Efficiency enhancement of a solar collector by examine Graphene-Silica/water mixture: A comprehensive study based on the empirical / numerical results

Nidal H. Abu-Hamdeh [a], Mashhour A. Alazwari [b] ⌗ ✉, Elias M. Salilih [b], S. Mohammad Sajadi [c d], Randa I. Hatamleh [e]

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Abstract

Graphene is simply one atomic layer of graphite, which can be synthesized from Flake Graphite, through Top-Down method. It has applications in thermal and energy systems such as Solar collector. A Flat-plate Solar collector collects the sunlight and transfers the heat energy to the tubes. The used fluid can be Nanofluid. In this study, first, Graphene/Silica-Water nanofluid prepared at varied mass fractions (0.1 to 0.4wt%). Then, thermal conductivity and viscosity (for 12.23 and 122.3 S^{-1} shear rates) were measured at varied temperatures (25 to 50°C). In order to reduce the cost of experiments, Artificial Neural Network algorithms (Levenberg Marquardt and Orthogonal Distance Regression) and Fuzzy model were trained and compared to find the trend of heat transfer and Viscosity. Also, Graphene/Silica-Water nanofluid was employed as Flat-plate Solar collector fluid to enhance the efficiency. Again, Artificial Neural Network algorithms and Fuzzy model were trained and compared to find the best model for trend prediction. This research presents novel equations for trend prediction of G/SiO$_2$-Water Nanofluid for enhancing the efficiency of industrial thermal and energy systems. Further, results displayed better trend prediction of Fuzzy model versus LM/ODR training ANN algorithms.

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