

Shaoyang Lin, Ph.D.

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EDUCATION

Ph.D. in Chemistry 2013-2019
Virginia Polytechnic Institute and State University, Blacksburg, VA

B.S. in Material Science and Engineering 2009-2013
South China University of Technology (SCUT), Guangzhou, China

RESEARCH EXPERIENCE

Division of Chemistry and Chemical Engineering, California Institute of Technology
Postdoctoral Research at Liquid Sunlight Alliance (LiSA) 2021-present
Research Advisor: Dr. Kimberly See

- Improving gas product selectivity of electrochemical CO₂ reduction reaction on gas diffusion electrodes with water-in-salt electrolytes
- Designing aqueous-nonaqueous mixed electrolytes for CO₂ reduction to control proton delivery pathways
- Controlling the mass transport of CO₂ and reaction intermediates to tune the product distribution

Department of Chemistry and Biochemistry, The Ohio State University
Postdoctoral Research 2019-2021
Research Advisor: Dr. Claudia Turro

- Elucidated proton relay insertion pathways in electrochemical hydrogen evolution reaction catalyzed by homogeneous dirhodium electrocatalysts
- Tuned the photocatalysis activity of dirhodium photocatalysts by modifying molecular structure

Department of Chemistry, Virginia Tech
Doctoral Research 2013-2019
Research Advisor: Dr. Amanda J. Morris

- Illustrated redox hopping charge transfer mechanism in metal-organic framework (MOF) based heterogeneous water oxidation electrocatalysts
- Enhanced photo-induced charge-separated lifetime and faraday efficiency of photoelectrochemical alcohol oxidation reaction in mixed linker MOF doped with both photosensitizer and catalyst

State Key Laboratory of Luminescent Materials and Devices, SCUT
Undergraduate Research 2012-2013
Research Advisor: Dr. Shijian Su

- Increased light-emitting efficiency of organic light-emitting diodes

PUBLICATIONS

1. **S. Lin**, Y. Fishler, S. Kwon, W. Nie, M. Y. Yang, J. Matthews, T. F. Jaramillo, T. Agapie, J. C. Peters, W. A. Smith, W. A. Goddard III, K. A. See, The Role of Electrolyte in Tuning the Binding Mode of adsorbed CO on Cu and Production Selectivity, 2023, *In preparation*.
2. Z. P. Ifkovits, J. T. Reed, P. A. Kempler, M. C. Meier, S. T. Byrne, **S. Lin**, A. Z. Ye, A. I. Carim, N. S. Lewis, Spontaneous Mesostructure Formation Produces Optically Transmissive Ni-P Films That are Catalytically Active for the Photoelectrochemical Hydrogen Evolution Reaction, *Sustainable Energy & Fuels*, 2023, *In revision*.

3. **S. Lin**, S. Banerjee, M. T. Fortunato, C. Xue, J. Huang, A. Y. Sokolov, C. Turro, Electrochemical Strategy for Proton Relay Installation Enhances the Activity of a Hydrogen Evolution Electrocatalyst, *J. Am. Chem. Soc.*, 2022, 144 (44), 20267–20277.
4. **S. Lin**, C. Turro, Dinuclear Rhodium Complexes as Panchromatic Sensitizers, Electrocatalysts, and Photocatalysts for Hydrogen Production, *Chem. Eur. J.*, 2021, 27, 5379-5387.
5. **S. Lin**, D. R. Cairnie, D. Davis, A. Chakraborty, M. Cai, A. J. Morris, Photoelectrochemical Alcohol Oxidation by Mixed Linker Metal-Organic Frameworks, *Faraday Discuss.*, 2021, 225, 371-383.
6. M. Cai, Q. Loague, J. Zhu, **S. Lin**, and A. J. Morris, Ruthenium(II)-polypyridyl Doped Zirconium(IV) Metal-organic Frameworks for Solid-state Electrochemiluminescence, *Dalton Trans.*, 2018, 47, 16807-16812.
7. J. Zhu, J. Liu, Y. Machain, B. Bonnett, **S. Lin**, M. Cai, M. C. Kessinger, P. M. Usov, W. Xu, S. D. Senanayake, D. Troya, A. R. Esker, A. J. Morris, Insights into CO₂ Adsorption and Chemical Fixation Properties of Hf-VPI-100 Metal-Organic Frameworks, *J. Mater. Chem. A*, 2018, 6, 22195-22203.
8. **S. Lin**, P. M. Usov, A. J. Morris, The Role of Redox Hopping in Metal-Organic Framework Electrocatalysis, *Chem. Commun.*, 2018, 54, 6965-6974.
9. **S. Lin**, A. K. Ravari, J. Zhu, M. Cai, P. M. Usov, S. R. Ahrenholtz, Y. Pushkar, and A. J. Morris, Insights into MOF Reactivity: Chemical Water Oxidation Catalysis [Ru(tpy)(dcbpy)OH₂]²⁺ Modified Metal-Organic Framework, *ChemSusChem*, 2018, 11, 464-471.
10. J. Zhu, P. M. Usov, W. Xu, P. C. Salazar, **S. Lin**, M. C. Kessinger, C. Landaverde-Alvarado, M. Cai, A. May, C. Slebodnick, D. Zhu, S. Senanayake, A. J. Morris, A New Class of Metal-Cyclam based Zirconium Metal-Organic Frameworks for CO₂ Adsorption and Chemical Fixation, *J. Am. Chem. Soc.*, 2018, 140 (3), 993–1003.
11. **S. Lin** (Cover Article), Y. Pineda-Galvan, W. A. Maza, C. C. Epley, J. Zhu, M. C. Kessinger, Y. Pushkar, and A. J. Morris, Electrochemical Water Oxidation by a Catalyst-Modified Metal–Organic Framework Thin Film, *ChemSusChem*, 2017, 10, 514-522.
12. C. C. Epley (Cover Article), K. L. Roth, **S. Lin**, S. R. Ahrenholtz, T. Z. Grove, A. J. Morris, Cargo delivery on demand from photodegradable MOF nano-cages, *Dalton Trans.*, 2017, 46, 4917-4922.
13. W. A. Maza, A. J. Haring, S. R. Ahrenholtz, C. C. Epley, **S. Lin**, A. J. Morris, Ruthenium (ii)-polypyridyl zirconium (iv) metal–organic frameworks as a new class of sensitized solar cells, *Chem. Sci.*, 2016, 7, 719-727.
14. S. R. Ahrenholtz, C. Landaverde-Alvarado, M. Whiting, **S. Lin**, C. Slebodnick, E. Marand, and A. J. Morris, Thermodynamic Study of CO₂ Sorption by Polymorphic Microporous MOFs with Open Zn(II) Coordination Sites, *Inorg. Chem.*, 2015, 54 (9), pp 4328–4336.

