

Hillary L. Smith

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Current Position

Swarthmore College
Assistant Professor of Physics

Swarthmore, PA
August 2018 - Present

Education

California Institute of Technology
Doctor of Philosophy in Materials Science

Pasadena, CA
June 2014

National Science Foundation Graduate Research Fellowship 2008-2011

Bryn Mawr College
Bachelor of Arts in Physics, Bachelor of Arts in Chemistry

Bryn Mawr, PA
May 2006

Graduated *magna cum laude* with honors in physics and chemistry

Research Appointments

- 3/2018 - 6/2018** Visiting Scientist, Australian Center for Neutron Research, Australian Nuclear Science and Technology Organisation (ANSTO), Sydney, Australia
- 9/2015 - 7/2018** Senior Researcher, Applied Physics and Materials Science Department, California Institute of Technology
- 4/2015 - 9/2015** Senior Scientist, Liox Power, Pasadena, CA
- 6/2014 - 4/2015** Postdoctoral Researcher, Applied Physics and Materials Science Department, California Institute of Technology
- 9/2008 - 6/2014** Graduate Research Assistant, Applied Physics and Materials Science Department, California Institute of Technology
- 6/2006 - 8/2008** Scientific Associate, Los Alamos Neutron Science Center, Los Alamos National Laboratory
- 8/2005 - 5/2006** Research Student, Chemistry Department, Bryn Mawr College

Publications

h-factor = 18 as of 8/1/22

Note: Names of undergraduate student co-authors are underlined

38. Q. Sun, S. Hou, B. Wei, Y. Sun, V. Ortiz, B. Sun, J.Y.Y. Lin, **H.L. Smith**, S. Danilkin, D.L. Abernathy, R. Wilson, C.W. Li, "Spin-phonon Interactions Induced Anomalous Thermal Conductivity in Nickel (II) Oxide," *Materials Today Physics*, 35, 101094 (2023).
37. **H.L. Smith**, C.N. Saunders, C.M. Bernal-Choban, S.H. Lohaus, C.J. Stoddard, L.K. Decker, J.Y.Y. Lin, J.L. Niedziela, D.L. Abernathy, J.-H. Na, M.D. Demetriou, B. Fultz, "Vibrational Dynamics in the Undercooled Liquid of Ultra-fragile Metallic Glasses," *Materialia*, 27, 101710 (2023).

36. C.M. Bernal-Choban*, **H.L. Smith***, C.N. Saunders, D.S. Kim, L. Mauger, D.L. Abernathy, B. Fultz, “Non-harmonic Contributions to the High-Temperature Phonon Thermodynamics of Cr,” *Physical Review B*, 107, 054312 (2023).
35. C.M. Quine*, **H.L. Smith***, C.C. Ahn, A. Hasse-Zamudio, D.A. Boyd, B. Fultz, “Hydrogen Adsorption and Isotope Mixing on Copper-Functionalized Activated Carbons,” *The Journal of Physical Chemistry C*, 126, 39 16579 (2022).
34. Q. Sun, B. Wei, Y. Su, **H.L. Smith**, D.L. Abernathy, C.W. Li, “Mutual Spin-Phonon Driving Effects and Phonon Eigenvector Renormalization in Nickel (II) Oxide,” *Proceedings of the National Academy of Sciences*, **119**, 29 2120553119 (2022).
33. Y. Su, **H.L. Smith**, M.B. Stone, D.L. Abernathy, M.D. Lumsden, C.P. Adams, C.W. Li, “Frustration-induced diffusive scattering anomaly and unexpected dimension change in FeGe₂,” *Physical Review B*, **106** 024406 (2022).
32. C.N. Saunders, D.S. Kim, O. Hellman, **H.L. Smith**, N.J. Weadock, S.T. Omelchenko, G.E. Granroth, C.M. Bernal-Choban, S.H. Lohaus, D.L. Abernathy, B. Fultz, “Thermal expansion and phonon anharmonicity of cuprite studied by inelastic neutron scattering and *ab initio* calculations,” *Physical Review B*, **105** 174308 (2022).
31. D.S. Kim, O. Hellman, N. Shulumba, C.N. Saunders, J.Y.Y. Lin, **H.L. Smith**, J.E. Herriman, J.L. Niedziela, D.L. Abernathy, C.W. Li, B. Fultz, “Temperature-dependent phonon lifetimes and thermal conductivity of silicon by inelastic neutron scattering and *ab initio* calculations,” *Physical Review B*, **102** 174311 (2020).
30. S.H. Lohaus, M.B. Johnson, P.F. Ahnn, C.N. Saunders, **H.L. Smith**, M.A. White, B. Fultz, “Thermodynamic stability and contributions to the Gibbs free energy of nanocrystalline Ni₃Fe,” *Physical Review Materials*, **4** 086002 (2020).
29. J. Lin, F. Islam, G. Sala, I. Lumsden, **H.L. Smith**, M. Doucet, M.B. Stone, D. Abernathy, G. Ehlers, A. J. Ankner, G. Granroth, “Recent developments of MCViNE and its applications at SNS,” *Journal of Physics Communications* **3** 085005 (2019).

