

Catherine Emily McCusker

Assistant Professor
Department of Chemistry
463 Brown Hall
East Tennessee State University
Johnson City, TN 37614

T: 432-439-4306

mccusker@etsu.edu

Professional Experience:

Assistant Professor

Department of Chemistry, East Tennessee State University

August 2016 – current

Postdoctoral Researcher

Advisor: Prof. Felix N. Castellano

Department of Chemistry and Center for Photochemical Sciences, Bowling Green State University

Department of Chemistry, North Carolina State University

January 2011 – August 2016

Education:

PhD in Chemistry

Michigan State University, East Lansing, Michigan

Dissertation: Probing Vibrational Relaxation Dynamics in Charge-Transfer Excited States: Synthesis, Physical, and Photophysical Characterization of Cyano-Substituted Polypyridyl Complexes of Ru(II).

Advisor: Dr. James K. McCusker

December 2010

Bachelor of Science *cum laude*

Roger Williams University - Bristol, Rhode Island

Majors: Chemistry and Biology

May 2003

Courses Taught at East Tennessee State University:

Chem 1111: General Chemistry Lab

- Honors section of Chem 1111

Chem 1121: General Chemistry Lab II

- Honors section of Chem 1121

Chem 3110: Descriptive Inorganic Chemistry

- Introductory undergraduate inorganic chemistry class

Chem 4110: Advanced Inorganic Chemistry

- Advanced undergraduate chemistry class

Chem 4010/5010: Seminar in Chemistry

- Seminar course for undergraduate and graduate students

Chem 4611: Advanced Integrated Lab – Dynamics

- Upper level undergraduate lab course

Chem 5120: Advanced Inorganic Chemistry II

- Core graduate inorganic chemistry class

Chem 4957/5957: Special Topics in Inorganic Chemistry – Inorganic Photochemistry

- Special topics inorganic class for both undergraduate and graduate students

Research Students Mentored:

Graduate Students

Norah Alqahtani	Fall 2016 – Summer 2018	MS Aug. 2018
Jean Noalick Aboa	Fall 2017 – Spring 2019	
Senan Rasheed	Spring 2018 – current	
Wasilat Adedolapo	Fall 2018 – current	
Adegbemisola Aregbe	Spring 2019 – current	
Irene Dzaye	Spring 2019 – current	

Undergraduate Students

Harper Baldwin	Spring 2018 – Spring 2019	BS May 2019
Nicholas Day	Fall 2018 – Spring 2019	BS May 2019
Toni Blevins	Fall 2018	BS May 2019
Tristan Slagle	Fall 2018 – Spring 2019	BS May 2019
Sylvia Meredith	Fall 2019 – current	
Alexis Harvey	Fall 2019 – current	

Funded Research Proposals:

“Development of Zinc Dipyrrin Sensitizers for Photocatalytic Carbon Dioxide Reduction” ACS Petroleum Research Fund Undergraduate New Investigator Award (\$55,000/ 2 years). PI: Catherine McCusker, **Funded Aug 2018**

Previous Research Experience:

North Carolina State University
Bowling Green State University
Postdoctoral Associate
January 2011-August 2016

Advisor: Dr. Felix N. Castellano

Michigan State University
Graduate Assistant
August 2003-December 2010

Advisor: Dr. James K. McCusker

California State University, Fullerton
REU Research Fellowship
Summer 2002

Advisor: Dr. Peter de Lijser

Roger Williams University
Undergraduate Research Student
Sept 2001-May 2003

**Advisors: Dr. Cliff Timpson
Dr. Daniel von Riesen**

Professional Development, Awards, and Memberships:

ACS Exams 2021 Foundations of Inorganic Chemistry Exam Committee 2019-2021

- Member of the committee for writing, testing, and implementing the 2021 edition of the Foundations of Inorganic Chemistry standardized exam.

