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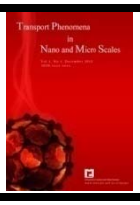

Modeling of effective thermal conductivity and viscosity of carbon structured nanofluid

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Abstract

This paper was aimed to address the modeling of effective thermal conductivity and viscosity of carbon structured nanofluids. Response surface methodology, D_optimal design (DOD) was employed to assess the main and interactive effects of temperature (T) and weight percentage (wt %) to model effective thermal conductivity and viscosity of multi wall and single wall carbon nanotube, CVD and RGO Graphene and nanoporous Graphene sheet. The second-order polynomial regression model was proposed for effective thermal conductivity and viscosity as a function of relevant investigated parameters. Effective thermal conductivity and viscosity of nanofluids measured using an accurate transient short hot wire system and a viscometer, respectively. nanofluids was prepared using two-step method and showed a desirable stability. In general, Graphene nanosheets have more effective thermal conductivity and viscosity compared to carbon nanotube because of variation in shape and likely size.

1. Introduction

Searching for new techniques to improve cooling performance of conventional heat transfer fluids performs a key role in various industrial applications including power generation, chemical processes, heating or cooling processes, and microelectronics. Using solid millimeter or micrometer-sized particles, Maxwell [1,2] present the well known idea of enhancing the thermal conductivity of fluid.

But particles of millimeter or micrometer size cause some problems such as severe pressure drops, sedimentation, clogging of channels.

Therefore, it seems that they are not applicable for many practical applications. Nanotechnology provides with an opening to synthesis a new generation of heat transfer fluids called nanofluid.

Indeed, nanometer-sizesd particle have been dispersed in conventional heat transfer fluid in order to improve performance of cooling devices. Choi [3] introduced an engineered Nanofluids with superior thermal properties compared to the conventional heat transfer fluids. Many researchers reported many experimental and and theoretical works which dedicated to determine thermal conductivity of nano-

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