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Education

University of Michigan
Ph.D. (chemistry) *May 2020*
GPA = 4.00/4.00
Advisors: Dr. habil. Nicolai Lehnert and Dr. Stephen Maldonado
Thesis: *Molecular Materials for Electrochemical Energy Conversion and Storage*

University of Michigan
M.S. (chemistry) *April 2017*
Advisors: Dr. habil. Nicolai Lehnert and Dr. Stephen Maldonado

Oberlin College
Bachelor of Arts in chemistry with honors received in *May 2013*
GPA = 3.70/4.00
Advisor: Dr. Jesse Rowsell
Thesis: *Progress Toward the Synthesis of New Organosulfonate Complexes from the Commodity Chemical H-Acid for the Assembly of Microporous Frameworks*

Publications

Total citations = 321 First author citations = 44 --used Google Scholar on 8/16/2024

Undergraduate co-authors are underlined.

Kauffman, M. and **MacInnes, M. M**. "Adsorption and incorporation of Ce^{IV} ions at tin oxide surfaces in aqueous sulfate media." *To be submitted to Advances in Colloid and Interface Science by December 2024.*

Shaw, T. E. IV; Jones, Z. R.; Adelman, S. L.; Anderson, N. H.; Bowes, E. G.; Bauer, E. D.; Dan, D.; Knope, K. E.; Kozimor, S. A.; **MacInnes, M. M.**; Mocko, V.; Rocha, F. R.; Root, H. D.; Stein, B. W.; Thompson, J. D.; Wacker, J. N. "$PuCl_3\{CoCp[OP(OEt)_2]_3\}$: Transuranic Elements Entering the Field of Heterometallic Molecular Chemistry ," *Chemical Science*, **2024**.

Livshits, M. Y.; Wolford, N. J.; Bahn, J. K.; **MacInnes, M. M.**; Greer, S. M.; Vellore Winfred, J. S. R.; Hanson, K.; Gompa, T. P.; Stein, B. W. "Exploring Differences in Lanthanide Excited State Reactivity Using a Simple Example: The Photophysics of La and Ce Thenoyltrifluoroacetone (TTA) Complexes." *Inorg. Chem.,* **2023**, 62, 13712-13721.

DiMucci, I. M.; Root, H. D.; Jones, Z. R.; Kozimor, S. A.; **MacInnes, M. M.**; Miller, J. L.; Mocko, V.; Oldham, W. J.; and Stein, B. W. "Photochemical Separation of Plutonium from Uranium." *Chem. Commun.*, **2022**, 58, 10961-10964.

Hazelnis, J. P.; Sartori, A.; Cheek, Q. B.; Giri, R. P.; **MacInnes, M. M.**; Murphy, B. M.; Magnussen, O. M.; and Maldonado, S. "Detection of Ge-Containing Adlayers at the Liquid Hg/Water Interface by In Situ X-Ray Reflectivity in Aqueous Borate Electrolytes Containing Dissolved GeO_2." *J. Phys. Chem. C*, **2022**, 126, 8177-8189.

MacInnes, M. M.; Jones, Z. R.; Anderson, N. H.; Eiroa-Lledo, C.; Knope, K. E.; Livshits, M. Y.; Kozimor, S. A.; Mocko, V.; Rocha, F. R.; Stein, B. W.; and Wacker, J. N. "Using Molten Salts to Probe Outer-Coordination Sphere Effects on Lanthanide(III/II) Electron-Transfer Reactions," *Dalton Trans.*, **2021**, DOI: 10.1039/d1dt02708e.

Lancaster, M.; Mow, R.; Liu, J.; Cheek, Q.; **MacInnes, M. M**.; Al-Jassim, M.; Deutsch, T.; Young, J.; Maldonado, S. "Protection of $GaInP_2$ Photocathodes by Direct Photoelectrodeposition of MoS_x Thin Films." *ACS Appl. Mater. Interfaces,* **2019**, 11, 25115-25122.

