Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Exploring Near-Field Radiative Heat Transfer for Thermophotovoltaic Applications[1] YASHAR GANJEH, BAI SONG, SEID SADAT, DAKOTAH THOMPSON, ANTHONY FIORINO, PRAMOD REDDY, EDGAR MEYHOFER, University of Michigan-Ann Arbor — Understanding near-field radiative heat transfer (NFRHT) is critical for developing efficient thermo-photovoltaic devices. Theoretical predictions suggest that when the spatial separation of two parallel planes at different temperatures is less than their Wien's thermal wavelength, thermal transport via radiation can be greatly enhanced. The radiative heat flow across nanoscale gaps is predicted to be orders-of-magnitude higher than that given by Stefan-Boltzmann law, due to contribution of evanescent waves. In order to test these predictions, a novel experimental platform was designed and built enabling parallelization of two planar surfaces (50 μm by 50 μm) with 500 microradian resolution in their relative orientation. This platform was used to probe NFRHT between two planes and also between a plane and a sphere. It was found that, when a 50 μm diameter silica sphere was approximately 20 nm away from a 50 by 50 μm^2 silica plane, a significant increase in radiative heat transfer coefficient was observed. This increase is 3 orders of magnitude higher than the value predicted by the blackbody limit. Other setups, including Au spheres and planes, and the plane-plane geometries are currently being investigated.

[1] 1) Army Research office (W911NF-12-1-0612), 2) NSF Thermal Transport Prcesses (CBET 1235691), 3) Center for Solar and Thermal Energy conversion, funded by the US Department of Energy, Office of Science, Basic Energy Sciences under award no. DE-SC0000957

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Date submitted: 19 Nov 2013 Electronic form version 1.4