properties of spinel zinc gallium oxonitrides. *Chemistry - A European Journal* 17, 12417-12428 (**2011**). doi:10.1002/chem.201101196

(20) Boppana, V. B. R. & **Jiao, F.*** Nanostructured MnO_2: an efficient and robust water oxidation catalyst. *Chemical Communications* 47, 8973-8975 (**2011**). doi:10.1039/C1CC12258D

Publications Prior to Employment at the University of Delaware

(19) 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]

(18) **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]

(17) **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]

(16) 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

(15) **Jiao, F.** & Frei, 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]

(14) **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]

(13) **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

(12) Hill, A. H.*, **Jiao, F.**, Bruce, P. G., Harrison, A., Kockelmann, W., & Ritter, C. Neutron diffraction study of mesoporous and bulk hematite, α-Fe_2O_3. *Chemistry of Materials* 20, 4891-4899 (**2008**). doi:10.1021/cm800009s

(11) Shaju, K. M., **Jiao, F.**, Debart, A. & Bruce, P. G.* Mesoporous and nanowire Co_3O_4 as negative electrodes for rechargeable lithium batteries. *Physical Chemistry Chemical Physics* 9, 1837-1842 (**2007**). doi:10.1039/B617519H
[WoS Highly Cited Paper]

(10) **Jiao, F.**, Harrison, A., Hill, A. H. & Bruce, P. G.* Mesoporous Mn_2O_3 and Mn_3O_4 with crystalline walls. *Advanced Materials* 19, 4063 (**2007**). doi:10.1002/adma.200700336

(9) **Jiao, F.**, Harrison, A. & Bruce, P. G.* Ordered three-dimensional arrays of monodispersed Mn_3O_4 nanoparticles with a core-shell structure and spin-glass behavior. *Angewandte Chemie-International Edition* 46, 3946-3950 (**2007**). doi:10.1002/ange.200700087

(8) **Jiao, F.** & Bruce, P. G.* Mesoporous crystalline β-MnO_2 - a reversible positive electrode for rechargeable lithium batteries. *Advanced Materials* 19, 657 (**2007**). doi:10.1002/adma.200602499
[WoS Highly Cited Paper]

(7) **Jiao, F.**, Bao, J. L. & Bruce, P. G.* Factors influencing the rate of Fe_2O_3 conversion reaction. *Electrochemical and Solid State Letters* 10, A264-A266 (**2007**). doi:10.1149/1.2783268

(6) **Jiao, F.**, Jumas, J. C., Womes, M., Chadwick, A. V., Harrison, A., & Bruce, P. G.* Synthesis of ordered mesoporous Fe_3O_4 and γ-Fe_2O_3 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]

(5) **Jiao, F.**, Harrison, A., Jumas, J. C., Chadwick, A. V., Kockelmann, W., & Bruce, P. G.* Ordered mesoporous Fe_2O_3 with crystalline walls. *Journal of the American Chemical Society* 128, 5468-5474 (**2006**). doi:10.1021/ja0584774
[WoS Highly Cited Paper]

(4) **Jiao, F.**, Shaju, K. M. & Bruce, P. G.* Synthesis of nanowire and mesoporous low-temperature $LiCoO_2$ by a post-templating reaction. *Angewandte Chemie-International Edition* 44, 6550-6553 (**2005**). doi:10.1002/anie.200501663

(3) 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-$SiW_{10}O_{36}^{8-}$ as ligand. *Chemical Journal of Chinese Universities-Chinese* 25, 199-203 (**2004**).

(2) **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

(1) **Jiao, F.**, Yue, B.*, Zhu, K. K., Zhao, D. Y., & He, H. Y.* α-Fe_2O_3 nanowires: Confined synthesis and catalytic hydroxylation of phenol. *Chemistry Letters* 32, 770-771 (**2003**). doi:10.1246/cl.2003.770

Patents

(1) **Jiao, F.**, Lu, Q., Hutchings, G. S., & Chen, J. G. Electrocatalyst for hydrogen evolution and oxidation reactions. US Patent: US9994961 B2 (**2018**).

