World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:10, No:07, 2016

Interaction of Non-Gray-Gas Radiation with Opposed Mixed Convection in a Lid-Driven Square Cavity

Authors : Mohammed Cherifi, Abderrahmane Benbrik, Siham Laouar-Meftah, Denis Lemonnier

Abstract : The present study was conducted to numerically investigate the interaction of non-gray-gas radiation with opposed mixed convection in a vertical two-sided lid-driven square cavity. The opposing flows are simultaneously generated by the vertical boundary walls which slide at a constant speed and the natural convection due to the gradient temperature of differentially heated cavity. The horizontal walls are thermally insulated and perfectly reflective. The enclosure is filled with air-H2O-CO2 gas mixture, which is considered as a non-gray, absorbing, emitting and not scattering medium. The governing differential equations are solved by a finite-volume method, by adopting the SIMPLER algorithm for pressure–velocity coupling. The radiative transfer equation (RTE) is solved by the discrete ordinates method (DOM). The spectral line weighted sum of gray gases model (SLW) is used to account for non-gray radiation properties. Three cases of the effects of radiation (transparent, gray and non-gray medium) are studied. Comparison is also made with the parametric studies of the effect of the mixed convection parameter, Ri (0.1, 1, 10), on the fluid flow and heat transfer have been performed.

Keywords : opposed mixed convection, non-gray-gas radiation, two-sided lid-driven cavity, discrete ordinate method, SLW model
Conference Title : ICCME 2016 : International Conference on Computational Mechanical Engineering
Conference Location : Montreal, Canada
Conference Dates : July 14-15, 2016