Contribution ID: **67** Type: **not specified**

Numerical and Analytical solutions of Heat and Mass transfer of Casson nanofluid flow with convective boundary conditions.

Tuesday, May 28, 2024 4:20 PM (10 minutes)

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Abstract: Heat and mass transfer of magnetohydrodynamic (MHD) Casson fliud in the presence of nanofluid, viscous dissipation, thermal radiation and magnetics effect is investigated. The MHD flow is steady, incompressible and generated due to exponentially stretching surface and convective boundary conditions is employed. The governing nonlinear partial differential equations describing the problems are formulated and transformed to ordinary differential equations via similarity variables. Analytical method via Homotopy perturbation method (HPM) is used to obtain the solutions for flow velocity, temperature and concentration. Numerical method solution is employed to validate the analytical solution. The effects of some embedded flow parameters such as magnetic parameter, Prandtl, Brownian motion, Eckert number, Lewis number, thermal radiation and thermophoresis parameters on flow velocity, temperature and concentrations distributions are presented graphically with aid of Maple sofware and discuss in details. It is found that increase in Casson parameter results in increase in temperature and nano particle concentrations. It is also found that magnetic parameter and Biot number due thermal convective conditions yield an increase in the temperature but has reverse effect on the flow velocity.
Key words: Casson fluid, Magnetohydrodynamics(MHD), nanofluid, Homotopy perturbation method

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Session Classification: Technical session 3