

Dennis S. Kim

Assistant Professor in the Electrical and Computer Engineering Department

University of Florida

Larsen Hall, 968 Center Dr Gainesville, FL 3261

Email: ds.kim@ufl.edu Website: pico.ece.ufl.edu

Citizenship

United States of America

Education

California Institute of Technology

Division of Engineering and Applied Science

PhD in Materials Science

2018

University of Massachusetts Amherst

College of Natural Science and Mathematics

BS Chemistry *with Departmental Honors*

2011

Commonwealth Honors College honors with greatest distinction

Graduated in 3 years with summa cum laude

Employment

University of Florida

Electrical and Computer Engineering Department

Assistant Professor

(Summer 2024 - present)

University of California, Los Angeles

Department of Chemistry & Biochemistry

Research Scientist

(Fall 2022 - Summer 2024)

Massachusetts Institute of Technology

Department of Materials Science and Engineering

Postdoctoral Associate

(Summer 2020 - Fall 2022)

University of California, Los Angeles

Department of Physics & Astronomy

STROBE Postdoctoral Research Fellow

(Summer 2017 - Summer 2020)

California Institute of Technology

Department of Applied Physics and Materials Science

Graduate Research Assistant

(Summer 2012 - Summer 2017)

University of Massachusetts Amherst

Department of Polymer Science and Engineering

Undergraduate Research Assistant

(Summer 2010 - Summer 2011)

Part-time Teaching Assistant

(Spring 2009 - Spring 2011)

Awards and Honors

STROBE Postdoctoral Fellow Award 2017

Langmuir-NSSA Outstanding Student Poster Presentation Award at the American Conference for Neutron Scattering 2014

Korean-American Scientists and Engineers Association KUSCO-KSEA Scholarship for Graduate Students 2013

Youngnak General Academic Scholarship 2012

California Institute of Technology Clark Graduate Fellowship 2011-2012

American Institute of Chemists Award 2011

George R. Richason, Jr. Award for Excellence in Undergraduate Research 2009

University of Massachusetts Amherst Commonwealth Honors College Merit Scholarship 2008-2011

Research Experiences

University of California, Los Angeles

Department of Chemistry & Biochemistry

Research Scientist

with *Prof. Prineha Narang*

(Fall 2022 - present)

First-principles and machine-learning computational approaches to discover non-equilibrium quantum materials.

Massachusetts Institute of Technology

Department of Materials Science and Engineering

Postdoctoral Associate

with *Prof. James M. LeBeau*

(Summer 2020 - Fall 2022)

Quantitative electron microscopy to understand the structure and dynamics of energy-related materials.

University of California, Los Angeles

Department of Physics & Astronomy

STROBE Postdoctoral Research Fellow

with *Prof. Jianwei (John) Miao*

(Summer 2017 - Summer 2020)

Developing and utilizing atomic electron tomography (AET) to study materials structure-properties relationships.

California Institute of Technology

Department of Applied Physics and Materials Science

Research Assistant

with *Prof. Brent T. Fultz*

(Summer 2012 - Summer 2017)

Thesis defended, 2017:

Silicon revisited: Understanding pure phonon anharmonicity and effects on thermophysical properties

Department of Chemistry

Research Assistant with *Prof. Nate S. Lewis*

(Spring 2012)

Investigated various processing techniques to synthesize more efficient interfaces between light absorbers and catalysts in artificial photosynthesis devices.

University of Massachusetts Amherst

Department of Polymer Science and Engineering

Research Assistant with *Prof. Thomas J. McCarthy*

(Summer 2009 - Spring 2011)

Senior Thesis: Novel Processing of Silicones: Thin films and Stöber composites studied hydrophobic-hydrophilic phase interactions in various silicones using various polymer processes.

Department of Chemistry

Research Assistant with *Prof. Lila Gierasch*

(Summer 2008 - Spring 2009)

Studied protein misfolding in CRABP-1 proteins, involved in retinol transport for vitamin processing, in different environments.

Publications

†These authors contributed equally to this work. ‡Corresponding author.

