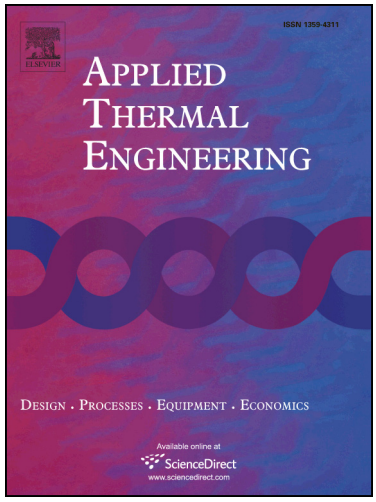

Flow Pattern Transition During Condensation of R134a and R1234ze(E) in Microchannel Arrays

Ji Wang, Jun Ming Li, Yunho Hwang

PII: S1359-4311(16)34049-2
DOI: http://dx.doi.org/10.1016/j.applthermaleng.2016.12.055
Reference: ATE 9675

To appear in: *Applied Thermal Engineering*

Received Date: 27 May 2016
Revised Date: 26 September 2016
Accepted Date: 11 December 2016

Please cite this article as: J. Wang, J. Ming Li, Y. Hwang, Flow Pattern Transition During Condensation of R134a and R1234ze(E) in Microchannel Arrays, *Applied Thermal Engineering* (2016), doi: http://dx.doi.org/10.1016/j.applthermaleng.2016.12.055

Flow Pattern Transition During Condensation of R134a and R1234ze(E) in Microchannel Arrays

Ji Wang[a], Jun Ming Li[a,*], Yunho Hwang[b]

[a] Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Department of Thermal Engineering, Tsinghua University, Beijing 100084, China

[b] Center for Energy Environmental Engineering, Department of Mechanical Engineering, University of Maryland, College Park, Maryland 20740, United States

* Corresponding author. Tel.: +86 10 62771001; E-mail: lijm@tsinghua.edu.cn

ABSTRACT

Two-phase flow pattern transition during the condensation of R134a and R1234ze(E) was experimentally investigated in a microchannel array made of borosilicate glass cooled symmetrically on the top and bottom by forced convection of water. The microchannel array consisted of 50 channels with the aspect ratio of 2.46, the hydraulic diameter of 301.6 μm and the length of 50 mm. Saturation temperatures are 20 to 25°C with mass fluxes varying from 6 to 50 kg/m^2/s. Observed patterns are annular flow, steady injection flow, quasi-symmetric wave flow and slug/bubbly flow. In addition, three flow pattern transition modes including steady injection, wave-coalescence injection, and liquid bridging were observed and mapped in terms of liquid Webb number versus condensation number. The steady injection transition was more studied in detail by measuring the bubble length variation and the moving velocity of bubbles and slugs with different mass fluxes of R134a and R1234ze(E). The transition mechanism of injection flow was identified by analyzing the force balance based on the