Abstract Submitted
for the APR10 Meeting of
The American Physical Society

The Effects of Aggregation on the Thermal Conductivity of Gold Nanoparticle Suspensions REBECCA CHRISTIANSON, ERIKA SWARTZ, JESSICA TOWNSEND, Franklin W. Olin College of Engineering, THOMAS KODGER, DAVID WEITZ, Harvard University, THOMAS MCKRELL, JACOPO BUONGIORNO, Massachusetts Institute of Technology — During the last ten years, the search for improved thermal transport fluids has led to the study of the thermal properties of suspensions of nanoparticles. Particularly in the literature on metallic nanoparticle suspensions, there has been a wide range of results reported, with some authors reporting enormously high enhancements to the thermal conductivity for extremely low particle concentrations. This has been hypothesized to be due to instability of the suspensions, with the formation of fractal aggregates resulting in effectively higher volume fractions with conduction pathways along the backbones of the aggregates. A few well-developed theoretical studies have been published to explain this effect. In this work, we report the results of an experimental study of the thermal conductivity of suspensions of fractal aggregates. We compare our results both to the literature results showing high enhancements for metallic nanoparticle systems, and to the theoretical works for thermal conductivity of fractal aggregates.

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Date submitted: 19 Oct 2009 Electronic form version 1.4