23. C.N. Saunders, V.V. Ladygin, **D.S. Kim**, D.L. Abernathy, B.T. Fultz, “Diffuse inelastic neutron scattering from anharmonic vibrations in cuprite”, *under review at Phys. Rev. Lett.* (2024).
22. **D.S. Kim**, C. Harris, M.D. Hanwell, B. Zhou, D. Chang, C. Ophus, P. Ercius, and J. Miao[‡], “Materials Data Bank, a modern open-source database for experimental atomic structure dissemination”, *under review at Sci. Data* (2024)
21. **D.S. Kim**[‡], M. Xu, and J.M. LeBeau[‡], “Modeling Temperature-Dependent Electron Thermal Diffuse Scattering via Machine-Learned Interatomic Potentials and Path-Integral Molecular Dynamics”, *Phys. Rev. Lett.* **132** (8), 086301 (2024).
20. F. Knoop, N. Shulumba, A. Castellano, J.P. Alvarinhas Batista, R. Farris, M.J. Verstraete, M. Heine, D. Broido, **D.S. Kim**, J. Klarbring, I. Abrikosov, S.I. Simak, O. Hellman, “TDEP: Temperature Dependent Effective Potentials”, *J. Open Source Softw.*, **9**(94), 6150 (2024).
19. C.M. Bernal-Choban, H.L. Smith, C. Saunders, **D.S. Kim**, D.L. Abernathy, and B. Fultz, “Non-harmonic contributions to the high-temperature phonon thermodynamics of Cr”, *Phys. Rev. B*, **107**, 054312 (2023).
18. H.G. Seo, A. Staerz, **D.S. Kim**, J.M. LeBeau, H.L. Tuller. “Tuning surface acidity of mixed conducting electrodes: Recovery of Si-induced degradation of oxygen exchange rate and area specific resistance”, *Adv. Mater.*, **35**, 2208182 (2023).
17. X. Chen[†], **D.S. Kim**[†], and J.M. LeBeau, “A Comparison of Molecular Dynamics Potentials Used to Incorporate Thermal Diffuse Scattering in Multislice Simulations”, *Ultramicroscopy*, **240**, 113644 (2023).
16. H.G. Seo, A. Staerz, **D.S. Kim**, D. Klotz, C. Nicollet, M. Xu, J.M. LeBeau, H.L. Tuller. “Reactivation of chromia poisoned oxygen exchange kinetics in mixed conducting solid oxide fuel cell electrodes by serial infiltration of lithia”, *Energy Environ. Sci.* **15**, 4038-4047 (2022). *MIT News*: “A simple way to significantly increase lifetimes of fuel cells and other devices” news.mit.edu (2022).
15. C. Saunders, **D.S. Kim**, O. Hellman, H.L. Smith, N.J. Weadock, S.T. Omelchenko, G.E. Granroth, C.M. Bernal, S.H. Lohaus, D.L. Abernathy, and B. Fultz, “Thermal expansion and phonon anharmonicity of cuprite (Cu₂O)”, *Phys. Rev. B* **105**, 174308 (2022).
14. A. Staerz, H.G. Seo, D. Klotz, **D.S. Kim**, J.M. LeBeau, H.L. Tuller. “The influence of Cr-additives on the polarization resistance of praseodymium-doped ceria cathodes for solid oxide fuel cells”, *J. Electrochem. Soc* **169** 044530 (2022).

13. Y. Yuan[†], D.S. Kim[†], J. Zhou[†], D.J. Chang, F. Zhu, Y. Nagaoka, Y. Yang, M. Pham, S.J. Osher, O. Chen, P. Ercius, A.K. Schmid, and J. Miao, “Three-dimensional atomic packing in amorphous solids with liquid-like structure”, *Nat. Mater.* **21**, 95-102 (2022).
12. X. Tian, X. Yan, G. Varnavides, Y. Yuan, D.S. Kim, C.J. Ciccarino, P. Anikeeva, P. Narang, X. Pan, and J. Miao, “Capturing 3D atomic defects and phonon localization at the 2D heterostructure interface”, *Sci. Adv.* **7**, 38 (2021).
11. Y. Yang, J. Zhou, F. Zhu, Y. Yuan, D.J. Chang, D.S. Kim, M. Pham, A. Rana, X. Tian, Y. Yao, S. Osher, A.K. Schmid, L. Hu, P. Ercius, and J. Miao, “Determining the three-dimensional atomic structure of an amorphous solid”, *Nature*, **592**, 60-64 (2021).
News & Views in Nature **592**, 31-32 (2021).
10. D.S. Kim[‡], O. Hellman, N. Shulumba, C. Saunders, J.Y.Y. Lin, H.L. Smith, J. Herriman, J.L. Niedziela, D.L. Abernathy, C.W. Li, and B. Fultz[‡], “Temperature-dependent phonon lifetimes and thermal conductivity of silicon by inelastic neutron scattering and *ab initio* calculation”, *Phys. Rev. B*, **102**, 174311 (2020).
9. D. Chang, D.S. Kim, X. Tian, J. Zhou, P. Ercius, and J. Miao, “Ptychographic Atomic Electron Tomography: Towards 3D Imaging of Individual Light Atoms in Materials”, *Phys. Rev. B.*, **102**, 174101 (2020).
8. X. Tian[†], D.S. Kim[†], S. Yang[†], C.J. Ciccarino, Y. Gong, Y. Yang, Y. Yang, Y. Yuan, B. Duschatko, P.M. Ajayan, J-C. Idrobo, P. Narang, and J. Miao, “Correlating the three-dimensional atomic defects and electronic properties of two-dimensional transition metal dichalcogenides”, *Nat. Mater.* **19**, 867-873 (2020).
News & Views in Nat. Mater. **19**, 827-828 (2020).
7. J. Zhou, Y.S. Yang, Y. Yang, D.S. Kim, A. Yuan, X. Tian, C. Ophus, F. Sun, A.K. Schmid, M. Nathanson, H. Heinz, Q. An, H. Zeng, P. Ercius, and J. Miao, “Observing crystal nucleation in four dimensions using Atomic electron tomography”, *Nature*, **570**, 500-503 (2019).
News & View in Nature **570**, 450-452 (2019)
6. D.S. Kim[‡], O. Hellman, J. Herriman, H.L. Smith, J.Y.Y. Lin, N. Shulumba, J.L. Niedziela, C.W. Li, D.L. Abernathy, and B. Fultz[‡], “Nuclear quantum effect with pure anharmonicity causes the anomalous thermal expansion of silicon”, *Proc. Natl. Acad. Sci. U.S.A.* **115** (9) 1992-1997 (2018).
Editor’s Choice in “Silicon sheds its harmonicity” Science, **360**, 6385 (2018).
5. H.L. Smith, Y. Shen, D.S. Kim, F.C. Yang, C.P. Adams, C.W. Li, D.L. Abernathy, M.B. Stone and B. Fultz, “The temperature dependence of phonons in FeGe₂”, *Phys. Rev. Mater.* **2**, 103602 (2018).