Before current position

28. **H.L. Smith***, Y. Shen*, D.S. Kim, F.C. Yang, C.P. Adams, C.W. Li, D.L. Abernathy, M.B. Stone, B. Fultz, “The temperature dependence of phonons in FeGe₂,” *Physical Review Materials* **2** 103602 (2018).
27. F.C. Yang, O. Hellman, M.S. Lucas, **H.L. Smith**, C.N. Saunders, Y. Xiao, P. Chow, B. Fultz, “Temperature dependence of phonons in Pd₃Fe through the Curie temperature,” *Physical Review B* **98** 024301 (2018).
26. G.E. Granroth, K. An, **H.L. Smith**, P. Whitfield, J. Neufeind, J. Lee, W. Zhou, V.N. Sedov, P.F. Peterson, A. Parizzi, H. Skorpenske, S.M. Hartman, A. Huq, D.L. Abernathy, “Event-based processing of neutron scattering data at the Spallation Neutron Source,” *Journal of Applied Crystallography*, **51** 616 (2018).
25. D.S. Kim, O. Hellman, J. Herriman, **H.L. Smith**, J.Y.Y. Lin, N. Shulumba, J.L. Niedziela, C.W. Li, D. Abernathy, B. Fultz, “Nuclear quantum effect with pure anharmonicity and the anomalous thermal expansion of silicon,” *Proceedings of the National Academy of Sciences*, **115** 1992 (2018).

