The 2nd Iranian Conference on Heat and Mass Transfer-ICHMT2014

19-20 November, 2014, Faculty of Mech. Eng., Semnan University, Semnan, Iran.

ICHMT2014-XXXX

Development of new model to predict dynamic viscosity of ethylene glycol based nanofluid containing $Mg(OH)_2$

Mohammad Hemmat Esfe[1], Amin Asadi[2], Seyfollah Sadodin[3], , Seyed Hadi Rostamian[4], Mohammad Ghavidel[2]

[1]Ph. D student of mechanical engineering, Semnan University; M.HemmatEsfe@semnan.ac.ir

[2]Graduate student of Mechanical Engineering, Science and Research Branch, Islamic Azad University, Semnan

[3]Associate Professor of mechanical engineering, Semnan university

[4]Ph.D Stududent, Semnan University

Abstract

In this study, the dynamic viscosity of $Mg(OH)_2$-ethylene glycol(EG) is measured. Also, new model for determining the dynamic viscosity of the nanofluid is proposed.

Due to the limitation of the previous correlations in order to predict the dynamic viscosity of the mentioned nanofluid, a new practical equation is suggested base on the experimental correlations. The results indicate that while the solid volume fraction is increased, the dynamic viscosity is increased simultaneously. It can be interesting to note that at lower temperatures this increase is more noticeable than those in higher temperatures. In addition, it is shown that a special temperature of 55^0C, the solid volume fraction has no significant impact on the dynamic viscosity of the nanofluid. This unique consequence can be considered as a paramount breakthrough in the engineering and industrial applications.

Keywords: New model, dynamic viscosity, solid volume fraction, margin of deviation

Introduction

A suspension of nano-sized particles in some fluids such as water, oil, ethylene glycol (EG) and diethylene glycol has been called nanofluid. In recent years, it has been found capable of providing significant enhancement in heat transfer in comparison with pure fluids. Usage of nanofluids is founded in various industrial and engineering systems such as cooling and heating systems, nuclear reactors, solar energy etc.

For the first time, Masuda et al. [1] measured the viscosity of a few water-based nanofluids in different temperatures, varying from the ambient to about 340K. Then, Pak and Cho [2] followed the same studies and proposed some extra information for Al2O3–water nanofluid. The viscosity of Al2O3 –water and TiO2-water nanofluids at ambient temperature is measured by Pak and Cho [3]. Their results show that the relative viscosities of TiO2/water and Al2O3/water in comparison with water increase by 3 and 100 times, respectively, at a solid volume fraction of 10%. The viscosity of Al_2O_3/water and CuO/ water