Double Diffusive Mixed Convection Heat Transfer inside a Vented Square Cavity

Sumon Saha, Mohammad Nasim Hasan, Iftheker Ahmed Khan

Abstract

A numerical study has been carried out for laminar double-diffusive mixed convection in a two-dimensional vented square cavity with discrete heat and contaminant sources applied on the bottom wall. An external air flow enters the cavity through an opening located at the bottom of the left vertical wall and exits from an opening located at the three different positions of the opposite wall. The developed mathematical model is governed by the two-dimensional continuity, momentum, energy, and concentration equations. The governing equations, written in non-dimensional form are solved by using Galerkin finite element method with triangular grid discretization system. The Reynolds number is fixed at 100 and the working fluid is considered as air. Numerical simulations are carried out for different combinations of the thermal Grashof numbers and results are presented in terms of streamlines, temperature and concentration distributions. The results indicate that the average Nusselt and Sherwood numbers on the heat and contaminant sources strongly depend on the positioning of the exit opening.

Keywords: double di usive mixed convection, vented cavity, finite element

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ABOUT THE AUTHORS

Sumon Saha
Department of Mechanical Engineering, The University of Melbourne, Victoria-3010 Australia

Mohammad Nasim Hasan
Department of Mechanical Engineering, Saga University, 1 Honjo-machi, Saga 840-8502 Japan

Iftheker Ahmed Khan
Department of Civil & Environmental Engineering, University of South Carolina,

Columbia, SC
29208
United States

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