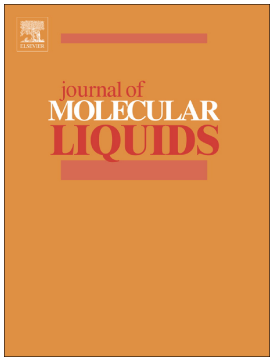

Enhanced heat transfer in unsteady magnetohydrodynamic nanofluid flow embedded with aluminum alloy nanoparticles

N. Sandeep, Ram Prakash Sharma, M. Ferdows

PII: S0167-7322(16)33281-0
DOI: doi: 10.1016/j.molliq.2017.03.051
Reference: MOLLIQ 7086

To appear in: *Journal of Molecular Liquids*

Received date: 23 October 2016
Accepted date: 15 March 2017

Please cite this article as: N. Sandeep, Ram Prakash Sharma, M. Ferdows , Enhanced heat transfer in unsteady magnetohydrodynamic nanofluid flow embedded with aluminum alloy nanoparticles. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), doi: 10.1016/j.molliq.2017.03.051

Enhanced heat transfer in unsteady magnetohydrodynamic nanofluid flow embedded with aluminum alloy nanoparticles

N.Sandeep[1] Ram Prakash Sharma[2] M.Ferdows[3*]

[1]Department of Mathematics, VIT University, Vellore-632014, India.
[2]Department of Mathematics, JECRC University, Jaipur-303905, Rajastan, India.
[3]Department of Applied Mathematics, University of Dhaka, Dhaka-1000, Bangladesh.
Email: ferdowsmohammad@yahoo.com

Abstract

Extrinsic magnetic fields are capable to set the thermal and physical properties of magnetic-nanofluids and regulate the flow and heat transfer characteristics. Applied magnetic field affects the thermal conductivity of magnetic-nanofluids and makes it aeolotropic. With this incentive, we investigate the flow and heat transfer characteristics of liquid film flow of magnetic-nanofluids over the vicinity of a thin elastic sheet by considering the transverse magnetic field with variable heat source/sink. We consider water as a base fluid embedded with the two different types of aluminum alloy nano/particles namely AA 7072 and AA 7075. AA 7072 is a special type of heat treatable aluminum alloy with 98% *Al* and 1% of *Zn* with the additives such as *Si*, *Fe* and *Cu* etc. Similarly, AA 7075 contains 90% *Al*, 5-6% *Zn*, 2-3% *Mg*, 1-2% *Cu* with the additives as *Si*, *Fe* and *Mn* etc. The transformed governing partial differential equations are solved numerically using R-K based shooting technique. The diagrammatic and tabular results depict the effect of pertinent parameters on common profiles of interest. It is found that the heat transfer rate of water-AA 7075 is significantly high when compared with the heat transfer rate of water-AA 7072. It is also found that the increasing percentage of *Cu* leads to enhance the heat transfer rate.

Keywords: MHD, *Al* alloys 7072, 7075, film flow, nanofluid, non-uniform heat source/sink.

1. Introduction

The flow and heat transfer of a thin film determining the coating process, chemical processing equipment's and heat exchangers design. It is having other applications include