

The characterization and thermo-physical property investigations of SiO₂/HFE7000 nanorefrigerants

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A B S T R A C T

This paper presents the characterizations and thermo-physical properties investigation of SiO₂/HFE7000 nanorefrigerants for 0.005–0.02% volume concentrations and temperature ranges of 283–303 K. SiO₂ nanoparticles were dispersed in HFE7000 refrigerants by utilizing the two-step method. The measurements of thermal conductivity and dynamic viscosity were performed by using KD2 Pro Thermal Properties Analyzer and LVDV-III Rheometer, respectively. The SiO₂/HFE7000 nanorefrigerants shows high stability with the SiO₂ nanoparticles remains suspended when observed for more than 90 days. The thermal conductivity is found increases by concentrations, but decreases by temperature. The highest thermal conductivity enhancement of 27% is observed at 0.02% volume concentration. Meanwhile, the dynamic viscosity of SiO₂/HFE7000 nanorefrigerants increases by volume concentrations however decreases by temperatures. The nanorefrigerants behaved as Newtonian fluids. As a conclusion, the present novel SiO₂/HFE7000 nanorefrigerants have potential in various heat transfer applications with great stability and thermo-physical properties behaviours.

Keywords: Nanorefrigerants SiO₂ nanoparticles HFE7000 refrigerants Thermal conductivity Dynamic viscosity