

Thermal Radiation at the Nanoscale

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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) Can radiative thermal conductances that are orders of magnitude larger than those between blackbodies be achieved²? 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.

[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, *Nature* **528**, 387-391 (2015).

[2] B. Song, D. Thompson, A. Fiorino, Y. Ganjeh, P. Reddy and E. Meyhofer, *Nature Nanotechnology* **11**, 509-514 (2016).