

# Charles C. L. McCrory, Ph.D.

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## Professional Appointments

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### Associate Professor, University of Michigan

- Associate Professor of Chemistry 2022-present
- Associate Professor of Macromolecular Science and Engineering 2022-present
- Assistant Professor of Chemistry 2015-2022
- Assistant Professor of Macromolecular Science and Engineering 2017-2022
- Dow Corning Assistant Professor of Chemistry 2017-2019

### Scientist, California Institute of Technology

- Member of the Professional Staff, Division of Chemistry and Chemical Engineering 2014-2015
- Lead Scientist, Benchmarking Project, Joint Center for Artificial Photosynthesis 2014-2015
- Senior Scientist, Benchmarking Project, Joint Center for Artificial Photosynthesis 2011-2014

## Academic and Professional Training

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### Postdoctoral Fellow, California Institute of Technology 2010-2011

*Advisor:* Jonas C. Peters, Division of Chemistry and Chemical Engineering

*Project:* Electrocatalytic Hydrogen Evolution by Molecular Co and Ni Complexes in Homogeneous Solution

### Ph.D. in Chemistry, Stanford University 2010

*Advisor:* Christopher E. D. Chidsey, Department of Chemistry

*Thesis:* Electrocatalytic Dioxygen Reduction by Surface-Immobilized Molecular Copper Complexes

### B.S. in Chemistry with Distinction and Departmental Honors, Indiana University 2004

### B.S. in Mathematics with Distinction, Indiana University 2004

*Advisor:* George E. Ewing, Department of Chemistry

*Thesis:* Thin Film Water on NaCl(001)

## Honors and Awards

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### Faculty:

- DOE Early Career Research Program Award, *Department of Energy* 2021-2026
- Scialog Fellow, Negative Emissions Science, *Research Corporation for Science Advancement* 2020-2022
- New Talent: Americas, *Dalton Transactions, Royal Society of Chemistry* 2020
- Cottrell Scholar Award, *Research Corporation for Science Advancement* 2019-2022
- Kavli Fellow, *National Academy of Sciences, Kavli Frontiers of Science Program* 2019
- NSF CAREER Award, *National Science Foundation* 2018-2023
- Nominated for Golden Apple Award, *Students of the University of Michigan* 2018, 2019
- Dow Corning Assistant Professor of Chemistry, *University of Michigan* 2017-2019

**Graduate:**

Ford Foundation Dissertation Fellowship, <i>National Research Council</i>	2008
Centennial Teaching Assistant Award, <i>Stanford University</i>	2008
Daniel Cubicciotti Award, Honorable Mention, <i>Electrochemical Society, San Francisco Section</i>	2008
Franklin Veatch Memorial Fellowship, <i>Stanford University</i>	2006

**Undergraduate:**

Elected to Phi Beta Kappa	2004
Mathers Summer Scholarship, <i>Indiana University</i>	2003
William H. Bell Award in Chemistry, <i>Indiana University</i>	2002
Sigma Xi Undergraduate Researcher Award, <i>Sigma Xi, Indiana University Chapter</i>	2002
Votaw Summer Research Scholarship, <i>Indiana University</i>	2002
Honors Division Summer Research Scholarship, <i>Indiana University</i>	2002
COMAP Mathematical Contest in Modeling, Honorable Mention,	2001, 2002
R. J. Grim Scholarship, <i>Indiana University</i>	2001-2002
Harry G. Day Summer Scholarship, <i>Indiana University</i>	2000
Upjohn & Pharmacia Summer Research Scholarship, <i>Indiana University</i>	2000
Wells Scholarship, <i>Indiana University</i>	1999-2003

**Publications**


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Total citations = 10,433; *h*-index = 21 ([Google Scholar](#))

**Publications Based on Work at the University of Michigan (18 published, 3 Submitted)**

McCrory Lab Undergraduate; McCrory Lab Graduate Student or Postdoc;

†Equally Contributing Author; \*Corresponding Author

41. Soucy, T. L.; Dean, W. S.; Rivera Cruz, K. E.; Eisenberg, J. B.; **McCrory, C. C. L.\*** “The Influence of pH and Electrolyte Concentration on Fractional Protonation and CO<sub>2</sub> Reduction Activity in Polymer-Encapsulated Cobalt Phthalocyanine.” *Submitted*.
40. Yao, L., Yin, C.; Rivera Cruz, K. E.; **McCrory, C. C. L.\***; Singh, N. R.\* “Translating Catalyst-Polymer Composites from Liquid to Gas-Fed CO<sub>2</sub> Electrolysis: Identifying and Bridging Knowledge Gaps in Hydrophobicity.” *Submitted*.
39. Michaud, S. E., Barber, M. M.; Rivera Cruz, K. E.; **McCrory, C. C. L.\*** “Electrochemical Oxidation of Primary Alcohols using a Co<sub>2</sub>NiO<sub>4</sub> Catalyst: Effects of Alcohol Identity and Electrochemical Bias on Product Distribution.” *ACS Catalysis*, **2023**, *13*, 515-529. DOI: [10.1021/acscatal.2c02923](https://doi.org/10.1021/acscatal.2c02923)
38. Nie, W.-X.\*, **McCrory, C. C. L.\*** “Strategies for Breaking Molecular Scaling Relationships for the Electrochemical CO<sub>2</sub> Reduction Reaction.” *Dalton Transactions*, **2022**, *51*, 6993-7010. DOI: [10.1039/D2DT00333C](https://doi.org/10.1039/D2DT00333C) **\*\*Invited Contribution. \*\*Featured in RSC Themed Collection “Dalton Transactions HOT Articles.”**

