Experimental Investigation And Development of New Correlation for Thermal Conductivity and Viscosity of BioGlycol/water based SiO_2 Nanofluids

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ABSTRACT

Nanofluids are a new class of engineered heat transfer fluids which exhibit superior thermophysical properties and have potential applications in numerous important fields. In this study, nanofluids have been prepared by dispersing SiO_2 nanoparticles in different base fluids such as 20:80% and 30:70% by volume of BioGlycol (BG)/water (W) mixtures. Thermal conductivity and viscosity experiments have been conducted in temperatures between 30 °C and 80 °C and in volume concentrations between 0.5% and 2.0%. Results show that thermal conductivity of nanofluids increases with increase of volume concentrations and temperatures. Similarly, viscosity of nanofluid increases with increase of volume concentrations but decreases with increase of temperatures. The maximum thermal conductivity enhancement among all the nanofluids was observed for 20:80% BG/W nanofluid about 7.2% in the volume concentration of 2.0% at a temperature of 70 °C. Correspondingly among all the nanofluids maximum viscosity enhancement was observed for 30:70% BG/W nanofluid about 1.38-times in the volume concentration of 2.0% at a temperature of 70 °C. The classical models and semi-empirical correlations failed to predict the thermal conductivity and viscosity of nanofluids with effect of volume concentration and temperatures. Therefore, nonlinear correlations have been proposed with 3% maximum deviation for the estimation of thermal conductivity and viscosity of nanofluids.

KEYWORDS: Nanofluids; BioGlycol; Silicon oxide; Thermal conductivity; Viscosity

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