International Journal of Pure and Applied Researches http://ijopaar.com; 2017 Vol. 3(1); pp. 43-56, ISSN: 2455-474X

HEAT TRANSFER TO MHD FREE CONVECTION FLOW OF A VISCOELASTIC DUSTY GAS THROUGH A POROUS MEDIUM WITH CHEMICAL REACTION

Srinathuni Lavanya[1] and D Chenna Kesavaiah[2]

[1]Research Scholar, Mewar University, Rajasthan, India
[2]Research Supervisor, Mewar University, Rajasthan, India
Email: chennakesavaiah@gmail.com

Abstract

In this paper we focused on combined effects of free convective an unsteady MHD dusty viscoelastic (Walters's liquid model- B) fluid through a porous medium induced by the motion of a semi-infinite flat plate under the influence of radiative heat transfer moving with velocity decreasing exponentially with time and chemical reaction taking into an account. The coupled partial differential equations are solved by analytically using perturbation technique and expressions for velocity distribution of a dusty gas and dust particles, temperature field and concentration profile have been studied for various combination of physical parameter are discussed graphically.

Keywords: Chemical reaction, MHD, Porous medium, Radiation, Viscoelastic fluid.

References

1. Chenna Kesavaiah D, Satyanarayana P V, Sudhakaraiah A & Venkataramana S (2013): Natural convection heat transfer oscillatory flow of an elastico-viscous fluid from vertical plate, IJRET, 959-966
2. Cogley A C, Vincent W G & Giles SE (1968). Differential approximation to radiative heat transfer in a non – grey gas near equilibrium, AIAAJ, 551-553
3. Cortell R (2006). A note on flow and heat transfer of a viscoelastic fluid over a stretching sheet, Int. J. Non- Linear Mech. 41, 78–85.
4. Gireesh B J & Mahanthesh B (2013). Perturbation solution for radiating viscoelastic fluid flow and heat transfer with convective boundary condition in non- uniform channel with hall current and chemical reaction, Hindawi publishing corporation ISRN thermodynamics, 1-14
5. Gretler W & Regenfelder R (2002). Similarity solution for laser-driven shock waves in a dust-laden gas with internal heat transfer effects, Fluid Dynamics Research, Vol. 30, (5), 293-313.
6. Harinath Reddy S, Raju M C & Keshava Reddy E (2016). Magneto convective flow of a non-Newtonian fluid through non-homogeneous porous medium past a vertical porous plate with variable suction, Journal of applied mathematics and physics, 4, 233-248
7. Madhura K R & Kalpana G (2013). Thermal effect on unsteady flow of a dusty visco-elastic fluid between two parallel plates under different pressure gradients, International Journal of Engineering and Technology, 2(2), 88-99
8. Mishra S R (2013). Free convective MHD flow of a visco-elastic (Walters model - b') dusty fluid through a porous medium and constant heat source, annals of faculty engineering hunedoara – International Journal of Engineering, Tome XI, 223-226
9. Om Prakash A, Devendra Kumar & Dwivedi Y K (2011). MHD free convection flow of a visco-elastic (Kuvshiniski type) dusty gas through a semi infinite plate moving with velocity decreasing exponentially with time and radiative heat transfer, *AIP Advances*
10. Omprakash, Makinde O D, Devendra Kumar & Dwivedi Y K (2015). Heat transfer to MHD oscillatory dusty fluid flow in a channel filled with a porous medium, Sadhana, Indian Academy of Sciences, Vol. 40 (4), 1273-1282
11. Pal D & Talukdar (2010). Perturbation analysis of unsteady magnetohydrodynamic convective heat and mass transfer in a boundary layer slip flow past a vertical permeable plate with thermal radiation and chemical reaction, Communications in Nonlinear Science and Numerical Simulation, Vol.15, (7), 1813 - 1830
12. Prakash J (2014). Effects of chemical reaction and radiation absorption on MHD flow of dusty viscoelastic fluid, Applications and applied mathematics, 9, 141-156
13. Prakash O, Kumar D & Dwovedo Y K (2010): Effects of thermal diffusion and chemical reaction on MHD flow of dusty visco-elastic (Walter's liquid model – B) fluid. J Electromagan Anal Appl, 2, 581-587
14. Shivaraj R & Rushi Kumar B (2013). Chemically reacting dusty viscoelastic fluid flow in an irregular channel with convective boundary, Ain Shams Engineering Journal, 4, 93-101
15. Varshney N K & Ram Prakash (2004). MHD free convection flow of a visco elastic dusty gas through a porous medium induced by the motion of a semi- infinite flat plate moving with velocity decreasing exponentially with time. Acta Ciencia Indica (India), Vol. XXX M. No. 2, 467-473.
16. Yao S, Fang T & Zhong Y (2011). Heat transfer of a generalized stretching/shrinking wall problem with convective boundary conditions. Commun Nonlin Sci Numer Simulat., 16, 752–60.