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 ($10 \leq Ra^* \leq 800$), cylinders radius ratio $R_r$ (0.293, 0.365 and 0.435) and the volume fraction ($0 \leq \phi \leq 0.5$). 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 $R_r=0.293$ and 519.6 % increase in average Nu for $R_r=0.365$ and for $R_r=0.435$ 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.