VIPeR Fellow Cohort 1 2018 – 2020

- One of 20 inorganic faculty from around the country selected to participate in an NSF funded study on the effect student centered teaching and learning has on student outcomes in foundation level inorganic chemistry courses

Inter-American Photochemical Society Poster Award January 2015

- Received second place poster presentation award at the January 2015 meeting

Mentoring and Teaching Practicum Fellow

Fall 2014 – Spring 2015

- One of 10 NCSU graduate students and postdoctoral scholars selected for this program
- Mentored by Prof. Karl Sienerth, analytical chemistry professor at Elon University

Member of the American Chemical Society

Member of Inter-American Photochemical Society

Member of Alpha Chi National Honor Society

Publications:

ETSU **Graduate** and Undergraduate Authors Indicated

25. "Quantifying Triplet State Formation in Zinc Dipyrin Complexes" **Alqahtani, N. Z.**; Blevins, T. G.; McCusker, C. E. *submitted to J. Phys. Chem. A Sept 2019*
24. "Vibrational Relaxation and Redistribution Dynamics in Ruthenium(II) Polypyridyl-Based Charge-Transfer Excited States: A Combined Ultrafast Electronic and Infrared Absorption Study" Brown, A. M., McCusker, C. E., Carey, M. C., Blanco-Rodríguez, A. M., Towrie, M., Clark, I. P., Vlček, A., and McCusker, J. K. *J. Phys. Chem. A* **2018**, *122*, 7941–7953.
23. "Enhancing the Visible-Light Absorption and Excited-State Properties of Cu(I) MLCT Excited States" Garakyaraghi, S., McCusker, C. E., Khan, S., Koutnik, P., Bui, A. T., and Castellano, F. N. *Inorg. Chem.* **2018**, *57*, 2296–2307.
22. "Restricted Photoinduced Conformational Change in the Cu (I) Complex for Sensing Mechanical Properties" Razgoniaev, A. O.; McCusker, C. E.; Castellano, F. N.; Ostrowski, A. D. *ACS Macro Lett.* **2017**, 920-924.
21. "Phenanthroline MLCT Chromophore Featuring Synthetically Tailored Photophysics" Garakyaraghi, S.; Crapps, P. D.; McCusker, C. E.; Castellano, F. N. *Cuprous. Inorg. Chem.* **2016**, *55*, 10628-10636.
20. "Exposing the Excited-State Equilibrium in an Ir(III) Bichromophore: A Combined Time Resolved Spectroscopy and Computational Study" Yarnell, J. E.; McCusker, C. E.; Leeds, A. J.; Breaux, J. M.; Castellano, F. N. *Eur. J. Inorg. Chem.* **2016**, *12*, 1808-1818.
19. "Materials Integrating Photochemical Upconversion" McCusker, C. E. and Castellano, F. N. *Top. Curr. Chem.* **2016**, *374*, 19.
18. "MLCT Sensitizers in Photochemical Upconversion: Past, Present, and Potential Future Directions" Castellano, F. N. and McCusker, C. E. *Dalton Trans.* **2015**, *44*, 17906-17910.
17. "Efficient Visible to Near-UV Photochemical Upconversion Sensitized by a Long Lifetime Cu(I) MLCT Complex" McCusker, C. E. and Castellano, F. N. *Inorg. Chem.* **2015**, *54*, 6035-6042.
16. "Transient Absorption Dynamics of Sterically Congested Cu(I) MLCT Excited States" Garakyaraghi, S.; Danilov, E. O.; McCusker, C. E.; Castellano, F. N. *J. Phys. Chem. A* **2015**, *119*, 3181-3193.
15. "Triplet State Formation in Homo- and Heterometallic Diketopyrrolopyrrole Chromophores" McCusker, C.E.; Hablot, D.; Ziessel, R.; Castellano, F. N. *Inorg. Chem.* **2014**, *53*, 12564-12571.
14. "Spectroelectrochemical Identification of Charge-Transfer Excited States in Transition Metal-based Polypyridyl Complexes" Brown, A. M.; McCusker, C. E.; McCusker J. K. *Dalton Trans.* **2014**, *43*, 17635-17646.
13. "Excited State Equilibrium Induced Lifetime Extension in a Dinuclear Platinum(II) Complex" McCusker, C.E.; Chakraborty, A.; Castellano, F. N. *J. Phys. Chem. A* **2014**, *118*, 10391-10399.
12. "Robust Cuprous Phenanthroline Sensitizer for Solar Hydrogen Photocatalysis" Khnayzer, K. S.; McCusker, C. E.; Olaiya, B. S.; Castellano, F. N. *J. Am. Chem. Soc.* **2013**, *135*, 14068-14070.
11. "Tracking of Tuning Effects in Bis-Cyclometalated Iridium Complexes: A Combined TRIR, Electrochemical, and Computational Study" Chirdon, D. N.; McCusker, C. E.; Castellano, F. N.; Bernhard, S. *Inorg. Chem.* **2013**, *52*, 8795-8804.

