

Don-Hyung Ha
(w) 617-253-0536 / (c) 215-498-2754
dhha@mit.edu

Massachusetts Institute of Technology
77 Massachusetts Ave, Rm 31-056,
Cambridge, MA 02139

EDUCATION & PROFESSIONAL APPOINTMENTS

Postdoctoral Associate, Massachusetts Institute of Technology, 2014.10 ~ Present

Electrochemical Energy Lab, Research Laboratory of Electronics

-Advisor: Yang Shao-Horn

-Research: Electrocatalysts for Energy Conversion

Ph. D, Cornell University, 2014.09

Department of Material Science and Engineering

-Advisor: Richard D. Robinson

-Thesis: Chemical Transformation of Nanocrystals toward Energy Applications

M. S., University of Pennsylvania, 2009

Department of Material Science and Engineering

-Advisor: Christopher B. Murray

-Thesis: PbSe/PbS Binary Nanocrystal Superlattice for Infrared Photodetectors

B. S., Korea University, 2007

Department of Material Science and Engineering

HONORS & AWARDS

- Teaching Assistant Award, Cornell University 2014
- Conference Grant, Cornell University 2014
- Best Poster Award Nominee, Materials Research Society (2012 Fall, 2013 Fall, and 2014 Spring)
- CCMR Best Poster Award, Cornell University 2013
- McMullen Fellowship, Cornell University 2009-2010
- Dow Chemical Company Foundation Fellowship, Cornell University 2009

PUBLICATIONS

FIRST-AUTHORED

1. **D.-H. Ha**,[†] M. Risch,[†] B. Han,[†] L. Giordano, K.P.C. Yao, and Y. Shao-Horn, "Activity and Stability of Cobalt Phosphides for Hydrogen Evolution Upon Water Splitting" ([†]= equally contributed)
Under Review
2. **D.-H. Ha**,[†] T. Ly, [†] J.M. Caron, H. Zhang, K.E. Fritz, and R.D. Robinson, "A General Method for High-Performance, Additive-Free Li-Ion Battery Electrodes from Colloidal Nanoparticles: The Case of MnS, Cu_{2-x}S, and Ge," *ACS Appl. Mater. Interfaces* 7, 25053 (2015) ([†]= equally contributed)
<http://dx.doi.org/10.1021/acsami.5b03398>
3. **D.-H. Ha**, A.H. Caldwell, M.J. Ward, S. Honrao, K. Mathew, R. Hovden, M.K.A. Koker, D.A. Muller, R.G. Hennig, and R.D. Robinson, "Solid-Solid Phase Transformations Induced through

Cation Exchange and Strain, in 2D Heterostructured Copper Sulfide Nanocrystals,” *Nano Lett.* 14, 7090 (2014) <http://dx.doi.org/10.1021/nl5035607>

4. **D.-H. Ha**, L.M. Moreau, S. Honrao, R.G. Hennig, and R.D. Robinson, “The Oxidation of Cobalt Nanoparticles into Kirkendall-Hollowed CoO and Co₃O₄: the Diffusion Mechanisms and Atomic Structural Transformations,” *J. Phys. Chem. C.* 117, 14303 (2013) <http://dx.doi.org/10.1021/jp402939e>

- Cover selection

5. L.M. Moreau,[†] **D.-H. Ha**,[†] H. Zhang, R. Hovden, D.A. Muller, and R.D. Robinson, "Defining Crystalline/Amorphous Phases of Nanoparticles through X-ray Absorption Spectroscopy and X-ray Diffraction: The Case of Nickel Phosphide," *Chem. Mater.* 25, 2394 (2013) <http://dx.doi.org/10.1021/cm303490y>
([†]= equally contributed)

6. **D.-H. Ha**, M.A. Islam and R.D. Robinson, "Binder-Free and Carbon-Free Nanoparticle Batteries: A Method for Nanoparticle Electrodes without Polymeric Binders or Carbon Black," *Nano Lett.* 12, 5122 (2012) <http://dx.doi.org/10.1021/nl3019559>

7. L.M. Moreau,[†] **D.-H. Ha**,[†] C.R. Bealing, H. Zhang, R.G. Hennig and R.D. Robinson, "Unintended Phosphorus Doping of Nickel Nanoparticles during Synthesis with TOP: A Discovery through Structural Analysis," *Nano Lett.* 12, 4530 (2012) <http://dx.doi.org/10.1021/nl301642g>
([†] = equally contributed)

- Highlighted in NSF research (www.research.gov)

