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Thermophysical and Heat Transfer Performance of Covalent and Noncovalent Functionalized Graphene Nanoplatelet-Based Water Nanofluids in an Annular Heat Exchanger

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Abstract : The new design of heat exchangers utilizing an annular distributor opens a new gateway for realizing higher energy optimization. To realize this goal, graphene nanoplatelet-based water nanofluids with promising thermophysical properties were synthesized in the presence of covalent and noncovalent functionalization. Thermal conductivity, density, viscosity and specific heat capacity were investigated and employed as a raw data for ANSYS-Fluent to be used in two-phase approach. After validation of obtained results by analytical equations, two special parameters of convective heat transfer coefficient and pressure drop were investigated. The study followed by studying other heat transfer parameters of annular pass in the presence of graphene nanopletelesbased water nanofluids at different weight concentrations, input powers and temperatures. As a result, heat transfer performance and friction loss are predicted for both synthesized nanofluids.

Keywords : heat transfer, nanofluid, turbulent flow, forced convection flow, graphene nanoplatelet
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