Thermal Conductivity and Viscosity Of Al_2o_3 Nanofluids for Different Based Ratio of Water and Ethylene Glycol Mixture

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ABSTRACT

In the thermal engineering applications, suspension of nanoparticles in conventional fluid has positive potential in enhancing the convective heat transfer performance. The evaluation of thermo-physical properties is essential to investigate the forced convection heat transfer of nanofluids. Hence, the present study reports the analysis on thermal conductivity and dynamic viscosity for Al_2O_3 nanoparticle dispersed in a different volume ratio of water (W) and ethylene glycol (EG) mixture. The Al_2O_3 nanofluids are formulated using the two-step method for three different base mixtures with volume ratio of 40:60, 50:50 and 60:40 (W:EG). The measurement of thermal conductivity and viscosity were performed using KD2 Pro Thermal Properties Analyzer and Brookfield LVDV-III Rheometer; respectively for temperature from 30 to 70 °C and volume concentration of 0.2–1.0%. The average thermal conductivity enhancement of Al_2O_3 nanofluids in the three base ratios varied from 2.6 to 12.8%. The nanofluids have better enhancement as the percentage of ethylene glycol increases. Meanwhile, the average dynamic viscosity enhanced up to 50% for 60:40 (W:EG). The enhancement of viscosity for nanofluids decreased with the increment percentage of ethylene glycol. The properties enhancement of the Al_2O_3 nanofluids is significantly influenced by the concentration, temperature, and based ratio.

KEYWORDS: Thermal conductivity; Viscosity; Nanofluids; Water-ethylene glycol mixture; Based ratio

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