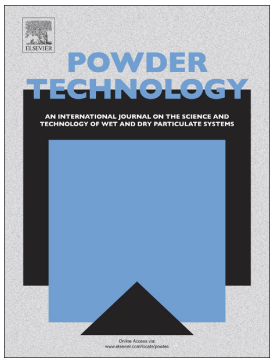

An experimental study on the stability and thermal conductivity of water-ethylene glycol/TiO2-MWCNTs hybrid nanofluid: Developing a new correlation

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An experimental study on the stability and thermal conductivity of water-ethylene glycol/TiO_2-MWCNTs hybrid nanofluid: developing a new correlation

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Abstract:

The thermal conductivity of water-ethylene glycol/TiO_2 -MWCNT hybrid nanofluid was studied. The volume fraction of the nanoparticles and the fluids were 50:50. The nanofluid was prepared by suspending TiO_2 nanoparticles-MWCNT in water-ethylene glycol using ultrasonic waves and addition of surfactants (CTAB). TiO_2 nanoparticles with a diameter of 10 to 25nm and MWCNT with a diameter of 20 to 30 nm were tested in different volume fractions of 0.05-1% and temperature range of 20-50°C. Nanofluid stability was examined using the imaging method, as well as the DLS test. Results indicated the quality of the nanofluid. The thermal conductivity was measured using the KD2-Prob device using the hot wire method, and the results showed that increase in temperature and volume fraction increases the thermal conductivity of nanofluid. However, increased volume fraction was found to increase thermal conductivity more effectively that temperature. Results showed that the thermal conductivity of nanofluid can increase by a maximum of 38.7%. Finally, two mathematical models were proposed to estimate the thermal conductivity of the nanofluid. The results obtained from the proposed models are very consistent with laboratory data.

Keywords: Temperature, Volume fraction, Thermal conductivity, Experimental investigation, Hybrid nanofluid

1- Introduction

Today, extensive studies have been carried out on the use of different methods to improve the heat transfer and flow in heat exchangers, in different studies, the use of nanofluid as a novel method is proposed [1-5]. Nanofluids are engineered colloids made of nanoparticles suspended in a base fluid. Thermal conductivity is the property that has catalyzed the attention of the