4. H.L. Smith, C.W. Li, A. Hoff, G.R. Garrett, **D.S. Kim**, F.C. Yang, M.S. Lucas, T. Swan-Wood, J.Y.Y. Lin, M.B. Stone, D.L. Abernathy, M. Demetriou, and B. Fultz, “Separating the configurational and vibrational entropy contributions in metallic glasses”, *Nat. Phys.* **13**, 900-905 (2017)
3. T. Lan, C.W. Li, O. Hellman, **D.S. Kim**, J.A. Muñoz, H.L. Smith, D.L. Abernathy, and B. Fultz, “Phonon quarticity induced by changes in phonon-tracked hybridization during lattice expansion and its stabilization of rutile TiO₂”, *Phys. Rev. B* **92**, 054304 (2015).
2. **D.S. Kim**[‡], H.L. Smith, J.L. Niedziela, C.W. Li, D.L. Abernathy, and B. Fultz[‡], “Phonon Anharmonicity in Silicon from 100 to 1500 K”, *Phys. Rev. B* **91**, 014307 (2015).
1. T. Lan, C.W. Li, O. Hellman, **D.S. Kim**, J.A. Muñoz, H.L. Smith, D.L. Abernathy, and B. Fultz, “Phonon quarticity induced by changes in phonon-tracked hybridization during lattice expansion and its stabilization of rutile TiO₂”, *Phys. Rev. B* **92**, 054304 (2015).

Presentations

Invited Talks

Invited Talks

13. **D.S. Kim**, University of Florida, Electrical and Computer Engineering Departmental Seminar (2024).
12. **D.S. Kim**, Michigan State University, Chemical Engineering and Materials Science, Departmental Seminar (2024).
11. **D.S. Kim**, University of Rochester, Mechanical Engineering, Departmental Seminar (2024).
10. **D.S. Kim**, Dartmouth College, Thayer School of Engineering, Special Charles C. Jones Research Seminar (2024).
9. **D.S. Kim**, University of North Carolina Chapel Hill, Applied Physical Sciences, Departmental Seminar (2024).
8. **D.S. Kim**, University of Kansas, Mechanical Engineering, Departmental Seminar (2023).
7. **D.S. Kim**, University of Southern California, Aerospace and Mechanical Engineering, Departmental Seminar (2023).
6. **D.S. Kim**, North Carolina State University, Materials Science and Engineering, Departmental Seminar (2023).
5. **D.S. Kim**, University of California, Los Angeles, Materials Science and Engineering, Departmental Seminar (2022).

4. D.S. Kim, University of Houston, Mechanical Engineering, Departmental Seminar (2022).
3. D.S. Kim, Materials Science and Engineering, Departmental Seminar (2022).
2. D.S. Kim, University of California, Irvine Mechanical Engineering, Departmental Seminar (2021).
1. D.S. Kim, B. Fultz, EMN Open Access Week Energy Materials Nanotechnology 2015, Chengdu, China (2015).