37. Soucy, T. L.; Dean, W. S.; Zhou, J.; Rivera Cruz, K. E.; **McCrory, C. C. L.\*** “Considering the Influence of Polymer-Catalyst Interactions on the Chemical Microenvironment of Electrocatalysts for the CO<sub>2</sub> Reduction Reaction.” *Accounts of Chemical Research*, **2022**, *55*, 252-261. DOI: [10.1021/acs.accounts.1c00633](https://doi.org/10.1021/acs.accounts.1c00633) **\*\*Invited Contribution to special issue: “CO<sub>2</sub> Reductions via Photo and Electrochemical Processes.”**
36. Soucy, T. L.†; Liu, Y.†; Eisenberg, J. B.; **McCrory, C. C. L.\*** “Enhancing Electrochemical Carbon Dioxide Reduction by Polymer-Encapsulated Cobalt Phthalocyanine through Incorporation of Graphite Powder.” *ACS Applied Energy Materials*, **2022**, *5*, 159-169. DOI: [10.1021/acsaem.1c02689](https://doi.org/10.1021/acsaem.1c02689).
35. Rivera Cruz, K. E.†; Liu, Y.†; Soucy, T. L., Zimmerman, P. M.\*; **McCrory, C. C. L.\*** “Increasing the CO<sub>2</sub> Reduction Activity of a Cobalt Phthalocyanine by Modulating the  $\sigma$ -donor Strength of Axially-Coordinating Ligands.” *ACS Catalysis*, **2021**, *11*, 13203-13216. DOI: [10.1021/acscatal.1c02379](https://doi.org/10.1021/acscatal.1c02379).
34. Nie, W.-X.; Tarnopol, D. E.; **McCrory, C. C. L.\*** “Enhancing a Molecular Electrocatalyst’s Activity for CO<sub>2</sub> Reduction by Simultaneously Modulating Three Substituent Effects.” *Journal of the American Chemical Society*, **2021**, *143*, 3764-3778, DOI: [10.1021/jacs.0c09357](https://doi.org/10.1021/jacs.0c09357).
33. § Nie, W.-X.; Tarnopol, D. E.; **McCrory, C. C. L.\*** “The Effect of Extended Conjugation on Electrocatalytic CO<sub>2</sub> Reduction by Molecular Catalysts and Macromolecular Structures.” *Current Opinions in Electrochemistry*, **2021**, *28*, 100716. DOI: [10.1016/j.coelec.2021.100716](https://doi.org/10.1016/j.coelec.2021.100716). **\*\*Invited Contribution to themed issue “Innovative Methods in Electrochemistry.”**
32. Michaud, S. E.; Riehs, M. T.; Feng, W.-J.; Lin, C.-C.; **McCrory, C. C. L.\*** “A CoV<sub>2</sub>O<sub>4</sub> Precatalyst for the Oxygen Evolution Reaction: Highlighting the Importance of Postmortem Catalyst Characterization.” *Chemical Communications*, **2021**, *57*, 883-886. DOI: [10.1039/D0CC06513G](https://doi.org/10.1039/D0CC06513G). **\*\*Invited Contribution to RSC Themed Collection “(Photo)electrocatalysis for Renewable Energy.”**
31. Kallick, J. K.; Feng, W.-J.; **McCrory, C. C. L.\*** “Controlled Growth of Multilayer Films of Discrete Molecular Catalysts using a Layer-by-Layer Growth Mechanism Based on Sequential Click Chemistry.” *ACS Applied Energy Materials*, **2020**, *3*, 6222-6231. DOI: [10.1021/acsaem.0c00332](https://doi.org/10.1021/acsaem.0c00332).
30. Liu, Y.†; Deb, A.†; Leung, K. Y.; Nie, W.-X.; Penner-Hahn, J. E.\*, **McCrory, C. C. L.\*** “Determining the Coordination Environment and Electronic Structure of Polymer-Encapsulated Cobalt Phthalocyanine under Electrocatalytic CO<sub>2</sub> Reduction Conditions using *in situ* X-ray Absorption Spectroscopy.” *Dalton Transactions*, **2020**, *49*, 16329-16339. DOI: [10.1039/D0DT01288B](https://doi.org/10.1039/D0DT01288B). **\*\*Invited Contribution to New Talent: America issue. \*\*Featured in RSC Themed Collection “Dalton Transactions HOT Articles.”**
29. Nie, W.-X.; Wang, Y.; Zheng, T.; Ibrahim, A., Xu, Z.; **McCrory, C. C. L.\*** “Electrocatalytic CO<sub>2</sub> Reduction by Cobalt Bis(pyridylmonoimine) Complexes: Effect of Ligand Flexibility on Catalytic Activity.” *ACS Catalysis*, **2020**, *10*, 4942-4959. DOI: [10.1021/acscatal.9b05513](https://doi.org/10.1021/acscatal.9b05513).
28. Leung, K. Y.; **McCrory, C. C. L.\*** “The Effect and Prevention of Trace Ag<sup>+</sup> Contamination from Ag/AgCl Reference Electrodes on CO<sub>2</sub> Reduction Product Distributions at Polycrystalline Copper Electrodes.” *ACS Applied Energy Materials*, **2019**, *2*, 8283-8293. DOI: [10.1021/acsaem.9b01759](https://doi.org/10.1021/acsaem.9b01759).
27. § Liu, Y.; Leung, K. Y.; Michaud, S. E.; Soucy, T. L.; **McCrory, C. C. L.\*** “Controlled Substrate Transport to Electrocatalyst Active Sites for Enhanced Selectivity in the Carbon Dioxide Reduction Reaction.” *Comments on Inorganic Chemistry*, **2019**, *39*, 242-269. DOI: [10.1080/02603594.2019.1628025](https://doi.org/10.1080/02603594.2019.1628025). **\*\*Invited Perspective/Review Article.**

