

C. Michael McGuirk

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Colorado School of Mines, Department of Chemistry
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EDUCATION

University of California, Berkeley Philomathia Postdoctoral Fellow with <i>Prof. Jeffrey R. Long</i>	5.1.2016–5.25.2019
Northwestern University Ph.D. in Chemistry with <i>Prof. Chad A. Mirkin</i>	8.1.2011–3.30.2016
University of Minnesota, Twin Cities B.A. in Chemistry with minor in Biochemistry <i>Summa Cum Laude</i> with High Honors	9.1.2006–5.15.2010

APPOINTMENTS

Colorado School of Mines Assistant Professor, Department of Chemistry	6.1.2019–Present
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RESEARCH TIMELINE

2019 – Present	“Supramolecular Materials Chemistry” <i>Primary Investigator</i> , Colorado School of Mines
2016 – 2019	“Elucidating the Molecular Origins of Step-Shaped Adsorption in Metal–Organic Frameworks” <i>Advisor: Prof. Jeff Long</i> , University of California, Berkeley
2011 – 2016	“Coordination Chemistry-Based Strategies for the Regulation and Enhancement of Hydrogen Bond-Donating Catalyst Activity” <i>Advisor: Prof. Chad Mirkin</i> , Northwestern University
2010 – 2011	“Development of Anti-Misting Formulations using Non-Newtonian Fluids” Ecolab Inc.
2009 – 2010	“Characterization of Clathrin-Dependent Uptake Mechanisms of Natriuretic Peptide Receptors” <i>Advisor: Prof. Lincoln Potter</i> , University of Minnesota, Twin Cities
2008 – 2009	“N-Heterocyclic Carbene-Based Ligands for the Isolation of Transient Cu(I)-Oxo Species” <i>Advisor: Prof. William Tolman</i> , University of Minnesota, Twin Cities

PREVIOUS RESEARCH EXPERIENCE

- **Post-Doctoral Research – University of California, Berkeley – Long Lab**
 - Discovery of, and molecular-level investigation into, the chemically specific cooperative adsorption mechanism of the commodity chemical carbon disulfide in diamine-appended metal–organic frameworks.

- Structural investigation of the origins of non-classic step-shaped adsorption in stimuli-responsive zeolitic imidazolate frameworks for storage and delivery of natural gas in the transportation sector.
- **Dissertation Research – Northwestern University – Mirkin Lab**
 - Established a platform for the *in situ* control of hydrogen bond-donating catalysis, based on a novel synthetic strategy that employed structurally addressable supramolecular coordination structures. These architectures have potential applications in controlled polymerization, chemical sensors, and amplification devices.
 - Harnessed the three-dimensional structural order of metal–organic frameworks for dramatically enhancing the activity of hydrogen bond-donating catalysis through the deliberate obviation of deleterious inter-catalyst association.

PRIMARY INVESTIGATOR GRANTS

1. Title: High Capacity Step-Shaped Hydrogen Adsorption in Robust, Pore-Gating Zeolitic Imidazolate Frameworks
Agency: Department of Energy, Office of Energy Efficiency and Renewable Energy
Award Number: DE-EE0008823
Awarded: August, 2019, Start: January 2020.
Time/Amount: 3 years, \$380,000
2. Title: CAREER: Studies of Chalcogen Bonding-Mediated Assembly towards Porous Crystalline Frameworks, Hierarchical Assemblies and Multicomponent Materials
Agency: National Science Foundation, Division of Materials Research, Solid State and Materials Chemistry
Award Number: 2142623
Awarded: November, 2021, Start: January 2022.
Time/Amount: 5 years, \$760,394

CORRESPONDING AUTHOR PUBLICATIONS

1. Halder, A.; Klein, R.A.; Lively, R.; **McGuirk, C. M.** A Family of Multivariate Frameworks with an Inverting Trend in Flexibility and Adsorption Pressure Threshold, *Chem. Commun.* **2022**, 58, 11394.
2. Eckstein, B. J.; Brown, L. C.; Noll, B.; Moghadasnia, M.; Balaich, G. J.; **McGuirk, C. M.** A Porous Chalcogen- Bonded Organic Framework, **2021**, *J. Am. Chem. Soc.* **2021**, 143, 20207.
3. Klein, R. A.; Shulda, S.; Strange, N. N.; Parilla, P. A.; Brown, C. M.; Gennet, T.; **McGuirk, C. M.** Structural and Mechanistic Insight into Hydrogen Adsorption in Flexible Framework ZIF-7. **2021**, *Chem. Sci.* **2021**, 12, 15620.
4. **McGuirk, C. M.**; Bazilian, M. D.; Kammen, D. Mining Plastic: Harvesting Stored Energy in a Re-use Revolution. *One Earth.* **2019**, 1, 392.

