

Accepted Manuscript

Numerical study of nanofluids thermal and hydraulic characteristics considering Brownian motion effect in micro fin heat sink



Wenwen Guo, Guoneng Li, Youqu Zheng, Cong Dong

PII: S0167-7322(18)31071-7
DOI: [doi:10.1016/j.molliq.2018.04.152](https://doi.org/10.1016/j.molliq.2018.04.152)
Reference: MOLLIQ 9055
To appear in: *Journal of Molecular Liquids*
Received date: 2 March 2018
Revised date: 27 April 2018
Accepted date: 30 April 2018

Please cite this article as: Wenwen Guo, Guoneng Li, Youqu Zheng, Cong Dong , Numerical study of nanofluids thermal and hydraulic characteristics considering Brownian motion effect in micro fin heat sink. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), doi:[10.1016/j.molliq.2018.04.152](https://doi.org/10.1016/j.molliq.2018.04.152)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Numerical study of nanofluids thermal and hydraulic characteristics considering Brownian motion effect in micro fin heat sink

Wenwen Guo,^a Guoneng Li,^a Youqu Zheng,^{*a} Cong Dong^a

^aDepartment of Energy and Environment System Engineering, Zhejiang University of
Science and Technology, Hangzhou 310023, China

* Corresponding author: zyq888@zust.edu.cn

Abstract

The thermal and hydraulic performance in a micro fin heat sink (MFHS) with ZnO-water nanofluids is investigated numerically using the static and dynamic single phase model (i.e. SSPM and DSPM). For DSPM, both the Brownian motion effect on thermal conductivity and viscosity was taken into consideration. The model is established and validated by comparing with literatures. It is found that the DSPM results are higher than SSPM in heat transfer performance and pressure drop by taking the Brownian motion effect into account. With Re ranging from 85 to 595 the heat transfer coefficient of DSPM and SSPM at ZnO volume concentration (ϕ) of 3.0% are enhanced by 25.6-38.3% and 16.6-23.8% respectively. Particle size and volume concentration are both critical to the nanofluids heat transfer performance of MFHS. DSPM considering Brownian motion by utilize proper thermal conductivity and viscosity model, which is probably more appropriate for investigating the influence of nanofluids particle size. Nanofluids of higher volume concentration and lower particle size are in favor of higher efficiency of heat sink in certain condition. The overall heat transfer efficiency (γ) was also evaluated and the maximum of 34.9 was obtained at $\phi=3.0\%$ and $d_p=30\text{nm}$ using DSPM ($\gamma_{\text{water}}=29.97$).

Keywords: micro fin heat sink; nanofluids; Brownian motion; numerical study; particle size.

Download English Version:

<https://daneshyari.com/en/article/7842010>

Download Persian Version:

<https://daneshyari.com/article/7842010>

[Daneshyari.com](https://daneshyari.com)