26. Liu, Y.; **McCrory, C. C. L.\*** “Modulating the Electrocatalytic Mechanism of Selective CO<sub>2</sub> Reduction by Cobalt Phthalocyanine Through Polymer Coordination and Encapsulation.” *Nature Communications*, **2019**, *10*, 1683. DOI: [10.1038/s41467-019-09626-8](https://doi.org/10.1038/s41467-019-09626-8).
25. McMillion, N. D.; Wilson, A. W.; McKenna, G. K.; Chang, M-C.; Lin, C-C.; Feng, W-J.; **Charles, C. C. L.**; Anderson, J. S.\* “Imidazole for Pyridine Substitution Leads to Enhanced Activity Under Milder Conditions in Cobalt Water Oxidation Electrocatalysis.” *Inorganic Chemistry*, **2019**, *58*, 1391-1397. DOI: [10.1021/acs.inorgchem.8b02942](https://doi.org/10.1021/acs.inorgchem.8b02942).
24. § **McCrory, C. C. L.\***, Jung, S.; Kallick, J. “Evaluating Electrocatalysts for Solar Water-Splitting Reactions.” In *Integrated Solar Fuels Generators*. Sharp, I; Lewerenz, H. J.; Atwater, H., Eds. Royal Society of Chemistry: London, **2019**, pp. 154-181. DOI: [10.1039/9781788010313-00154](https://doi.org/10.1039/9781788010313-00154). **\*\*Invited Book Chapter**.
23. Nie, W.-X.; **McCrory, C. C. L.\*** “Electrocatalytic CO<sub>2</sub> Reduction by a Cobalt Bis(Pyridyl)Monoimine) Complex: Effect of Acid Concentration on Catalyst Activity and Stability.” *Chemical Communications*, **2018**, *54*, 1579-1582. DOI: [10.1039/C7CC08546J](https://doi.org/10.1039/C7CC08546J).
22. Lin, C.-C.; **McCrory, C. C. L.\*** “Effect of Chromium Doping on Electrochemical Water Oxidation Activity by Co<sub>3-x</sub>Cr<sub>x</sub>O<sub>4</sub> Spinel Catalysts.” *ACS Catalysis*, **2017**, *7*, 443-451. DOI: [10.1021/acscatal.6b02170](https://doi.org/10.1021/acscatal.6b02170).
21. Jung, S.\*; Kortlever, R.; Jones, R. J. R.; Lichterman, M. F.; Agapie, T.; **McCrory, C. C. L.\***; Peters, J. C.\* “Gastight Hydrodynamic Electrochemistry: Design for a Hermetically Sealed Rotating Disk Electrode Cell.” *Analytical Chemistry*, **2017** *89*, 581-585. DOI: [10.1021/acs.analchem.6b04228](https://doi.org/10.1021/acs.analchem.6b04228).

#### **Publications Based on Work at Joint Center for Artificial Photosynthesis**

20. Kramer, W. W.; **McCrory, C. C. L.\*** “Polymer Coordination Promotes Selective CO<sub>2</sub> Reduction by Cobalt Phthalocyanine.” *Chemical Science*, **2016**, *7*, 2506-2515. DOI: [10.1039/C5SC04015A](https://doi.org/10.1039/C5SC04015A). **\*\*Cover Article – Inside Front Cover. \*\*Featured in RSC Themed Collection “Global Energy Challenges: Fossil Fuels.”**
19. Jung, S.\*; **McCrory, C. C. L.\***; Ferrer, I. M.; Peters, J. C.\*; Jaramillo, T. F.\* “Benchmarking Nanoparticulate Metal Oxide Electrocatalysts for the Alkaline Water Oxidation Reaction.” *Journal of Materials Chemistry A*, **2016**, *4*, 3068-3076. **\*\*Invited contribution for themed issue “Water Splitting and Photocatalysis.” \*\*Featured in RSC Themed Collection “2016 Journal of Materials Chemistry A Most Accessed Manuscripts.”**
18. **McCrory, C. C. L.\***; Szymczak, N. K.; Peters, J. C.\* “Evaluating Activity for Hydrogen-Evolving Cobalt and Nickel Complexes at Elevated Pressures of Hydrogen and Carbon Dioxide.” *Electrocatalysis*, **2016**, *7*, 87-96.
17. **McCrory, C. C. L.\***; Jung, S.; Ferrer, I. M.; Chatman, S. M.; Peters, J. C.\*; Jaramillo, T. F.\* “Benchmarking Hydrogen Evolving Reaction and Oxygen Evolving Reaction Electrocatalysts for Solar Water Splitting Devices.” *Journal of the American Chemical Society*, **2015**, *137*, 4347-4357.