(2) 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

2019 Spring	Chemical Engineering Thermodynamics II (CHEG 325)
2018 Fall	Electrochemical Energy Engineering (CHEG632)
2018 Spring	Chemical Engineering Thermodynamics II (CHEG 325)
2017 Spring	Chemical Engineering Thermodynamics II (CHEG 325)
2017 Spring	Special Topics in Energy (CHEG 614)
2016 Fall	Chemical Engineering Laboratory II (CHEG 445)
2016 Spring	Chemical Engineering Thermodynamics II (CHEG 325)

2016 Spring	Special Topics in Energy (CHEG 614)
2015 Fall	Introduction to Engineering (EGGG 101)
2015 Spring	Chemical Engineering Laboratory I (CHEG 345)
2015 Spring	Special Topics in Energy (CHEG 614)
2014 Fall	Chemical Engineering Thermodynamics I (CHEG 231)
2014 Spring	Chemical Engineering Laboratory I (CHEG 345)
2014 Spring	Special Topics in Energy (CHEG 614)
2013 Fall	Chemical Engineering Thermodynamics I (CHEG 231)
2013 Spring	Chemical Engineering Laboratory I (CHEG 345)
2013 Spring	Special Topics in Energy (CHEG 614)
2012 Fall	Chemical Engineering Thermodynamics I (CHEG 231)
2012 Spring	Chemical Engineering Laboratory I (CHEG 345)
2012 Spring	Special Topics in Energy (CHEG 614)
2011 Fall	Chemical Engineering Thermodynamics I (CHEG 231)
2011 Spring	Special Topics in Energy (CHEG 614)
2010 Fall	Chemical Engineering Kinetics (CHEG 332)

Presentations at national conferences and workshops

(1) "High-rate CO_2 and CO electrolysis to C_{2+} products", invited seminar, Department of Electrical and Computer Engineering, University of Toronto, Canada (**2018**).
(2) "Electrochemical CO_2 Conversion to Valuable Chemicals", invited talk, AICHE Annual Meeting, Pittsburgh, PA (**2018**).
(3) "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, Department of Chemical and Environmental Engineering, University of California Riverside, CA (**2018**).
(4) "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, Joint Center for Artificial Photosynthesis, Caltech, Pasadena, CA (**2018**).
(5) "Electrochemical carbon dioxide & carbon monoxide reduction to valuable chemicals", invited seminar, College of Chemistry & Biochemistry, University of California Los Angeles, CA (**2018**).
(6) "Bimetallic catalyst with a core-shell structure for CO_2 reduction", invited talk, ACS National Meeting – Boston, MA (**2018**).
(7) "Electrochemical CO_2 conversion to valuable chemicals", invited talk, ACS National Meeting – Boston, MA (**2018**).
(8) "Electrochemical carbon dioxide conversion to alcohols", invited talk, ACS National Meeting - New Orleans, LA (**2018**).
(9) "Electrochemical CO_2 Conversion to Valuable Chemicals", invited seminar, Delaware State University, Dover, DE (**2018**).
(10) "Electrochemical CO2 conversion to valuable chemicals", invited seminar, School of Chemical Science and Engineering, Tongji University, Shanghai, China (**2018**).
(11) "Electrochemical Carbon Dioxide Conversion to Valuable Chemicals", invited seminar, Lawrence Berkeley National Laboratory, Berkeley, CA (**2017**).
(12) "Nanoporous Materials for Electrochemical Systems", invited seminar, Pacific Northwest National Laboratory, Richland, WA (**2017**).