8. **D.-H. Ha**, L.M. Moreau, C.R. Bealing, H. Zhang, R.G. Hennig and R.D. Robinson, "The structural evolution and diffusion during the chemical transformation from cobalt to cobalt phosphide nanoparticles," *J. Mater. Chem.* 21, 11498 (2011) <http://dx.doi.org/10.1039/C1JM10337G>

- Highlighted as a 'hot article' for Journal of Materials Chemistry (<http://blogs.rsc.org/jm/>)

- Inside cover selection

CO-AUTHORED

9. O.O. Otelaja, **D.-H. Ha**, T. Ly, H. Zhang, and R.D. Robinson, “Highly Conductive Cu₂-xS Nanoparticle Films through Room Temperature Processing, and an Order of Magnitude Enhancement of Conductivity via Electrophoretic Deposition” *ACS Appl. Mater. Interfaces* 6, 18911 (2014) <http://dx.doi.org/10.1021/am504785f>
10. A.H. Caldwell, **D.-H. Ha**, X. Ding, and R.D. Robinson, “Analytical modeling of localized surface plasmon resonance in heterostructure copper sulfide nanocrystals” *J. Chem. Phys.* 141, 164125 (2014) <http://dx.doi.org/10.1063/1.4897635>
11. H. Zhang, L.V. Solomon, **D.-H. Ha**, S. Honrao, R.G. Hennig, and R.D. Robinson, “(NH₄)₂S, A Highly Reactive Molecular Precursor for Low Temperature Anion Exchange Reactions in Nanoparticles,” *Dalton Trans.* 42, 12596 (2013) <http://dx.doi.org/10.1039/C3DT50803J>

12. M. Aksit, B.C. Hoselton, H. Kim, **D.-H. Ha**, R.D. Robinson. "Synthesis and Properties of Electrically Conductive, Ductile, Extremely Long ($\sim 50 \mu\text{m}$) Nanosheets of $\text{K}_x\text{CoO}_2 \cdot y\text{H}_2\text{O}$ " *ACS Appl. Mater. Interfaces* 5, 8998 (2013) <http://dx.doi.org/10.1021/am402064g>
13. H. Zhang, **D.-H. Ha**, R. Hovden, L.F. Kourkoutis and R.D. Robinson, "Controlled Synthesis of Uniform Cobalt Phosphide Hyperbranched Nanocrystals Using Tri-n-octylphosphine Oxide as a Phosphorus Source," *Nano Lett.* 11, 188 (2011) <http://dx.doi.org/10.1021/nl103400a>
14. K. S. Chang, H. Kim, D. K. Park, T. K. Ko, M. C. Ahn, **D.-H. Ha**, J.-B. Song, S. J. Lee, H. M. Kim and H. Lee, "Joint Characteristics of YBCO Coated Conductor by Removing a Metallic Stabilizer," *IEEE Trans. Appl. Supercond.* 18, 1220 (2008) <http://dx.doi.org/10.1109/TASC.2008.920811>

TO BE SUBMITTED

- A. W. Nelson, **D.-H. Ha**, A. H. Caldwell, and R.D. Robinson, "Selective Etching of Copper Sulfide Nanocrystals with Phosphine"
- M.J. Ward, M.K.A. Koker, **D.-H. Ha**, A.H. Caldwell, and R.D. Robinson, "X-ray Observations of Chemical Transformations in Heterostructured Nanocrystals,"

PATENTS

R.D. Robinson and **D.-H. Ha**, "Binder Free and Carbon Free Nanoparticle Containing Component, Method and Applications" (Publication number: WO2014025743 A1, US20150188128 A1, Application number: US 14/419,735, PCT number: PCT/US2013/053735, Publication date: 07/02/2015)

R.D. Robinson and **D.-H. Ha**, "Heterostructure Nanostructure Including 2D Atomic Phase Composition, Related Methods and Applications," U.S. Provisional Application No. 62/058,728, filed 10/2/2014.

TEACHING EXPERIENCE

Teaching Assistant

MSE 1140 Materials for Energy Systems

Cornell University, Spring 2014

(Led lab sessions and weekly discussion sessions)

-*Teaching Assistant Award Selection* (top three graduate teaching assistants each academic year in MSE Cornell University)

CHEM 700 – Selected Topics (Characterization of Inorganic Materials)

University of Pennsylvania, Fall 2008

Guest Lecturer

MSE 2060 Atomic and Molecular Structure of Matter, Cornell University

4 times (04/29/2011, 04/18/2012, 04/10/2013, and 04/28/2014)

- X-ray characterization of nanomaterials

MSE 1140 Materials for Energy Systems, Cornell University

Spring 2014 (05/05/2014)

- Nanomaterials for electrochemical storage

Mentor

Undergraduate researchers

- Mentored 7 undergraduate students
(Two students won the MSE Senior Thesis Award)
(Two students currently PhD students at Northwestern, one at MIT, and one at Stanford)

