Heat transfer performance of TiO_2 –SiO_2 nanofluids in a tube with wire coil inserts

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ABSTRACT

The compound technique that combines nanofluids with wire coil inserts has proven itself in achieving double augmentation in heat transfer. This paper presents the thermal hydraulic performance of TiO_2-SiO_2 nanofluids with wire coil inserts. The experiments were conducted for Reynolds number from 2300 to 12,000 to determine the heat transfer performance and friction factor of TiO_2-SiO_2nanofluids with wire coil inserts. The TiO_2-SiO_2 nanofluids were prepared by using the two-step method for volume concentrations of 0.5–3.0%. The wire coil inserts are designed at various ratios of pitch over diameter (*P/D*) in the range of 0.83–4.17. The heat transfer performance of nanofluids was enhanced for a maximum of 254.4%, while the friction factor was obtained in the range of 1.76–6.38 times higher than water/EG in a plain tube. The thermal performance factor (TPF), η for the nanofluids with wire coil inserts at all volume concentrations was observed greater than 1.0. The optimum performance of TiO_2-SiO_2 nanofluids with wire coil occurred at 2.5% volume concentration and 1.50 pitch ratio. At this condition, the TiO_2-SiO_2 nanofluids with wire coil inserts provide the highest TPF and represent the best condition for cooling system applications.

KEYWORDS:

Heat transfer; Thermal hydraulic performance; TiO_2-SiO_2 nanofluids; Hybrid nanofluids; Wire coil inserts