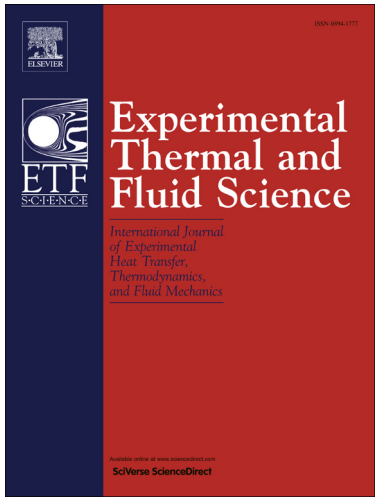

Two-phase flow pattern and pressure drop in silicon multi-microchannel with expansion-constriction cross-section

Lei Chai, Liang Wang, Mingzheng Zhou, Guodong Xia

PII: S0894-1777(14)00237-4
DOI: http://dx.doi.org/10.1016/j.expthermflusci.2014.09.012
Reference: ETF 8308

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 5 June 2014
Revised Date: 28 August 2014
Accepted Date: 20 September 2014

Please cite this article as: L. Chai, L. Wang, M. Zhou, G. Xia, Two-phase flow pattern and pressure drop in silicon multi-microchannel with expansion-constriction cross-section, *Experimental Thermal and Fluid Science* (2014), doi: http://dx.doi.org/10.1016/j.expthermflusci.2014.09.012

Two-phase flow pattern and pressure drop in silicon multi-microchannel with expansion-constriction cross-section

Lei Chai[a,b] Liang Wang[b] Mingzheng Zhou[a,c] Guodong Xia[a,*]

[a] Key Laboratory of Enhanced Heat Transfer and Energy Conservation, Ministry of Education, College of Environmental and Energy Engineering, Beijing University of Technology, Beijing, China

[b] Institute of Engineering Thermophysics, Chinese Academy of Sciences, Beijing, China

[c] State Nuclear Power Technology R&D Center, Beijing, China

Abstract Gas-liquid two-phase intermittent flow pattern and frictional pressure drop in new silicon multi-microchannel were investigated experimentally by means of the IDT high-speed camera mounted together with a Nikon microscope. Each test section consisted of 10 parallel microchannels with 0.1 mm wide and 0.2 mm deep in constant cross-section segment and each microchannel consisted of an array of periodic reentrant cavities. The major two-phase flow pattern observed was intermittent in the test sections, and the intermittent sub regimes in the new microchannels were different from those displayed in the rectangular straight microchannel. Using nitrogen and deionized water as working fluids, the intermittent sub regime maps for the new multi-microchannel were obtained. Meanwhile, the pressure drops were compared with several existing correlations based on the homogeneous or separated mixture assumption. Results show that the homogeneous flow model cannot predict the two-phase pressure drop data well, while the separated flow model is proposed to provide a better prediction of the

* Corresponding author. Tel.: +86 10 67391985 8301; fax: +86 10 67391983.

E-mail address: xgd@bjut.edu.cn (G. Xia).