MacInnes, M. M.; Cousineau, B. R.; Youngs, S. M.; Sinniah, K.; Reczek, J. J.; Maldonado, S. "Discovery of Unusually Stable Reduced Viologen via Synergistic Folding and Encapsulation" *J. Electrochem. Soc.* **2019**, 166, H825-H834.

Hlynchuk, S.; **MacInnes, M. M**.; and Maldonado, S. "Sensitization of p-GaP by physisorbed triarylmethane dyes." *J. Phys. Chem.* **2018**, 122, 20073-20082.

MacInnes, M. M.; Hlynchuk, S.; Acharya, S.; Lehnert, N.; Maldonado, S., "Reduction of graphene oxide thin films by cobaltocene and decamethylcobaltocene." *ACS Appl. Mater. Interfaces*, **2018**, 10, 2004-2015.

Eady, S. C.; **MacInnes, M. M**.; Lehnert, N. "Immobilized Co-bis(benzenedithiolate) complexes: exceptionally active heterogeneous electrocatalysts for dihydrogen production from mildly acidic aqueous solutions." *Inorg. Chem.*, **2017**, *56*, 11654-11667

Eady, S. C.; **MacInnes, M. M**.; Lehnert, N. "A smorgasbord of carbon: electrochemical analysis of cobalt-bis(benzenedithiolate) complex adsorption and electrocatalytic activity on diverse graphitic supports." *ACS Appl. Mater. Interfaces*, **2016**, *8*, 23624-23634

Olson, A. C.; Keith, J. M.; Batista, E. R.; Boland, K. S.; Daly, S. R.; Kozimor, S. A.; **MacInnes, M. M**.; Martin, R. L.; Scott, B. L. "Using solution- and solid-state S K-edge X-ray absorption spectroscopy with density functional theory to evaluate M-S bonding for MS_4^{2-} (M=Cr, Mo, W) dianions." *Dalton Trans.*, **2014**, *43*, 17283-17295

Boland, K. S.; Hobart, D. E.; Kozimor, S. A.; **MacInnes, M. M**.; Scott, B.L. "The coordination chemistry of trivalent lanthanides (Ce, Nd, Sm, Eu, Gd, Dy, Yb) with diphenyldithiophosphinate anions." *Polyhedron*, **2014**, *67*, 540-548

Spencer, L. P.; Yang, P.; Minasian, S. G.; Jilek, Robert E.; Batista, E. R.; Boland, K. S.; Boncella, J. M.; Conradson, S.D.; Clark, D.L.; Hayton, T.W.; Kozimor, S.A.; Martin, R.L.; **MacInnes, M. M**.; Olson, A.C.; Scott, B.L.; Shuh, D.K.; Wilkerson, M.P. "Tetrahalide Complexes of the $[U(NR_2)]^{2+}$: Synthesis, Theory, and Chlorine K-Edge X-ray Spectroscopy." *J. Amer. Chem. Soc.*, **2013**, *135*, 2279

Daly, S. R.; Klaehn, J. R.; Boland, K. S.; Kozimor, S. A.; **MacInnes, M. M**.; Peterman, D. R.; Scott, B. L. "NMR Spectroscopy and Spectral Characterization of Dithiophosphinate Ligands Relevant to Minor Actinide Extraction Processes." *Dalton Trans.,* **2012**, *41*, 2163

Professional Experience

Assistant Professor of Chemistry at Grinnell College *August 2022 – present*

- Tenure track
- Courses: Instrumental Analysis lecture and lab (CHM 358), Inorganic and Analytical Chemistry lecture and lab (CHM 210 – prior to fall 2023), Analytical Chemistry lecture and lab (CHM 210 – fall 2023 and later)), General Chemistry lab (CHM 129L)
- Mentored 8 research students (CHM/BCM 499, 299, 297) to date

Postdoctoral researcher at Los Alamos National Laboratory *June 2020 – June 2022*

- Electrochemical analysis of lanthanide and actinide ions in molten salt and aqueous matrices
- Radiochemistry and actinide separations experience

