Shaoyang Lin, Ph.D.

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HIGHLIGHTS

- Experienced in heterogeneous/homogeneous electrochemical water splitting and CO_2 reduction
- Initiated and led 4 research projects on investigating electrochemical reaction mechanisms, and improving electrocatalyst/electrolyzer performance with 6 first-author papers and 12 peer-reviewed publication in total
- Excellent communication skills evidenced by 6 conference presentations and collaboration with teams from multiple universities and research institutes
- Instrument and software: Potentiostat (CV, electrolysis, EIS, DPV, LSV, SWV, RDE), GC, MS, HPLC, NMR, UV-vis, FTIR, Raman, nsTA, Fluorescence, Stopped-flow, TGA, PXRD, DLS, Sputterer, Spin coater, Glovebox, SolidWorks, CV simulation, DFT simulation

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 C2 product selectivity of electrochemical CO_2 reduction reaction on gas diffusion electrodes (GDE) with water-in-salt electrolytes
- Designing aqueous-nonaqueous mixed electrolytes for CO_2 reduction to control proton delivery pathways
- Controlling the mass transport of CO_2 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 with one certified patent

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. 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.
5. 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 CO_2 Adsorption and Chemical Fixation Properties of Hf-VPI-100 Metal-Organic Frameworks, *J. Mater. Chem. A*, 2018, 6, 22195-22203.
6. **S. Lin**, C. Turro, Dinuclear Rhodium Complexes as Panchromatic Sensitizers, Electrocatalysts, and Photocatalysts for Hydrogen Production, *Chem. Eur. J*. 2021, 27, 5379-5387.
7. **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.
8. 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 CO_2 Adsorption and Chemical Fixation Properties of Hf-VPI-100 Metal-Organic Frameworks, *J. Mater. Chem. A*, 2018, 6, 22195-22203.
9. **S. Lin**, P. M. Usov, A. J. Morris, The Role of Redox Hopping in Metal-Organic Framework Electrocatalysis, *Chem. Commum*, 2018, 54, 6965-6974.
10. **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 $[Ru(tpy)(dcbpy)OH_2]^{2+}$ Modified Metal-Organic Framework, *ChemSusChem*, 2018, 11, 464-471.
11. 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 CO_2 Adsorption and Chemical Fixation, *J. Am. Chem. Soc.* 2018, 140 (3), 993–1003.
12. **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.
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 CO_2 Sorption by Polymorphic Microporous MOFs with Open Zn(II) Coordination Sites, *Inorg. Chem.* 2015, 54 (9), 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.

SELECTED CONFERENCE PRESENTATIONS

1. **S. Lin**, K. A. See et al., Enhancing the product selectivity of C_2H_4 over C_1 gases of electrochemical CO_2 reduction with water-in-salt electrolyte, upcoming ACS Fall 2023.
2. **S. Lin**, C. Turro, New electrochemical strategy of introducing proton relay to a paddlewheel Rh_2(II,II) hydrogen evolution electrocatalyst, ACS Spring 2021.
3. **S. Lin**, A. J. Morris et al., Investigations of Water Oxidation by Catalysts Incorporated Metal-Organic Frameworks, the 254th ACS National Meeting, August 2017.
4. **S. Lin**, A. J. Morris et al., Photoelectrochemical Alcohol Oxidation by Mixed Linker Metal-Organic Frameworks , GRC Electron Donor-Acceptor Interactions, 2018.
5. **S. Lin**, A. J. Morris, Metal-Organic Framework Thin Film as Electrocatalyst for Water Oxidation, 2nd International Solar Fuels Main Conference, July 2017.

TEACHING AND MENTORING EXPERIENCE

Teaching Assistant at VT: General Chemistry Lab, Analytical Chemistry Lab and Physical Chemistry Lab
Research mentor: 4 undergraduate students and 3 PhD students at VT, OSU and Caltech

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