Comprehensive review of principle factors for thermal conductivity and dynamic viscosity enhancement in thermal transport applications: An analytical tool approach

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ABSTRACT

In past decades, nanofluid science has been widely investigated for thermal related activities. In thermal transport applications, thermal conductivity and dynamic viscosity are closely related to cooling system performance enhancement. The genuine anomaly behind thermal conductivity and dynamic viscosity enhancement in nanofluid is still undiscoverable. In this paper, comprehensive study on principle factor behind thermophysical propertyenhancement focusing on thermal conductivity and dynamic viscosity is conducted. Thus, a detailed review of existing experimental results for thermal conductivity and dynamic viscosity enhancement are compiled and discussed in this manuscript. Analytical tool approach such as fishbone diagram and summary tables are used to highlight principle factor for thermal conductivity and dynamic viscosity enhancement. The principal factor which influences the thermal conductivity is shape of the particle, nanofluid preparation, interfacial layer, Brownian motion, particle clustering and aggregation. Meanwhile, the principal factor influencing dynamic viscosity is the physical behavior of the particle, nanofluid preparation, particle clustering and aggregation. The optimum nanofluid should have high thermal conductivity and minimum viscosity. High thermal conductivity is mandatory for maximum heat absorption in thermal transport applications. Meanwhile, minimum viscosity ensures less pressure drop which reduces the power consumption and increases the overall efficiency of the system.

KEYWORDS:

Thermal conductivity; Dynamic viscosity; Nanofluid; Brownian motion interfacial layer