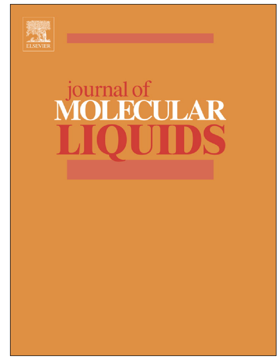
Accepted Manuscript



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PII: S0167-7322(18)33121-0
DOI: doi:10.1016/j.molliq.2018.07.119
Reference: MOLLIQ 9440

To appear in: *Journal of Molecular Liquids*

Received date: 16 June 2018
Revised date: 28 July 2018
Accepted date: 31 July 2018

Please cite this article as: Reza Dormohammadi, Mahmood Farzaneh-Gord, Amir Ebrahimi-Moghadam, Mohamad Hossein Ahmadi , Heat transfer and entropy generation of the nanofluid flow inside sinusoidal wavy channels. Molliq (2018), doi:10.1016/j.molliq.2018.07.119

Heat Transfer and Entropy Generation of the Nanofluid Flow inside Sinusoidal Wavy Channels

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ABSTRACT

Corrugating channel walls is a way to enhance heat transfer in heat exchangers. In the current investigation, the entropy generation minimization approach has been employed to optimize heat transfer and fluid flow within a wavy channel. A numerical method has been built to compute entropy generation rate in a sinusoidal wavy-wall channel with copper-water (Cu-water) nanofluid flow. The governing equations have been discretized using finite volume method for a two-dimensional steady flow. The effects of geometrical and flow parameters, including nanoparticles volume fraction (0.01< ϕ <0.05), Richardson number (0.1< Ri <10), wave amplitude ratio (0.1< α <0.3) and wave length ratio (1< λ <3), have been investigated. Results reveal that increasing nanoparticle volume fraction within investigated Richardson number will increase Nusselt number. In addition, the maximum entropy generation rate declines as Richarson number increases. The optimal wave amplitude ratio (corresponding to lowest entropy generation), for wave length ratios of λ=1 and λ=2, found to be α=0.2. Also, for wave length ratio of λ=3, the minimum entropy generation approximately occurs at α=0.1.

***Keywords*:** Wavy channel; Sinusoidal wall; Nanofluid; Heat transfer; Entropy generation; Computational fluid dynamics (CFD)