Contributed Talks

13. D.S. Kim, X. Chen, and J. LeBeau, MRS Spring 2022, Honolulu, HI (2022).
12. D.S. Kim, Y. Yuan, J. Zhou, and J. Miao, MRS Spring 2022, Honolulu, HI (2022).
11. D.S. Kim, X. Tian, S. Yang, and J. Miao, MRS Spring 2022, Honolulu, HI (2022).
10. D.S. Kim, X. Tian, S. Yang, and J. Miao, MRS Fall 2019, Boston, MA (2019).
9. D.S. Kim and B. Fultz, MRS Fall 2019, Boston, MA (2019).
8. D.S. Kim, O. Hellman, J. Herriman, H.L. Smith, J.Y.Y. Lin, N. Shulumba, J.L. Niedziela, C.W. Li, D.L. Abernathy, and B. Fultz, MRS 2017, Boston, MA (2017).
7. D.S. Kim, O. Hellman, J. Herriman, H.L. Smith, J.Y.Y. Lin, N. Shulumba, J.L. Niedziela, C.W. Li, D.L. Abernathy, and B. Fultz, ICNS 2017, Daejeon, South Korea (2017).
6. D.S. Kim, O. Hellman, J. Herriman, H.L. Smith, J.Y.Y. Lin, N. Shulumba, J.L. Niedziela, C.W. Li, D.L. Abernathy, and B. Fultz, TMS 2017, San Diego, CA (2017).
5. D.S. Kim, O. Hellman, J.Y.Y. Lin H.L. Smith, J.L. Niedziela, C.W. Li, D.L. Abernathy, B. Fultz, ACNS 2016, Nashville, TN (2016).
4. D.S. Kim, O. Hellman, J.Y.Y. Lin H.L. Smith, J.L. Niedziela, C.W. Li, D.L. Abernathy, B. Fultz, TMS 2016, Nashville, TN (2016).
3. D.S. Kim, H.L. Smith, J.L. Niedziela, C.W. Li, D.L. Abernathy, B. Fultz, American Physical Society March Meeting 2015, San Antonio, TX (2015).
2. D.S. Kim, H.L. Smith, J.L. Niedziela, C.W. Li, D.L. Abernathy, B. Fultz, proceedings of the 2014 US-Korea Conference on Science, Technology, and Entrepreneurship 'Forward Together' (2014).
1. D.S. Kim, J. Munoz, H. L. Smith, B. Fultz, accepted to the proceedings of the 2013 US-Korea Conference on Science, Technology, and Entrepreneurship "Toward Harmonious World with Science, Technology, and Entrepreneurship" (2013).

Poster Presentations

1. D.S. Kim, Hillary L. Smith, J.L. Niedziela, D.L. Abernathy, B. Fultz, presented at American Conference for Neutron Scattering (2014). *Langmuir-NSSA Outstanding Student Poster Presentation Award*

Teaching and Mentoring Experiences

University of California, Los Angeles

Organization for Cultural Diversity in Science (OCDS)

Networking panel for Spring Showcase Science and Engineering (Spring 2023)

City University of Hong Kong

Croucher Summer Course on Neutron Scattering

Invited instructor for a course on Inelastic Neutron Scattering (Summer 2018)

California Institute of Technology

Applied Physics and Materials Science Department

Teaching Assistant for APh/MS 105c States of Matter (Grad course) (Spring 2014-2016)

Teaching Assistant for APh/MS 120 Diffraction and Structure (Grad course) (Fall 2013)

The Solar Army: NSF Center for Chemical Innovation in Solar Fuels Outreach

Solar Army General (Volunteer) (2013-2015)

Korean-American Scientists and Engineers Association (KSEA)

KSEA-SC Major Fair Invited Booth Speaker (2015-2016)

National Mathematics & Science Competition Graduate Volunteer (2012, 2013, 2015)

Space Journey Science Camp Graduate Volunteer (2012)

University of Massachusetts Amherst

Mathematics Department

Paid Teaching Assistant for Math 127: Calculus I (2009-2011)

Students Mentored

Claire Saunders, PhD (Caltech PhD → Nuclear Materials Scientist at Helion Energy, Inc.)

Yao Yang, PhD (UCLA PhD → Assistant Professor at Westlake University, China)

Seungkyeum Kim (UCLA undergraduate student → Caltech PhD Candidate)

Abinash Kumar, PhD (MIT PhD → Staff at NanoSpective)

Dillan J. Chang (UCLA PhD → Allstate Corporation)

Xi Chen (MIT PhD Candidate → Research Staff at the Allen Institute)

Michael Xu (MIT PhD Candidate)

Matt Shammami (UCLA PhD Student)