PRIMARY AUTHOR PUBLICATIONS

1. **McGuirk, C. M.**; Runčevski, T.; Oktawiec, J.; Turkiewicz, A.; Taylor, M.; **Long, J. R.** Influence of Metal Substitution on the Pressure-Induced Phase Change in Flexible Zeolitic Imidazolate Frameworks. *J. Am. Chem. Soc.* **2018**, *140*, 15924.
2. **McGuirk, C. M.**; Siegelman, R. L.; Drisdell, W. S.; Runčevski, T.; Milner, P. J.; Oktawiec, J.; Wan, L. F.; Su, G. M.; Jiang, H. Z. H.; Reed, D. A.; Gonzalez, M. I.; Prendergast, D.; **Long, J. R.** Cooperative Adsorption of Carbon Disulfide in Diamine-Appended Metal–Organic Frameworks. *Nat. Commun.* **2018**, *9*, 5133.
3. **McGuirk, C. M.**; Mendez-Arroyo, J.; d’Aquino, A. I.; Stern, C. L.; **Mirkin, C. A.** A Concerted Two-Prong Approach to the *in Situ* Allosteric Regulation of Bifunctional Catalysis. *Chem. Sci.* **2016**, *7*, 6674.
4. **McGuirk, C. M.**; Katz, M. J.; Stern, C. L.; Sarjeant, A. A.; Hupp, J. T.; Farha, O. K.; **Mirkin, C. A.** Turning on Catalysis: Incorporation of a Hydrogen Bond Donating Squaramide Moiety into a Zr-Metal-Organic Framework. *J. Am. Chem. Soc.* **2015**, *137*, 919.
5. **McGuirk, C. M.**; Mendez-Arroyo, J.; Lifschitz, A. M.; **Mirkin, C. A.** Allosteric Regulation of Supramolecular Oligomerization and Catalytic Activity via Coordination-Based Control of Competitive Hydrogen Bonding Events. *J. Am. Chem. Soc.* **2014**, *136*, 16594.
6. **McGuirk, C. M.**; Stern, C. L.; **Mirkin, C. A.** Small Molecule Regulation of Self-Association and Catalytic Activity in a Supramolecular Coordination Complex. *J. Am. Chem. Soc.* **2014**, *136*, 4689.

SECONDARY AUTHOR PUBLICATIONS

1. Massimi, S. E.; Metzger, K. E.; **McGuirk, C. M.**; Trewyn, B. G. Best Practices in the Characterization of MOF@MSN Composites. *Inorg. Chem.* **2022**, *61*, 4219.
2. Mao, V. Y.; Milner, P. J.; Lee, J.-H.; Forse, A. C.; Kim, E. J.; Siegelman, R. L.; **McGuirk, C. M.**; Porter-Zasada, L.; Neaton, J. B.; Reimer, J. A.; Long, J. R. Cooperative Carbon Dioxide Adsorption in Alcoholamine- and Alkoxyalkylamine-Functionalized Metal–Organic Frameworks. *Angew. Chem. Int. Ed.*, **2020**, *59*, 2.
3. Wang, S.; **McGuirk, C. M.**; d’Aquino, A. I.; Mason, J. A.; **Mirkin, C. A.** Metal-Organic Framework Nanoparticles. *Adv. Mater.* **2018**, *30*, 1800202.
4. d’Aquino, A. I.; Cheng, H. F.; Barroso-Flores, J.; Kean, Z. S.; Mendez-Arroyo, J.; **McGuirk, C. M.**; **Mirkin, C. A.** An Allosterically Regulated, Four-State Macrocyclic. *Inorg. Chem.* **2018**, *57*, 3568.
5. Wang, S.; **McGuirk, C. M.**; Ross, M. B.; Wang, S.; Chen, P.; Xing, H.; Liu, Y.; **Mirkin, C. A.** General and Direct Method for Preparing Oligonucleotide-Functionalized Metal–Organic Framework Nanoparticles. *J. Am. Chem. Soc.* **2017**, *139*, 9827.
6. Shahjamali, M. M.; Zhou, Y.; Zaraee, N.; Xue, C.; Wu, J.; Large, N.; **McGuirk, C. M.**; Boey, F.; Dravid, V.; Schatz, G. C.; **Mirkin, C. A.** Ag-Ag₂S Hybrid Nanoprisms: Structural vs. Plasmonic Evolution. *ACS Nano* **2016**, *10*, 5362.

