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Semi analytical analysis for transient Eyring-Powell squeezing flow in a stretching channel due to magnetic field using DTM

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Abstract

This paper deals with heat and mass transfer in unsteady two-dimensional MHD squeezing flow of Eyring-Powell fluid between two parallel infinite plates. Heat generation/absorption, thermal radiation and Joule heating influences are taken into consideration. The governing nonlinear PDEs are converted to nonlinear ODEs using similarity transformations. Analytical solution for the velocity, temperature and concentration distribution has been obtained by means of Differential Transformation Method (DTM). The comparisons between the results of DTM and numerical method (Runge-Kutta Fehlberg), proved high precision of DTM. The effects of various parameters, including squeeze number, radiation parameter, heat generation/absorption parameter and Hartmann number on the flow field, skin friction coefficient and heat transfer have been studied. The achieved results reveal that Lorentz force generated by magnetic field parameter (Ha), reduces velocity distribution. Also, it is found that the temperature profile reduces with the increase of radiation parameter (R).

Keywords: Eyring-Powell fluid; Magnetohydrodynamic (MHD); Thermal radiation; Stretching channel; Differential Transformation Method (DTM).

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