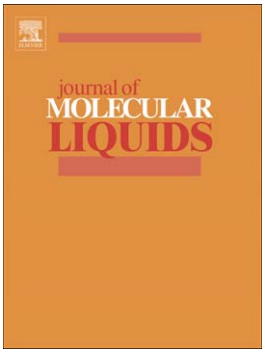

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Effect of heat absorption in natural convection nanofluid flow along a vertical wavy surface

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Abstract:

Effects of heat absorption and nanoparticle on natural convection heat transfer along vertical wavy surface have been investigated. Transport equations have been solved numerically by accurate implicit finite difference scheme. The skin friction and Nusselt number are plotted against variation of several parameters for two types of nanoparticles namely, alumina (Al_2O_3) and magnetite (Fe_3O_4). The impact of nanoparticle concentration on flow and heat transfer process in the problem under investigation has been studied in detail. The results indicate that Al_2O_3-water nanofluid exhibits higher skin friction and heat transfer rate in comparison to Fe_3O_4 water based nanofluid. The influence of heat absorption parameter is to increase the heat transfer rate and decrease the skin friction coefficient. For heat absorption case percent change in the skin friction and Nusselt number for two nanoparticles is shown in tabular form where comparison to the flat plate (pure fluid) and wavy surface (pure fluid) cases have also been made. The present results have been validated by producing the results available in literature and a very good agreement is observed.

Keywords: Natural convection, nanofluid, heat absorption, vertical wavy surface, Keller-Box method

1. Introduction

The real heat transfer processes associated with the change of some form of energy into thermal energy have the possibility of involving internal heat absorption. Heat transfer and fluid flow phenomena with heat absorption is associated with large temperature gradient which is frequently met in several engineering and thermal processes such as, in the combustion chamber, in thermal control of space ships, in casting and blading of gas turbines and in spent fuel storage [1], in post-accident heat removal [2], in engine cooling system and in insulation of buildings etc.

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