



Friday October 14, 2016

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Presentation: 11:40 AM, BRK 2001

“Radiative Heat Transfer at the Nanoscale”

Abstract: Radiative heat transfer between objects separated by nanometer-sized gaps is of considerable interest due to its promise for non-contact modulation of heat transfer and for several energy conversion applications. Although radiative heat transfer at macroscopic distances is well understood, radiative heat transfer at the nanoscale remains largely unexplored. In this talk, I will describe ongoing efforts in our group to experimentally elucidate nanoscale heat radiation. Specifically, I will present our recent experimental work where we have addressed the following questions: 1) Can existing theories accurately describe radiative heat transfer in single nanometer sized gaps¹? 2) What is the role of film thickness on nanoscale radiation²? and 3) Can radiative thermal conductances that are orders of magnitude larger than those between blackbodies be achieved³? In order to address these questions we have developed a variety of instrumentation including novel nanopositioning platforms and microdevices, which will also be described. Finally, I will briefly outline how these advances can be leveraged for future investigations of nanoscale radiative heat transport, near-field thermophotovoltaic energy conversion and near-field based solid-state refrigeration.

Bio: Prof. Pramod Reddy received a B. Tech and M. Tech in Mechanical Engineering from the Indian Institute of Technology, Bombay in 2002, and a Ph.D. in Applied Science and Technology from the University of California, Berkeley in 2007. He was a recipient of the NSF CAREER award in 2009, and the DARPA Young Faculty Award in 2012. He is currently an associate professor in the departments of Mechanical Engineering and Materials Science and Engineering at the University of Michigan, Ann Arbor.

References:

- [1] K. Kim, B. Song, V. Fernández-Hurtado, W. Lee, W. Jeong, L. Cui, D. Thompson, J. Feist, M. T. H. Reid, F. J. García-Vidal, J. C. Cuevas, E. Meyhofer and P. Reddy, “Radiative heat transfer in the extreme near-field”, *Nature* 528, 387-391 (2015).
- [2] B. Song, Y. Ganjeh, S. Sadat, D. Thompson, A. Fiorino, V. Fernández-Hurtado, J. Feist, F. J. García-Vidal, J. C. Cuevas, P. Reddy and E. Meyhofer, “Enhancement of near-field radiative heat transfer using polar dielectric thin films“, *Nature Nanotechnology* 10, 253-258 (2015).
- [3] B. Song, D. Thompson, A. Fiorino, Y. Ganjeh, P. Reddy and E. Meyhofer, “Radiative heat conductance between dielectric and metallic parallel plates at nanoscale gaps”, *Nature Nanotechnology* 11, 509-514 (2016).

Host: Prof. Vladimir Shalaev

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