University of Michigan graduate student *Sept. 2015 – May 2020*

- Electrochemistry and photoelectrocatalysis, specifically proton reduction using gallium phosphide and silicon as semiconductor electrodes and molecular cobalt catalysts.
- Carbon surfaces, esp. reduced graphene oxide and graphene oxide synthesis, characterization, and functionalization.
- Electrochemical and spectroscopic characterization of host-guest interactions
- Maintained and operated an x-ray photoelectron spectrometer
- Mentored four undergraduate students and four 1^{st} year graduate students on their research projects, several of which were unrelated to my own research:
    - Quantum dot sensitization of GaP photocathodes
    - Ferrocene-based materials for aqueous redox flow batteries
    - Benchtop perovskite solar cell synthesis design for use in undergraduate laboratory class

Graduate Student Instructor at University of Michigan *Sept. 2015 – May 2017*

- Taught general chemistry and organic chemistry recitation and laboratory classes.
    - Developed lesson plans, worksheets, quizzes, and exams.
    - Graded quizzes, exams, and laboratory reports.

Substitute Chemistry Instructor at Interlochen Arts Academy *Aug. 2014 – Dec. 2014*

- Taught 10^{th}-12^{th} grade chemistry, including AP chemistry.
    - Developed lesson plans, homework, quizzes, exams, and laboratory experiments.
    - Graded homework, quizzes, exams, and laboratory reports.
    - Conducted parent-teacher conferences.

DAAD RISEpro intern with BASF SE in Ludwigshafen, Germany *July 2013 – Dec. 2013*

- Organic synthetic chemistry research for organic photovoltaics, specifically hole transport materials
- Presented findings in German to department

Senior undergraduate honors project in chemistry *Sept. 2012 – May 2013*

- Yearlong laboratory research project concluding with a written thesis, presentation, and defense.
- Research involved synthetic inorganic chemistry probing four-coordinate boron centers

SULI Fellowship intern at Los Alamos National Laboratory *Summer 2011 and Summer 2012*

- Worked under Dr. Stosh Kozimor in the Chemistry Division
- Two consecutive summer internships involving inorganic synthesis of lanthanide and uranyl coordination compounds.
- Trained in air-sensitive and nuclear chemistry

Teaching assistant for chemistry laboratory class at Oberlin College *Feb. 2011 – May 2011*

- Taught introductory chemistry lab. Graded lab reports, prepped labs, monitored and helped students during class.

Private and group chemistry tutor at Oberlin College *2011 – 2013*

Research Student Mentorship

Grinnell College (8 total)

- Spring 2023: 1 second year student
- Summer 2023: 1 second year, 1 third year, and 1 fourth year
- Fall 2023: 1 third year, 1 fourth year (both continuing from summer)
- Spring 2024: 1 fourth year (continuing), 1 third year (continuing), 1 second year, 1 first year
- Summer 2024: 1 second year, 1 fourth year

University of Michigan (as a graduate student) (6 total)

- 5 undergraduate students and 1 high school student (2016 – 2019)

Institutional Service

Committees

- Grinnell College Chemistry Department Seminar Series Coordinator *AY 2024/25*
- Grinnell College Eco-Campus Committee *AY 2024/25*
- Grinnell College Scholarship Selection Committee for the Barry M. Goldwater and the Churchill Fellowships *Fall 2023*
- Grinnell College Biochemistry Majors Committee (permanent member) *Sept. 2022 – present*

Participated in GSP (Grinnell Science Project) events

- GSP is a program to increase inclusivity and diversity within STEM in college students
- Panel on pathways in science *Oct. 2022*
- Winter reunion dinner *Jan. 2023*

Academic advising

- 2024/23: 3 advisees

Other Service and Outreach

Market Science *Summer 2024*

- Brought students to Grinnell Farmers Market where they engaged market attendees in conversations about their science
- Prepared poster and demonstrations to facilitate these conversations and engagement
- Helped students prepare to talk to a lay audience about high level scientific concepts
- The goals were to coach students in accessible and equitable science communication and to foster conversations with our broader community about our research.

