

Accepted Manuscript

Critical condition for bubble breakup in a microfluidic flow-focusing junction

Xiaoda Wang, Chunying Zhu, Taotao Fu, Ting Qiu, Youguang Ma

PII: S0009-2509(17)30078-7

DOI: <http://dx.doi.org/10.1016/j.ces.2017.01.066>

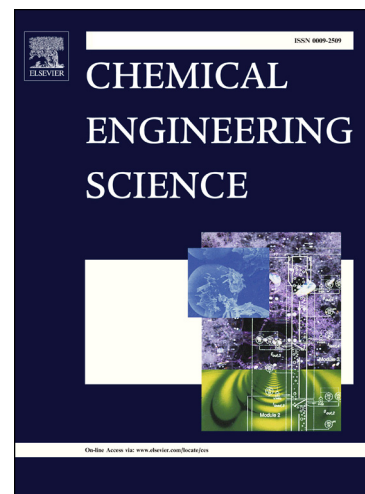
Reference: CES 13413

To appear in: *Chemical Engineering Science*

Received Date: 28 October 2016

Revised Date: 23 January 2017

Accepted Date: 28 January 2017



Please cite this article as: X. Wang, C. Zhu, T. Fu, T. Qiu, Y. Ma, Critical condition for bubble breakup in a microfluidic flow-focusing junction, *Chemical Engineering Science* (2017), doi: <http://dx.doi.org/10.1016/j.ces.2017.01.066>

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.

Critical condition for bubble breakup in a microfluidic flow-focusing junction

Xiaoda Wang^{a, b}, Chunying Zhu^a, Taotao Fu^{a, *}, Ting Qiu^b, Youguang Ma^{a, *}

^a State Key Laboratory of Chemical Engineering, Collaborative Innovation Center of Chemical science and Engineering (Tianjin), School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072, China

^b School of Chemical Engineering, Fuzhou University, Fuzhou 350116, China

* Corresponding authors: ttfu@tju.edu.cn (T. Fu); ygma@tju.edu.cn (Y. Ma)

Abstract:

The critical condition for bubble breakup in a microfluidic flow-focusing junction was studied in this work. The experiments were conducted in a square microchannel of 400 μm wide. The critical condition for bubble breakup was investigated by varying the bubble length l_0 , liquid viscosity μ , velocity of the liquid from the main channel of the flow-focusing junction u_1 , and velocity of the liquid from the side channels of the junction u_2 . By analyzing the effects of these factors on the dynamical evolution of gas-liquid interface for bubble deformation and breakup, expressions for describing the bubble deformation and breakup time were established, respectively. On the basis of these two expressions, the critical condition for the bubble breakup in a microfluidic flow-focusing junction was deduced: $\frac{l_0}{w_c} = 1.5 \left(\frac{u_1}{u_2} \right)^{0.75} Ca_2^{-0.13}$, where w_c is the width of microchannel, $Ca_2 = u_2 \mu / \gamma$, and γ is the surface tension.

Download English Version:

<https://daneshyari.com/en/article/4763861>

Download Persian Version:

<https://daneshyari.com/article/4763861>

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