International Communications in Heat and Mass Transfer 86 (2017) 181–189

Contents lists available at ScienceDirect

International Communications in Heat and Mass Transfer

journal homepage: www.elsevier.com/locate/ichmt

An experimental study on the thermal conductivity and dynamic viscosity of TiO_2-SiO_2 nanofluids in water: Ethylene glycol mixture

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ARTICLE INFO

Keywords:
Thermal conductivity
Dynamic viscosity
TiO_2-SiO_2 nanofluids
Water-ethylene glycol mixture
Newtonian fluid

ABSTRACT

The hybrid nanofluid has been thriving among researchers due to its potential to improve heat transfer performance. Therefore, various studies on heat transfer properties need to be carried out to provide a better understanding on hybrid nanofluid performance. In this paper, the experimental work is focused on the thermal conductivity and dynamic viscosity of TiO_2-SiO_2 nanofluids in a mixture of water and ethylene glycol (EG) with volume ratio of 60:40. The stable suspension of TiO_2-SiO_2 prepared at volume concentrations of 0.5 to 3.0%. The measurements of thermal conductivity and dynamic viscosity were performed at a temperature range of 30 to 80 °C by using KD2 Pro Thermal Properties Analyser and Brookfield LVDV III Ultra Rheometer, respectively. The thermal conductivity of TiO_2-SiO_2 nanofluids was improved by increasing the volume concentration and temperature with 22.8% maximum enhancement. Besides, the viscosity of TiO_2-SiO_2 nanofluids showed evidence of being influenced by nanofluid concentration and temperature. Additionally, the TiO_2-SiO_2 nanofluids behaved as a Newtonian fluid for volume concentration up to 3.0%. The properties enhancement ratio suggested that TiO_2-SiO_2 nanofluids will aid in heat transfer for concentrations of more than 1.5% and within the range of the temperature studied. A new correlation for thermal conductivity and dynamic viscosity of TiO_2-SiO_2 nanofluids were developed and found to be precise.