Christopher Dames
Associate Professor & Vice Chair for Graduate Matters
Department of Mechanical Engineering
University of California, Berkeley
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Research Interests

Fundamental studies of heat transfer and energy conversion, using theoretical and experimental methods.

Education

Ph. D., 2006 — *Massachusetts Institute of Technology* — Cambridge, MA
Mechanical Engineering.
Major: Heat transfer. Minors: Fluid mechanics, Solid state physics.
Thesis: "Thermal properties of nanowires and nanotubes: modeling and experiments."
Thesis Adviser: Prof. Gang Chen.

M.S., 2001 — *University of California, Berkeley* — Berkeley, CA
Mechanical Engineering.
M.S. Project: "Application of deformable diffraction gratings for parallel detection of bio-molecules." M. S. Adviser: Prof. Arun Majumdar.

B.S., 1998 — *University of California, Berkeley* — Berkeley, CA
Mechanical Engineering.
(*University of Auckland*, one year study abroad) — Auckland, New Zealand
Foreign exchange student in the Department of Mechanical Engineering, 2/97 - 11/97.

Appointments & Work Experience

7/2016 - present	Vice Chair for Graduate Matters, Dept. of Mechanical Engineering, UC Berkeley
7/2015 - 6/2016	Vice Chair of Instruction, Dept. of Mechanical Engineering, UC Berkeley
12/2013 -present	Faculty Staff Scientist/Engineer, Lawrence Berkeley Lab, Materials Sciences Division
7/2013 - present	Associate Professor (tenured), Dept. of Mechanical Engineering, UC Berkeley.
7/2011 - 6/2013	Acting Associate Professor, Dept. of Mechanical Engineering, UC Berkeley.
7/2011 - present	Adjunct Faculty, Department of Mechanical Engineering, UC Riverside.
9/2006 - 6/2011	Assistant Professor, Department of Mechanical Engineering, UC Riverside.
6/2006 - 8/2006	Postdoctoral Scholar, Department of Mechanical Engineering, Massachusetts Institute of Technology (Adviser: Prof. Gang Chen).
6/1998 - 6/1999	Research Engineer, Solo Energy Corp., Alameda, CA.

Awards & Honors

2017	UCB Mechanical Engineering Department award for "Excellence in the Instruction of Undergraduate-Level Courses," for Spring + Fall 2016
2015	Viskanta Fellowship and heat transfer lecture at Purdue University
2011-2016	NSF CAREER Award
2009-2012	DARPA Young Faculty Award
2008-2009	UC Regents Faculty Fellowship
2003	Best presentation award, Mat. Res. Soc. Fall Meeting, Thermoelectrics Symposium
2001-2002	MIT Presidential Fellowship
1994-1998	UC Berkeley Chancellor's Scholarship

