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Nanofluids: Stability and Thermophysical Properties for Heat Transfer

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Abstract

Research studies about nanofluids are on the rise owing to the mounting interest and demand for nanofluids as heat transfer fluids in a wide variety of applications in recent years. The stability of nanofluids is one key challenge hindering the widespread practical application of nanofluids. Studies showed that stability depend on pH, sonication time, different types of shapes, and sizes of nanoparticles with different base fluids, nanofluid preparation methods, volume fractions, and surfactants as well as functionalizing.

The incorporation of nanoparticles in the base fluid leads to change in the thermophysical properties such as thermal conductivity, viscosity, and specific heat that affect the convective heat transfer. Several factors affecting the thermophysical properties; including types of nanoparticles, solid volume fraction, different base fluid, stability, temperature, particle size, shape, pH, sonication, and surfactants. There are many contradictory results found in the literature on the influence of effective parameters on thermophysical properties. It has been observed that the thermophysical properties are affected by the mentioned parameters.

The recent development in this field indicates that the application of nanofluid in this thermal system showed promising performance. Proper characterization of nanofluids (with hybrid nanofluids as well recently) results in more efficient heat transfer fluids compared to single nanoparticle-based nanofluid. However, more intense research is needed towards the selection of proper hybrid nanoparticles, their preparation, characterization, and long-term stability to exploit their full potential.