- Lifschitz, A. M.; Young, R. M.; Mendez-Arroyo, J.; **McGuirk, C. M.**; Wasielewski, M. R.; Mirkin, C. A. Cooperative Electronic- and Structural-Regulation in a Bioinspired Allosteric Photoredox Catalyst. *Inorg. Chem.* **2016**, *55*, 8301.
- Wang, S.; Morris, W.; Liu, Y.; **McGuirk, C. M.**; Zhou, Y.; Hupp, J. T.; Farha, O. K.; Mirkin, C. A. Surface-Specific Functionalization of Nanoscale Metal-Organic Frameworks. *Angew. Chem. Int. Ed.* **2015**, *54*, 14738.
- Lifschitz, A. M.; Rosen, M. S.; **McGuirk, C. M.**; Mirkin, C. A. Allosteric Supramolecular Coordination Constructs. *J. Am. Chem. Soc.* **2015**, *137*, 7252.
- Lifschitz, A. M.; Young, R. M.; Mendez-Arroyo, J.; Stern, C. L.; **McGuirk, C. M.**; Wasielewski, M. R.; Mirkin, C. A. An Allosteric Photoredox Catalyst Inspired by Photosynthetic Machinery. *Nat. Comm.* **2015**, *6*, 6541.
- Lifschitz, A. M.; Young, R. M.; Mendez-Arroyo, J.; Roznyatovskiy, V. V.; **McGuirk, C. M.**; Wasielewski, M. R.; Mirkin, C. A. Chemically Regulating Rh(I)-Bodipy Photoredox Switches. *Chem. Comm.* **2014**, *50*, 6850.
- Kennedy, R. D.; Machan, C. W.; **McGuirk, C. M.**; Rosen, M. S.; Stern, C. L.; Sarjeant, A. A.; Mirkin, C. A. General Strategy for the Synthesis of Rigid Weak-Link Approach Platinum(II) Complexes: Tweezers, Triple-Layer Complexes, and Macrocycles. *Inorg. Chem.* **2013**, *52*, 5876.
- Dickey, D. M.; Barbieri, K. A.; **McGuirk, C. M.**; Potter, L. R. Arg 13 of B-Type Natriuretic Peptide Reciprocally Modulates Binding to Guanylyl Cyclase but not Clearance Receptors. *Mol. Pharmacol.* **2010**, *78*, 431.

PATENTS

- Hodge, C. A.; **McGuirk, C. M.**; Blattner, A. R.; Notermann, C. L. Sprayable Aqueous Chlorine-Based Cleaning Compositions with Reduced Misting. PCT Int. Appl., WO 2015123324 A1 20150820, **2015**.
- Hodge, C. A.; **McGuirk, C. M.**; Levitt, M. D.; Larson, D.; Kiesel, E.; Blattner, A. R. Development of Extensional Viscosity for Reduced Atomization for Diluted Concentrate Sprayer Applications. PCT Int. Appl., WO 2013043699 A2 20130328, **2013**.
- Hodge, C. A.; Blattner, A. R.; Kohnke, T. J.; Levitt, M. D.; Marquardt, J. E.; **McGuirk, C. M.**; Silvernail, C. M.; Larson, D. Bio-Based Glass Cleaner and Forming Use Solution. U.S. Pat. Appl. Publ. 20130255719 A1 20131003, **2013**.

SELECT LEADERSHIP AND OUTREACH ACTIVITIES

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- 2022 – Current** **Early Career Editorial Board at the *Journal of Physics and Chemistry of Solids***
- Serve as an associate editor at the journal, managing paper submissions, peer reviews, and themed issues.
- 2020 – Current** **Cientifico Latino Graduate Student Mentor**

- Mentor a college senior from a underrepresented minority through the application process for graduate school, including proofreading application materials.

2018 – Current Skype a Scientist Participant

- Hold question and answer sessions about my research and general science with 10th–12th grade classes in schools in Hawaii and Alberta, Canada.

SELECT PRESENTATIONS

1. “Exploring Function and Form in Synthetic Porous Frameworks” *Abraham Clearfield Student Invited Seminar in Inorganic Chemistry*, Texas A&M University, September 14, 2022, College Station, TX, **invited speaker**.
2. “A Porous Chalcogen-Bonded Framework” *International Symposium on Porous Organic Polymers*, September 1, 2022, Boulder, CO
3. “Structural and Mechanistic Insight into Hydrogen Adsorption in Flexible Framework ZIF-7” *Fundamentals of Adsorption 14th International Conferences*, May 26, 2022, Broomfield, CO
4. “Structural and Mechanistic Insight into Hydrogen Adsorption in Flexible Framework ZIF-7” *ACS National Meeting*, March 23, 2022, San Diego, CA
5. “A Porous Chalcogen-Bonded Framework” *ACS Southwest Regional Meeting*, November 1, 2021, Austin, TX, **invited speaker**.
6. “Synthetic Porous Frameworks: Connectivity-Dependent Discovery and Application” University of Denver, September 23, 2021, Denver, CO, **invited speaker**.

AWARDS

- Scialog® Fellow for Negative Emissions Science (2022)
- NSF CAREER (2021)
- DOE EFRC Ten at Ten (2019)
- Philomathia Postdoctoral Fellowship (2016)
- Representative of the Lindau Nobel Laureate Meeting (2015)

REFERENCES AVAILABLE

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