Experimental investigation of heat transfer and friction factor of TiO_2-SiO_2 nanofluids in water: ethylene glycol mixture

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A B S T R A C T

This paper introduces the combination of two different nanoparticles suspended in the base fluid for the enhancement of forced convection heat transfer. The aims of the experimental study are to investigate the heat transfer performance and friction factor of TiO_2-SiO_2 nanofluids in a circular tube under turbu-lent flow. The TiO_2-SiO_2 nanofluids are prepared by using the two-step method for 0.5 to 3.0% volume concentration with nanoparticle mixture ratio of 50:50. The TiO_2-SiO_2 nanoparticles are dispersed in a base fluid of water/EG mixture with a 60:40 volume ratio. The forced convection heat transfer experi-ment is conducted under working temperatures of 30, 50 and 70 °C and a constant heat flux boundary condition. The heat transfer coefficient of TiO_2-SiO_2 nanofluids is enhanced with increase of volume con-centration and temperature. It was observed that the maximum enhancement of convective heat transfer is 81% higher than the base fluid for a volume concentration and temperature of 3.0% and 70 °C, respec-tively. Furthermore, the friction factor of TiO_2-SiO_2 nanofluids is slightly increased with volume concen-tration, however insignificantly. Finally, the regression correlation model of TiO_2-SiO_2 nanofluids was developed from the experimental results for the estimation of Nusselt number and friction factor.

Keywords: Heat transfer; Friction factor; TiO_2-SiO_2 nanofluids; Water-ethylene glycol mixture Hybrid nanofluids