Curriculum Vitae (2021)
Robert M. Hovden

Materials Science & Engineering
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EDUCATION

Ph.D. Applied Physics,	2014, Cornell University
M.Sc. Applied Physics,	2010, Cornell University
B.Sc. Summa Cum Laude, Physics,	2007, Georgia Institute of Technology

APPOINTMENTS

2017-	Assistant Professor, Materials Science	University of Michigan	MI
2014-2017	Postdoctoral Associate, Applied Physics	Cornell University	NY
2007-2013	Research Assistant, Applied Physics	Cornell University	NY
2006, 2005	Summer Researcher, Computer Science	Jet Propulsion Labs	CA
2007-2008, 2010	Teaching Assistant, Applied Physics	Cornell University	NY
2004-2007	Teaching Assistant, Mathematics	Georgia Tech	GA

SELECTED PUBLICATIONS (10 of 70, Google scholar: *h*-index 33, 6000+ citations, Erdős # 4)

10. Limits of Three-Dimensional Resolution and Dose for Aberration-Corrected Electron Tomography, R Yalisove, SH Sung, P Ercius, R Hovden, **Physical Review Applied** 15, 014003 (2021)

9. *Nanoscale deformation mechanics reveal resilience in nacre of Pinna nobilis shell*, J. Gim, N. Schnitzer, L. M. Otter, Y. Cui, S. Motreuil, F. Marin, S. E. Wolf, D. E. Jacob, A. Misra, R. Hovden, **Nature Communications 10**, 4822 (2019)

8. *Nanoscale assembly processes revealed in the nacroprismatic transition zone of Pinna nobilismollusc shells*, R. Hovden*, S.E. Wolf*, M.E. Holtz, F. Marin, D.A. Muller, L.A. Estroff **Nature Comm*. 6**, 1097* (*2015*)

7. *Control of Metastable Charge Density Wave Phases in Ultrathin 1T-TaS_2*, A.W. Tsen, R. Hovden, D.Z. Wang, Y.D. Kim, J. Okamoto, K.A. Spoth, Y. Liu, W.J. Lu, Y.P. Sun, J. Hone, L. F. Kourkoutis, P. Kim, A.N. Pasupathy ***Proc. Natl. Acad. Sci. U.S.A. 112**, 15054 (2015)*

6. R. Hovden, A. W. Tsen, B. Savitzky, P. Liu, I. Baggari, Y. Liu, W. Lu, Y. Sun, P. Kim, A.N. Pasupathy, L.F. Kourkoutis, "Atomic lattice disorder in charge-density-wave phases of exfoliated dichalcogenides (1T-TaS_2)", ***Proc. Natl. Acad. Sci. U.S.A.* 113***,* 11420 (2016)

5. *The mesoscale order of nacreous pearls*, J. Gim, A. Koch, L. M. Otter, B. H. Savitzky, S. Erland, L. A. Estroff, D. E. Jacob, R. Hovden, **Proc. Natl. Acad. Sci. U.S.A. 118**, 42 (2021)

4. *Engineering new limits to magnetostriction through metastability in iron-gallium alloys*, P. Meisenheimer, R. Steinhardt, S.H. Sung, L. Williams, S. Zhuang, M. Nowakowski, S. Novakov, M. Torunbalci, B. Prasad, C. Zollner, Z. Wang, N. Dawley, J. Schubert, A. Hunter, S. Manipatruni, D. Nikonov, I. Young, L. Chen, J. Bokor, S. Bhave, R. Ramesh, J. Hu, E. Kioupakis, R. Hovden, D. Schlom, J. Heron, **Nature Communications** 12, 2757 (2021)

3. S.H. Sung, N. Schnitzer, L. Brown, J. Park, R. Hovden, *"*Stacking, strain, and twist in 2D materials quantified by 3D electron diffraction*",* **Physical Review Materials *3***, 064003 (2019)

2. H. Yoo, R. Engelke, S. Carr, S. Fang, K. Zhang, P. Cazeaux, S.H. Sung, R. Hovden, A.W. Tsen, T. Taniguchi, K. Watanabe, G.C. Yi, M. Kim, M. Luskin, E.B. Tadmor, E. Kaxiras, P. Kim, "Atomic and electronic reconstruction at the van der Waals interface in twisted bilayer*",* **Nature Materials 18**, 448–453 (2019)

