# Experimental investigation of thermal conductivity and dynamic viscosity on nanoparticle mixture ratios of TiO2-SiO2 nanofluids

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**ABSTRACT**
In recent years, research is focused on enhancing the thermo-physical properties of single component nanofluids. Hence, the hybrid or composite nanofluids are developed to enhance the heat transfer performance. The thermo-physical properties of TiO2-SiO2 nanoparticles suspended in a base fluid of water (W) and ethylene glycol (EG) mixture with 60:40 vol ratio are investigated. The experiments were conducted for 1.0% volume concentration of TiO2-SiO2 nanofluids with different mixture ratios of 20:80, 40:60, 50:50, 60:40 and 80:20. The measurements of thermal conductivity and dynamic viscosity were performed in the temperature range of 30–80 °C by using KD2 Pro Thermal Properties Analyzer and Brookfield LVDV III Ultra Rheometer respectively. The highest thermal conductivity for TiO2-SiO2 nanofluid was obtained with a ratio of 20:80 and the maximum enhancement exceeded up to 16% higher than the base fluids. The nanofluids with a ratio of 50:50 provided the lowest effective thermal conductivity. Meanwhile, the dynamic viscosity variation for all mixture ratios is always lower than the ones with a ratio of 50:50. The properties enhancement ratio suggests that TiO2-SiO2 nanofluid with 1.0% volume concentration will aid the heat transfer for all mixture ratios except for the ratio of 50:50. As a conclusion, the optimum mixture ratios for TiO2-SiO2 nanofluids are attained with 40:60 and 80:20 ratios where the combination of enhancement in thermal conductivity and dynamic viscosity had more advantages to heat transfer as compared to other ratios..

**KEYWORDS:**
Thermal conductivity; Dynamic viscosity; TiO2-SiO2 nanofluids; Water-ethylene glycol mixture; Mixture ratio