

## SIDNEY E. CREUTZ

Hand Chemical Laboratory  
Department of Chemistry  
Mississippi State University  
Starkville, MS 39759

Room 3310  
(336) 301-4854  
screutz@chemistry.msstate.edu

### Education

#### **California Institute of Technology**

*Fall 2010 – Feb. 2016*

Ph.D in Chemistry

Thesis Advisor: Prof. Jonas Peters

Thesis: *Design, Synthesis, and Study of Novel Platforms for Iron-N<sub>2</sub> Chemistry and Photoinduced, Copper-mediated C-N Bond Formation*

#### **Massachusetts Institute of Technology**

*Fall 2006 - Spring 2010*

B.S. in Chemistry

Minor in Materials Science and Engineering

Thesis Advisor: Prof. Christopher Cummins

Thesis: *Synthesis and Reactivity of Tris(enolate) Phosphine Ligands on Niobium*

### Positions and Experience

#### **Assistant Professor (Mississippi State University, Department of Chemistry)**

*July 2019-present*

Research focused on inorganic, bioinorganic, and materials chemistry with applications in health, energy and synthesis.

#### **Postdoctoral Researcher with Professor Daniel Gamelin (University of Washington)**

*March 2016-present*

Development of new synthetic strategies to access colloidal nanocrystal materials, including doped semiconductor nanocrystals and metal halide perovskites; focused on materials with potential applications in photovoltaics and optoelectronics, and on the use of post-synthetic modification strategies to access challenging targets.

#### **Graduate Research Assistant: Professor Jonas Peters (Caltech)**

*Jan. 2011 – March 2016*

Organometallic and organic synthesis, including the development and mechanistic studies of the first photoinduced copper-catalyzed coupling reactions, the study of temperature-dependent spin state manipulation of iron complexes, the development of the second known iron catalyst for N<sub>2</sub> fixation to ammonia, and inorganic model studies to elucidate the mechanism of biological nitrogen fixation.

### Publications (\* = corresponding author(s))

1. Billups, J. R.; Fokakis, Z. N.; **Creutz, S. E.\*** Octahedral iron complexes of pyrazine(diimine) pincers: Ligand electronic effects and protonation. *Inorg. Chem.* **2020**. Accepted: DOI: 10.1021/acs.inorgchem.0c02211.