1. *Nature and evolution of incommensurate charge order in manganites visualized with cryogenic scanning transmission electron microscopy, I. El Baggari, B.H. Savitzky, A.S. Admasu, J. Kim, S.W. Cheong, R. Hovden, L.F. Kourkoutis, **Proc. Natl. Acad. Sci. U.S.A. 115**, 1445 (2018)*

INVITED TALKS

27. Defining Theoretical Limits of Aberration-Corrected Electron Tomography: New Bounds for Resolution, Object Size, and Dose, **APS March Meeting**, COVID, March 2021
26. *Electron Tomography for Functional Nanomaterials*, Robert Hovden, University of Michigan, **MRS OnDemand Webinar Series**, April 2020 (560 attendees)
25. *Maximal Resolution from the Ronchigram: Human vs. Deep Learning*, **AI for Atoms, Oak Ridge National Lab**, December 2020
24. *Defining Theoretical Limits of Aberration-Corrected Electron Tomography: New Bounds for Resolution, Object Size, and Dose,* **APS March Meeting**, Denver CO, March 2020 *(cancelled COVID-19)*
23. *Probing Atomic Structure Across Higher Dimensional Materials Using sub-Angstrom Electron Beams,* **Physics Colloquium at Wayne State University**, Detroit MI, Jan 2020
22. *Defining Theoretical Limits of Aberration-Corrected Electron Tomography: New Bounds for Resolution, Object Size, and Dose, **Frontiers of Electron Microscopy and Materials Science,*** Ashville NC, Sept 2019
21. *From 2D to 3D with High-Resolution Electron Tomography and Live Reconstruction, **Leadership Computer Facility, Argonne National Lab,*** Lemont IL, July 2019
20. *Probing Atomic Lattice Distortions Across Scale & Dimensions with sub-Angstrom Electron Beams,* **DOW Chemical**, Midland MI, Dec. 2018
19. *Determining atomic structure from 2D to 3D with high-energy electron beams,* **Midwest Imaging and Micro-analysis Workshop at Notre Dame**, Notre Dame University, May 2018
18. *Removing Stripes, Scratches, and Curtaining with Irrecoverable Compressed Sensing*, Jonathan Schwartz, Robert Hovden, **11th Annual FIB SEM Workshop**, Canadian Center for Electron Microscopy, McMaster University May 2018.
17. *Probing Atomic Structure across Scale and Dimensions with Highly Convergent Electron Beams*. [Keynote], **Michigan Microscopy & Microanalysis Society,** Ann Arbor MI, Nov. 2017
16. *Applications of Advanced Electron Microscopy Methods in Materials/Chemistry Research*, **McMaster University**, Hamilton ON, Jun. 2017
15. *Reconstruction Algorithms and Data Processing for Nanoscale Tomography*, **Canadian Centre for Electron Microscopy**, Hamilton ON, Jun. 2017
14. *Tomography practical aspects*, **Cornell University,** PARADIM Summer School and Workshop on Electron Microscopy, Ithaca NY
13. *Linear Imaging Theory*, **Cornell University,** PARADIM Summer School and Workshop on Electron Microscopy, Ithaca NY, June 2017
12. *Probing Atomic Structure Across Scale and Dimensions with sub-Angstrom Electron Beams*, **Applied Physics Program at University of Michigan**, Mar. 2017
11. *Probing Atomic Structure Across Scale and Dimensions with sub-Angstrom Electron Beams* **Dept. of Materials Science, University of Michigan**, Mar. 2016
10. *Structure, Symmetry, and Stacking of 2D Materials*, **U. Penn Dept. of Materials Science Colloquium**, Feb. 2016
9. *Determining Atomic Structure in 3D with the Modern Electron Microscope,* **NION Inc.** Kirkland WA, Feb. 2016
8. *Atomic Imaging of 2D and 3D Materials with Scanning Transmission Electron Microscopy*, **Portland State Physics Colloquium**, Portland OR, Feb. 2016
7. *Observing Symmetry and Stacking Order in 2D Materials with Electron Microscopy*, **Molecular Foundry at Lawrence Berkeley Lab**, Berkeley CA, Jan. 2016