PATENT

1. **S. Lin**, R. Yao, D. Wang, W. Ye, G. Li, S. Zhuo, R. Tan, Chinese National Utility Model Patent: A Device Structure for Improving the Light Extraction Efficiency of Bottom Emitting OLED. Patent number: CN202817032U.

CONFERENCE PRESENTATIONS

Oral Presentation

1. **S. Lin**, C. Turro, New electrochemical strategy of introducing proton relay to a paddlewheel Rh₂(II,II) hydrogen evolution electrocatalyst, ACS Spring 2021.

2. **S. Lin**, Y. Pineda-Galvan, W. A. Maza, C. C. Epley, J. Zhu, M. C. Kessinger, Y. Pushkar, and A. J. Morris, Investigations of Water Oxidation by Catalysts Incorporated Metal-Organic Frameworks, the 254th ACS National Meeting, August 2017.

Poster Presentation

1. **S. Lin**, K. A. See et al., Enhancing the product selectivity of C₂H₄ over C₁ gases of electrochemical CO₂ reduction with water-in-salt electrolyte, upcoming ACS Fall 2023.
2. **S. Lin**, A. Chakraborty, M. Cai, B. Bonnett, A. J. Morris, Photoelectrochemical Alcohol Oxidation by Mixed Linker Metal-Organic Frameworks, GRC Electron Donor-Acceptor Interactions, 2018.
3. **S. Lin**, A. J. Morris, Metal-Organic Framework Thin Film as Electrocatalyst for Water Oxidation, 2nd International Solar Fuels Main Conference, July 2017.
4. **S. Lin**, Y. Pineda-Galvan, W. A. Maza, C. C. Epley, J. Zhu, M. C. Kessinger, Y. Pushkar, and A. J. Morris, Electrochemical Water Oxidation by Functionalized Metal Organic Frameworks, 2016 MII Technical Conference and Review.
5. **S. Lin**, W. A. Maza, S. R. Ahrenholtz, C. C. Epley, A. J. Morris, Photo-electrochemical and electrochemical water oxidation by Functionalized Metal Organic Framework, The 2015 SERC Conference.

TEACHING EXPERIENCE

Teaching Assistant

General Chemistry Lab	2013-2017
Analytical Chemistry Lab	Spring 2016, Fall 2018
Physical Chemistry Lab	Fall 2016

MENTORING EXPERIENCE

Undergraduate students (VT): Hunter Jacobs and Dylan Davis <i>Photoelectrochemical alcohol oxidation by mixed ligand metal-organic framework</i>	2016-2018
Undergraduate student (OSU): Kiki Bashir <i>Paddlewheel dirhodium catalyst for electrochemical hydrogen evolution reaction</i>	2019-2020
WAVE summer undergraduate student (Caltech): Ubaid Kazianga <i>Inorganic solid-state electrolyte for electrochemical CO₂ reduction in MEA electrolyzer</i>	2022

HONORS AND AWARDS

Chemistry Graduate Student Research Award, Department of Chemistry, VT, 2019
 Graduate School Doctoral Assistantship Awards, Department of Chemistry, VT, 2018
 ACS-DIC Student Travel Award, 2017