Abstract

This research investigates the natural convection heat transfer of nanofluid taking the water as based fluid with TiO2 nano particles in an annulus enclosure of a three dimension filled with silica sand as porous media between two horizontal concentric cylinders. Fins attached to the inner cylinder and steady state conditions are applied. The finite difference approach is used and the results obtained using the MATLAB program. The parameters affected on the system are modified Rayleigh number (10 ≤ Ra* ≤ 800), cylinders radius ratio Rr (0.293, 0.365 and 0.435) and the volume fraction (0 ≤ ϕ ≤ 0.5). It was found that the increase of Ra* and/or decrease in radius ratio result an increase in heat transfer. For cold cylinder with Ra* = 800, adding TiO2 nanoparticles of a volume fraction equal 0.5 cause to increase the average Nu by 450% for Rr=0.293 and 519.6 % increase in average Nu for Rr=0.365 and for Rr=0.435 the % increase in the average Nu is 536.33. Effect of nanoparticles on enhancement of heat transfer at high Ra* is more significant than that at low Ra*.

References


Index Terms

Computer Science
Applied Sciences

**Keywords**

Laminar free convection, TiO$_2$ Nanofluid, Porous media, Horizontal annulus.