

多相流

微机电系统中的矩形通道内微气泡控制生长

董涛, 杨朝初, 毕勤成, 张玉龙, 谷丹丹, 张春权

厦门大学萨本栋微机电研究中心;北京理工大学爆炸科学与技术国家重点实验室;西安交通大学动力工程多相流国家重点实验室

收稿日期 2006-6-27 修回日期 2006-8-23 网络版发布日期 2007-1-10 接受日期

摘要 采用微机电系统(MEMS)硅加工工艺,设计、加工出了6种不同规格的实验用微气泡控制生长MEMS器件;构建了MEMS器件中微气泡控制生长实验系统并完成了实验,讨论了热负荷、微加热元宽度、微通道截面参数、工质流速及物性参数等对微气泡生长的影响。结果表明:同等实验条件下,加热电压幅值越高,微气泡生长速率越快;加热脉冲宽度仅对微气泡形成后的进一步生长有影响;加热条件相同的前提下,微加热元宽度越大,气泡成核所需的时间越短、微气泡生长速率越快;微通道宽度一定且高宽比大于1的条件下,高宽比越小,后期微气泡生长速率越慢;微流体的流速越高,微气泡生长始点越晚、生长速率也越低。相同实验条件下,R113、FC-72、去离子水三者中,R113中微气泡生长始点最靠前、生长速率最快,去离子水中微气泡生长最靠后、生长速率最慢。

关键词 [微机电系统](#) [微流体相变](#) [微气泡生长](#) [微小有限空间](#) [矩形微通道](#)

分类号

Micro-bubble controlled growth in rectangular microchannel of micro-electro-mechanical systems

DONG Tao, YANG Zhaochu, BI Qincheng, ZHANG Yulong, GU Dandan, ZHANG Chunquan

Abstract

With the silicon microfabrication process, six micro-electro-mechanical systems(MEMS) devices for exploring micro-bubble growth were designed and fabricated. Experimental investigations of micro-bubble growth in micro restrained space were performed. The results showed that the micro-bubble growth rate was influenced by heat power, dimensions of microheater, microchannel section, microfluidic velocity, and materials of the fluid. A higher heating voltage resulted in faster bubble growth. The width of heating pulse took effect during the latter period of bubble growth. Under the same heating voltage and pulse width, a larger width of the microheater led to faster bubble growth. When the aspect ratio of the microchannel section was over 1.0, a smaller aspect ratio brought on slower bubble growth during the latter period. The larger the microfluidic velocity, the later the bubble growth start point, and the slower the bubble growth. Under the same test condition, the bubble growth rate of R113 was the largest among the three working fluids, followed by FC-72 and deionized water, due to the effect of thermophysical parameters of the fluids.

Key words [MEMS](#) [microfluidic phase change](#) [micro-bubble growth](#) [micro restrained space](#) [rectangular microchannel](#)

DOI:

通讯作者 董涛 nustlibrary@263.net

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(1910KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

相关信息

- ▶ [本刊中 包含“微机电系统”的 相关文章](#)
- ▶ [本文作者相关文章](#)

- [董涛](#)
- [杨朝初](#)
- [毕勤成](#)
- [张玉龙](#)
- [谷丹丹](#)
- [张春权](#)