6. *Atomic Imaging of 2D and 3D Materials with Scanning Transmission Electron Microscopy*, **Naval Research Lab**, Washington D.C., Oct. 2014
5. *When Art Exceeds Perception*, **CCA Biennial Symposium: Intimate Cosmologies**, Ithaca NY, Sept. 2014
4. *Artifact Reduction in Fourier Analysis of Atomic Resolution Images / The Cornell Spectrum Imager*, **NION Intl. Workshop on Electron Microscopy Software**, Iceland, Mar. 2014
3. *Open-Source Visualization of 3D Data: From Tomography to Spectroscopy*, **Kitware Inc.** Albany NY, Mar. 2014
2. *Imaging Limitations from 2D to 3D in Scanning Transmission Electron Microscopes*, **NION Inc.** Kirkland WA, Sept. 2013
1. *3D and Spectroscopic Characterization of Devices At The Atomic Scale Using Aberration-Corrected Electron Microscopy*, **Frontiers of Characterization and Metrology for Nanoelectronics at NIST**, Gaithersburg MD, Mar. 2013

PUBLICATION LIST

SCIENTIFIC PAPERS

68. *The mesoscale order of nacreous pearls*, J. Gim, A. Koch, L. M. Otter, B. H. Savitzky, S. Erland, L. A. Estroff, D. E. Jacob, R. Hovden, **Proc. Natl. Acad. Sci. U.S.A. 118**, 42 (2021)

67. *Ultrafast Modulations and Detection of a Ferro-rotational Charge Density Wave Using Time-resolved Electric Quadrupole Second Harmonic Generation* X. Luo, D. Obeysekera, C. Won, S.H. Sung, N. Schnitzer, R. Hovden, S.W. Cheong, J. Yang, K. Sun, L. Zhao, **Physical Review Letters 127**, 126401 (2021)

66. *Electron overflow of AlGaN deep ultraviolet light emitting diodes* A Pandey, J Gim, R Hovden, Z Mi, **Appl. Physics Letters** 118 (24), 241109

65. *Engineering new limits to magnetostriction through metastability in iron-gallium alloys*, P. Meisenheimer, R. Steinhardt, S.H. Sung, L. Williams, S. Zhuang, M. Nowakowski, S. Novakov, M. Torunbalci, B. Prasad, C. Zollner, Z. Wang, N. Dawley, J. Schubert, A. Hunter, S. Manipatruni, D. Nikonov, I. Young, L. Chen, J. Bokor, S. Bhave, R. Ramesh, J. Hu, E. Kioupakis, R. Hovden, D. Schlom, J. Heron, **Nature Communications** 12, 2757 (2021)

64. *Limits of Three-Dimensional Resolution and Dose for Aberration-Corrected Electron Tomography*, R Yalisove, SH Sung, P Ercius, R Hovden, **Physical Review Applied** 15, 014003 (2021) **[Editor's Choice]**

63. *An AlGaN tunnel junction light emitting diode operating at 255 nm*, A Pandey, J Gim, R Hovden, Z Mi, **Applied Physics Letters 117**, 241101 (2020)

62. *Dynamic Compressed Sensing for Real-Time Tomographic Reconstruction*, J Schwartz, H Zheng, M Hanwell, Y Jiang, R Hovden, **Ultramicroscopy 219**, 113122 (2020)

61. *Optimal STEM Convergence Angle Selection using a Convolutional Neural Network and the Strehl Ratio*, N Schnitzer, SH Sung, R Hovden, **Microsc. & Microanaly. 26**, 921-928 (2020)

60. *Contamination of TEM Holders Quantified and Mitigated with Open-Hardware*, High-Vacuum Bakeout System YM Goh, J Schwartz, E Rennich, T Ma, B Kerns, R Hovden, **Microsc. & Microanaly.** 26, p906-912 (2020)

59. *Imaging Polarity in Two Dimensional Materials by Breaking Friedel's Law*, P Deb, MC Cao, Y Han, ME Holtz, S Xie, J Park, R. Hovden, DA Muller, **Ultramicroscopy 215**, 113019 (2020)

58. *Graphene-assisted molecular beam epitaxy of AlN for AlGaN deep-ultraviolet light-emitting diodes*, P. Wang, A. Pandey, J. Gim, W. Jin Shin, E.T. Reid, D.A. Laleyan, Y. Sun, D. Zhang, Z Liu, Z. Zhong, R. Hovden, Z. Mi, **Appl. Phys. Lett. 116**, 171905 (2020)

