

Second-Law Analysis for Buoyancy-Driven Hydromagnetic Couple Stress Fluid Flow through a Porous Channel

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Abstract: This paper examines the combined effects of the buoyancy force and of the magnetic field on the entropy generation rate in the flow of a couple stress fluid through a porous vertical channel. The flow's dynamical equations were non-dimensionalised and solved via the application of the Adomian decomposition method (ADM). Variations of some thermophysical parameters were conducted and discussed, with regard to the physics of the fluid. Our result shows that the entropy generation rate increases as the buoyancy increases in the fluid. In addition, the irreversibility in the flow system results mainly from the fluid's viscosity, ohmic heating and the buoyancy.

Keywords: Magnetic field, Buoyancy force, Entropy generation, Slip flow, Irreversibility ratio, ADM