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Numerical Heat Transfer Performance of Water-Based Graphene Nanoplatelets

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Abstract : Since graphene nanoplatelet (GNP) is a promising material due to desirable thermal properties, this paper is related to the thermophysical and heat transfer performance of covalently functionalized GNP-based water/ethylene glycol nanofluid through an annular channel. After experimentally measuring thermophysical properties of prepared samples, a computational fluid dynamics study has been carried out to examine the heat transfer and pressure drop of well-dispersed and stabilized nanofluids. The effect of concentration of GNP and Reynolds number at constant wall temperature boundary condition under turbulent flow regime on convective heat transfer coefficient has been investigated. Based on the results, for different Reynolds numbers, the convective heat transfer coefficient of the prepared nanofluid is higher than that of the base fluid. Also, the enhancement of convective heat transfer coefficient and thermal conductivity increase with the increase of GNP concentration in base-fluid. Based on the results of this investigation, there is a significant enhancement on the heat transfer rate associated with loading well-dispersed GNP in base-fluid.

Keywords : nanofluid, turbulent flow, forced convection flow, graphene, annular, annulus
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