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Full Text

*International Journal of Refrigeration* • Volume 138, Pages 118 - 132 • June 2022

#### Document type

Article

#### Source type

Journal

#### ISSN

01407007

#### DOI

10.1016/j.ijrefrig.2022.03.026

#### Publisher

Elsevier Ltd

#### CODEN

IJRFD

#### Original language

English

View less ^

# Rheological Behaviour and Thermal Conductivity of Polyvinyl Ether Lubricant Modified with SiO<sub>2</sub>-TiO<sub>2</sub> Nanoparticles for Refrigeration System

[Comportement rhéologique et conductivité thermique d'un lubrifiant à base d'éther polyvinylique modifié par des nanoparticules de SiO<sub>2</sub>-TiO<sub>2</sub> pour un système frigorifique]

Ismail M.F.<sup>a, c</sup>; Azmi W.H.<sup>a, b</sup> ; Mamat R.<sup>a</sup>; Rahim, R. Ab<sup>d</sup>

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<sup>a</sup> Department of Mechanical Engineering, College of Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

<sup>b</sup> Centre of Excellence for Advanced Research in Fluid Flow, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

<sup>c</sup> Faculty of Mechanical and Manufacturing Engineering Technology, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya 75150, Durian Tunggal, Melaka, Malaysia

<sup>d</sup> ECE Department, Kulliyah of Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, Malaysia, Malaysia

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## Abstract

Before any nanolubricant is being applied in a refrigeration system, its thermo-physical properties shall be investigated. In this paper, hybrid nanolubricant is prepared by dispersing SiO<sub>2</sub>-TiO<sub>2</sub> nanoparticles at 50:50 composition ratio into the polyvinyl ether (PVE) compressor lubricant using a two-step method. The investigation was done for volume concentrations from 0.01 to 0.10% under temperature range of 303 to 353 K. The Newtonian behaviour of the nanolubricant was obtained, and relative thermo-physical enhancement was determined by comparing its performance to the pure lubricant. It was observed that the maximum increment viscosity does not exceed 3% from the base fluid, while thermal conductivity for 0.1% concentration increases up to 1.6%. Overall observation also reveals that both rheological and thermal properties increase by increasing concentrations, but the same properties decrease with temperature. An interesting finding is the nanolubricant had viscosity decrement than the pure lubricant specifically at 303 K. New regression models were suggested for thermo-physical properties with high accuracy R-squared values of 0.9989 and 0.9920 for viscosity and thermal conductivity, respectively. As a conclusion, SiO<sub>2</sub>-TiO<sub>2</sub>/PVE nanolubricant is recommended in refrigeration systems with a volume concentration of less than 0.10%. © 2022 Elsevier Ltd and IIR

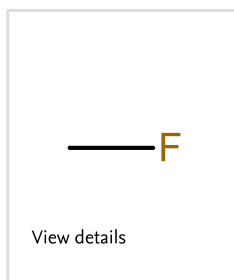
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Hybrid nanolubricant; Newtonian; Polyvinyl ether lubricant; Regression model; Thermal conductivity; Viscosity

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✉ Azmi, W.H.; Department of Mechanical Engineering, College of Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia; email:wanazmi2010@gmail.com

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