Publications

Refereed Journal Publications

44. G. Wehmeyer, T. Yabuki, C. Monachon, J. Wu, and C. Dames, "Thermal diodes, regulators, and switches: Physical mechanisms and potential applications," *Applied Physics Reviews* **4**, 041304 (2017).
43. S. Pandya, J. D. Wilbur, B. Bhatia, A. R. Damodaran, C. Monachon, A. Dasgupta, W. P. King, C. Dames, and L. W. Martin, "Direct Measurement of Pyroelectric and Electrocaloric Effects in Thin Films". *Physical Review Applied* **7**, 034025 (2017).
42. S. Lee, K. Hippalgaonakar, F. Yang, J. Hong, C. Ko, J. Suh, K. Liu, K. Wang, J.J. Urban, X. Zhang, C. Dames, S.A. Hartnoll, O. Delaire, and J. Wu, "Anomalously low electronic thermal conductivity in metallic vanadium dioxide," *Science* **355**, 371 (2017).
41. J. Lee, W. Lee, G. Wehmeyer, S. Dhuey, D. Olynick, S. Cabrini, C. Dames, J. J. Urban, and P. Yang, "Investigation of phonon coherence and backscattering using silicon nanomeshes". *Nature Communications* **8**, 14054 (2017).
40. Z. Wei, G. Wehmeyer, C. Dames, and Y. Chen, "Geometric tuning of thermal conductivity in three-dimensional anisotropic phononic crystals," *Nanoscale* DOI: 10.1039/C6NR04199J (2016).
39. C. Monachon, L. Weber, and C. Dames, "Thermal Boundary Conductance: A materials science perspective," *Annual Review of Materials Research* **46**, 433 (2016).
38. J. D. Kilbane, E. M. Chan, C. Monachon, N. J. Borys, E. S. Levy, A. D. Pickel, J. J. Urban, P. J. Schuck, and C. Dames, "Far-field optical nanothermometry using individual sub-50 nm upconverting nanoparticles". *Nanoscale* 8, 11611-11616 (2016).
37. Wenzhong Bao[*], Andrea Pickel[*], Qing Zhang, Yannan Chen, Yonggang Yao, Jiayu Wan, Kun Fu, Yibo Wang, Jiaqi Dai, Hongli Zhu, Dennis Drew, Michael Fuhrer, Chris Dames[*], and Liangbing Hu,[*] "Flexible, High Temperature, Planar Lighting with Large Scale Printable Nanocarbon Paper," *Advanced Materials* 28, 4684 (2016).
36. H. Natesan, W. Hodges, J. Choi, S. Lubner, C. Dames, and J. Bischof, "A Micro-Thermal Sensor for Focal Therapy Applications". *Scientific Reports* 6, 21395 (2016).
35. C. Dames, "Cost optimization of thermoelectric materials for power generation: The case for ZT at (almost) any cost," invited Viewpoint article for *Scripta Materialia* 111, 16 (2016).
34. Z. Chen and C. Dames, "An anisotropic model for the minimum thermal conductivity". *Applied Physics Letters* 107, 193104 (2015).

33. J. Suh, K. M. Yu, D. Fu, X. Liu, F. Yang, J. Fan, D. J. Smith, Y. H. Zhang, J. K. Furdyna, C. Dames, W. Walukiewicz, and J. Wu, "Simultaneous Enhancement of Electrical Conductivity and Thermopower of Bi2Te3 by Multi-Functionality of Native Defects," *Advanced Materials* 27, 3681 (2015)
32. V. Mishra, C. L. Hardin, J. E. Garay, and C. Dames, "A 3 Omega Method to Measure an Arbitrary Anisotropic Thermal Conductivity Tensor," *Review of Scientific Instruments* 86, 054902 (2015).
31. T. Hori, J. Shiomi, and C. Dames, "Effective phonon mean free path in polycrystalline nanostructures", *Applied Physics Letters* 106, 171901 (2015).
30. F. Yang and C. Dames, "Heating frequency dependent thermal conductivity: an analytical solution from diffusive to ballistic regime and its relevance to phonon scattering measurements," *Physical Review B* **91**, 165311 (2015).
29. L. Shi, C. Dames, J. R. Lukes, P. Reddy, J. C. Duda, D. Cahill, J. Lee, A. Marconnet, K. Goodson, J. H. Bahk, A. Shakouri, R. Prasher, J. Felts, W. P. King, B. Han, and J. C. Bischof, "Evaluating Broader Impacts Of Nanoscale Thermal Transport Research". *Nanoscale and Microscale Thermophysical Engineering* 19, 127 (2015).
28. A. T. Wieg, Y. Kodera, Z. Wang, C. Dames, and J. E. Garay, "Thermomechanical properties of rare earth doped AlN for laser gain media: The role of grain boundaries and grain size," *Acta Materialia* 86, 148 (2015).
27. Sean D. Lubner, Jeunghwan Choi, Geoff Wehmeyer, Bastian Waag, Vivek Mishra, Harishankar Natesan, John C. Bischof, and Chris Dames, "Reusable bi-directional 3ω sensor to measure thermal conductivity of 100-μm thick biological tissues", *Review of Scientific Instruments* **86**, 014905 (2015).
26. H. Guo, M. I. Khan, C. Cheng, W. Fan, C. Dames, J. Wu and A. M. Minor, "VO_2 nanowire-based microthermometer for quantitative evaluation of electron beam heating," *Nature Communications* **5**, 4986 (2014).
25. S. LeBlanc, S. Yee, M. Scullin, C. Dames, and K. E. Goodson, "Material and Manufacturing Cost Considerations for Thermoelectrics," *Renewable and Sustainable Energy Reviews* **32**, 313 (2014).
24. W. Jang, W. Bao, L. Jing, C. N. Lau, and C. Dames, "Thermal Conductivity of Suspended Few-layer Graphene by a Modified T Bridge Method," *Applied Physics Letters* **103**, 133102 (2013).
23. J. P. Angle, Z. Wang, C. Dames, and M. L. Mecartney, "Comparison of two-phase thermal conductivity models with experiments on dilute ceramic composites," *Journal of the American Ceramic Society* 96, 2935 (2013).
22. S. K. Yee, S. LeBlanc, K. E. Goodson, and C. Dames, "$ per Watt Metrics for Thermoelectric Power Generation: beyond ZT," *Energy & Environmental Science* 6, 2561 (2013).
21. Z. Chen, Z. Wei, Y. Chen, and C. Dames, "Anisotropic Debye model for the thermal boundary conductance," *Physical Review B* **87**, 125426 (2013).
20. F. Yang and C. Dames," Mean free path spectra as a tool to understand thermal conductivity in bulk and nanostructures", *Physical Review B* 87, 035437 (2013).
19. Z. Wei, Y. Chen, and C. Dames, "Negative correlation between in-plane bonding strength and cross-plane thermal conductivity in a model layered material," *Applied Physics Letters* **102**, 011901 (2013).
18. W. Bao, K. Myhro, Z. Zhao, Z. Chen, W. Jang, L. Jing, F. Miao, H. Zhang, C. Dames, and C. N. Lau, "In Situ Observation of Electrostatic and Thermal Manipulation of Suspended Graphene Membranes," *Nano Letters* **12**, 5470 (2012).