10. "Mono- and Dinuclear Cationic Iridium(III) Complexes Bearing a 2,5-Dipyridylpyrazine (2,5-dpp) Bridging Ligand" Donato, L.; McCusker, C. E.; Castellano, F. N.; Zysman-Colman, E. *Inorg. Chem.* **2013**, *52*, 8495-8504.
9. "Design of a Long-Lifetime, Earth-Abundant, Aqueous Compatible Cu(I) Photosensitizer Using Cooperative Sterics" McCusker, C. E. and Castellano, F. N. *Inorg. Chem.* **2013**, *52*, 8114-8120.
8. "Orange-to-Blue and Red-to-Green Photon Upconversion with a Broadband Absorbing Copper(I) MLCT Sensitizer" McCusker, C. E. and Castellano, F. N. *Chem. Commun.* **2013**, *49*, 3537-3539.
7. "Dondorff Rings: Synthesis, Isolation, and Properties of 60° Bisterpyridine-based Folded Tetramers" Schultz, A.; Li, X.; McCusker, C. E.; Moorefield, C. N.; Castellano, F. N.; Wesdemiotis, C.; Newkome, G. R. *Chem.--Eur. J.* **2012**, *18*, 11569-11572.
6. "Spectroscopy and Photophysics in Cyclometalated Ru(II) Bis(Bipyridyl) Complexes" Muro-Small, M. L.; Yarnell, J. E.; McCusker, C. E.; Castellano, F. N. *Eur. J. Inorg. Chem.* **2012**, *2012*, 4004-4011.
5. "Metal Coordination Induced π -Extension and Triplet State Production in Diketopyrrolopyrrole Chromophores" McCusker, C. E.; Hablot, D.; Ziessel, R.; Castellano, F. N. *Inorg. Chem.* **2012**, *51*, 7957-7959.
4. "Ligand Localized Triplet State Photophysics in a Platinum(II) Terpyridyl Perylenediimideacetylide" Prusakova, V.; McCusker, C. E.; Castellano, F. N. *Inorg. Chem.* **2012**, *51*, 8589-8598.
3. "Bidirectional Ping-Pong Energy Transfer and 3000-fold Lifetime Enhancement in a Re(I) Charge Transfer Complex" Yarnell, J. E.; Deaton, J. C.; McCusker, C. E.; Castellano, F. N. *Inorg. Chem.* **2011**, *50*, 7820-7830.
2. "Synthesis and Characterization of Cyano-Substituted Bipyridyl Complexes of Ruthenium(II)" McCusker, C. E. and McCusker J. K. *Inorg. Chem.* **2011**, *50*, 1656-1669.
1. "Preparation and structure of an unexpected dehydrogenation product from 2,6-diphenylcyclohexanone oxime" de Lijser, H. J. P.; Dedeian, C. E.; Sawyer, J. R.; Herron, S. R.; Kantardjieff, K. A. *J. Chem. Crystallogr.* **2004**, *34*, 103-110.

