

Mitchell Lancaster

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Highlights

- Extensive training in electrochemical analysis, materials synthesis and characterization
- 2 first author publications, 6 total publications

Education

University of Michigan *Ann Arbor, MI* 2015-Fall 2019
Ph.D. Candidate, Department of Chemistry

University of Minnesota *Minneapolis/St. Paul, MN* 2011-2014
B.S. Chemistry

Research & Related Experience

Graduate Research *University of Michigan* 2015-Present
Advisor: Dr. Stephen Maldonado

- Developed a microfabricated semiconductor ultramicroelectrode platform for investigation of charge transfer thermodynamics and kinetics at semiconductor/liquid contacts
- Enhanced the corrosion resistance and optical properties of III-V semiconductor photoelectrode materials through electrodeposited transition metal catalyst thin films
- Established liquid metal-based, electrochemical growth methods for Group IV and III-V semiconductor materials and characterized their structure and composition

DOE Office of Science Fellowship *National Renewable Energy Lab, Golden, CO* 2018

- Employed electrodeposited protective layers to stabilize high performance photocathodes for efficient water splitting
- Fabricated microscopic semiconductor/electrolyte contacts through photolithography for photovoltage augmentation during photoelectrochemical hydrogen generation

Analytical Technician *General Mills-Medallion Labs, Golden Valley, MN* 2015
Supervisors: Brett Post and Lindsay Trapp

- Performed assays and method development for the detection of carotenoids, fructans, and dietary fiber in foods and supplements using UPLC/HPLC methods while conforming to ISO and AOAC guidelines

Undergraduate Research *University of Minnesota* 2012-2014
Advisor: Dr. Philippe Bühlmann

- Investigated binding of carbonate in carbonate-selective ionophores through synthesis of tetraalkylammonium carbonate salts, NMR analysis, and *Mathematica* modelling
- Assessed speciation and toxicity of ionic silver in microorganism environments using silver ion-selective electrodes

Technical Skills

- **Electrochemistry:** Galvanostatic and potentiostatic methods, electroplating, voltammetric analysis, anodic and cathodic etching, impedance spectroscopy, COMSOL modelling, MATLAB and Mathematica curve fitting, microelectrode fabrication and analysis

- **Materials Characterization:** Reflectivity, quantum yield, ellipsometry. X-ray diffraction/fluorescence, electron microscopy. Raman, IR, XP, and UV-Vis spectroscopy
- **Microfabrication:** Contact photolithography, wet and dry etching, electroplating

Publications

- Lancaster, M.;** Maldonado, S. (*Invited*) Perspective on Photoelectrochemistry *J. Am. Chem. Soc.* In preparation.
- Hlynchuk, S.; **Lancaster, M.;** MacInnes, M. M.; Vasquez, R.; Maldonado, S. Fundamental Principles of Semiconductor/Electrolyte Junctions: From Historical Perspectives to Modern Understanding. In: *Handbook of Inorganic Photochemistry*. In Press.
- Lancaster, M.;** Mow, R.; Liu, J.; Cheek, Q.; MacInnes, M. M.; Al-Jassim, M. M.; Deutsch, T. G.; Young, J. L.; Maldonado, S. Protection of GaInP₂ Photocathodes by Direct Photoelectrodeposition of MoS_x Thin Films *ACS Appl. Mater. Interfaces* In Revision.
- Lancaster, M.*;** Acharya, S.*; Maldonado, S. Semiconductor Ultramicroelectrodes (SUMEs): Platforms for Studying Charge-Transfer Processes at Semiconductor/Liquid Interfaces *Anal. Chem.* **2018**, *90*, 12261-12269.
- DeMuth, J.*; Ma, L.*; **Lancaster, M.;** Acharya, S.; Cheek, Q.; Maldonado, S. Eutectic-Bismuth Indium as a Growth Solvent for the Electrochemical Liquid-Liquid-Solid Deposition of Germanium Microwires and Coiled Nanowires *Cryst. Growth Des.* **2018**, *18*, 677-685.
- Fahrenkrug, E.; Rafson, J.; **Lancaster, M.;** Maldonado, S. Concerted Electrodeposition and Alloying of Antimony on Indium Electrodes for Selective Formation of Indium Antimonide *Langmuir* **2017**, *33*, 9280-9287.
- Mousavi, M. P. S.; Gunsolus, I. L.; Pérez De Jesús, C. E.; **Lancaster, M.;** Hussein, K.; Haynes, C. L.; Bühlmann, P. Dynamic Silver Speciation as Studied with Fluorous-Phase Ion-Selective Electrodes: Effect of Natural Organic Matter on the Toxicity and Speciation of Silver *Sci. Total Environ.* **2015**, *537*, 453-461.

Selected Presentations

- Lancaster, M.;** Maldonado, S. (*Invited Oral*) Charge Transfer at III-V Semiconductor Ultramicroelectrodes. Pittcon, Philadelphia, PA, March 2019.
- Lancaster, M.;** Acharya, S.; Maldonado, S. (*Poster*) Measurement of Charge Transfer Kinetics at Semiconductor Ultramicroelectrodes. Gerischer Symposium, Boulder, CO, August 2018.
- Lancaster, M.;** Acharya, S.; Maldonado, S. (*Oral*) Size-Dependent Electrochemistry of n-Si and n-GaP Semiconductor Ultramicroelectrodes. 233rd ECS Meeting, Seattle, WA, May 2018.

Awards and Honors

PPG Summer Research Fellowship	2019
Society of Electroanalytical Chemistry Student Travel Award	2019
Electrochemical Society Physical and Analytical Electrochemistry Travel Grant	2018
Department of Energy Office of Science Graduate Student Research Award	2018
Karle Symposium Analytical Cluster Poster Award	2017

Teaching and Mentoring

- Taught laboratory courses in general chemistry and bioanalytical chemistry and supervised a special general chemistry section focused on ambient fabrication of perovskite solar cells
- Mentored two undergraduate students tasked with electrodepositing CoO_x thin films on macroporous GaP photoanodes and electrochemical formation Ni-Ga intermetallics