16. Rittle, J.; **McCrory, C. C. L.**; Peters, J. C.\* “A 10<sup>6</sup>-fold Enhancement in N<sub>2</sub>-Binding Affinity of an Fe<sub>2</sub>(μ-H)<sub>2</sub> Core upon Reduction to a Mixed-Valent Fe<sup>II</sup>Fe<sup>I</sup> State.” *Journal of the American Chemical Society*, **2014**, *136*, 13853-13862.
15. Saadi, F. H.; Carim, A. I.; Velazquez, J. M.; **McCrory, C. C. L.**; Soriaga, M. P.\*; Lewis, N. S.\* “Operando Synthesis of Macroporous Molybdenum Diselenide Films for the Electrocatalysis fo the Hydrogen Evolution Reaction.” *ACS Catalysis*, **2014**, *4*, 2866-2873.
14. Lacy, D. C.; **McCrory, C. L.**; Peters, J. C.\* “Studies of Cobalt-Mediate CO<sub>2</sub> Reduction using a Redox-Active Ligand.” *Inorganic Chemistry*, **2014**, *53*, 4980-4988.
13. Hsieh, C.-H.; Erdem, O. F.; Ding, S.; Crouthers, D. J.; Liu, T.; **McCrory, C. C. L.**; Lubitz, W.; Popescu, C. V.; Reibenspies, J. H.; Hall, M. B.; Darensbourg, M. Y.\*; “Redox Active Iron Nitrosyl Units in Proton Reduction Electrocatalysis.” *Nature Communications*, **2014**, *5*, 3684.
12. Baricuatro, J. H.; Kim, Y.-G.; Saadi, F.; **McCrory, C. C. L.**; Sanabria-Chinchilla, J.; Crouthers, D.; Darensbourg, M. Y.; Soriaga, M. P.\* “Heterogenization of a Water-Insoluble Molecular Complex for Catalysis of the Proton-Reduction Reaction in Highly Acidic Aqueous Solutions.” *Electrocatalysis*, **2014**, *5*, 226-228.
11. **McCrory, C. C. L.\***; Jung, S.; Peters, J. C.\*; Jaramillo T. F.\* “Benchmarking Heterogeneous Electrocatalysts for the Oxygen Evolution Reaction.” *Journal of the American Chemical Society*, **2013**, *135*, 16977-16987. **\*\*Featured as Editor’s Choice article in Science magazine. \*\*Featured in ACS Select Virtual Issue on “Inorganic Chemistry Driving the Energy Sciences.”**
10. Suseno, S.; **McCrory, C. C. L.**; Tran, R.; Gul, S.; Yano, J.; Agapie, T.\* “Molecular Mixed-Metal Manganese Oxido Cubanes as Precursors to Heterogeneous Oxygen Evolution Catalysts.” *Chemistry, a European Journal*, **2015**, *21*, 13420-13430.
9. Luca, O. R.\*; **McCrory, C. C. L.**; Dalleska, N. F.; Koval, C. A.\* “The Selective Electrochemical Conversion of Preactivated CO<sub>2</sub> to Methane.” *Journal of the Electrochemical Society*, **2015**, *162*, H473-H476.
8. Soriaga, M. P.\*; Baricuatro, J. H.; Cummins, K. D.; Kim, Y.-G.; Saadi, F. H.; Sun, G.; **McCrory, C. C. L.**; McKone, J. R.; Velazquez, J. M.; Ferrer, I. M.; Carim, A. I.; Javier, A.; Chmielowiec, B.; Lacy, D. C.; Gregoire, J. M.; Sanabria-Chinchilla, J.; Amashukeli, X.; Royea, W. T.; Brunschwig, B. S.; Hemminger, J. C.; Lewis, N. S.; Stickney, J. L.; “Electrochemical Surface Science Twenty Years Later. Expeditions into the Elecrocatalysis of Reactions at the Core of Artificial Photosynthesis.” *Surface Science*, **2015**, *641*, 285-294.
7. Ni, K.-Y.; Lin, F.; Jung, S.\*; Fang, L.; Nordlund, D.; **McCrory, C. C. L.**; Weng, T-C.; Ercius, P.; Doeff, M. M.; Zheng, H.\*; “Tuning Complex Transition Metal Hydroxide Nanostructures as Active Catalysts for Water Oxidation by a Laser-Chemical Route.” *Nano Letters*, **2015**, *15*, 2498-2503

#### **Publications Based on Postdoctoral, Graduate, and Undergraduate Work**

6. Brownell, K.; **McCrory, C. C. L.**; Chidsey, C. E. D.; Perry, R. H.; Zare, R. N.\*; Waymouth, R. M.\* “Electrooxidation of Alcohols Catalyzed by Amino Alcohol Ligated Ruthenium Complexes.” *Journal of the American Chemical Society*, **2013**, *135*, 14299-14305.



