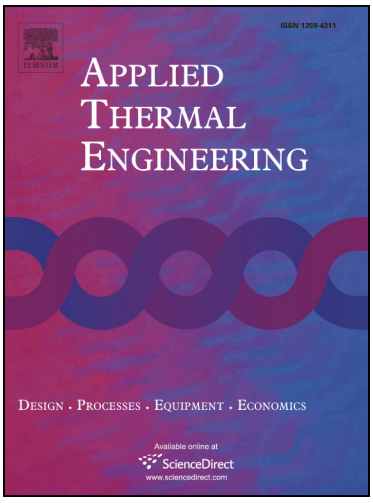

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Effects of concentration of participating media on turbulent natural convection in cubic cavity

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Abstract

To use and understand the large-scale natural convection in the building and systems, heat transfer analysis of the natural convection with radiation is important. The radiation effect is influenced by concentration of the participating media in the considered system. In this study, an effects of concentration of participating media on turbulent natural convection inside a cubic cavity were investigated. The turbulence effect was modeled by large eddy simulation. Further, the radiative heat transfer was calculated by the radiation element method using the ray emission model. In addition, the gas radiation was modeled by the full-spectrum *k*-distribution method. By varying the partial pressures of H_2O and CO_2, the effect of the participating media were evaluated. From the calculation, gas radiation effects affected the flow instability and restrained the temperature stratification when the concentration of the participating media was higher. However, the convective heat transfer have not been affected by the significant flow instability by the radiation effects.

Keywords: radiative heat transfer, participating media, turbulence, natural convection, LES, FSK