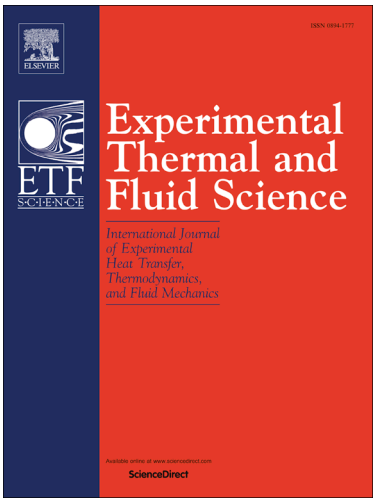

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Convective Thermal Performance and Entropy generation analysis on Solution Combustion Synthesis derived Magnesia nano-dispersion flow susceptible by a micro-fin tube

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Abstract

The article focuses on the combined effect of convective heat transfer and entropy generation analysis on Solution Combustion Synthesis (SCS) derived magnesia (17 nm) nanoparticles dispersed in ethylene glycol-water (50:50) flowing through a micro-fin tube heat exchanger, which is first of the research kind. At particle volume concentrations, φ=0.025, 0.05, 0.1, 0.2, 0.3 and 0.6%, nanofluids were prepared using two-step method. At the Reynolds number (Re) range between 4951 and 10091, the investigations were performed. The variations in temperature and volume concentration upon the thermal conductivity and viscosity enhancements have resulted in the enhancement of the Nusselt number and friction factor. Due to the maximum viscosity enhancement at φ=0.6%, the Performance Evaluation Factor (PEF) of 1.6 is found maximum at φ=0.3%, in spite of the maximum Nusselt number enhancement was reported at φ=0.6%. The entropy generation analysis indicates the Bejan number below 0.75 for φ=0.6% at Reynolds number greater than or equal to 7169, signifying the possibility of entropy generation due to friction dominating the heat transfer when Re>10000. The exact trade-off point beyond which the nanofluid usage becomes disadvantageous is at the optimal Reynolds number of 7169 for φ=0.6%. The Nusselt number and friction factor correlations also were predicted.