

Joshua J. DeMuth

4837 Packard Rd. Ann Arbor, MI 48104 | 847-271-3355 | demuthj@umich.edu

Education

- University of Michigan**, *Ph.D Materials Chemistry* Ann Arbor, MI
2013 – Fall 2017
- Cumulative GPA 3.80/4.0
- Northern Illinois University**, *B.S. Chemistry and Minor in Applied Mathematics* DeKalb, IL
2013
- Cumulative GPA 3.85/4.0, *magna cum laude*

Selected Awards

- ❖ Rackham Graduate Student Research Awards 2014
- ❖ James and Madeleine Davis Graduate Fellowship (**4 per incoming class**) 2013
- ❖ American Institute of Chemist Award (**2 recipients per department**) 2013

Publications and Patent Applications

1. **DeMuth, J.; Ma, L.**; Lancaster, M.; Acharya, S.; Cheek, Q.; and Maldonado, S. *Cryst. Growth Des.*, 2018, ASAP
2. **Demuth, J.; Farenkrug, E.**; Ma, L.; Shodiya, T.; Deitz, J. I.; Grassman, T. J.; and Maldonado, S. , *J. Am. Chem. Soc.*, **2017**, 139, 6960–6968.
3. Maldonado, S.; Fahrenkrug, E.; **DeMuth, J.** **US Patent Application** No. 62/444,083, 2016
4. Ma, L.; Lee, S.; **DeMuth, J.**; and Maldonado, S.; "Direct Electrochemical Deposition of Crystalline Silicon Nanowires at $T \geq 60^\circ \text{C}$ " *RSC Adv.*, **2016**, 6, 78818-78825
5. **DeMuth, J.**; Fahrenkrug, E.; and Maldonado, S. *Cryst. Growth Des.*, **2016**, 16, 7130–7138
6. **DeMuth, J.**; Ma, L.; Maldonado, S. et al. *Electrochim. Acta*, **2016**, 197, 353-361

Selected Oral Presentations

Electrochemical Society, Phoenix, AZ 2015
DeMuth, J.; et al., "The Electrodeposition of Crystalline Gallium Antimonide Using Electrochemical Liquid-Liquid Solid (ec-LLS) Deposition." (**Invited** speaker), Abstract 919.

Pittcon, Atlanta, GA 2016
DeMuth, J.; et al., "Electrodeposition of Semiconductor Thin Films Using Electrochemical Liquid-Liquid-Solid (ec-LLS) Deposition." (**Invited** speaker), Abstract 1280-2.

Research Experience

University of Michigan Ann Arbor, MI
Graduate student with Prof. Stephen Maldonado 2014-Present

- Developed new low temperature ($\sim 90^\circ \text{C}$) thin film deposition technique for epitaxial growth of covalent (group IV) semiconductors.
- Tested custom electrochemical cell to produce thin (10-20 μm) liquid metal electrodes used for depositing thin film covalent semiconductors
- Prepared samples for HRTEM and atom probe tomography (APT) analysis from thin films using dual beam FIB lift out technique.
- Characterized structural properties, orientation and composition of crystalline thin films and nanowires using HRTEM, STEM, electron diffraction and EDS.
- Determined dopant concentrations and distribution in nanowires using resistance measurements and APT.

Joshua J. DeMuth

4837 Packard Rd. Ann Arbor, MI 48104 | 847-271-3355 | demuthj@umich.edu

- Microfabricated nanodroplets using lithographically defined templates. Worked in a class 10 cleanroom (Lurie Nanofabrication Facility).
- Developed and programmed computational model for the electrodeposition and diffusional transport of Ge in liquid metal droplets and films.
- Mentored 2 undergraduate students in electrochemistry and materials characterization.
- Collected X-ray reflectivity and diffraction for *in situ* analysis of electrodeposition.
- Developed electron density model and performed statistical fits on experimental data.
- Planned and performed experiments extemporaneously under high pressure situations (beamtime is valuable) and collaborated with team across language barriers.

Technical Skills

- Characterized crystallinity, morphology, orientation and chemical composition of thin films and nanomaterials using electron microscopy (**SEM**, **EDS**, **TEM** techniques, **STEM** and **EBSD**), X-ray techniques (**XRR**, **PXRD**, **GIXRD**, **Rocking Curve**), **APT**, **Raman** spectroscopy, **AFM**, **optical profilometry** and **ellipsometry**.
- Sample preparation with **dual beam systems** (SEM + FIB) for APT and TEM analysis.
- Strong comprehension of crystal growth, crystallography and electron microscopy
- **Microfabrication**: photolithography (projection and contact), reactive ion etching, plasma enhanced chemical vapor deposition (**PECVD**), metal evaporation / sputtering and chemical mechanical planarization (**CMP**).
- Selected **Software**: Proficient in Python, Solid Works, MATLAB, Mathematica.

Leadership Experience

University of Michigan

Ann Arbor, MI

Future Faculty Graduate Student Instructor with Prof. Stephen Maldonado

2014-2015

- Developed new curriculum and experimental procedures for teaching general chemistry using concepts in solar energy conversion and lead halide perovskite solar cells.

Woodland Elementary School

Gurnee, IL

ACS Science Coach for Mrs. Jena Blanik

2015-present

- Received grants for teaching science to students learning English as a second language.
- Performed and planned science demonstrations (~6 per year).
- Organized and managed large event (~90 people) with interactive science demonstrations