

Experimental investigation on the effect of particle concentration and temperature on thermophysical properties of water based metal oxide nanofluids

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Abstract

The dimensionless heat transfer parameters such as Nusselt number, Reynolds number and Prandtl number are function of thermophysical properties of the nanofluids and these numbers strongly influences the convective heat transfer coefficient. In thermal systems, the heat transfer coefficient quantifies the rate of heat transfer. The thermophysical properties of the nanofluid vary with particle concentration and temperature. In the present study, experimental analysis has been performed to evaluate the influence of particle concentration and temperature on thermophysical properties of various metal oxide nanofluids. For this study aluminium oxide (Al_2O_3), copper oxide (CuO), titanium dioxide (TiO_2), silicon dioxide (SiO_2) nanoparticles with deionised water are chosen and all the experimental results are compared with pure water. The experimentally measured thermophysical properties of the various nanofluids with the empirical correlations are compared. A considerable deviation is observed between the measured results and the empirical solutions. Therefore, a new correlation is developed to estimate the viscosity of nanofluids. Finally, from the results it can concluded that, nanofluids have enhanced thermo-physical properties, they may be considered as a suitable fluid for various heat transfer applications.

Keywords: Nanofluid; Particle concentration; Temperature; Thermophysical properties.