Community Garden caretaker (Imagine Grinnell) *Summers 2023, 2024*

- Planted and cared for a community garden in Grinnell, IA
- Gave excess harvests to the Grinnell College food pantry

Letters to a Prescientist (LPS) *2020-2022*

- Wrote letters to middle school and elementary school students, talking about my science and their interests in science and other things
- The program serves lower income urban and rural schools

Peer reviewer *May 2018 – present*

- *Journal of the Electrochemical Society*
- *Inorganic Chemistry*
- ACS Petroleum Research Fund

Graduate Employee Organization *Feb. 2018 – April 2020*

- Chemistry department steward

    - Representative in the graduate student labor union at the University of Michigan (University of Michigan GEO): promoted membership, attended meetings, organized events and actions, distributed information
- Organizing committee member
    - Leadership role: trained new stewards in several departments and acted as their point of contact and support. Held stewards accountable for their plans and goals.

F.E.M.M.E.S. after-school events coordinator *April 2017 – April 2020*

- F.E.M.M.E.S. is a group at the University of Michigan that organizes capstone events at the university and after school events at regional elementary schools in which 4th and 5th grade girls participate in demos and activities relating to STEM.
- I organized events once a month at schools in the area and I designed and implemented new activities and lessons for these events.

Karle Symposium organizing committee *Feb. – August 2017*

- University of Michigan annual chemistry symposium designed and run by graduate students. Participated as a member of the publicity subcommittee for one year.

F.E.M.M.E.S. volunteer *Oct. 2016 – March 2017*

- Volunteered at the capstone events hosted at U of M

Science Olympiad Coach, Potions division *Feb. 2016 – May 2016*

- Martin Luther King Junior Elementary School, Ann Arbor, MI, Grades 4-5

Treasurer of the Chemistry Majors Committee (Oberlin College) *Sept. 2012 – May 2013*

Vice president of the Oberlin College Equestrian Team *Sept. 2012 – May 2013*

Secretary of the Oberlin College Equestrian Team *Sept. 2011 – May 2012*

Grant/Fellowship Applications

Harris Faculty Fellowship *Submitted August 2024*

- "Electrochemical characterization of ion adsorption at solid-liquid interfaces"
- Lead PI
- $7800 and one extra semester of pre-tenure sabbatical

NSF MRI pre-proposal *Submitted August 2024*

- "Acquisition of a State-of-the-art X-ray Photoelectron Spectroscopy System"
- Submitted by Iowa State University Materials Analysis Research Laboratory
- I submitted supporting material as a user of the instrument

NSF LEAPS-MPS grant *Unsuccessful July 2024*

- "LEAPS-MPS: Electrochemical characterization of ion adsorption at solid-liquid interfaces"
- Lead PI
- $221,536.70 over 2 years
- Award number 2419025

Electrochemical Society Conference Travel Grant *Awarded August 2023*

- $500
- Talk titled "Cerium ion adsorption to fluorine-doped tin oxide electrodes"

NSF LEAPS-MPS grant *Unsuccessful July 2023*

- "LEAPS-MPS: Electrochemical Sensing and Separations"
- Lead PI
- $196,302 over 2 years

- Award number 2316921

NSF MRI grant *Awarded July 2022*
- "MRI: Acquisition of a 500-MHz NMR Spectrometer for Chemistry and Materials Research"
- NMR Spectrometer: $399,990
- Award number 2216273

Roy J. Carver Trust *Awarded July 2022*
- "Incorporation of Modern 400 MHz NMR Spectrometer into Grinnell College Chemistry and Biological Chemistry Curricula."
- $200,000

Los Alamos National Laboratory LDRD-DR grant *Awarded June 2021*
- Laboratory Directed Research and Development – Direct Research
- Co-author
- $1.5m over 3 years

NSF-GRFP Fellowship *Awarded April 2017*
- National Science Foundation Graduate Research Fellowship Program
- $138k over 3 years