2. De Siena, M. C.; Rachkov, A. G.; Fainblat, R.; James, D.; **Creutz, S. E.**; Stoll, S. L.; Gamelin, D. R.\* Using redox titrations to probe the role of trivalent impurity ions in the ferromagnetism of colloidal EuS nanocrystals. *Chem. Mater.* **2020**: Just Accepted: DOI: 10.1021/acs.chemmater.0c03020.
3. Zhang, W.; Zilevu, D.; **Creutz, S. E.**\*; Zhang, D.\* Quantification of the optical properties of perovskite nanocrystals using combination of polarized resonance synchronous and polarized anti-stokes, on-resonance, and stokes-shifted spectroscopy. *J. Phys. Chem. C.* **2020**, *37*, 20388-20397.
4. De Siena, M. C.<sup>‡</sup>; **Creutz, S. E.**<sup>‡</sup>; Regan, A.; Malinowski, P.; Jiang, Q.; Kluherz, K. T.; Zhu, G.; Lin, Z.; De Yoreo, J. J.; Xu, X.; Chu, J.-H.; Gamelin, D.R.\* 2D van der Waals nanoplatelets with robust ferromagnetism. *Nano Lett.* **2020**, *20*, 2100-2106.
5. De Siena, M. C.; Sommers, D.; **Creutz, S. E.**; Dunham, S. T.; Gamelin, D. R.\* Spinodal decomposition during anion exchange in colloidal Mn<sup>2+</sup>-doped CsPbX<sub>3</sub> (X = Cl, Br) perovskite nanocrystals. *Chem. Mater.* **2019**, *31*, 7711-7722.
6. **Creutz, S. E.**; Liu, H.; Kaiser, M.; Li, X.; Gamelin, D. R.\* Structural diversity in cesium bismuth halide nanocrystals. *Chem. Mater.* **2019**, *31*, 4685-4697.
7. Kroupa, D. M.; Roh, J. Y.; Milstein, T. J.; **Creutz, S. E.**; Gamelin, D. R.\* Quantum-cutting ytterbium-doped CsPb(Cl<sub>1-x</sub>Br<sub>x</sub>)<sub>3</sub> thin films with photoluminescence quantum yields over 190%. *ACS Energy Lett.* **2018**, *3*, 2390-2395.
8. **Creutz, S. E.**; Crites, E. N.; De Siena, M. C.; Gamelin, D. R.\* Anion exchange in cesium lead halide perovskite nanocrystals and thin films using trimethylsilyl halide reagents. *Chem. Mater.* **2018**, *30*, 4887-4891.
9. **Creutz, S. E.**; Crites, E. N.; De Siena, M. C.; Gamelin, D. R.\* Colloidal nanocrystals of lead-free double-perovskite (elpasolite) semiconductors: synthesis and anion exchange to access new materials. *Nano Lett.* **2018**, *18*, 1118-1123.
10. **Creutz, S. E.**; Fainblat, R.; Kim, Y.; De Siena, M. C.; Gamelin, D. R.\* A selective cation exchange strategy for the synthesis of colloidal Yb<sup>3+</sup>-doped chalcogenide nanocrystals with strong broadband visible absorption and long-lived near-IR emission. *J. Am. Chem. Soc.* **2017**, *139*, 11814-11824.
11. Nelson, H.; Hinterding, S.; Fainblat, R.; **Creutz, S. E.**; Li, X.; Gamelin, D.R.\* Mid-gap states and normal vs inverted bonding in luminescent Cu<sup>+</sup>- and Ag<sup>+</sup>-doped CdSe nanocrystals. *J. Am. Chem. Soc.* **2017**, *139*, 6411-6421.
12. **Creutz, S.E.**; Peters, J.C.\* Exploring secondary-sphere interactions in FeN<sub>x</sub>H<sub>y</sub> complexes relevant to N<sub>2</sub> fixation. *Chem. Sci.* **2016**, *8*, 2321-2328.
13. **Creutz, S.E.**; Peters, J.C.\* Spin-state tuning at pseudo-tetrahedral d(6) ions: spin crossover in [BP<sub>3</sub>]Fe(II)-X complexes. *Inorg. Chem.* **2016**, *55*, 3894-3906.
14. **Creutz, S.E.**; Peters, J.C.\* Diiron bridged-thiolate complexes that bind N<sub>2</sub> at the Fe<sup>II</sup>Fe<sup>II</sup>, Fe<sup>II</sup>Fe<sup>I</sup>, and Fe<sup>I</sup>Fe<sup>I</sup> redox states. *J. Am. Chem. Soc.* **2015**, *137*, 7310-7313.
15. **Creutz, S.E.**; Peters, J.C.\* N<sub>2</sub> binding and catalytic reduction of N<sub>2</sub> to NH<sub>3</sub> by an Fe complex featuring a C<sub>alkyl</sub>-atom anchor. *J. Am. Chem. Soc.* **2014**, *136*, 1105-1115.
16. Bissember, A.C.; Lundgren, R.J.<sup>‡</sup>; **Creutz, S.E.**<sup>‡</sup>; Peters, J.C.\*; Fu, G.C.\* Transition-metal catalyzed alkylations of amines with alkyl halides: Photoinduced, copper-catalyzed couplings of carbazoles. *Angew. Chem. Int. Ed.* **2013**, *52*, 5233-5237. († equal contribution)
17. **Creutz, S.E.**<sup>‡</sup>; Lotito, K.J.<sup>‡</sup>; Fu, G.C.\*; Peters, J.C.\* Photoinduced Ullmann C-N Coupling: Demonstrating the Viability of a Radical Pathway. *Science* **2012**, *338*, 647-651. († equal contribution)

18. **Creutz, S.E.**; Krummenacher, I.; Clough, C.R.; Cummins, C.C.\* A trigonal and hindered tertiary phosphine ligand rendered anionic by a niobate anchor: Formation of zwitterionic M(I) (M = Cu, Ag, Au, Rh) complexes. *Chem. Sci.* **2011**, *2*, 2166-2172.
19. Fox, A.R.; **Creutz, S.E.**; Cummins, C.C.\* A bimetallic uranium  $\mu$ -dicarbide complex: synthesis, X-ray crystal structure, and bonding. *Dalton Trans.* **2010**, *39*, 6632-6634.

## Patents

1. Gamelin, D. R.; Kroupa, D.; Roh, J. Y.; **Creutz, S. E.** *Highly emissive ytterbium-doped CsPbCl<sub>3</sub> polycrystalline thin films*. Provisional patent application filed April 2018.
2. Peters, J. C.; Anderson, J. S.; **Creutz, S. E.**; Rittle, J. D. *Catalytic Ammonia Synthesis by Transition Metal Molecular Complexes*. April 16 2015. 14/515,716.

