Synthesis and characterizations of ZnO based Nanofluids for Heat Transfer Improvement in a Circular Heat Exchanger

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Abstract

The ZnO nanoparticles have synthesized by using Sono-chemical technique and characterized by XRD, FTIR, UV-Vis, and FESEM, characterizations to confirm the proper synthesis. The two-step preparation of ZnO-DW based nanofluids were achieved after dispersing ZnO nanoparticles in base fluid (distilled water) by using high probe sonicator, and four different (0.025, 0.05, 0.075 and 0.1) wt.% concentrations of ZnO-DW based nanofluids have been prepared. All the ZnO-DW based nanofluids were investigated thoroughly for different thermophysical properties and their optimistic effects on improvement of heat transfer coefficient in a circular heat exchanger. The thermophysical properties like thermal conductivity, viscosity, density, friction loss and pumping power etc of ZnO-DW based nanofluids shows promising effects on heat transfer improvement in a circular heat exchanger. Experimental investigations on heat transfer characteristics were conducted in a circular heat exchanger with constant heat flux and different Reynold's numbers in turbulent flow regimes conditions. The addition of ZnO solid nanoparticles in base fluid (DW) gives a surprising improvement in thermal conductivity about 47% increased. The maximum improvement in heat transfer has topped up for 0.1 wt.% concentration of ZnO-DW based nanofluid, which is about 52% more than base fluid. The outcomes arises by experiments reveals the ZnO-DW based nanofluids are best combination for heat transfer applications.

Keywords**:** *Synthesis of ZnO; Preparation of ZnO based nanofluids; Heat Transfer Coefficient; Reynolds; Viscosity.*

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