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A mechanistic modeling of heat conduction in nanoparticulates suspensions (nanofluids) RUI QIAO, PING HE, Department of Mechanical Engineering, Clemson University — Nanofluids are a new class of heat transfer fluids consisting of nanoparticles dispersed in a base fluid and often show superior thermal conductivity. The mechanisms of heat conduction in nanofluids are unclear at present, and many mechanisms, e.g., Brownian motion of nanoparticles and particle clustering, have been proposed to play important role in determining the overall heat conduction. Here we examine the role of nanoparticle Brownian motion by using numerical modeling. We propose a mesoscopic particle method for modeling of heat conduction in nanofluids. We show that the proposed method can accurately reproduce 1) the Brownian dynamics of nanoparticles and 2) the heat conduction in strongly heterogeneous media. We then apply the method to investigate the role of nanoparticle Brownian motion in determining the heat conduction in nanofluids by comparing the thermal conductivity for "frozen" nanofluids and dynamic nanofluids. Implications of the simulation results for engineering design of nanofluids will be discussed.

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