*Co-first author

24. J.L. Niedziela, R. Mills, M.L. Loquillo, H.D. Skorpenske, D. Armitage, **H.L. Smith**, J.Y.Y. Lin, M.S. Lucas, M.B. Stone, D. Abernathy, "Design and operating characteristic of a vacuum furnace for time-of-flight inelastic neutron scattering measurements," *Review of Scientific Instruments*, **88** 105116 (2017).
23. **H.L. Smith**, C.W. Li, A. Hoff, G. Garrett, D.S. Kim, F.C. Yang, M.S. Lucas, T. Swan-Wood, J.Y.Y. Lin, M.B. Stone, D. Abernathy, M. Demetriou, B. Fultz, "Separating the configurational and vibrational entropy contributions in metallic glasses," *Nature Physics*, **13** 900 (2017).
22. Y. Shen, C.W. Li, X. Tang, **H.L. Smith**, B. Fultz, "Phonon Anharmonicity and Components of the Entropy in Palladium and Platinum," *Physical Review B* **93** 214303 (2016).
21. S.J. Tracy, L. Mauger, **H.L. Smith**, H.J. Tan, J.E. Herriman, Y.M. Ziao, B. Fultz, "Polaron Mobility and Disorder of the Sodium Sublattice in Triphylite- Na_xFePO_4 ," *Chemistry of Materials* **28** 3051 (2016).
20. J.Y.Y. Lin, **H.L. Smith**, G.E. Granroth, D.L. Abernathy, M.D. Lumsden, B. Winn, A.A. Aczel, M. Aivazis, B. Fultz, "Monte Carlo Neutron Ray Tracing Simulation of Multiple Scattering and Multi-Excitation Scattering," *Nuclear Instruments and Methods A* **810** 86 (2016).
19. E. Talaie, V. Duffort, **H.L. Smith**, B. Fultz, L.F. Nazar, "Structure of the High Voltage Phase of Layered $\text{P2-Na}_x[\text{Mn}_{1/2}\text{Fe}_{1/2}]\text{O}_2$ and the Positive Effect of Ni Substitution on its Stability," *Energy & Environmental Science* **8** 2512 (2015).
18. T. Lan, C.W. Li, O. Hellman, J.A. Munoz, **H.L. Smith**, D.L. Abernathy, B. Fultz, "Phonon quarticity induced by lattice expansion, and the stabilization of rutile TiO_2 ," *Physical Review B* **92** 054304 (2015).
17. C.W. Li, **H.L. Smith**, T. Lan, J.L. Niedziela, J.A. Munoz, J.B. Keith, L. Mauger, D. Abernathy, B. Fultz, "Phonon Anharmonicity of Monoclinic and Yttrium-Stabilized Zirconia," *Physical Review B* **91** 144302 (2015).
16. A. Junghans, E.B. Watkins, R.D. Barker, S. Singh, M.J. Waltman, **H.L. Smith**, L. Pocivavsek, J. Majewski, "Analysis of biosurfaces by neutron reflectometry: From simple to complex interfaces," *Biointerfaces* 10(1), 019014 (2015).
15. D.S. Kim, **H.L. Smith**, J.L. Niedziela, C.W. Li, D. Abernathy, B. Fultz, "Phonon Anharmonicity in Silicon from 100 to 1500K," *Physical Review B* **91** 014307 (2014).
14. T. Lan, C.W. Li, J.L. Niedziela, **H.L. Smith**, D.L. Abernathy, G.R. Rossman, B. Fultz, "Anharmonic Lattice Dynamics of Cuprite Ag_2O Studied by Inelastic Neutron Scattering and First Principles Molecular Dynamics Simulations," *Physical Review B* **89** 054306 (2014).
13. H.J. Tan, **H.L. Smith**, L. Kim, T.K. Harding, S.C. Jones, B. Fultz, "Electrochemical Cycling and Lithium Insertion in Nanostructured FeF_3 Cathodes," *Journal of the Electrochemical Society* **161** (3) A1 (2014).
12. D.G. Abrecht, J.A. Munoz, **H.L. Smith**, B. Fultz, "Spin-State Effects on the Thermal Dihydrogen Release from Solid-State $[\text{MH}(\eta^2\text{-H}_2\text{dppe}_2)]^+$ (M = Fe, Ru, Os) Organometallic Complexes for Hydrogen Storage Applications," *Journal of Physical Chemistry* (118) 1783 (2014).
11. A. Junghans, M.J. Waltman, **H.L. Smith**, L. Pocivacek, N. Zebda, K. Birukov, M. Viapiano, J. Majewski, "Understanding Dynamic Changes in Live Cell Adhesion with Neutron Reflectometry," *Modern Physics Letters B* **28** 1430015 (2014).

10. †**H.L. Smith**, B.C. Hornbuckle, L. Mauger, B. Fu, S. Tracy, G.B. Thompson, M.S. Lucas, Y.Xiao, M.Y. Hu, J. Zhao, E. Ercan Alp, B. Fultz, “Changes in Vibrational Entropy During the Early Stages of Chemical Unmixing in fcc Cu-6%Fe,” *Acta Materialia* **61** 7466 (2013).
9. M.S. Jablin, M. Zherenkov, B.P. Toperverg, M. Dubey, **H.L. Smith**, A. Vidyasagar, R. Toomey, A.J. Hurd, J. Majewski, “In-Plane Correlations in a Polymer-Supported Lipid Membrane Measured by Off-Specular Neutron Scattering,” *Physical Review B* **106** 138101 (2011).
8. **H.L. Smith**, J. Hickey, M.S. Jablin, A. Trujillo, J.P. Freyer, J. Majewski, “Mouse Fibroblast Cell Adhesion Studied by Neutron Reflectometry,” *Biophysical Journal* **98** 793 (2010).
7. M. Hirayama, M. Yonemura, K. Suzuki, N. Torikai, **H.L. Smith**, E. Watkins, J. Majewski, R. Kanno, “Surface Characterization of LiFePO₄ Epitaxial Thin Films by X-Ray/Neutron Reflectometry,” *Electrochemistry* **78** 413 (2010).
6. **H.L. Smith**, R.L. Usala, E.W. McQueen, J.I. Goldsmith, “Novel Polyaromatic-Terminated Transition Metal Complexes for the Functionalization of Carbon Surfaces,” *Langmuir* **26** 3341 (2010).
5. M. Dubey, M.S. Jablin, **H.L. Smith**, J. Majewski, “Investigations of Surrogate Cellular Membranes Using Neutron Reflectometry,” *Acta Crystallographica D* **66** 1237 (2010).
4. **H.L. Smith**, M.S. Jablin, A. Vidyasagar, J. Saiz, E. Watkins, R. Toomey, A.J. Hurd, J. Majewski, “Model Lipid Membranes on a Tunable Polymer Cushion,” *Physical Review Letters* **102** 228102 (2009).
3. L. He, **H.L. Smith**, J. Majewski, C.Y. Fujimoto, C.J. Cornelius, D. Perahia, “Interfacial Effects on Water Penetration into Ultrathin Ionomer Films: An in-situ Study Using Neutron Reflectometry,” *Macromolecules* **42** 5745 (2009).
2. A. Vidyasagar, **H.L. Smith**, J. Majewski, R.G. Toomey, “Continuous and Discontinuous Volume-Phase Transitions in Surface-Tethered, Photo-Crosslinked poly(*N*-isopropylacrylamide) Networks,” *Soft Matter*, **5** 4733 (2009).
1. **H.L. Smith**, M.C. Howland, A.W. Szmodis, Q. Li, L.L. Daemen, A.N. Parikh, J. Majewski, “Early Stages of Oxidative Stress-Induced Membrane Permeabilization: A Neutron Reflectometry Study,” *Journal of the American Chemical Society*, **131** 3631 (2009).

