



Nathanael J. Downes  
University of Michigan, Department of Chemistry  
930 N. University Ave, Ann Arbor, MI 48109  
[downesn@umich.edu](mailto:downesn@umich.edu)

### Education:

**University of Michigan, Ann Arbor, MI** Summer, 2017 - Present  
*Ph.D Pre-Candidate, Department of Chemistry*  
Maldonado Group

**Allegheny College, Meadville, PA** Fall, 2013 – Spring, 2017  
B.S. Chemistry

### Professional Preparation:

**Graduate Research** University of Michigan  
Advisor: Prof. Stephen Maldonado January, 2018 – Present

- Investigating the electrochemical activity and deposition characteristics of various silicon based precursors for silicon thin film generation in non-aqueous media.
- Defining new methods for the electrodeposition of crystalline Group IV thin films.
- Characterizing thin films via Raman spectroscopy and scanning electron microscopy.

Advisor: Prof. Charles McCrory September, 2017- December, 2017

- Designed an electrochemical cell for the low-temperature synthesis of mixed metal nitrides.
- Investigated catalytic activity of single metal nitrides for electrochemical  $N_2RR$  using a high-pressure reaction vessel.

Advisor: Prof. Nicolai Lehnert May, 2017-August, 2017

- Synthesized and characterized molybdenum dithiolene molecular electrocatalysts for hydrogen evolution reaction.
- Investigated the electrocatalytic activity of molybdenum dithiolene complexes using cyclic voltammetry.

**Undergraduate Research**  
Advisor: Prof. Tim Chapp January, 2015 – May, 2017

- Performed large-scale multi-step synthetic procedure to generate air-sensitive diphosphine ligand.
- Created a library of Ni halide complexes with bis(mesitylphosphine)propane.
- Characterized Ni(diphos) complexes using wide array of 1D and 2D NMR experiments.

### **Teaching Experience**

Graduate Student Instructor University of Michigan  
Course: *CHEM 211* September, 2017 - April, 2018

- Taught fundamental techniques in an introductory organic chemistry laboratory.

Undergraduate Teaching Assistant  
Course: *Organic Chemistry I: Lab* January, 2016 - December, 2016

- Taught fundamental techniques in an introductory organic chemistry laboratory.
- Collected and worked up  $^1\text{H}$  NMR spectra for several sections.

*General Chemistry I*

**August, 2015 – December, 2015**

- Explained technical concepts and provided procedural feedback.
- Assisted students in use of UV-vis, GC, and related computational software.

**Related Experience:**

Environmental Health and Safety Compliance Officer's Assistant

**October, 2016 – May, 2017**

- Ensured the functionality and presence of safety equipment in laboratory spaces across campus, including but not limited to, fume hoods, safety showers, emergency defibrillators, fire extinguishers, first aid kits, emergency exit floor plans etc.

University of Michigan Paleontology Research Assistant

**Summer 2016**

Advisor: Prof. Daniel Fischer

- Reapplied fractured cementum to mammoth tusk surface and reassembled denton core.
- Stabilized mammoth tusk surface using aliphatic oils and the interior through targeted epoxy pours.
- Applied chemistry background to remove gritty mineral deposits on fossil specimen extracted from riverbed.

Honors and Achievements:

Thomas Lord Charitable Trust Student-Faculty Research Fund

**2015**

Alden Scholar

**2014-2015**

Presentations and Posters:

*Downes, Nathanael.* Towards a Sterically Hindered Bimetallic Nickel Complex Capable of Producing Hydrogen. Allegheny Senior Thesis Defense, April 23<sup>rd</sup>, 2017 (oral presentation).

*Downes, Nathanael;* Chapp, T. W. Synthesis and reactivity of secondary phosphine ligands with Ni(0) and Ni(II). Abstracts of Papers, 251<sup>st</sup> ACS National Meeting, San Diego, CA, United States, March 13<sup>th</sup>-17<sup>th</sup> INORG (poster presentation).

*Downes, Nathanael;* Chapp, Timothy W. Hydrogen: Use, Production, and Potential. Allegheny College ACROSS Summer Symposium Series, July 14<sup>th</sup>, 2015 (oral presentation).