(13) "Ag-Sn Bimetallic Catalyst with a Core-Shell Structure for CO_2 Reduction", oral presentation, AICHE Annual Meeting, Minneapolis, MN (**2017**).
(14) "Electrochemical Conversion of Carbon Dioxide to Alcohols", oral presentation, NETL CO_2 Capture Technology Project Review Meeting, Pittsburgh, PA (**2017**).
(15) "Ultra-Thin Electrocatalysts for Carbon Dioxide Reduction", oral presentation, 25th North American Catalysis Society Meeting, Denver, CO (**2017**).
(16) "Nanostructured Materials as Advanced Electrocatalysts", oral presentation, 25th North American Catalysis Society Meeting, Denver, CO (**2017**).
(17) "Nanoporous materials: synthesis and electrocatalytic properties", invited keynote presentation, 254th American Chemical Society. National Meeting & Exposition, Washington, DC (**2017**)
(18) "Electrochemical carbon dioxide conversion", invited speaker, Air Liquide Technical Exchange Seminar, Air Liquide, Newark, DE (**2017**).
(19) "Mesoporous metal sulfides and carbides", oral presentation, MESD, AIChE annual meeting, San Francisco, CA (**2016**).
(20) "Novel Nanostructured Materials for Energy Applications", invited keynote presentation, Novel Nanomaterial Symposium, Division of Energy and Fuels, ACS 252th National Meeting, Philadelphia, PA (**2016**).
(21) "Electrochemical Conversion of Carbon Dioxide", invited speaker, Solar Fuels Generation: PV and Electrolysis Workshop, Newark, DE (**2016**).
(22) "Nanoporous materials for electrochemical systems", invited seminar speaker, Department of Chemical and Biological Engineering, Drexel University, Philadelphia, PA (**2016**).
(23) "Nanostructured Catalysts for Solar Fuel Production", invited speaker, Catalysis for Artificial Photosynthesis, KAUST Catalysis Center Symposium, Saudi Arabia (**2016**).
(24) "Nanoporous materials for electrochemical systems", invited seminar speaker, Lenfest Center for Sustainable Energy, Columbia University, New York, NY (**2015**).
(25) "Nanoporous materials for electrochemical systems", invited seminar speaker, Department of Chemical Engineering, University of Oklahoma, Norman, OK (**2015**).
(26) "Advanced Energy Storage Systems", invited seminar speaker, Eastman Chemical Company, Kingsport, TN (**2015**).
(27) "Nanoporous Materials for Energy Storage Systems", invited seminar speaker, Department of Chemistry, University of Connecticut, Storrs, CT (**2015**).
(28) "Nanostructured Metals: Advanced Electrocatalysts for Carbon Dioxide Reduction", oral presentation, AIChE Annual Meeting, Salt Lake City, UT (**2015**).
(29) "Cobalt oxide nanocubanes for photocatalytic water oxidation", oral presentation, Division of Catalysis Science and Technology, ACS 250th National Meeting, Boston, MA (**2015**).
(30) "Nanostructured metals for electrochemical carbon dioxide reduction", oral presentation, Division of Energy and Fuels, ACS 250th National Meeting, Boston, MA (**2015**).
(31) "Nanoporous Bimetallic Catalyst for Hydrogen Evolution", oral presentation, Division of Energy and Fuels, ACS 250th National Meeting, Boston, MA (**2015**).
(32) "In Situ/Operando XAS studies of electrochemical systems", invited speaker, Division of Energy and Fuels, ACS 249th National Meeting, Denver, CO (**2015**).
(33) "Nanoporous materials for energy applications", invited speaker, Division of Catalysis Science and Technology, ACS 249th National Meeting, Denver, CO (**2015**).

(34) "Synthesis of mesoporous metal sulfides", oral presentation, Division of Inorganic Chemistry, ACS 249th National Meeting, Denver, CO (**2015**).
(35) "Nanoporous Ag for Electrocatalytic CO_2 reduction", oral presentation, AIChE annual meeting, Atlanta, GA (**2014**).
(36) "Nanostructured $LiMnPO_4$ Matrix as Flexible High-Rate Cathode Materials", oral presentation, MESD, AIChE annual meeting, Atlanta, GA (**2014**).
(37) "Nanoporous materials for electrocatalytic CO_2 reduction", invited speaker, Division of Energy and Fuels, ACS 248th National Meeting, San Francisco, CA (**2014**).
(38) "Nanoporous Materials for Energy Storage and Conversion", invited speaker, Catalysis Society of Metropolitan New York Spring Symposium (**2014**).
(39) "Nanoporous Materials for Solar Fuel Production", invited speaker, Catalysis Club of Philadelphia Spring Symposium, Bethlehem, PA (**2014**).
(40) "Nanoporous Materials for Electrochemical Systems", invited seminar speaker, Chemical and Biomolecular Engineering, University of Maryland, College Park, MD (**2014**).
(41) "Nanoporous Materials for CO_2 to CO Conversion", invited speaker, Air Liquide Technical Exchange Seminar, Air Liquide, Newark, DE (**2014**).
(42) "Nanoporous solids for electrochemical energy conversion and storage", invited speaker, Gordon Research Conference – Nanoporous Materials & Their Applications, Holderness, NH, (**2013**).
(43) "Nanoporous Materials for Energy Storage and Conversion", invited seminar speaker, Department of Chemistry and Centers on Advanced and Functional Materials, Universite Laval, Quebec, Canada (**2013**).
(44) "Nanomaterials for Energy Conversion and Storage", invited seminar speaker, Chemical Engineering Department, University of New Hampshire, NH (**2013**).
(45) "Nanomaterials for Energy Storage and Conversion", invited seminar speaker, National Institute of Standards and Technology, Gaithersburg, MD (**2013**).
(46) "Mesoporous Spinels as Efficient Oxygen Evolution Catalysts", oral presentation, AIChE annual meeting, San Francisco, CA (**2013**).
(47) "In-situ XAS Study of Self-switching electrocatalyst for OER and ORR", oral presentation, AIChE annual meeting, San Francisco, CA (**2013**).
(48) "In-situ XAS Study of Self-switching electrocatalyst for OER and ORR", oral presentation, MRS Spring meeting, San Francisco, CA (**2013**).
(49) "Mesoporous Spinels as Efficient Oxygen Evolution Catalysts", oral presentation, MRS Fall Meeting, Boston, MA (**2012**).
(50) "Ordered Mesoporous Li-Ni-Mn-O Spinels as Potential 5V Cathode Materials for Li-ion Batteries", oral presentation, MRS Fall Meeting, Boston, MA (**2012**).
(51) "Highly Ordered Mesoporous Materials as Potential Electrodes for Li-ion Batteries", oral presentation, MESD, AIChE annual meeting, Pittsburgh, PA (**2012**).
(52) "Nanostructured manganese oxides as efficient oxygen evolution catalysts", oral presentation, AIChE annual meeting, Pittsburgh, PA (**2012**).
(53) "Nanomaterials for Solar Fuel Production", oral presentation, MRS Spring Meeting, San Francisco, CA (**2012**).
(54) "Ionothermal Synthesis of Transition Metal Phosphate Frameworks", oral presentation, MRS Spring Meeting, San Francisco, CA (**2012**).
(55) "Nanostructured manganese oxides as efficient and robust oxygen evolution catalysts", poster presentation, MRS Fall Meeting, Boston, MA (**2011**).

