Abstract Submitted
for the 4CF15 Meeting of
The American Physical Society

Transient thermoreflectance measurement of gold nanoparticle thermal boundary resistance. BRIAN GREEN, MARK SIEMENS, University of Denver, STEPHEN BUDY COLLABORATION, SCOTT REED COLLABORATION — Macroscopic thermal transport is explained by classical thermal diffusion, but as nanostructure length scales approach the phonon mean free path, nanoscale effects emerge such as sensitivity to the presence of surfaces and the onset of ballistic transport. We present experimental measurements in which we time-resolve the cooling dynamics of gold nanospheres, approximately 19 nm in diameter, in a polymer matrix and deposited on a glass substrate. We use the transient thermoreflectance (TTR) method in colinear pump/probe experiments. Excitation and probe signals are generated from an 800 nm near-infrared pulsed laser, with pulse duration about 3 orders of magnitude less than the diffusion time of these structures. The measured thermal dynamics show sub-picosecond heating and a steady cooling decay. Fitting these experimental data with a model of diffusive thermal transport in a stratified, spherical nanostructure, we determine the gold/polymer thermal boundary resistance and compare the result with theoretical models.

Brian Green
University of Denver

Date submitted: 11 Sep 2015 Electronic form version 1.4