17. A. T. Wieg, Y. Kodera, Z. Wang, T. Imai, C. Dames, and J. E. Garay, “Visible photoluminescence in polycrystalline aluminum nitride ceramics with high thermal conductivity,” *Applied Physics Letters* **101**, 111903 (2012).
16. Z. Wei, Y. Chen, and C. Dames, “Wave packet simulations of phonon boundary scattering at graphene edges,” *Journal of Applied Physics* **112**, 024328 (2012).
15. E. S. Toberer, L. L. Baranowski, and C. Dames, “Advances in thermal conductivity,” *Annual Review of Materials Research* **42**, 179 (2012).
14. Z. Wang, J. E. Alaniz, W. Jang, J. E. Garay, and C. Dames, "Thermal Conductivity of Nanocrystalline Silicon: Importance of Grain Size and Frequency-Dependent Mean Free Paths". *Nano Letters* **11**, 2206 (June 2011).
13. W. Jang, Z. Chen, W. Bao, C. N. Lau, and C. Dames, "Thickness-dependent thermal conductivity of encased graphene and ultrathin graphite," *Nano Letters* **10**, 3909 (2010).
12. F. Yang, T. Ikeda, G. J. Snyder, and C. Dames, "Effective thermal conductivity of polycrystalline materials with randomly oriented superlattice grains," *Journal of Applied Physics* **108**, 034310 (2010).
11. Z. Chen, W. Jang, W. Bao, C. N. Lau, and C. Dames, "Thermal contact resistance between graphene and silicon dioxide," *Applied Physics Letters* **95**, 161910 (2009).
10. C. C. Chen, W. Bao, J. Theiss, C. Dames, C. N. Lau, and S. Cronin, "Raman spectroscopy of ripple formation in suspended graphene," *Nano Letters* **9**, 4172 (2009).
9. W. Bao, F. Miao, Z. Chen, H. Zhang, W. Jang, C. Dames, and C. N. Lau, "Controlled ripple texturing of suspended graphene and ultrathin graphite membranes," *Nature Nanotechnology* **4**, 562 - 566 (2009).
8. C. Dames, “Solid-state thermal rectification with existing bulk materials” *ASME Journal of Heat Transfer* **131**, 061301 (2009).
7. C. Dames, S. Chen, C. T. Harris, J. Y. Huang, Z. F. Ren, M. S. Dresselhaus, G. Chen, "A hot wire probe for thermal measurements of nanowires and nanotubes inside a transmission electron microscope," *Review of Scientific Instruments*, 78, 10493 (2007).
6. B. Cord, C. Dames, K. Berggren, and J. Aumentado, “Robust shadow-mask evaporation via lithographically-controlled undercut,” *Journal of Vacuum Science and Technology B* **24**, 3139 (2006).
5. C. Dames and G. Chen, “1, 2, and 3ω methods for measurement of thermal properties,” *Review of Scientific Instruments* **76**, 124902 (2005).
4. B. Poudel, W. Wang, C. Dames, J. Huang, S. Kunwar, D. Wang, D. Banerjee, G. Chen and Z. Ren, “Formation of crystallized titania nanotubes and their transformation into nanowires,” *Nanotechnology* **16**, 1935 (2005).
3. C. Dames, G. Chen, B. Poudel, W. Wang, J. Huang, Z. Ren, Y. Sun, J. I. Oh, C. Opeil, S.J., and M. J. Naughton, “Low dimensional phonon heat capacity of titanium dioxide nanotubes,” *Applied Physics Letters* **87**, 031901 (2005).
2. G. Chen, A. Narayanaswamy, and C. Dames, “Engineering nanoscale phonon and photon transport for direct energy conversion,” *Superlattices and Microstructures* **35**, 161 (2004).
1. C. Dames and G. Chen, “Theoretical phonon thermal conductivity of Si-Ge superlattice nanowires,” *Journal of Applied Physics* **95**, 682 (2004).