(56) "Rechargeable lithium oxygen batteries", poster presentation, 4th Symposium on Energy Storage: Beyond Lithium Ion, Pacific Northwest National Laboratory, Richland, WA (**2011**).
(57) "Novel catalysts for energy conversion and storage", invited seminar speaker, School of Chemistry, Sun Yat-Sen University, Guangzhou, China (**2011**).
(58) "Novel materials for lithium-ion batteries", invited seminar speaker, Electrochemistry Division, US Army Research Laboratory, Adelphi, MD (**2010**).
(59) "Novel materials for lithium-ion batteries", invited seminar speaker, Experimental Station, E. I. DuPont de Nemours, Wilmington, DE (**2010**).

Presentations Prior to Employment at the University of Delaware
(60) "Metal oxide nanoclusters as efficient water oxidation catalysts", oral presentation, MRS Spring Meeting, San Francisco, CA (**2009**).
(61) "Co_3O_4 nanoclusters supported in mesoporous silica as efficient and robust water oxidation catalysts", oral presentation, ACS Fall Meeting, Washington DC (**2009**).
(62) "Mesoporous metal oxides for energy storage and conversion", oral presentation, MRS Spring Meeting, San Francisco, CA (**2008**).
(63) "Mesoporous electrode materials for lithium-ion batteries", invited presentation, 16th International Symposium on Solid Ion, Shanghai, China (**2007**).
(64) "Mesoporous Transition Metal Oxides: Synthesis, Magnetism, Energy", oral presentation, RSC Solid State Group Conference, University College London, London, United Kingdom (**2006**).
(65) "Nanowire and Mesoporous Transition Metal Oxides: Synthesis and Characterization", oral presentation, Nanomaterial EastChem Conference, University of St Andrews, St Andrews, United Kingdom (**2006**).
(66) "Nanomaterials for Energy Storage", oral presentation, MC7: Functional Materials for the 21st Century, University of Edinburgh, Edinburgh, United Kingdom (**2005**).
(67) "2D and 3D Mesoporous Iron Oxides", poster presentation, New Opportunities in Materials Chemistry Conference, University College London, Royal Institute, London, United Kingdom (**2004**).
(68) "2D and 3D Mesoporous Iron Oxides", poster presentation, Dalton Discussion No. 7, University of St Andrews, St. Andrews, United Kingdom (**2004**).

Reviewer/Panelist for Proposals and Workshops

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**)
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 (a 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
Catalysis Today
Chemical Communications
Chemistry of Materials
ChemSusChem
Energy and Environmental Science
Energy and Fuels
Industrial & Engineering Chemistry Research
Journal of Catalysis
Journal of Materials Chemistry A
Journal of the American Chemical Society
Journal of the Electrochemical Society
Nano Energy
Nature
Nature Catalysis
Nature Communications
Nature Energy
Nature Nanotechnology
Physical Chemistry Chemical Physics
Science Advances

Membership in Professional Societies

American Chemical Society
American Institute of Chemical Engineering

Conference Symposium Organizer/Session Chair

(1) AIChE Annual Meeting, Session chair: Electrocatalysis and Photoelectrocatalysis (**2018**).
(2) 256th American Chemical Society National Meeting, ENFL, Symposium co-organizer: Carbon Dioxide Conversion & Artificial Photosynthesis (**2018**).

