Stability and thermal conductivity of tri-hybrid nanofluids for high concentration in water-ethylene glycol (60:40)

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ABSTRACT
Research has been focused on improving the thermal properties of single nanofluid components for recent years. Therefore, hybrid nanofluids or composites have been developed to improve heat transfer performance. Stability and thermal conductivity of Al2O3-TiO2- SiO2 nanoparticles are suspended in the fluid base of water (W) and ethylene glycol (EG) mixture with volume ratio of 60:40. Methods: Experiments were tri-hybrid nanofluid stability was investigated for volume concentration of 0.5 ~ 3.0%, and temperature conditions from 30 to 70°C for thermal conductivity measurements using a KD2 Pro Thermal Properties Analyzer. The experimental results show that the tri-hybrid nanofluid stability analysis was performed using a stable UV-Vis method for up to 30 days after preparation with 10 hour sonication time. Results: Comparison of data concentration ratios with sedimentation for single, hybrid, and trihybrid nanofluids yielding a stable tri-hybrid nanofluid with 80-90% value. Evaluation of zeta potential for tri-hybrid nanofluids yielded 63.72 mV in excellent stability classification. Sedimentation of this visual observation is influenced by the gravity of the movement of particles in the tube after 30 days. Conclusion: The highest thermal conductivity for tri-hybrid nanofluids was obtained at 3.0% and a maximum increase of up to 27% higher than that of the basic fluid (EG/W). Tri-hybrid nanofluids with a concentration of 0.5% gave the lowest effective thermal conductivity of 13.4% at 70°C.

KEYWORDS
Ethylene glycol-water; Stability; Thermal conductivity;Tri-hybrid nanofluids; Viscosity; Volume concentration

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