Entropy generation analysis of nanofluid flow in a circular tube subjected to constant wall temperature

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Abstract

Due to their improved thermal conductivity, nanofluids have the potential to be used as heat transfer fluids in thermal systems. However adding particles into nanofluids will increase the viscosity of the fluid flow. This demonstrates that there is a trade-off between heat transfer enhancement and viscosity. It might not be deal to achieve a heat transfer enhancement along with a relatively high pumping power. This study presents an analytical investigation on the entropy generation of a nanofluid flow through a circular tube with a constant wall temperature. Nanofluid thermo-physical properties are obtained from literature or calculated from suitable correlations. The present study focuses on water-based alumina and titanium dioxide nanofluids. Outcome of the analysis shows that titanium dioxide nanofluids offer lower total dimensionless entropy generation compared to that of alumina nanofluids. Addition of 4% titanium dioxide nanoparticles reduces the total dimensionless entropy generation by 9.7% as compared to only 6.4% reduction observed when using alumina. It is also noted that dimension configurations of the circular tube play a significant role in determining the entropy generation. (C) 2012 Elsevier Ltd. All rights reserved.

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