(3) 256th American Chemical Society National Meeting, ENFL, Symposium co-organizer: Sustainable Energy Conversion via Innovative Electrocatalysis & Photocatalysis (**2018**).
(4) AIChE Annual Meeting, Session co-chair: Electrocatalysis and Photoelectrocatalysis (**2017**).
(5) 25th Biennial North American Meeting of the North American Catalysis Society, Session co-chair: Catalysis Poisoning and Deactivation 1 (**2017**).
(6) 25th Biennial North American Meeting of the North American Catalysis Society, Session co-chair: Environmental: CO_2 conversion 1 (**2017**).
(7) 254th American Chemical Society National Meeting, ENFL, Symposium co-organizer: Innovative Chemistry & Electrocatalysis for Low-Carbon Energy & Fuels: Discovery to Application (**2017**).
(8) 254th American Chemical Society National Meeting, CATL, Symposium co-organizer: Advances in Carbon Dioxide Utilization (**2017**).
(9) 91st American Chemical Society Colloid and Surface Science Symposium, Session co-organizer, New York (**2017**).
(10) 250th American Chemical Society National Meeting, ENFL, Symposium organizer: Innovative Chemistry & Electrocatalysis for Low-Carbon Energy & Fuels: Discovery to Application (**2015**).
(11) 248th American Chemical Society National Meeting, ENFL, Session co-chair: Carbon Dioxide Management: Recent Advances in Carbon Dioxide Capture, Conversion, Utilization and Storage (**2014**).
(12) AIChE Annual Meeting, Session co-chair: Biocomposites (**2013**).
(13) AIChE Annual Meeting, Session co-chair: Structure, Properties and Characterization of Nanocomposites (**2012**).

Service at University of Delaware

Junior Faculty Advisory Council (2014 – 2017)
Departmental Seminar Series Coordinator (2012 – 2014)
Undergraduate student advisor (2010 – Present)
Department Safety Committee (2012 – Present)

Collaborators (Current & Past)

Aditya Bhan (University of Minnesota)
Peter Bruce (University of St Andrews)
Jingguang G. Chen (Columbia University)
Heinz Frei (LBNL)
William A. Goddard III (CalTech)
Liangbing Hu (University of Maryland)
Jean-Claude Jumas (University Montpellier)
Yijin Kang (Northwestern University)
Freddy Kleitz (University of Vienna)
Yuanyue Liu (University of Texas at Austin)
Qi Lu (Tsinghua University)
Yuyan Shao (PNNL)
Mark Snyder (Lehigh University)

Dong Su (Brookhaven National Laboratory)
Dion Vlachos (University of Delaware)
John Xiao (University of Delaware)
Hongliang Xin (Virginia Tech)
Bingjun Xu (University of Delaware)
Xiaoxiang Xu (Tongji University)
Yushan Yan (University of Delaware)
Yang Yang (University of Central Florida)
Haimei Zheng (LBNL)
Kake Zhu (East China University of Science and Technology)

Postdoctoral Researcher & Student Advising

Postdoctoral Researchers

(1) Hongjie Tang (2017 – Present)

Graduate Students

(1) Wesley Luc (2014 – Present)
(2) Matthew Jouny (2015 – Present)
(3) Emily Jeng (2016 – Present)
(4) Byung Hee (Brian) Ko (2017 – Present)
(5) Haeun Shin (2018 – Present)
(6) Sean Overa (2018 – Present)

Visiting Graduate Students

(1) Jingjing Lyu (2017 – Present)

Undergraduate Students

Sarah DiBenede	(2018 - Present)	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)

Visiting High School Students

(1) Edward Bao (2012 – 2013)

Alumni

(1) Seif Yusuf M.Ch.E (2010 – 2012)

(2)	Bryan Yonemoto	PhD (2010 – 2015)
(3)	Gregory Hutchings	PhD (2010 – 2015)
(4)	Yan Zhang	M.Ch.E (2012 – 2015)
(5)	Qi Lu	Postdoctoral fellow (2012 – 2016)
(6)	Jonathan Rosen	PhD (2011 – 2016)
(7)	Andrew Craft	M.Ch.E. (2015 – 2017)
(8)	Wenlei Zhu	Postdoctoral fellow (2017 – 2018)