Technical Skills

Laboratory techniques: Electrochemistry and photoelectrochemistry, actinide and transuranic chemistry, inert atmosphere glovebox, Schlenk line, high temperature manipulations and molten salt chemistry, column chromatography purifications, synthetic organic and inorganic chemistry, spin-coating, plasma-etching and wet etching, four-point probe measurements

Analysis: X-ray photoelectron spectroscopy (**XPS**), atomic force microscopy (**AFM**), **IR** spectroscopy, **UV-Vis** spectroscopy, **Raman** and micro-Raman spectroscopies, **NMR** spectroscopy, scanning electron microscopy (**SEM**), energy dispersive spectroscopy (**EDS**), X-ray fluorescence spectroscopy (**XRF**), fluorescence spectroscopy, electron paramagnetic resonance spectroscopy (**EPR**), atomic absorption and emission spectroscopies (**AAS, AES, ICP-MS**), gas chromatography (**GC**), mass spectrometry (**MS**), high performance liquid chromatography (**HPLC**).

Software: Microsoft Office, Origin, Adobe Illustrator, CasaXPS, CH Instruments software, VersaStudio, Anasys Studio, Gwyddion, CasaXPS, DigiElch, ImageJ, IgorPro

Language: English (first language), German (intermediate, B2 level)

Invited Presentations

University of Iowa	*April 2024*
Electrochemical Society Spring Meeting, Vancouver	*June 2022*
Grinnell College	*December 2021*
Bowdoin College	*December 2021*
University of San Francisco	*November 2021*
Harvey Mudd College	*November 2021*
Providence College	*November 2021*
Santa Clara University	*November 2021*
Murray State University	*November 2021*
Albion College	*June 2021*

University of Notre Dame *November 2019*

Argonne National Laboratory *October 2019*

Los Alamos National Laboratory *October 2019*

Albion College *December 2016*

Selected Contributed Presentations

"Cerium Ion Adsorption to Fluorine-Doped Tin Oxide Electrodes." Oral presentation at the Electrochemical Society Annual Meeting, Gothenburg, Sweden
October 2023

"Tuning the Electrodeposition of Actinides in Molten Alkali Halide Salts." Oral presentation at the American Chemical Society Midwest Regional Meeting (MWRM), Iowa City, IA
October 2022

"Effects of Film Morphology on Electrocatalyst Immobilization on Graphitic Thin Films" Materials Research Society, fall meeting
December 2019

"Molecular Immobilization on Carbon Materials." Oral presentation at the 3rd Molecules and Materials for Artificial Photosynthesis conference in Cancun, Mexico
March 2018

"Insights into the Reduction of Graphene Oxide and its Use as an Electrode Coating." Oral presentation at the Karle Symposium, University of Michigan, Ann Arbor, MI
August 2017

"Progress Toward the Synthesis of New Organosulfonate Complexes from the Commodity Chemical H-Acid for the Assembly of Microporous Frameworks." Honors presentation to department, Oberlin College, Oberlin, OH.
May 2013

"Dithiophosphinates as an Approach to the Separation of Actinides and Lanthanides." Oral presentation at the national American Chemical Society conference in New Orleans
April 2013

Awards and Recognition

Poster presentation award at the University of Michigan Karle Symposium *August 2018*
Short talk award at the 3rd Molecules and Materials for Artificial Photosynthesis conference *March 2018*
Student talk award at the University of Michigan Karle Symposium *August 2017*
National Science Foundation Graduate Research Fellowship awardee *April 2017*
Poster presentation award at the University of Michigan Karle Symposium *July 2016*
ACS Undergraduate Award in Inorganic Chemistry *June 2013*
Graduated with honors from Oberlin College *May 2013*
American Chemical Society recognized bachelor's degree in chemistry *May 2013*
Oberlin College award for inorganic chemistry *May 2013*
Member of Sigma Xi *Inducted May 2013*
Cleveland Section of the American Chemical Society Meeting in Miniature oral presentation *March 2013*
Los Alamos National Laboratory Summer Student Symposium poster presentation award for the chemistry division *August 2012*