57. *Electron Tomography for Functional Nanomaterials*, R. Hovden, D. A. Muller, **MRS Bulletin 45**, 298-304 (2020) **[Invited]**

56. *High-efficiency AlGaN/GaN/AlGaN tunnel junction ultraviolet light-emitting diodes*, A. Pandey, W.J. Shin, J. Gim, R. Hovden, Z. Mi, **Photonics Research 8**, 331-337 (2020)

55. *Nanoscale deformation mechanics reveal resilience in nacre of Pinna nobilis shell*, J. Gim, N. Schnitzer, L. M. Otter, Y. Cui, S. Motreuil, F. Marin, S. E. Wolf, D. E. Jacob, A. Misra, R. Hovden, **Nature Communications 10**, 4822 (2019)

54. *Magnetic frustration control through tunable stereochemically driven disorder in entropy-stabilized oxides*, P. B. Meisenheimer, L. D. Williams, S. H. Sung, J. Gim, P. Shafer, G. N. Kotsonis, J.-P. Maria, M. Trassin, R. Hovden, E. Kioupakis, J. T. Heron, **Physical Review Materials 3**, 104420 (2019)

53. *Deep Ultraviolet Luminescence Due to Extreme Confinement in Monolayer GaN/Al (Ga) N Nanowire and Planar Heterostructures*, A. Aiello, Y. Wu, A. Pandey, P. Wang, W. Lee, D.

Bayerl, N. Sanders, Z. Deng, J. Gim, K. Sun, R. Hovden, E. Kioupakis, Z. Mi, P. Bhattacharya, **Nano Letters 19**, 7852-7858 (2019)

52. *A Single Junction Cathodic Approach for Stable Unassisted Solar Water Splitting*, Y. Wang, Y. Wu, J. Schwartz, S. H. Sung, R. Hovden, Z. Mi, **Joule 3**, 2444-2456 (2019)

51. *Stacking, strain, and twist in 2D materials quantified by 3D electron diffraction,* S.H. Sung, N. Schnitzer, L. Brown, J. Park, R. Hovden, **Physical Review Materials *3***, 064003 (2019)

50. *Atomic and electronic reconstruction at the van der Waals interface in twisted bilayer*, H. Yoo, R. Engelke, S. Carr, S. Fang, K. Zhang, P. Cazeaux, S.H. Sung, R. Hovden, A.W. Tsen, T. Taniguchi, K. Watanabe, G.C. Yi, M. Kim, M. Luskin, E.B. Tadmor, E. Kaxiras, P. Kim, **Nature Materials 18**, 448–453 (2019)

49. *Removing Stripes, Scratches, and Curtaining with Non-Recoverable Compressed Sensing*, J. Schwartz, Y. Jiang, Y. Wang, A. Aiello, P. Bhattacharya, H. Yuan, Z. Mi, N. Bassim, R. Hovden, **Microsc. & Microanaly. 25**, 705-710 (2019)

48. *An $In_{0.42}Ga_{0.58}N$ Tunnel Junction Nanowire Photocathode Monolithically Integrated on a Nonplanar Si Wafer*, Y. Wang, S. Vankaa, J. Gim, Y. Wu, R. Fan, Y. Zhang, J. Shie, M. Shend, R. Hovden, Z. Mi, **Nano Energy 57**, 405–413 (2019)

47. *Optical and Interface Characteristics of $Al_{0.56}Ga_{0.44}N/Al_{0.62}Ga_{0.38}N$ Multiquantum Wells with ~280nm Emission Grown by Plasma-Assisted Molecular Beam Epitaxy*, A. Aiello, A. Pandey, A. Bhattacharya, J. Gim, X. Liu, D.A. Laleyan, R. Hovden, Z. Mi, P. Bhattacharya **Journal of Crystal Growth 508**, 66–71 (2019)

46. *Heteroepitaxy of Fin-Shaped InGaN Nanoridge Using Molecular Beam Epitaxy,* Y.B. Park, J. Gim, R. Yalisove, R. Hovden, Z. Mi, ***Cryst. Growth Des. 18***, 5750–5756 (2018)