Book Chapters

B4. C. Dames, "Measuring the thermal conductivity of thin films: 3 omega and related electrothermal methods," invited chapter in the *Annual Review of Heat Transfer*, Begell House (2013).

B3. C. Dames, "Microscale Conduction," invited chapter in the textbook *Heat Conduction*, 3rd edition, lead author Latif Jiji, Springer, 2009.

B2. C. Dames, "Resistance Temperature Detectors," invited chapter in the *Encyclopedia of Micro- and Nanofluidics*, Springer-Verlag, D. Li (Ed.), 2008.

B1. C. Dames and G. Chen, "Thermal conductivity of nanostructured thermoelectric materials," invited chapter in *Thermoelectrics Handbook: Macro to Nano*, Chapter 42, CRC Press, ed. D. Rowe, 2005.

Professional Activity and Service

Reviewing Journal Articles

ACS Macro Letters
ACS Nano
Acta Materialia
Advanced Functional Materials
Applied Physics Letters
Applied Physics Reviews
ASHRAE Journal
ASME Journal of Heat Transfer
Energy & Environmental Science
Europhysics Letters (EPL)
Heat Transfer Engineering
IEEE Transactions on Nanotechnology
IEEE Transactions on Electron Devices
International Journal of Heat and Mass Transfer
International Journal of Thermal Sciences
International Journal of Thermophysics
International Journal of Transport Phenomena
Journal of Applied Physics
Journal of Electronic Packaging
Journal of Chemical Physics
Journal of Materials Research
Journal of Microelectromechanical Systems
Journal of Nanoparticle Research
Journal of Physical Chemistry
Journal of Physics D
Journal of Thermophysics and Heat Transfer
Journal of Vacuum Science & Technology B
Materials Today
Measurement Science & Technology
Microsystems & Nanoengineering
NanoLetters
Nanoscale & Microscale Thermophysical Eng.
Nanoscale Research Letters
Nanotechnology
Nature
Nature Communications
Nature Energy
Nature Materials
Nature Nanotechnology
New Journal of Physics
Numerical Heat Transfer
Physical Review B
Physical Review E
Physical Review Letters
Physics Letters A
PLoS One
Proc. National Academy of Sciences (PNAS)
Review of Scientific Instruments
Scientific Reports
Scripta Materialia
Superlattices and Microstructures

Reviewing Proposals

ACS-PRF (American Chemical Society - Petroleum Research Fund)

ARO (Army Research Office)

ARPA-E (Advanced Research Projects Agency - Energy)

CECAM (Centre Européen de Calcul Atomique et Moléculaire)

DOE (Department of Energy)

NOAA (National Oceanic and Atmospheric Administration)

NSF-CBET (National Science Foundation - Chem., Bioeng., Environ., & Transport Systems Division).

