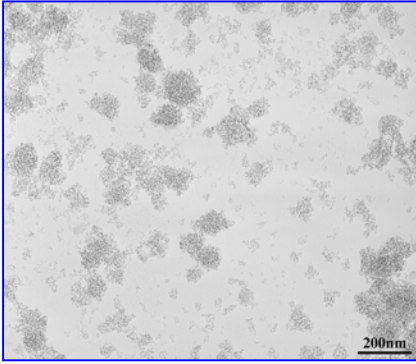
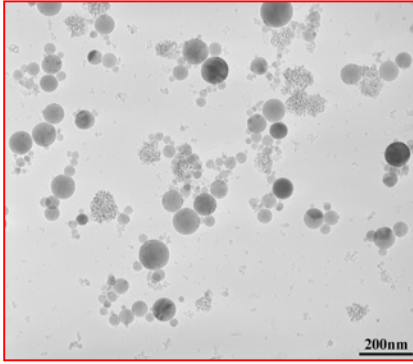


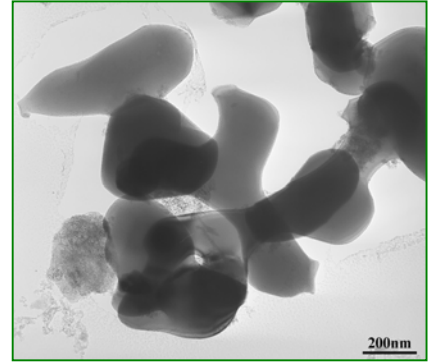
### TEM Images (x50000) of Nanoparticles



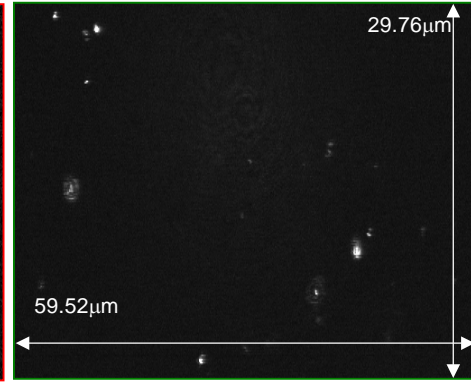
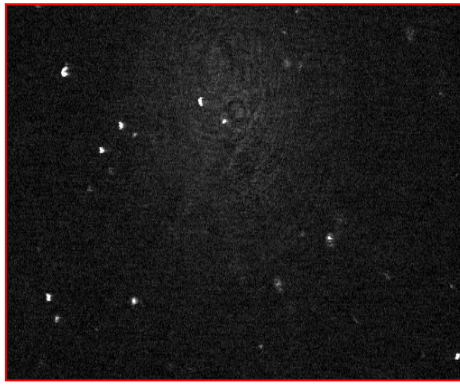
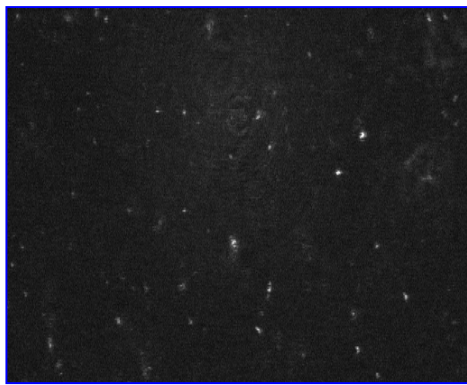
$d = 11\text{nm}$



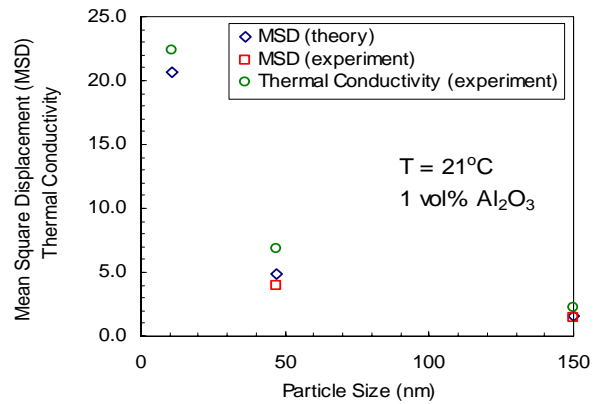
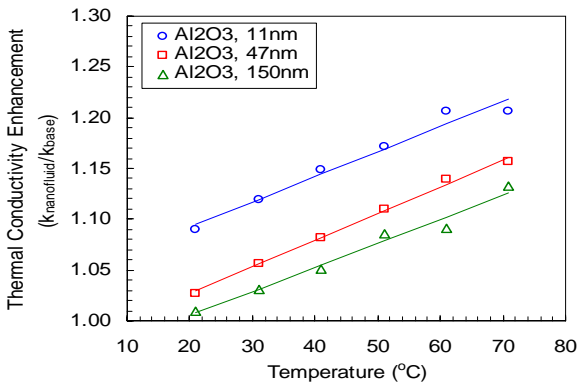
$d = 47\text{nm}$



$d = 150\text{nm}$



### Optical Microscopic Images (x630) of Nanoparticle Brownian Motions in Water



## Thermal Conductivity Enhancement of Nanofluids by Brownian Motion

C. H. Chon and K. D. Kihm

Micro and Nano Scale Fluidics and Energy Transport Laboratory [www.engr.utk.edu/~minsfet]  
University of Tennessee, Knoxville, Tennessee

Thermal conductivity has increased dramatically in a nanofluid, which included small portion of nano-sized metal particles. A key mechanism of enhanced thermal conductivity is Brownian motion called micro-convection, millions of times interaction between nanoparticles and base fluid molecules. And the smaller nanoparticles increase their surfaces and the number of interaction and it leads the more enhanced thermal conductivity of a nanofluid. Furthermore higher temperature of a base fluid leads more active Brownian motion of nanoparticles. With the experimental measurement of thermal conductivity and optical visualization of particle motions, the relationship between Brownian motion and enhanced thermal conductivity based on different sized nanoparticles and temperature changes was observed.