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Stability and thermophysical studies on deep eutectic solvent based carbon nanotube nanofluid (Article)

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Abstract

Commercial coolants such as water, ethylene glycol and triethylene glycol possess very low thermal conductivity, high vapor pressure, corrosion issues and low thermal stability thus limiting the thermal enhancement of the nanofluids. Thus, a new type of base fluid known as deep eutectic solvents (DESs) is proposed in this work as a potential substitute for the conventional base fluid due to their unique solvent properties such as low vapor pressure, high thermal stability, biodegradability and non-flammability. In this work, 33 different DESs derived from phosphonium halide salt and ammonium halide salts were synthesised. Carbon nantubes (CNTs) with different concentrations (0.01 wt%-0.08 wt%) were dispersed into DESs with the help of sonication. Stability of the nanofluids were determined using both qualitative (visual observation) and quantitative (UV spectroscopy) approach. In addition, thermo-physical properties such as thermal conductivity, specific heat, viscosity and density were investigated. The stability results indicated that phosphonium based DESs have higher stability (up to 4 d) as compared to ammonium-based DESs (up to 3 d). Thermal enhancement of 30% was observed for ammonium based DES-CNT nanofluid whereas negative thermal enhancement was observed in phosphonium based DES-CNT nanofluid. © 2017 IOP Publishing Ltd.

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