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Thermo-physical properties of Al_2O_3-SiO_2/PAG composite nanolubricant for refrigeration system

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ABSTRACT

Thermal conductivity and viscosity of the Al_2O_3-SiO_2/PAG composite nanolubricants for 0.02 to 0.1% volume concentrations at a temperature range of 303 to 353 K were investigated. Al_2O_3 and SiO_2 nanoparticles were dispersed in the Polyalkylene Glycol (PAG 46) lubricant using the two-step method of preparation. Thermal conductivity and viscosity were measured using KD2 Pro Thermal Properties Analyzer and LVDV-III Rheometer, respectively. The result shows that the thermal conductivity and viscosity of composite nanolubricants increase with volume concentration and decreases with temperature. Composite nanolubricants behave as Newtonian in the range of the temperatures and volume concentrations studied. The highest thermal conductivity increment is 2.41% at 0.1% concentration and temperature of 303 K. A maximum value of 9.71% in viscosity at 0.1% concentration is observed at temperature of 333 K. A new correlation model to predict the properties of composite nanolubricants has been proposed for applications in refrigeration systems.

Propriétés thermo-physiques du nanolubrifiant composite Al_2O_3-SiO_2/PAG pour les systèmes frigorifiques

Mots clés : Nanolubrifiants composites ; Conductivité thermique ; Viscosité dynamique ; Newtonien ; Système frigorifique

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