Abstract

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Double Diffusive Natural Convection in a Square Cavity with Segmental Heat Sources

double-diffusive convective flow in a square enclosure with segmental heat sources is solved numerically. Constant
temperatures and concentration are imposed along the right wall of the enclosure at low temperature and concentration which
assumed as a heat and mass sink. The heaters are at constant temperature and concentration assumed as source
of heat and mass at the left wall while the rest of this wall is adiabatic. The other two sides of the cavity are assumed
adiabatic walls. The flow laminar under steady state condition are considered. The transport equations for continuity,
momentum, energy and mass transfer are solved. The numerical procedure adopted in this analysis yields
consistent performance over a wide range of parameters, Rayleigh number ($10^3 \leq Ra \leq 10^6$), dimensionless heater
lengths ($0.2 \leq L/h_1 \leq 1$), buoyancy ratio ($-10 \leq 
 n \leq 10$), Prandtl number, ($0.01 \leq \text{Pr} \leq 100$). This study was done for constant
Lewis number $Le = 2$. The results show the average Nusselt number and average Sherwood number are increased with the
increasing of the Rayleigh number, the dimensionless heater length, Prandtl number. On the other hand, the Prandtl
number has significant effect on the Nusselt number and average Sherwood number to the value of $Pr = 0.7$. The
results for the average Nusselt number are correlated as a function of dimensionless heater length, buoyancy
ratio, Rayleigh number, Prandtl number. The results were compared with previous results and a good agreement was
found.