Undergraduate Student Research Supervision

Shintaro Inaba (Swarthmore ‘26)	Spring 2023, Summer 2023
Kai Yang Tan (Swarthmore ‘25)	Spring 2023
Simon Ji (Swarthmore ‘23)	Summer 2022, Research Assistant Fall 2022
Solomon Murdock (Swarthmore ‘25)	Summer 2022, Research Assistant Fall 2022
Colby Stoddard (Swarthmore ‘23)	Research for Credit Spring 2022 and Fall 2022, Summer 2022, Thesis Student Spring 2023
Elizabeth Brown (Swarthmore ‘23)	Summer 2021, Summer 2022, Research for Credit Fall 2022, Spring 2023
Alexandra Specht (Swarthmore ‘22)	Summer 2021

†Received the 2013 Acta Materialia Student Award

Aleah Wilson (Swarthmore '23)	Summer 2021
Elena Lee (Swarthmore '23)	Summer 2020, Research Assistant Fall 2020
Dylan Torrance (Swarthmore '22)	Summer 2020
Lucy Decker (Swarthmore '21)	Summer 2020, Research for Credit Spring 2020, Research Assistant Fall 2019, Summer 2019
Iris Wang (Swarthmore '21)	Summer 2019
Alexandria Rensing (Swarthmore '21)	Summer 2019, Research Assistant Fall 2019
Miriam Stein (Swarthmore '20)	Summer 2019
Ariel Hasse (Caltech '20)	Summer 2017, Fall 2017
Aadith Moorthy (Caltech '18)	Summer 2016
Carla Watson (Caltech '15)	Fall 2014, Spring 2015
Connie Hsueh (Caltech '15)	Summer 2013
Nick Parker (Caltech '14)	Summer 2012
Laura Kim (Caltech '13)	Summer 2011, Fall 2011, Spring 2012

Courses Taught

PHYS 5, The World of Particles and Waves - Fall 2022 (co-taught)

PHYS 7, Introductory Mechanics - Fall 2020, Fall 2019, Fall 2018

PHYS 7, Introductory Mechanics Lab - Fall 2020, Fall 2018

PHYS 13, Thermodynamics and Statistical Mechanics - Spring 2020, Spring 2019

PHYS 15, Optics - Spring 2019

PHYS 81/82/83, Advanced Laboratory - Fall 2022, Spring 2020, Fall 2019, Spring 2019, Fall 2018, instructor of record Fall 2019, Fall 2022

PHYS 62, Physics Journal Club, 0.5 cr - Fall 2019, Fall 2022

PHYS 113, Quantum Theory - Spring 2020

PHYS 135, Condensed Matter Physics - Spring 2023

Pomona College PHYS 174, Contemporary Experimental Physics - Spring 2016

Pomona College PHYS 41, General Physics Lab - Spring 2015

Pomona College PHYS 174, Spacetime, Quanta, and Entropy Lab - Fall 2014

Caltech MS 115B, Fundamentals of Materials Science - Winter 2012 (teaching assistant)