45. *Thickness and Stacking Sequence Determination of Exfoliated Dichalcogenides (1T-TaS2, 2H-MoS2) Using Scanning Transmission Electron Microscopy*, R. Hovden, P. Liu, N. Schnitzer, A.W. Tsen, Y. Liu, W. Lu, Y. Sun, L.F. Kourkoutis, **Microsc. & Microanaly.** (2018) **[Awarded Best M&M Paper 2018]**

44. *Image registration of low signal-to-noise cryo-STEM data*, B.H. Savitzky, I. El Baggari, C. Clement, E. Waite, J.P. Sheckelton, C. Pasco, A.S. Admasu, J. Kim, S.W. Cheong, T.M. McQueen, R. Hovden, L.F. Kourkoutis, **Ultramicroscopy 191**, 56-65 (2018)

43. *Nature and evolution of incommensurate charge order in manganites visualized with cryogenic scanning transmission electron microscopy,* I. El Baggari, B.H Savitzky, A.S. Admasu, J. Kim, S.W. Cheong, R. Hovden, L.F. Kourkoutis, **Proc. Natl. Acad. Sci. U.S.A. 115**, 1445 (2018)

42. *Solar Water Oxidation by an InGaN Nanowire Photoanode with a Bandgap of 1.7 eV*, S. Chu, S. Vanka, Y. Wang, J. Gim, Y. Wang, Y.H. Ra, R. Hovden, H. Guo, I. Shih, Z. Mi, **ACS Energy Letters 3**, 307 (2018)

41. *Sampling limits for electron tomography with sparsity-exploiting reconstructions*, Y. Jiang, E. Padgett, R. Hovden, D.A. Muller, **Ultramicroscopy 186**, 94 (2018)

40. *A Simple Preparation Method for Full-Range Electron Tomography of Nanoparticles and Fine Powders*, E. Padgett, R. Hovden, J.C. DaSilva, B.D. Levin, J.L. Grazul, T. Hanrath, D.A. Muller, **Microsc. & Microanaly. 23**,1150 (2017)

39. *Bending and breaking of stripes in a charge ordered manganite,* B.H. Savitzky, I. El Baggari, A.S. Admasu, J. Kim, S.W. Cheong, R. Hovden, L.F. Kourkoutis**, Nature Communications 8**, 1883 (2017)

38. *Physical Confinement Promoting Formation of Cu_2O–Au Heterostructures with Au Nanoparticles Entrapped within Crystalline Cu_2O Nanorods*, E. Asenath-Smith, J.M. Noble, R. Hovden, A.M. Uhl, A. DiCorato, Y.Y. Kim, A.N. Kulak, F.C. Meldrum, L.F. Kourkoutis, L.A. Estroff, **Chemistry of Materials 29**, 555(2016)

37. *Atomic lattice disorder in charge-density-wave phases of exfoliated dichalcogenides (1T-TaS_2)*, R. Hovden, A. W. Tsen, B. H. Savitzky, P. Liu, I. El Baggari, Y. Liu, W.J. Lu, Y. Sun, P. Kim, A. N. Pasupathy, L. F. Kourkoutis, **Proc. Natl. Acad. Sci. U.S.A. 113***,* 11420 (2016)

36. *Atomically engineered ferroic layers yield a room-temperature magnetoelectric multiferroic* Mundy, Brooks, Holtz, Moyer, Das, Rébola, Heron, Clarkson, Disseler, Liu, Farhan, Held, Hovden, Padgett, Mao, Paik, Misra, Kourkoutis, Arenholz, Scholl, Borchers, Ratcliff, Ramesh, Fennie, Schiffer, Muller, Schlom, **Nature 537**, 523 (2016)

35. *Propagation of Structural Disorder in Epitaxially Connected Quantum Dot Solids from Atomic to Micron Scale*, B.H. Savitzky, R. Hovden, K. Whitham, J. Yang, F. Wise, T. Hanrath, L.F. Kourkoutis **Nano Letters 19**, 5714 (2016)

34. *Nanomaterial datasets to advance tomography in scanning transmission electron microscopy,* B. Levin, E. Padgett, C.C. Chen, M.C. Scott, R. Xu, W. Theis, Y. Jiang, Y. Yang, C. Ophus, H. Zhang, D. Ha, D. Wang, Y. Yu, H. D. Abruña, R. D. Robinson, P. Ercius, L. F. Kourkoutis, J. Miao, D. A. Muller & R. Hovden **Nature Scientific Data** 160041 (2016)