5. **McCrory, C. C. L.**; Uyeda, C.; Peters, J. C.\* “Electrocatalytic Hydrogen Evolution in Acidic Water with Molecular Cobalt Tetraazamacrocycles.” *Journal of the American Chemical Society*, **2012**, *134*, 3164-3170.
4. **McCrory, C. C. L.**; Devadoss, A; Ottenwaelder, X; Lowe, R. D.; Stack, T. D. P.\*; Chidsey, C. E. D.\* “Electrocatalytic O<sub>2</sub> Reduction by Covalently Immobilized Copper(I) Complexes: Evidence for a Binuclear Cu<sub>2</sub>O<sub>2</sub> Intermediate.” *Journal of the American Chemical Society*, **2011**, *133*, 3696-3699.
3. **McCrory, C. C. L.**; Ottenwaleder, X.; Stack. T. D. P.\*; Chidsey, C. E. D.\*; “Mechanistic and Kinetic Studies of the Electrocatalytic Reduction of O<sub>2</sub> to H<sub>2</sub>O with Mononuclear Cu Complexes of Substituted 1,10-Phenanthroline.” *Journal of Physical Chemistry A*, **2007**, *111*, 12641-12650. \*\* [Invited Article: Giacinto Scole Festschrift](#)
2. Conley, N. R.; Pearson, D. M.; Labios, L. A.; **McCrory, C. C. L.**; Waymouth, R. M.\* “Aerobic Alcohol Oxidation with a Cationic Palladium Complex: Insights into Catalyst Design and Decomposition.” *Organometallics*, **2007**, *26*, 5447-5453.
1. Cantrell, W.; **McCrory, C.**; Ewing, G. E.\*; “Nucleated Deliquescence of Salt.” *Journal of Chemical Physics*, **2002**, *116*, 2116-2120.

#### *United States Patents*

**McCrory, C.**; Jung, S.; Jones, R. J. R.; Rotating Disk Electrode Cell, U.S. Patent 10,451,580 B2, Oct. 22, 2019.

## Presentations

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**55** Total *Invited* Seminars and Conference Presentations as Faculty at U-M (52 delivered, 3 upcoming)

### Invited Departmental Seminars and Related Seminars:

#### **As Faculty Member at UM (36 delivered)**

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|---|------------|
| 36. University of Buffalo, Buffalo, NY  | March 2023 |
| 35. University of California Irvine, Irvine, CA   | Feb. 2023  |
| 34. ACS Division of Inorganic Chemistry Periodic Table Talk   | Jan. 2023  |
| 33. University of Wisconsin, Madison, WI  | Dec. 2022  |
| 32. Purdue University, West Lafayette, IN   | Nov. 2022  |
| 31. Virginia Clean Energy and Catalysis Club<br>University of Virginia, Virginia Tech, and Virginia Commonwealth University | May 2022   |
| 30. Stonybrook University, Department of Chemistry, Stony Brook, NY   | March 2022 |
| 29. Iowa State University, Department of Chemistry, Ames, IA  | Oct. 2021  |
| 28. California Institute of Technology, Division of Chemistry and Chemical Engineering,<br>Pasadena, CA                     | Sep. 2021  |
| 27. University of Southern California, Department of Chemistry, Los Angeles, CA   | Sep. 2021  |
| 26. Stanford University, Department of Chemistry, Stanford, CA  | May 2021   |

25. University of Zurich, Department of Chemistry, Zurich, Switzerland May 2021
24. University of Utah, Salt Lake City, UT April 2021
23. University of Rochester, Department of Chemistry, Rochester, NY April 2021
22. University of Illinois at Urbana-Champaign, Department of Chemistry, Urbana, IL April 2021
21. University of Illinois at Chicago, Chicago, IL March 2021
20. Yale University, Department of Chemistry, New Haven, CT March 2021
19. University of California Berkeley, College of Chemistry, Berkeley, CA Jan. 2021
18. University of Chicago, Department of Chemistry, Chicago, IL Jan. 2021
17. Virginia Tech University, Department of Chemistry, Blacksburg, VA Dec. 2020
16. University of Texas at Austin, Department of Chemistry, Austin, TX Oct. 2020
15. Texas A&M University, Department of Chemistry, College Station, TX Oct. 2020
14. Andrews University, Department of Chemistry and Biochemistry, Berrien, MI  
Dwain L Ford Guest Lecture Series Feb. 2020
13. Notre Dame University, Department of Chemistry, South Bend, IN Nov. 2020
12. Illinois Institute of Technology, Department of Chemistry, Chicago, IL Oct. 2019
11. Wayne State University, Department of Chemistry, Detroit, MI Oct. 2019
10. Michigan State University, Center of Research Excellence in Complex Materials,  
East Lansing, MI  
Renewable Energy Storage Seminar Series Oct. 2019
9. University of North Carolina Chapel Hill, Department of Chemistry, Chapel Hill, NC Sep. 2019
8. California Institute of Technology, Joint Center for Artificial Photosynthesis,  
Pasadena, CA July 2018
7. Dow Chemical Company, Midland, MI Oct. 2017
6. Shanghai Jiao Tong University, School of Chemistry and Chemical Engineering,  
Shanghai, China May 2017
5. University of Science and Technology of China, School of Chemistry and Materials,  
Heifei, China May 2017
4. Nanjing University, School of Chemistry and Chemical Engineering, Nanjing, China May 2017
3. Nankai University, College of Chemistry, Tianjin, China May 2017
2. University of the South, Department of Chemistry, Sewanee, TN Dec. 2016
1. Muhlenberg College, Department of Chemistry, Allentown, PA Sep. 2015

**Invited Departmental Seminars Prior to UM**

Pennsylvania State University, Department of Chemistry, State College, PA	Jan. 2015
University of Illinois at Chicago, Department of Chemistry, Chicago, IL	Dec. 2014
University of Michigan, Department of Chemistry, Ann Arbor, MI	Dec. 2014

