

Accepted Manuscript

A comparative study of flow boiling performance in reentrant copper microchannels and reentrant porous microchannels with multi-scale rough surface

Daxiang Deng, Ruxiang Chen, Yong Tang, Longsheng Lu, Tao Zeng, Wei Wan

PII: S0301-9322(15)00014-2

DOI: <http://dx.doi.org/10.1016/j.ijmultiphaseflow.2015.01.004>

Reference: IJMF 2148

To appear in: *International Journal of Multiphase Flow*

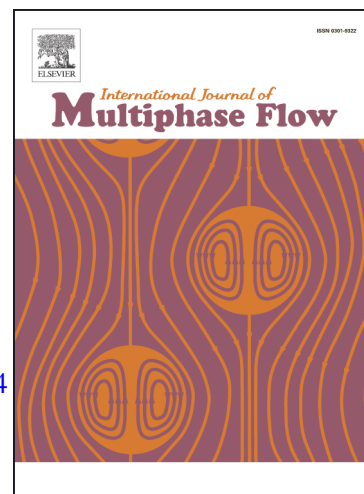
Received Date: 6 June 2014

Revised Date: 19 January 2015

Accepted Date: 20 January 2015

Please cite this article as: Deng, D., Chen, R., Tang, Y., Lu, L., Zeng, T., Wan, W., A comparative study of flow boiling performance in reentrant copper microchannels and reentrant porous microchannels with multi-scale rough surface, *International Journal of Multiphase Flow* (2015), doi: <http://dx.doi.org/10.1016/j.ijmultiphaseflow.2015.01.004>

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.



**A comparative study of flow boiling performance in reentrant copper
microchannels and reentrant porous microchannels with multi-scale
rough surface**

Daxiang Deng^{1,2*}, Ruxiang Chen³, Yong Tang⁴, Longsheng Lu⁴, Tao Zeng¹, Wei Wan¹

¹*Department of Mechanical & Electrical Engineering, Xiamen University, Xiamen, 361005, China*

²*ShenZhen Research Institute of Xiamen University, ShenZhen, 518057, China*

³*ABB Xiamen Low Voltage Equipment Company, 12-20 Chuangxin 3rd Road, Xiamen, 361006, China*

⁴*Key Laboratory of Surface Functional Structure Manufacturing of Guangdong High Education Institutes, School of Mechanical and Automotive Engineering, South China University of Technology, Guangzhou 510640, China*

Abstract:

Flow boiling in porous-based microchannel heat sinks offers a potential and attractive solution for efficient cooling of high-heat-flux devices. In this study, a type of Ω -shaped reentrant porous microchannels with multi-scale rough surface (RPM-RS) was fabricated via a solid-state sintering method and constructed for heat sink cooling. Two-phase boiling experiments were conducted to explore their enhancement in flow boiling performance compared to the solid copper microchannels with the same reentrant configurations. Two coolants tests, i.e., deionized water and ethanol, with inlet subcooling of 10 °C and 40 °C, were conducted at mass fluxes of 125-300 kg/m²·s. Experimental results show that the RPM-RS promoted the bubble nucleation and reduced the wall superheat for the onset of nucleate boiling (ONB) significantly. They presented a significant enhancement in two-phase heat transfer at low to moderate heat fluxes, as well as a considerable mitigation of the two-phase flow instabilities. Furthermore, They produced more uniform heat sink base temperatures compared to reentrant copper microchannels (RCM). The above encouraging results of reentrant porous microchannels highlight their promising potential to be an alternative of conventional solid microchannels for thermal management applications.

Key words: Microchannel heat sinks; Flow boiling; Porous microchannels; Multi-scale rough surface

*Corresponding author. Tel.: +86 592 2186926; fax: +86 592 2186383.

E-mail address: dengdaxiang88@gmail.com (D.X. Deng).

Download English Version:

<https://daneshyari.com/en/article/7060347>

Download Persian Version:

<https://daneshyari.com/article/7060347>

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