Abstract

Double-diffusive convection within a tri-dimensional in a horizontal annulus partially filled with a fluid-saturated porous medium is numerically investigated. The aim of this work is to understand the effects of a source of heat and solute on the fluid flow and heat and mass transfer rates. Design/methodology/approach–In the formulation of the problem, the Darcy–Brinkman–Forchheimer model is adopted to the fluid flow in the porous annulus. The laminar flow regime is considered under steady state conditions. Moreover, the transport equation for continuity, momentum, energy and mass transfer are solved using the Patankar–Spalding technique. Findings–Through this investigation, the predicted results for both average Nusselt and Sherwood numbers were correlated in terms of Lewis number, thermal Grashof number and buoyancy ration. A comparison was made with the published results and a good agreement was found. Originality/value–The paper's results are validated by favorable comparisons with previously published results. The results of the problem are presented in graphical forms and discussed. This paper aims to study the behavior of the flow structure and heat transfer and mass for different parameters.