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

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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 anisotropic. 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

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