## Selected Presentations

1. Creutz, S. E.; Taylor, M.; Gamelin, D. R. "Synthetic Approaches to Two-Dimensional Inorganic Nanocrystals and Nanocrystal-Derived Films for Thin-Film Devices." Intelligence Community Academic Research Symposium, Washington, D. C., September 2019 (*Talk*).
2. Creutz, S.E.; Taylor, M.; Gamelin, D. R. "Colloidal nanocrystals and films with improved charge carrier mobilities: towards applications in flexible electronics." Intelligence Community Academic Research Symposium, Washington, D.C., September 2018 (*Poster*).
3. Creutz, S.E.; De Siena, M. C.; Crites, E. N.; Fainblat, R.; Kim, Y.; Gamelin, D. R. "Colloidal nanocrystals as a platform for the discovery and synthesis of new materials." Colloidal Semiconductor Nanocrystals Gordon Conference, Smithfield, RI, July 2018 (*Poster*).
4. Creutz, S.E.; De Siena, M. C.; Crites, E. N.; Fainblat, R.; Kim, Y.; Gamelin, D. R. "Colloidal nanocrystals as a platform for the discovery and synthesis of new materials." Inorganic Chemistry Gordon Conference, Biddeford, ME, June 2018 (*Poster*).
5. Creutz, S.E.; Peters, J.C. "Diiron  $\mu$ -thiolate complexes that bind N<sub>2</sub> across multiple oxidation states: Towards new structural/functional models of nitrogenase." ACS National Meeting, Boston, MA, Aug. 19, 2015. (*Talk*).
6. Creutz, S.E.; Peters, J.C. "Tunable spin equilibria in four-coordinate iron trisphosphine phosphinimino complexes." ACS National Meeting, Boston, MA, Aug. 19, 2015. (*Talk*).
7. Creutz, S.E.; Peters, J.C. "Design and synthesis of new iron complexes for nitrogen fixation." Gray-Hill Lecture Series, Occidental College, Jun. 19, 2015. (*Talk*).
8. Creutz, S.E.; Peters, J.C. "New ligand platforms for iron-dinitrogen chemistry." Inorganic Organometallics Seminar, Caltech, Mar. 13, 2015. (*Talk*).
9. Creutz, S.E.; Peters, J.C. "New Ligand Platforms for Iron-Dinitrogen Chemistry: More Inspiration from FeMoCo." SoCal Organometallics Meeting, Pasadena, CA, Feb. 22, 2015. (*Talk*).
10. Creutz, S.E.; Peters, J.C. "Ligand Design for Dinitrogen Binding and Functionalization at Iron." Inorganic Reaction Mechanisms Gordon Conference, Galveston, TX, Mar. 1-6, 2015. (*Poster*).
11. Creutz, S.E.; Peters, J.C. "Photoinduced, copper-catalyzed C-N Ullmann coupling." SoCal Inorganic Photochemistry Meeting, Two Harbors, CA, Sep. 26-28, 2014. (*Talk*).
12. Creutz, S.E.; Peters, J.C. "Investigating the Role of Secondary-Sphere Interactions in Iron-Nitrogen Chemistry." Iron-Sulfur Enzymes Gordon Research Conference, Stonehill, MA, Jun. 15-20, 2014. (*Poster*).

13. Creutz, S.E.; Peters, J.C. "Ligand Design for Iron-Catalyzed Nitrogen Fixation." Inorganic-Organometallics Seminar, Caltech, Apr. 11, 2014. (*Talk*).
14. Creutz, S.E.; Peters, J.C. "N<sub>2</sub> binding and catalytic reduction of N<sub>2</sub> to NH<sub>3</sub> by an Fe complex featuring a C<sub>alkyl</sub>-atom anchor." Metals in Biology Gordon Research Conference and Bioinorganic Chemistry Gordon Research Seminar, Ventura, CA, Jan. 26-Feb. 2, 2014. (*Poster*).
15. **Selected poster talk.** Creutz, S.E.; Peters, J.C. "Binding, functionalization, and catalytic reduction of N<sub>2</sub> by iron in a tris(phosphino)alkyl scaffold." Gordon Research Seminar and Conference in Organometallic Chemistry, Newport, RI, July 6-12, 2013. (*Poster and talk*).

### **Awards and Fellowships**

Intelligence Community Postdoctoral Fellowship, 2017  
National Science Foundation Graduate Fellowship, 2010  
Alpha Chi Sigma Award (MIT Chemistry Department award for seniors), 2010  
Barry M. Goldwater Scholarship, 2009  
ACS Analytical Chemistry Award (MIT Chemistry Department award for juniors), 2009  
Sophomore Achievement Award (MIT Chemistry Department award for sophomores), 2008

### **Teaching Experience**

*General Chemistry I (CH1213), Mississippi State University (Fall 2019-2020)*  
*Teaching Assistant, Physical Methods for Inorganic Chemistry (Ch153b, Caltech; Spring 2015)*  
*Teaching Assistant, Organometallic Chemistry (Ch154a, Caltech; Winter 2014)*  
*Teaching Assistant, Physical Chemistry III: Statistical Thermodynamics (5.62, MIT; Spring 2010)*  
*Teaching Assistant, Principles of Chemical Science (5.112, MIT; Fall 2009)*

### **Professional Activities**

#### *Peer Reviewer*

Journal of the American Chemical Society  
Chemical Communications  
Inorganic Chemistry  
Dalton Transactions  
Polyhedron  
J. Phys. Chem. Lett.