Simulation of laminar natural convection heat transfer of water – alumina nanofluid

Kazem Dehghani[1*], Mahdi Hamzehi[2]

[1] Department of Energy Conversion, Dezful Branch, Islamic Azad University, Dezful, Iran
[2] Departments of Mechanical Engineering, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran

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Abstract

The purpose of this paper is investigation the accuracy of various models in laminar natural convection heat transfer of nanofluids simulation. In this study single phase and different two phase methods in Eulerian – Eulerian approach are compared. Simulations were done for a square cavity containing water - Alumina nanofluid. It is assumed that the top and bottom surface of the cavity are completely isolated and the left and right walls were considered as a hot and cold walls respectively. In this study nanofluid with volume fraction of 0.1%, 0.3%, 1%, 2%, 3% and 4% has been used. The results shows that, at the small Rayleigh number and small volume fraction of nanoparticles, results for all models closer together and with increase Rayleigh and volume fraction of nanoparticles, differences between the models are significant. The results for single phase and mixture two phase models are similar. A closer look shows that, heat transfer with eulerian model is less than other single phase and mixture two phase models and is closer to the experimental results. Beside this, in eulerian two phase models, the Nusselt number is reduced with increasing volume fraction of nanoparticles that is similar to the experimental results.

[*]**Corresponding author:** s_kdehghani@yahoo.com

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