

Article preview

Abstract

Introduction

Section snippets

References (48)

Cited by (3)



Dynamic viscosity prediction using artificial intelligence for an antifreeze containing MWCNT–alumina hybrid nanopowders

Suqin Hua ^a, Dheyao J. Jasim ^{b,c}, As'ad Alizadeh ^d, S. Ali Eftekhari ^e, Navid Nasajpour-Esfahani ^f, Mahmoud Shamsborhan ^g, Davood Toghraie ^h

Show more

Add to Mendeley Share Cite

<https://doi.org/10.1016/j.engappai.2023.107046>

Get rights and content

Abstract

This paper investigates the impact of Solid Volume Fraction (SVF) and temperature on the dynamic viscosity of a hybrid antifreeze composed of MWCNTs and aluminum oxide in a mixture of water (80%) and ethylene-glycol (20%). An Artificial Neural Network (ANN) is used to predict the viscosity of the nanofluid, which was generated at different SVFs ranging from 0.25% to 1% and temperatures ranging from 25 °C to 50 °C. This study aims to establish a correlation between viscosity and input parameters in the antifreeze. Results demonstrate that Shear Rate (SR) and SVF have opposite effects on the viscosity of the nanofluid. Increasing SVF leads to a strong increase in viscosity deviation and higher mean values of viscosity while increasing SR results in a sharp decline in both the mean value and variation of the viscosity. The temperature has a smaller impact on viscosity variance than SR and SVF. The proposed ANN model with a two-layer network and 13 neurons having nonlinear activation functions in the hidden layer shows an accurate prediction of viscosity versus inputs. The proposed methodology offers an improvement of up to 10 times in predicting viscosity accuracy as compared to GMDH and decision tree techniques. The findings of this study can have important implications for the design of heat exchangers using nanofluids especially in portable devices.

Recommended articles

Unsupervised transfer learning for intelligent health status identification of...

Engineering Applications of Artificial Intelligence, Vol...
Guiting Tong, ..., Jianhui Lin

The computational study of initial temperature/pressure and atomic doping...

Materials Science and Engineering: B, Volume 296, 20...
Yuan Zhou, ..., Davood Toghraie

A two-phase multi-criteria decision-making with interval-valued Pythagorean normal...

Engineering Applications of Artificial Intelligence, Vol...
Yuan Xu

Show 3 more articles

Article Metrics

Citations

Citation Indexes: 3

Captures

Readers: 12

Mentions

News Mentions: 1



View details