Transport phenomena in suspensions of nanoparticles (nanofluids)

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Synopsis

Transport phenomena at the nanoscale are of importance to many nanotechnology applications. Examples include micro and nano fluidics, semiconductor quantum dots and superlattices, polymer nanocomposites, multilayer coatings, thermoelectronic energy converter, data storage, fuel cell technology, microelectronic and optoelectronic devices, and MEMS (microelectromechanical) sensors. Conventional macroscopic theories may not be applicable to these systems. This work forms part of an effort to address this issue. It aims at transport phenomena in suspensions of nanoparticles with a focus on heat transfer.

Macroscale heat transfer is often divided into three modes: Conduction, Convection, and Radiation. Heat transfer problems are solved based on the conservation laws of mass, momentum and energy in combination with the constitutive equations between heat flux and temperature or temperature gradient (for energy equation), and between stresses and shear rates (for momentum equation). This presentation will start with an overview of heat transfer at the nanoscale including their features and the state-of-art in the field. Heat transfer in suspensions of nanoparticles will then be discussed. This will include transport properties of and particle migration in suspensions of nanoparticles.