

Effect of Nanoparticle Diameter of Nano-Fluid on Average Nusselt Number in the Chamber

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Abstract : In this numerical study, effects of using Al₂O₃-water nanofluid on the rate of heat transfer have been investigated numerically. The physical model is a square enclosure with insulated top and bottom horizontal walls while the vertical walls are kept at different constant temperatures. Two appropriate models are used to evaluate the viscosity and thermal conductivity of nanofluid. The governing stream-vorticity equations are solved using a second order central finite difference scheme, coupled to the conservation of mass and energy. The study has been carried out for the nanoparticle diameter 30, 60, and 90 nm and the solid volume fraction 0 to 0.04. Results are presented by average Nusselt number and normalized Nusselt number in the different range of ϕ and D for mixed convection dominated regime. It is found that different heat transfer rate is predicted when the effect of nanoparticle diameter is taken into account.

Keywords : nanofluid, nanoparticle diameter, heat transfer enhancement, square enclosure, Nusselt number

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