

ABSTRACT

A three-dimensional (3D) numerical study has been performed to investigate the effects of non-gray gas radiation on double-diffusive natural convection in a cubic enclosure filled with either air–H₂O or air–CO₂ mixtures in cooperating situations. Gas radiation was taken into account by the discrete ordinates method (DOM) associated with the spectral line weighted-sum-of-gray-gases (SLW) spectral model. Results obtained for two average concentrations of H₂O and CO₂ (10% and 20%) show that radiation modifies the temperature and concentration structures by creating oblique stratifications. The heat transfer rate is decreased, whereas mass transfer is not much modified. In addition, a comparison between 2D and 3D results is presented