NSF-ERC (Engineering Research Center): Member of Site Visit Review Team.

Editorial Activities

Associate Editor, *IEEE Transactions on Components, Packaging and Manufacturing Technology*, April 2011-2013.

Guest Editor (1 of 2) for a special issue of the *ASME Journal of Heat Transfer*, including but not limited to submissions at the first Energy Nanotechnology International Conference, Cambridge, MA, June 2006. Issue published in April 2008.

Conference Organizational Activities

Conference Co-Chair, The 8th US-Japan Joint Seminar on Nanoscale Transport Phenomena, Santa Cruz, CA, July 13-16, 2014.

Scientific Committee, Eurotherm Seminar #103, Nanoscale and Microscale Heat Transfer IV, Lyon, France, October 15-17, 2014.

Symposium Co-Organizer: "Nanoscale Thermoelectrics: Materials and Transport Phenomena - II," 2013 MRS Spring Meeting.

Technical Program Committee, and Track Co-Chair, 3rd Microscale and Nanoscale Heat and Mass Transfer Conference (MNHMT), Atlanta, GA, March 3-6, 2012.

Scientific Committee, Eurotherm Seminar #91, Microscale Heat Transfer III, Poitiers, France, August 29-31, 2011.

Co-organizer for a DMP Focus Topic on "Thermoelectric Materials and Phenomena" for the 2010 March APS Meeting (in Portland OR). Topic had 6 sessions and 5 invited speakers.

Session Chair and Co-Chair at various conferences: ASME MNHMT, ASME IMECE, ASME Summer Heat Transfer Conference, InterPACK.

Professional Societies

Chair, ASME Heat Transfer Division K-9 Committee on Nanoscale Thermal Transport, 7/2017 - present. Served continuously since this group's founding in 2012, first as Vice Chair for Collaborative Efforts and then as Vice Chair (2012 - 6/2017).

Member of ASME, MRS

Teaching (UC Berkeley: Fall 2011 - present)

			Average Student Evaluations	
UC Berkeley Course	Level	Offer-ings Taught	Question 1: "Rate the overall teaching effectiveness of this instructor" Score out of 7	Question 2: "How worthwhile was this course compared with others at U.C.?" Score out of 7
ME40: Thermodynamics	Soph., required	1	5.7 (Dept. Avg. 5.5)	5.7 (Dept. Avg. 5.5)
ME109: Heat Transfer	Junior, required	2	6.3 (Dept. Avg. 5.3)	5.7 (Dept. Avg. 5.2)
ME151: Advanced Heat Transfer (Roomshared with a graduate version ME292E in Spring 2017; scores lumped here)	Technical Elective	2	6.3 (Dept. Avg. 5.7)	6.0 (Dept. Avg. 5.6)
ME251: Heat Conduction	Graduate	2	6.4 (Dept. Avg. 6.0)	6.2 (Dept. Avg. 5.9)
ME 259: Microscale Thermophysics & Heat Transfer	Graduate	4	6.2 (Dept. Avg. 5.9)	6.0 (Dept. Avg. 5.8)

Teaching (UC Riverside: Fall 2006 - Spring 2011)

			Average Student Evaluations	
UC Riverside Course	Level	Offerings Taught	Question 13: "Instructor was effective as a teacher overall" Score (Percentile among Dept.)	Question 19: "The course overall as a learning experience was excellent" Score (Percentile among Dept.)
ME 100A: Thermodynamics	Junior Level, required	4	4.6 / 5 (83%)	4.5 / 5 (75%)
ME 116B: Heat Transfer	Technical Elective	2	4.8 / 5 (86%)	4.6 / 5 (83%)
ME 122: Vibrations	Technical Elective	2	4.8 / 5 (86%)	4.6 / 5 (80%)
ME 241A: Fundamentals of Heat and Mass Transfer	Graduate	2	4.9 / 5 (95%)	4.8 / 5 (85%)
*ME243: Advanced Mechanical Engineering Thermodynamics	Graduate	1	4.6 / 5 (88%)	4.2 / 5 (71%)
*ME 244: Nanoscale Heat Transfer & Energy Conversion	Graduate	2	4.9 / 5 (91%)	4.8 / 5 (90%)

*ME243 and ME244: Developed new courses.