Unsteady Magnetohydrodynamic Free convection and Heat Transfer Flow of Al_2O_3—Cu/ Water Nanofluid Over a Non-linear Stretching Sheet In a Porous Medium

T Hymavathi[1a] and Joel Mathews[1b]

[a]Department of Applied Mathematics, KRU, Dr. MRAR College of Post-Graduation studies,Nuzvid,521201, A.P, India

[b]Department of Applied Mathematics, Krishna University, Machilipatnam, 521003, A.P, India

Emails:[a]talla.hymavathikru@gmail.com, [b]lollajoel.mathews765@gmail.com

ABSTRACT

This article investigates the impact of time-dependent magnetohydrodynamics free convection flow of a nanofluid over a non-linear stretching sheet immersed in a porous medium. The combination of water as a base fluid and two different types of nanoparticles, namely Aluminum oxide (Al_2O_3) and Copper (Cu), is taken into account. The impacts of thermal radiation, viscous dissipation, and heat source/sink are examined. The governing coupled non-linear partial differential equations (PDE's) are reduced to ordinary differential equations (ODE's) using suitable similarity transformations. The solutions of the principal equations are computed in closed form by applying the MATLAB bvp4c method. The velocity and temperature profiles, as well as the skin friction coefficient and Nusselt number are discussed through graphs and tables for various flow parameters. The current simulations are suitable for the thermal flow processing of magnetic nanomaterials in the chemical engineering and metallurgy industries. From the results, it is noticed that the results of Copper nanofluid have a better impact than those of Aluminium nanofluid.

Keywords: Non-linear stretching; Magnetohydrodynamics; Viscous dissipation; Heat source/sink; Porous medium.