

Abstract

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numerical simulation of double diffusive laminar mixed convection in a horizontal annulus with hot, solutal rotating inner cylinder” international journal of thermal sciences vol. (46) no. 7, pp 637-648, (2007)

a numerical investigation of double-diffusive laminar mixed convection within a two-dimensional, horizontal annulus has been carried out. the inner cylinder was considered to rotate in an anti-clockwise direction to introduce the forced convection effect. in addition, the solutal and thermal buoyancy forces are sustained by maintaining the inner and outer cylinders at uniform temperatures and concentrations, but their values for the inner are higher than the outer. the laminar flow regime is considered under steady state conditions. moreover, the transport equations for continuity, momentum, energy and mass transfer are solved using the Patankar–Spalding technique. the streamlines, isotherms and isoconcentrations as well as both local and average Nusselt and Sherwood numbers were studied. the study covers a wide range for $10^2 \leq \text{Pr} \leq 10^6$, $0.1 \leq \text{Sc} \leq 20$ and $0 \leq \Omega \leq 20$. through this investigation, the following parameters are kept constant: Prandtl number at 0.7, the rotational Reynolds number at 100, the radius ratio at 0.5. the predicted results for both average Nusselt and Sherwood numbers were correlated in terms of Lewis number, thermal Rayleigh number and buoyancy ratio. a comparison was made with the published results and a good agreement was found.