

Numerical Solution for Mixed Convection Boundary Layer Flow About a Solid Sphere in a Micropolar Fluid with Convective Boundary Conditions

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ABSTRACT

In this paper, the steady mixed convection boundary layer flow on a solid sphere with convective boundary conditions has been studied for cases of both assisting (heated sphere) and opposing flows (cooled sphere). The boundary layer equations are transformed into non-dimensional form and are reduced to a nonlinear system of partial differential equations, which are solved numerically using an implicit finite-difference scheme. Numerical solutions are obtained for the local skin friction coefficient, the local heat transfer coefficient, as well as the velocity and temperature profiles. The features of the flow and heat transfer characteristics for different values of the mixed convection parameter, the Prandtl number Pr , the micropolar parameter K , the conjugate parameter and the coordinate running along the surface of the sphere, x , are analyzed and discussed.

KEYWORDS: Boundary layer; Convective Boundary Conditions; Micropolar Fluid; Mixed convection Solid sphere

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