**Invited Conference Talks and Symposia:****As Faculty Member at UM (16 delivered, 3 upcoming)**

19. Symposium on Advanced Biological Inorganic Chemistry, Kolkata, India ( <i>upcoming</i> )	Jan. 2024
18. Telluride Science Research Center Workshop, Telluride, CO ( <i>upcoming</i> ) Molecule Transformation through Proton-Coupled Electron Transfer for Energy Storage and Conversion	July 2023
17. 265 <sup>th</sup> ACS National Meeting, Indianapolis, IN ( <i>upcoming</i> ) Theoretical and Experimental Approaches to Catalyst Development Symposium	March 2023
16. Telluride Science Research Center Workshop, Telluride, CO Platinum Group Metals and PGM-free Electrocatalysts: Catalyst/Ionomer Interactions	March 2023
15. 2022 Southeast Regional Meeting of the American Chemical Society (SERMACS), San Juan, Puerto Rico The Chemistry of Solar Fuels Symposium	Oct. 2022
14. 263 <sup>rd</sup> ACS National Meeting, San Diego, CA The Role of Fundamental Interfacial Processes in Electrocatalysis	March 2022
13. 262 <sup>nd</sup> ACS National Meeting, Atlanta, GA New Methods in Nanocatalyst Development	Aug. 2021
12. Telluride Science Research Center Workshop, Telluride, CO Platinum Group Metal-free and Advanced Platinum Group Metal Electrocatalysts: Small Molecules Activation and Conversion	Jan. 2020
11. 258 <sup>th</sup> ACS National Meeting, San Diego, CA Charge and Substrate Transport in 3D Electrocatalytic Materials	Aug. 2019
10. 2019 Cottrell Scholars Conference, Tuscon, AZ	July 2019
9. Telluride Science Research Center Workshop, Telluride, CO Platinum Group Metal-free Electrocatalysts: Structure-to-Property Relations, Materials Synthesis and Integration in Catalyst Layers	June 2019
8. 257 <sup>th</sup> ACS National Meeting, Orlando, FL Sustainable Energy Conversion via Innovative Electrocatalysis and Photocatalysis Symposium	April 2019



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| 7. | Telluride Science Research Center Workshop, Telluride, CO<br>Interfacial Chemistry and Charge Transfer in Energy Storage and Conversion     | July 2018  |
| 6. | CCI-Solar Fuels Capstone Meeting, Ventura, CA   | July 2018  |
| 5. | 2018 Gordon Research Conference on Electrochemistry, Ventura, CA<br>Next Generation Electrocatalysts Session                                | Jan. 2018  |
| 4. | 254 <sup>th</sup> ACS National Meeting, Washington, DC<br>Innovative Chemistry & Electrocatalysis for Low-Carbon Energy and Fuels Symposium | Aug. 2017  |
| 3. | ACS Central Regional Meeting, Dearborn, MI<br>Catalysis by Metal Complexes and Nanomaterials Symposium                                      | June 2017  |
| 2. | 253 <sup>rd</sup> ACS National Meeting, San Francisco, CA<br>ACS Sustainability in Electrocatalytic Fuel and Chemical Production Symposium  | April 2017 |
| 1. | 253 <sup>rd</sup> ACS National Meeting, San Francisco, CA<br>Synthesis & Characterization of Materials for Energy Applications Symposium    | April 2017 |

#### **Invited Conference Talks and Symposia Prior to UM**

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|---|------------|
| AIChE Annual Meeting, Pittsburgh, PA<br>Electrokinetics and Electrocatalysis Tutorial Session                                   | Oct. 2012  |
| Europe-US Strategic Meeting - Solar Fuels: Light Capture and Electron Flow, Prague, Czech Republic                              | May 2011   |
| Electrochemical Society, San Francisco Section, Berkeley, CA<br>Award Presentation - Daniel Cubicciotti Award Honorable Mention | April 2008 |

#### **Contributed Talks:** (1 as Faculty at UM, 7 total)

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|---|------------|
| 251 <sup>st</sup> ACS National Meeting, San Diego, CA                         | March 2016 |
| 1 <sup>st</sup> International Solar Fuels Conference (ISF-1), Uppsala, Sweden | May 2015   |
| 245 <sup>th</sup> ACS National Meeting, New Orleans, LA                       | April 2013 |
| 241 <sup>st</sup> ACS National Meeting, Anaheim, CA                           | March 2011 |
| Gordon Research Seminar, Renewable Energy: Solar Fuels                        | Jan. 2011  |
| 215 <sup>th</sup> ECS National Meeting, San Francisco, CA                     | May 2009   |
| 2008 Conference of Ford Fellows, Washington, D.C.                             | Sep. 2008  |

