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ORIGINAL ARTICLE

MHD flow and heat transfer of a micropolar fluid over a stretching surface with heat generation (absorption) and slip velocity

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Abstract In this work, the effects of slip velocity on the flow and heat transfer for an electrically conducting micropolar fluid over a permeable stretching surface with variable heat flux in the presence of heat generation (absorption) and a transverse magnetic field are investigated. The governing partial differential equations describing the problem are converted to a system of non-linear ordinary differential equations by using the similarity transformation, which is solved numerically using the Chebyshev spectral method. The effects of the slip parameter on the flow, micro-rotation and temperature profiles as well as on the local skin-friction coefficient, the wall couple stress and the local Nusselt number are presented graphically. The numerical results of the local skin-friction coefficient, the wall couple stress and the local Nusselt number are given in a tabular form and discussed.

1. Introduction

The study of flow and heat transfer past a stretching sheet problems has gained considerable interest because of its extensive engineering applications, such as in the extrusion of plastic sheets, paper production, crystal growing and glass blowing. Crane [1] presented an exact similarity solution in closed analytical form for the laminar boundary flow of an incompressible, steady viscous fluid over a stretching surface with a velocity varying linearly with the distance from a fixed point. Gupta and Gupta [2] extended the Crane's problem to include suction or blowing and studied its influence on the heat and mass transfer in the boundary layer over a stretching surface. Vajravelu and Rollins [3] studied the heat transfer characteristics in an electrically conducting fluid over a stretching sheet with variable wall temperature and internal heat generation or absorption.

The problem of MHD flow and heat transfer over a stretching surface has gained considerable interest because of its applications in industry. For example in the extrusion of a polymer sheet from a die, the sheet is sometimes stretched. During this process, the properties of the final products depend

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