

## عنوان مقاله:

A neural network approach to estimate non-Newtonian behavior of nanofluid phase change material containing mesoporous silica particles

## محل انتشار:

ماهنامه بین المللی مهندسی، دوره 34، شماره 8 (سال: 1400)

تعداد صفحات اصل مقاله: 8

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## خلاصه مقاله:

Neural networks are powerful tools for evaluating the thermophysical characteristics of nanofluids to reduce the cost and time of experiments. Dynamic viscosity is an important property in nanofluids that usually needs to be accurately computed in heat transfer and nanofluid flow problems. In this paper, the rheological properties of nanofluid phase change material containing mesoporous silica nanoparticles are predicted by the artificial neural networks (ANNs) method based on the experimental database reported in literature. Experimental inputs include nanoparticle mass fractions (۰-۵ wt.%), temperatures (۳۵-۵۵ °C), and shear rates (۱۰-۲۰۰ s<sup>-1</sup>), and targets include dynamic viscosities and shear stresses. A multilayer perceptron feedforward neural network with Levenberg-Marquardt back-propagation training algorithm is utilized to predict rheological properties. The optimal network architecture consists of ۲۲ neurons in the hidden layer based on the minimum mean square error (MSE). The results showed that the developed ANN has an MSE of  $6.67 \times 10^{-4}$  and  $6.55 \times 10^{-3}$  for the training and test dataset, respectively. The predicted dynamic viscosity and shear stress also have the maximum relative error of ۶.۲۶% and ۰.۴۱۸%, respectively.

## کلمات کلیدی:

Nanofluid, Non-Newtonian, Dynamic viscosity, Rheological properties, Artificial Neural Network

## لینک ثابت مقاله در پایگاه سیویلیکا:

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