Presentations:

"Designing Earth-Abundant Sensitizers for Solar Fuels Photochemistry" Catherine E. McCusker. Invited seminar presentation Appalachian State University, Boone, NC March 2019

"Quantifying the Triplet State Yield in Zinc Dipyrrin Complexes" **Norah Z. Alqahtani**, [Toni Blevins](#) and Catherine E. McCusker. Invited oral presentation Inter-American Photochemical Society, Sarasota, FL, January 2019

"Quantifying the Triplet State Yield in Zinc(II) Dipyrrin Complexes" **Norah Z. Alqahtani** and Catherine E. McCusker. Poster Presentation Electron Donor-Acceptor Interactions Gordon Research Conference, Newport, RI, August 2018

"Designing a Family of Long Lifetime Copper(I) Phenanthroline Complexes" Catherine E. McCusker and Felix N. Castellano. Invited oral presentation SERMACS, Memphis, TN, November 2015

"Designing a Family of Long Lifetime Copper(I) Phenanthroline Complexes" Catherine E. McCusker and Felix N. Castellano. Oral and poster presentation Photochemistry Gordon Research Seminar and Conference, Easton, MA, July 2015

"Extending the Lifetime of Copper(I) Phenanthroline Complexes for Upconversion Photochemistry" Catherine E. McCusker and Felix N. Castellano. Poster presentation Inter-American Photochemical Society, Sarasota, FL, January 2015

"Extending the Lifetime of Copper(I) Phenanthroline Complexes for Upconversion Photochemistry" Catherine E. McCusker and Felix N. Castellano. Poster presentation NC Photochem 2014, Raleigh, NC, October 2014

"Excited State Equilibrium Induced Lifetime Extension in a Dinuclear Platinum(II) Complex" Catherine E. McCusker, Arnab Chakraborty, and Felix N. Castellano. Oral presentation ACS National Meeting, San Francisco, CA, August 2014

"Extending the Lifetime of Copper(I) Phenanthroline Complexes for Upconversion Photochemistry" Catherine E. McCusker and Felix N. Castellano. Oral and poster presentation Electron Donor-Acceptor Interactions Gordon Research Seminar and Conference, Newport, RI, August 2014

"Extending the Lifetime of Copper(I) Phenanthroline Complexes: Designing Earth Abundant Sensitizers" Catherine E. McCusker and Felix N. Castellano. Oral presentation 20th ISPPCC, Traverse City, MI, July 2013

"Cuprous Phenanthroline Sensitized Photochemical Upconversion" Catherine E. McCusker and Felix N. Castellano. Oral presentation ACS National Meeting, New Orleans, LA, April 2013

"Copper(I) Bis-Phenanthroline Complexes as First Row Sensitizers for Upconversion Photochemistry" Catherine E. McCusker and Felix N. Castellano. Oral and poster presentation Electron Donor-Acceptor Interactions Gordon Research Seminar and Conference, Newport, RI, August 2012

"Copper(I) Bis-Phenanthroline Complexes as First Row Sensitizers for Upconversion Photochemistry" Catherine E. McCusker and Felix N. Castellano. Oral presentation ACS National Meeting, San Diego, CA, March 2012

"Probing Vibrational Relaxation of Charge Transfer Excited States: Synthesis and Characterization of Cyano-Substituted Bipyridyl Complexes of Ruthenium(II)" Catherine E. McCusker and James K. McCusker. Poster presentation Electron Donor-Acceptor Interactions Gordon Conference, Newport, RI, August 2010

"Synthesis and Characterization of Infrared Probes of Vibrational Relaxation in Charge-Transfer Excited States" Catherine E. McCusker and James K. McCusker. Oral presentation ACS National Meeting, Chicago, IL, March 2007

"Studies of Ruthenium Complexes Attached to Oxide Surfaces" Catherine E. Dedeian, Hannah Nandor, Cliff Timpson and Daniel von Riesen. Poster presentation ACS National Meeting, New Orleans LA, March 2003

"Synthesis and Characterization of Novel Ligand-Bridged Ruthenium Complexes" Randy Petrichko, Catherine E. Dedeian, Cliff Timpson and Daniel von Riesen. Poster presentation ACS National Meeting, Orlando, FL, April 2002