33. *High Dynamic Range Pixel Array Detector for Scanning Transmission Electron Microscopy M.W. Tate, P. Purohit, D. Chamberlain*, K.X. Nguyen, R. Hovden, C.S. Chang, P. Deb, E. Turgut, J.T. Heron, D.G. Schlom, D.C. Ralph, G.D. Fuchs, K.S. Shanks, H.T. Philipp, D.A. Muller, S.M. Gruner, **Microsc. & Microanaly. 22**, 237 (*2016*)

32. *Nanoscale assembly processes revealed in the nacroprismatic transition zone of Pinna nobilismollusc shells*, R. Hovden*, S.E. Wolf*, M.E. Holtz, F. Marin, D.A. Muller, L.A. Estroff **Nature Comm*. 6****,*** *1097* (*2015*)

31. *Control of Metastable Charge Density Wave Phases in Ultrathin 1T-TaS_2*, A.W. Tsen, R. Hovden, D.Z. Wang, Y.D. Kim, J. Okamoto, K.A. Spoth, Y. Liu, W.J. Lu, Y.P. Sun, J. Hone, L. F. Kourkoutis, P. Kim, A.N. Pasupathy ***Proc. Natl. Acad. Sci. U.S.A. 112****, 15054 (2015)*

30. *Enhanced Supercapacitor Performance for Equal Co–Mn Stoichiometry in Colloidal Co3-xMn x O4 Nanoparticles, in Additive-Free Electrodes*, S.D. Perera, X. Ding, A. Bhargava, R. Hovden, A. Nelson, L.F. Kourkoutis, R.D. Robinson **Chemistry of Materials 27**, 7861 (2015)

29. *IL-TEM Imaging of Site-Selective Pt Nanocatalysts: Electrochemical Activation and Surface Disordering*, R. Arán-Ais, Y. Yu, R. Hovden, J. Solla-Gullon, E. Herrero, J. Feliu, H. Abruña, **J. Am. Chem. Soc. 137**, 14922 (*2015*)

28. *Hierarchically Structured Hematite Architectures Achieved by Growth in a Silica Hydrogel*, E. Asenath-Smith, R. Hovden, L.F. Kourkoutis, L.A. Estroff, **J. Am. Chem. Soc. 137**, 5184 (2015)

27. *Multicomponent Nanomaterials with Complex Networked Architectures from Orthogonal Degradation and Binary Metal Backfilling in ABC Triblock Terpolymers*, C.D. Cowman, E. Padgett, K.W. Tan, R. Hovden, Y. Gu, N. Andrejevic, D.A. Muller, G.W. Coates, and U. Wiesner, **J. Am. Chem. Soc. 137**, 6026 (2015)

26. Periodic Artifact Reduction in Fourier Transforms of Full Field Atomic Resolution Images, R. Hovden, Y. Jiang, H.L. Xin, L.F. Kourkoutis, **Microsc. & Microanaly. 21**, 436 (2015).

25. *Solid-Solid Phase Transformations Induced through Cation Exchange and Strain, in 2D Heterostructured Copper Sulfide 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, **Nano Letters 14**, 7090 (2014)

24. *Nanoparticle Metamorphosis: An in Situ High-Temperature Transmission Electron Microscopy Study of the Structural Evolution of Heterogeneous Au:Fe2O3 Nanoparticles*, W.J. Baumgardner, Y. Yu, R. Hovden, S. Honrao, R.G. Hennig, H.D. Abruña, D.A. Muller, T. Hanrath, **ACS Nano 8**, 5315 (2014).

23. *Breaking the Crowther limit: Combining depth-sectioning and tilt tomography for high-resolution, wide-field 3D reconstructions*, R. Hovden, P. Ercius, Y. Jiang, D. Wang, Y. Yu, H.D. Abruña, V. Elser, D.A. Muller, **Ultramicroscopy 140**, 26 (2014).

22. *Atomic Imaging with Highly Convergent Electron Beams*, R. Hovden, **Ph.D. Dissertation, Cornell University** (2014).

21. *Stacking Order Dependent Second Harmonic Generation and Topological Defects in h-BN Bilayers*, C.J. Kim, L. Brown, M.W. Graham, R. Hovden, R.W. Havener, P.L. McEuen, D.A. Muller, J. Park, **Nano Letters 13**, 5660 (2013).

