

PROMOTION RECOMMENDATION
The University of Michigan
College of Literature, Science, and the Arts

Charles McCrory, assistant professor of chemistry, College of Literature, Science, and the Arts, and assistant professor of macromolecular science and engineering, College of Engineering, is recommended for promotion to associate professor of chemistry, with tenure, College of Literature, Science, and the Arts, and associate professor of macromolecular science and engineering, without tenure, College of Engineering.

Academic Degrees:

Ph.D.	2010	Stanford University
B.S.	2004	Indiana University

Professional Record:

2017-present	Assistant Professor of Macromolecular Science and Engineering, University of Michigan
2017-2019	Dow Corning Assistant Professor of Chemistry, University of Michigan
2015-present	Assistant Professor of Chemistry, University of Michigan
2014-2015	Member of the Professional Staff, Division of Chemistry and Chemical Engineering, California Institute of Technology
2014-2015	Lead Scientist, Benchmarking Project, Joint Center for Artificial Photosynthesis, California Institute of Technology
2011-2014	Senior Scientist, Benchmarking Project, Joint Center for Artificial Photosynthesis, California Institute of Technology
2010-2011	Post-doctoral Fellow, California Institute of Technology, California Institute of Technology

Summary of Evaluation:

Teaching: Professor McCrory has a strong record in all aspects of his teaching. Professor McCrory taught CHEM 130, the largest introductory chemistry course, five times and CHEM 511, a graduate course in materials chemistry, four times. His Q2 student evaluations were comparable to other CHEM 130 instructors. More important was his significant revision of the course to emphasize learning concepts over facts. These revisions include reformatting exams, providing in-class discussion and problem-solving time, and using a new textbook that promotes his goal. In terms of mentoring, his group has done well as shown by the good size group he has recruited and the placement of his graduate students. He has mentored 12 undergraduates, a sizable number, and three of his papers include undergraduates as co-authors.

Research: Professor McCrory is an inorganic and materials chemist with a specialty in electrochemistry. One focus of his research has been on understanding catalysis of carbon dioxide reduction. Reduction of CO₂ is thermodynamically favorable but requires catalysis to achieve meaningful rates of reaction. It is also extremely relevant as it can lead to production of fuels in a carbon neutral manner and in solar energy systems. Professor McCrory has significantly advanced the concept of encapsulating catalytic metal atoms within a polymer to enhance catalysis or selectivity. He has also investigated how ligands bound to metals can be used to modulate molecular catalysts, and how various solid-state catalysts can be altered to affect CO₂ reduction and oxidation of water to O₂ (important in fuel cells). His measurements are guiding the development of new and

better catalysts. He has been well recognized for this work with a DOE Early Career Award, a NSF Career award, and a Cottrell Scholar award. His funding and research trajectory leave him well positioned to accelerate and grow his research program.

Recent and Significant Publications:

- Nie, W.-X., Tarnopol, D. E., McCrory, C. C. L. (2021). Enhancing a molecular electrocatalyst's activity for CO₂ reduction by simultaneously modulating three substituent effects. *Journal of the American Chemical Society*, 143(10), 3764-3778. doi: 10.1021/jacs.0c09357
- Liu, Y., McCrory, C. C. L. (2019). Modulating the electrocatalytic mechanism of selective CO₂ reduction by cobalt phthalocyanine through polymer coordination and encapsulation. *Nature Communications*, 10(1), 1-10. doi: 10.1038/s41467-019-09626-8
- Rivera Cruz, K. E., Liu, Y., Soucy, T. L., Zimmerman, P. M., McCrory, C. C. L. (2021). Increasing the CO₂ reduction activity of a cobalt phthalocyanine by modulating the σ -donor strength of axially coordinating ligands. *ACS Catalysis*, 11(21), 13203-13216. doi: 10.1021/acscatal.1c02379
- Nie, W.-X., Wang, Y., Zheng, T., Ibrahim, A., Xu, Z., McCrory, C. C. L. (2020). Electrocatalytic CO₂ reduction by cobalt bis(pyridylmonoimine) complexes: Effect of ligand flexibility on catalytic activity. *ACS Catalysis*, 10(9), 4942-4959. doi: 10.1021/acscatal.9b05513

Service: Professor McCrory is a model citizen who enriches the department through meaningful service and outreach. He is one of two faculty advisors for commUNITY, a new organization to give voice to underrepresented students, and the advisor for our new local chapter of NOBCCChE (National Organization of Black Chemists and Chemical Engineers). Professor McCrory does a tremendous amount of informal mentoring to BIPOC students. He has served as a panelist on the university's workshops on NSF CAREER proposals, Sustainability, and Newnan's Student Engagement. Professor McCrory was a contributing PI on a project sponsored by the Research Corporation to promote DEI best practices and networking throughout academia. Additionally, Professor McCrory and his group members have contributed scientific exhibits at local museums.

External Reviewers:

Reviewer (A): "I consider Prof. McCrory to be a tremendously talented individual with an equally high degree of motivation and diligence, great experimental skills and scientific judgment...[Professor McCrory] is a real gem, as a scientist and as a person..."

Reviewer (B): "My overall impression of Prof. McCrory's scholarly work is that he has shown excellent productivity while maintaining high quality in his work...Looking at the totality of Prof. McCrory's work, I would describe him as a leader in the area of CO₂RR [carbon dioxide reduction reaction], not just among early career scientists but more broadly."

Reviewer (C): "Understanding the reduction mechanism of CO₂ to inform future catalyst design towards more active and selective catalyst is a hot area and Dr. McCrory's work has provided a new perspective in designing model catalyst systems to investigate the coordination environment around the active site...The quality of his papers is high and in some very good journals, indicating scientific leadership."

Reviewer (D): "Dr. McCrory has made some very important contributions to the area of CO₂ electroreduction. Relative to other researchers in the area, he is better, mostly because of his interest in developing understanding in addition to just turnover (rate). I anticipate..."


Dr. McCrory will have a stellar career...Prof. McCrory is the real deal: an excellent scientist with the ability...to develop new and important insight into problems of importance.”

Reviewer (E): “He has published innovative work...I note, in particular, his outstanding mechanistic work on electrocatalytic reduction of carbon dioxide (Nature Communications and RSC Chemical Communications) and his creative design work on electrocatalysts for oxidative splitting of water (ACS Catalysis).”

Reviewer (F): “He has distinguished himself through his studies of controlling the local environment of electrocatalysts to improve their activity and selectivity. His paper that describes how the immobilization of a cobalt phthalocyanine electrocatalyst within a polyvinylpyridine polymer film leads to complete suppression of HER leaving CO₂ reduction as the only viable reaction channel [Chem. Sci. 2016, 2506] is superb.”

Summary of Recommendation:

Professor McCrory has developed a detailed understanding of the reduction of CO₂ based on catalysts within controlled chemical environments, paving the way for efficient use of this reaction in producing fuels from solar energy. He is teaching some of the largest and most important classes in the department in an effective and novel way. His service contributions, especially related to improving climate, are at the highest level. The Executive Committees of the College of Literature, Science, and the Arts, and the College of Engineering, recommend that Assistant Professor Charles McCrory be promoted to the rank of associate professor of chemistry, with tenure, College of Literature, Science, and the Arts, and associate professor of macromolecular science and engineering, without tenure, College of Engineering.



Anne Curzan, Dean
Geneva Smitherman Collegiate Professor of
English Language and Literature, Linguistics,
and Education
Arthur F. Thurnau Professor
College of Literature, Science, and the Arts



Alec D. Gallimore, Ph.D.
Robert J. Vlasic Dean of Engineering
College of Engineering

May 2022