## Active Research Support

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<b>Energy Frontier Research Center, Department of Energy (CoPI, Thrust Co-Lead)</b> <i>Center for Closing the Carbon Cycle (4C)</i>	2022-2026
<b>Department of Energy Early Career Research Program (DE-SC0022019, PI)</b> <i>Building from Discrete Molecular Electrocatalysts to Macromolecular Catalyst Architectures: the Effects of Charge Delocalization and Electronic Coupling on Electrocatalytic Activity</i>	2021-2026
<b>NSF CAREER Award (CHE-1751791, PI)</b> <i>Promoting Selective Electrochemical CO<sub>2</sub> Reduction by Controlling a Catalyst's Primary, Secondary, and Outer Coordination Spheres</i>	2018-2023
<b>NSF Standard Grant (CH-2004035, PI)</b> <i>Increasing the Reductive Stability of Self-Assembled Monolayers on Metallic Surfaces to Enable Reductive Electrocatalysis</i>	2020-2023
<b>Research Corporation Scialog: Negative Emissions Science (NES) Collaborative Research Grant, Alfred P. Sloan Foundation (PI)</b> <i>Electrified Low-Temperature Process for CO<sub>2</sub> Capture and Conversion (e-LT-C3)</i>	2021-2023
<b>Carbon Neutrality Accelerator Program, Graham Sustainability Institute, University of Michigan (CoPI)</b> <i>Chemistry and Technology of CO<sub>2</sub> Capture and Conversion to Fuels</i>	2021-2023

## Teaching Experience

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### University of Michigan

Instructor	Chem 649: Electrochemistry	W 2022
Course Coordinator	Chem 130: General Chemistry >1500 students, 4 instructors, 16 GSIs	F 2021
Instructor	Chem 130: General Chemistry	W 2017, W 2018, W 2019, W 2020, F 2021
Instructor	Chem 510/MSE 511: Graduate Materials Chemistry	F 2015, F 2016, F 2017, F 2018

### California Institute of Technology

Session Instructor	JCAP Winter School: Electrochemical Measurements	2013, 2014
Guest Lecturer	Ch 153B: Advanced Inorganic Chemistry	2011-2013, 2015

## **Mentoring, Outreach, and Diversity, Equity, and Inclusion (DEI) Activities**

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### **Science Café, UM Museum of Natural History, March 2023 (*upcoming*)**

“Renewable Energy Storage” discussion as part of UMMNH Science Café

### **Permanent Museum Exhibit, UM Museum of Natural History, 2021-2023**

“Renewable Energy Storage” exhibit as part of the “People and the Planet” permanent collection. Debuted 12/2022 and expected to run for ~10 years. Includes multimedia and interactives on different storage technologies: water splitting, pumped hydrostorage, and intercalation batteries.

### **Distinctive Voices in Science Forum, National Academy of Sciences, Irvine, CA, Sep. 2022**

“Designing Catalysts that Use Green Electricity to Convert Carbon Dioxide into Useful Chemicals and Fuels.” Seminar series that invites internationally recognized researchers to the Beckman Center to present their research areas to the general public. Only the 3<sup>rd</sup> researcher from UM to present in the 16 years of this invitation-only seminar series (others are Prof. Monica Dus, Prof. Felix Warneken, and Prof. Jeff Sakamoto)

### **Faculty Advisor for 2023 ACS National Graduate Polymer Research Conference (NGPRC), University of Michigan Macro Program, 2021-2023.**

#### **Faculty Advisor for Student Groups at U-M:**

**NOBCCHE, U-M Chapter:** *National Organization for the Professional Advancement of Black Chemists and Chemical Engineers, University of Michigan Chapter* (2020-present)

**commUNITY,** *a student group focused on social and professional development of BIPOC students, faculty and staff at U-M* (2020-present)

**ACS Polymer Division,** *University of Michigan Chapter* (2020-present)

### **Faculty Mentor for D-Rise, 10-week paid summer research internship for underprivileged students at Cass Tech High School in Detroit, MI. (Summer 2018, Summer 2019, Summer 2022)**

### **Faculty Mentor for M-CORE: Michigan chemistry Opportunities for Research and Education, visit weekend to U-M Chemistry Department for senior undergraduate students from underrepresented groups featuring 1-on-1 meetings with faculty mentors and advising on graduate school applications. (Fall 2015, 2016, 2018, 2019, 2020, 2022)**

### **Informal Mentoring/Advising of Students from Underrepresented Groups (2016-present)**

Informal discussions with students from underrepresented groups about topics such as maintaining motivation, coping with “Imposter Syndrome” and “Survivor Guilt,” learning from research failures, time management, handling (micro)aggressions, and effectively communicating with faculty mentors.

### **Faculty Panelist for Newnan’s Student Engagement Committee Workshop**

*Letters of Recommendation Workshop* (March 2021)

Discussion on how students can build relationships with professors in virtual environments, especially for minoritized and/or traditionally marginalized students.

**Faculty Presenter for NOBCChE, U-M Chapter Meeting***Navigating through Challenges as a Student in STEM* (Dec. 2020)

Discussion based on my experiences as a student, postdoc, staff scientist, and educator, and focused on how to cope with feelings of isolation and “otherness” as a BIPOC student at primarily white institutions; strategies for coping with imposter syndrome; how to constructively handle (micro)aggressions, etc.

**Faculty Panelist for commUNITY Workshop***Remote Learning & Success: Facilitated by U-M Counseling and Psychological Services* (Nov. 2020)

Discussion on strategies for staying motivated during online learning, engaging with instructors and research advisors, accepting lower productivity due to the pandemic, and when and how to ask for help.

**Presenter/Facilitator for UM Student Chapter of the American Chemical Society Workshop***Chemistry Graduate Student Admissions Workshop* (Feb. 2020)

Focus of presentation was on addressing six general questions: “(1) Should I pursue a Ph.D.?; (2) How do I prepare now for grad school later?; (3) Where should I apply to Grad School?; (4) What’s included in graduate applications?; (5) How and when (and from whom) do I request recommendation letters?; and (6) How are applications evaluated and what does ‘holistic’ review really mean?”