20. *Hierarchical Porous Polymer Scaffolds from Block Copolymers*, H. Sai, K.W. Tan, K. Hur, E. Asenath-Smith, R. Hovden, Y. Jiang, M. Riccio, D.A. Muller, V. Elser, L.A. Estroff, S.M. Gruner, U. Wiesner, **Science 341**, 6145 (2013).

19. *Strain Solitons and Topological Defects in Bilayer Graphene*, J. S. Alden, A.W. Tsen, P.Y. Huang, R. Hovden, L. Brown, J. Park, D.A. Muller, and P.L. McEuen, ***Proc. Natl. Acad. Sci. U.S.A.* 110**, 11256 (2013).

18. *Multicompartment Mesoporous Silica Nanoparticles with Branched Shapes: An Epitaxial Growth Mechanism*, T. Suteewong, H. Sai, R. Hovden, D.A. Muller, M. Bradbury, S.M. Gruner, U. Wiesner, **Science 340**, 6130 (2013).

17. *Bibliometrics for Internet Media: Applying the h-Index to YouTube,* R. Hovden, **J. Am. Soc. Inf. Sci. Tec 64**, 2326 (2013).

16. *Defining Crystalline/Amorphous Phases of Nanoparticles through X-ray Absorption Spectroscopy and X-ray Diffraction: The Case of Nickel Phosphide*, L.M. Moreau, D.H. Ha, H. Zhang, R. Hovden, D.A. Muller, and R.D. Robinson, **Chem. Mater. 25**, 2394 (2013).

15. *Channeling of a subangstrom electron beam in a crystal mapped to two-dimensional molecular orbitals*, R. Hovden, H.L. Xin, D.A. Muller, **Phys. Rev. B 86**, 195415 (2012).

14. *Structurally ordered intermetallic platinum–cobalt core–shell nanoparticles with enhanced activity and stability as oxygen reduction electrocatalysts*, D. Wang, H.L. Xin, R. Hovden, H. Wang, Y. Yu, D.A. Muller, F. J. DiSalvo, H.D. Abruña, **Nature Materials 12**, 81 (2012).

13. *Tuning ORR Activity via Controllable Dealloying: A Model Study of Ordered Cu3Pt/C Intermetallic Nanocatalysts*, D. Wang, Y. Yu, H.L. Xin, R. Hovden, P. Ercius, J.A. Mundy, H. Chen, JH Richard, D.A. Muller, F.J. DiSalvo, and H.D. Abruña, **Nano Letters 12**, 5230 (2012).

12. *Data Processing for Atomic Resolution Electron Energy Loss Spectroscopy*, P. Cueva, R. Hovden*, J A Mundy, H. Xin, D A Muller, **Microsc. & Microanaly. 18**, 667 (2012) **corr. author*

11. *Efficient elastic imaging of single atoms on ultrathin supports in a scanning transmission electron microscope*, R. Hovden, D.A. Muller, **Ultramicroscopy 123**, 59 (2012).

10. *Twinning and Twisting of Tri- and Bilayer Graphene*, L. Brown*, R. Hovden*, P. Huang, M. Wojcik, D.A. Muller, J. Park, **Nano Letters 12**, 1609 (2012) **co-first author*

9. *Direct Imaging of a Two-Dimensional Silica Glass on Graphene*, P.Y. Huang, S. Kurasch, A. Srivastava, V. Skakalova, J. Kotakoski, A.V. Krasheninnikov, R. Hovden, Q. Mao, J.C. Meyer, J. Smet, D.A. Muller, U. Kaiser, **Nano Letters 12**, 1081(2012).

8. *Three-Dimensional Tracking and Visualization of Hundreds of Pt−Co Fuel Cell Nanocatalysts During Electrochemical Aging*, Y. Yu, H.L. Xin, R. Hovden, D. Wang, E.D. Rus, J.A. Mundy, D. A. Muller, and H.D. Abruña, **Nano Letters 12**, 4417 (2012).

7. *Atomic-Resolution Spectroscopic Imaging of Ensembles of Nanocatalyst Particles Across the Life of a Fuel Cell*, H.L. Xin*, J.A. Mundy*, Z. Liu, R. Cabezas , R. Hovden, L.F. Kourkoutis, J. Zhang, N Subramanian, R Makharia, F Wagner, and DA Muller, **Nano Letters 12**, 490 (2011)

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