NSF-REU (Research Experiences for Undergraduates)

- Mentored 4 REU student
(One student currently PhD student at University of Colorado, Boulder)

CONFERENCE PRESENTATIONS

14. The Interplay between Cation Diffusion and Strain to Induce Solid-Solid Phase Transformations in 2D Heterostructured Nanocrystals

D.-H. Ha, A.H. Caldwell, M.J. Ward, S. Honrao, K. Mathew, R. Hovden, M.K.A. Koker, D.A. Muller, R.G. Hennig, and R.D. Robinson

Gordon Research Conference (Colloidal Semiconductor Nanocrystals), Bryant University, 2014, Poster

13. Cation-Exchange and Strain Mediated Phase Transformation in Heterostructured Copper Sulfide Nanocrystals

D.-H. Ha, A.H. Caldwell, R. Hovden, S. Honrao, R.G. Hennig, D.A. Muller, and R. D. Robinson

Materials Research Society, San Francisco, *Spring 2014*, Oral

12. Symmetry-Driven Interface Formation in Nanoparticle Cation Exchange

D.-H. Ha, A.H. Caldwell, R. Hovden, D.A. Muller, and R. D. Robinson

Materials Research Society, Boston, *Fall 2013*, Poster

11. The Oxidation of Cobalt Nanoparticles into Kirkendall-Hollowed CoO and Co₃O₄: The Diffusion Mechanisms and Atomic Structural Transformations

D.-H. Ha, L. M. Moreau, S. Honrao, R. G. Hennig, and R. D. Robinson

Materials Research Society, Boston, *Fall 2013*, Poster

- *Best Poster Award Nominated*

10. Co₃O₄ Nanoparticle Assemblies for Binder-Free and Carbon-Free Nanoparticle Batteries

D.-H. Ha, L. M. Moreau, S. Honrao, R. G. Hennig, and R. D. Robinson

CCMR 2013 Symposium, Cornell University, 2013, Poster

- *Best Poster Award Selection*

9. Binder-free and Carbon-free Nanoparticle Batteries: A Method for Nanoparticle Electrodes without Polymeric Binders or Carbon Black

D.-H. Ha, M. A. Islam and R. D. Robinson,

Materials Research Society, Boston, *Fall 2012*, Poster

- *Best Poster Award Nominated*

8. Binder-free and Carbon-free Nanoparticle Batteries: A Method for Nanoparticle Electrodes without Polymeric Binders or Carbon Black

D.-H. Ha, M. A. Islam and R. D. Robinson,

Energy Storage Technology Conference, Rochester, *Fall 2012*, Poster

7. Binder-Free Cobalt Oxide Nanoparticle Films through Electrophoretic Deposition for Li-ion Batteries

D.-H. Ha, M. A. Islam and R. D. Robinson,
Materials Research Society, Boston, *Fall 2011*, Poster

6. The Structural Evolution and Diffusion During The Chemical Transformation From Cobalt To Cobalt Phosphide Nanoparticles

D.-H. Ha, L. M. Moreau, C. R. Bealing, H. Zhang, R. G. Hennig and R. D. Robinson
Materials Research Society, Boston, *Fall 2011*, Poster

5. The Structural Evolution and Diffusion during the Chemical Transformation from Metal to Metal Phosphide/Oxide Nanoparticles

D.-H. Ha, L. M. Moreau, C. R. Bealing, H. Zhang, R. G. Hennig and R. D. Robinson
Gordon Research Conference (Nanocrystals & Nanostructures), Mt. Holyoke College, *2011*, Poster

4. Binderless Cobalt Oxide Nanoparticle Films through Electrophoretic Deposition, for Li-ion Batteries

D.-H. Ha, M. A. Islam and R. D. Robinson,
American Institute of Chemical Engineers Conference, Minneapolis, *2011*, Oral

3. The Structural Evolution and Diffusion during the Chemical Transformation from Cobalt to Cobalt Phosphide Nanocrystals

D.-H. Ha, L. M. Moreau, C. R. Bealing, H. Zhang, R. G. Hennig and R. D. Robinson
American Institute of Chemical Engineers Conference, Minneapolis, *2011*, Oral

2. Infrared Photodetector based on PbSe/PbS Binary Superlattice

D.-H. Ha, C. B. Murray,
American Physical Society, Pittsburgh, *Spring 2009*, Oral

1. PbSe/PbS Binary Nanocrystal Superlattice for Infrared Photodetectors

D.-H. Ha, C. B. Murray,
Materials Research Society, San Francisco, *Spring 2009*, Poster