**Panelist for CSE|UM: Chemical Sciences at the Interface of Education at University of Michigan, a professional development student group.**

Industry to Academia Panel (Nov. 2019)

Academic Laboratory Management Panel (March 2017)

Early Faculty Careers Panel (Nov. 2016)

**Faculty Mentor/Panelist for U-M NextProf Science, multiday professional development workshop for senior graduate students and postdocs throughout the US from underrepresented background interested in faculty careers in STEM fields.**

Faculty Mentor in Chemistry including 1-on-1 meetings with participants, feedback and advice on research and teaching statements (Winter 2019, Winter 2020)

Panelist for Chemistry Career Discussion Panel (Winter 2016)

**Poster Judge at Annual Biomedical Research Conference for Minority Student (ABRCMS) (Nov. 2019)****University of Michigan Museum of Natural History – Scientist Spotlight**

McCrory Lab Interactive Exhibit: “Ready, Shine, Bubble!” (Oct. 2019)

**Panelist at NSF CAREER Program Proposal Workshop at U-M, focused on providing practical guidance to U-M early faculty on successfully applying to for the NSF CAREER Award. (March 2018, March 2019)****Faculty Organizer for CHEM 801: Analytical Student Seminar Series (Fall 2018)****Faculty Mentor/Grader for MACRO 800: Research Seminars**

Derek Frank, Matzger Group, Faculty Grader (June 2019)

Taesu Kim, Goodson Group, Faculty Mentor (Jan-March 2019)

Taeyong Ahn, Banaszak Holl Group, Faculty Mentor (May-July 2018)

**Forsythe Young Scientists’ Expo featuring U-M Science Spotlight**

McCrory Lab Interactive Exhibit: “Electrochemical Water Splitting” (March 2018)

**Ann Arbor Hands-On Museum — Science for the Public Event**

McCrory Lab Interactive Exhibit: “Will it Bubble” (April 2017)

**Faculty Speaker for U-M Applied Physics Seminar (AP 514):**

“Increasing Electrocatalytic Activity and Selectivity of Molecular Systems for Small Molecule Transformations.” (March 2018)

“Electrocatalytic Transformations of Small Molecules for Renewable Energy Applications.” (Oct. 2015)

**Interview with *MiSciWriters* Blog:** “Water Splitting Part II: Research at U-M.” (Feb. 2016)**Speaker at Lightning Session for Water@Michigan Symposium**

“Electrochemical Reduction of Groundwater Pollutants for Wastewater Remediation.” (Jan. 2016)

**Academic Service**

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**Manuscript Reviewer: (> 250 reviews)****Publishing Service**

Guest Editor, *Journal of Chemical Physics*, “In Situ and Operando Characterization” Special Issue (*upcoming*), 2023

**Proposal and Program Reviewer (2017-present)**

Department of Energy, *Office of Energy Efficiency and Renewable Energy (EERE)*: Bioenergy Technologies Office (BETO), 2021 Peer Review Panel, CO<sub>2</sub> Utilization Technology Area

Department of Energy: *Basic Energy Sciences (BES)*; *Energy Efficiency and Renewable Energy (EERE)*

National Science Foundation: *Division of Chemistry (CHE)*; *Division of Materials Research (DMR)*

American Chemical Society: *Petroleum Research Fund*

Research Corporation for Science Advancement: *Cottrell Scholars Program*

Others: *Royal Society of New Zealand*, *Netherlands Organization for Scientific Research*, *Reaxys PhD Prize*

**Symposium Organizing/Planning:**

2023 Materials Research Society Fall Meeting & Exhibit, Boston, MA, *Emerging Electrocatalytic Materials and Devices for Clean Energy and Environmental Applications*, Symposium Organizer, November 2023 (*upcoming*)

4<sup>th</sup> Japanese-American-German Kavli Frontiers of Science Symposium, Dresden, Germany, *Quantum Science and Technology*, Planning Group Member, October 2023 (*upcoming*)

3<sup>rd</sup> Japanese-American-German Kavli Frontiers of Science Symposium, Irvine, CA, *Small Molecule Transformations with Inorganic Compounds and Materials*, Planning Group Member, September 2022

258<sup>th</sup> ACS National Meeting, San Diego, CA, *Charge and Substrate Transport in 3-D Electrocatalytic Materials*, Division of Inorganic Chemistry, Symposium Organizer, August 2019

**University of Michigan/Departmental Service**

Chemistry Department Executive Committee (2022-present)

LSA Carbon Neutrality Working Group—Facilities and Operations (2021-2022)

Michigan Materials Characterization Center (MC)<sup>2</sup> Advisory Council (2019-2020)

Chemistry Safety Strategy Committee (2020-2021, 2022-present)

Chemistry Recruiting Committee (2015-2016, 2019-2020, 2022-present)

Chemistry Diversity Committee (2016-2017, 2020-2022)

Chemistry Undergraduate Advising Committee (2019-2022)

Chemistry Faculty Search Committee (2018-2019)

Chemistry Graduate Student Admissions Committee (2016-2019)

**Professional Society Memberships and Affiliations:**

American Chemical Society (**ACS**), American Institute of Chemical Engineers (**AIChE**), Electrochemical Society (**ECS**), National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (**NOBCChE**)