Metal Oxide and Graphene Based Future Nanofluids for Effective Energy Transportation

Waqar Ahmed
Malaysia Japan Institute of Technology (MJIIT), Malaysia

Metal oxide and Graphene-based nanofluids were prepared using the ultra-sonochemical technique and 2 step nanofluid preparation method. The heat convection characteristics of as-prepared nanofluids were observed for a closed single conduit (circular, square, Tand annular) in turbulent flow regimes. The prepared nanofluids were characterized for UV-vis, FTIR, XRD, FESEM, and TEM analysis to confirm the accurate synthesis of Metal oxides and Graphene nanoparticles. Analytical data related to heat transfer properties of the synthesized nanofluids for the heat exchanger, incorporated with the conduit test section were collected. The addition of metal oxides and Graphene solid nanoparticles in the water, water@Ethylene glycol, and Ethylene Glycol enhanced the value of thermal conductivity and other thermos physical characteristics of the prepared nanofluids. Supreme thermal conductivity was recorded at a higher value of temperature for used 0.1 wt.% of Metal oxides and Graphene-based nanofluids. Adding the more wt.% of the Metal oxides and Graphene solid nanoparticles in the distilled water, Distilled water@Ethylene Glycol and Ethylene Glycol had increased the thermal conductivity subsequently with variations in temperature from 20 to 45ºC.

Furthermore, Nusselt numbers of Metal oxides and Graphene-based nanofluids were calculated at different wt.% of solid nanoparticles present in varying base fluids. The occurrence of solid nanoparticles into the base fluid intensify the Nusselt (Nu) number by 51.5%, 43.79%, 38%and 24.06% for 0.1 wt.%, 0.075 wt.%, 0.05 wt.% and 0.025wt.% concentrations, respectively. Varying wt.% of ZnO (0.1 wt.%, 0.075 wt.%, 0.05wt.%). The absolute average heat transfer of Metal oxide and Graphene-based nanofluids using at the highest concentration of 0.1 wt.% was enhanced compared to the base fluid. The magnitude of absolute average heat transfer was increased from 600 W/m2k for the EG@DW mixture to 1292 W/m2k for Zinc Oxide @ Glycol-based nanofluids. Correspondingly, the heat transfer development at the other three (0.075 wt.%, 0.05 wt.%, and 0.025 wt.%) was observed as 600–1167, 600–1010, and 600–970 W/m2k, respectively, which is superior to pure Ethylene Glycol base fluid.

Biography

Waqar Ahmed has done his Ph D. degree in Material Physics from the University of Malaya world QS ranking 65. As a Ph D. researcher at the Institute for advanced studies at the University of Malaya, he has led his research activities to synthesize the metal oxides, graphene, carbon nanotubes, and their binary and ternary composite for energy-related varying applications like (energy storage, sensors, energy transportation, Heat, and Mass Transfer, Heating and cooling of electrical and electronic systems, which helps in solidified of his interest in the area of materials and nanofluids. These experiences have reinforced his research interest in material that inspired a career in synthesis and applications of nanomaterials..

waqarum.ah@gmail.com