

传递现象

低高宽比微通道中的流动沸腾不稳定性

张炳雷, 徐进良, 肖泽军

中国科学院广州能源研究所

收稿日期 2006-8-8 修回日期 2006-10-11 网络版发布日期 2007-7-13 接受日期

摘要

以甲醇为工质, 在不同进口温度、质量流速、热通量和倾角下对低高宽比矩形微通道中流动沸腾不稳定性进行了研究。在宽广的参数范围内发现存在3类不稳定性: 流量漂移静态不稳定性、压力降型脉动动态不稳定性及压力降和密度波复合不稳定性。由于大长径比 ($L/D=159.5$) 实验段本身及实验段上游可压缩容积的存在, 导致在水动力曲线负斜率区压力降型脉动的发生。分析了进口温度、倾角、质量流量、热通量等因素对不稳定性的影响, 发现压力降型脉动的发生主要取决于质量流量、热通量及进口温度三者的影响, 给出了以热力学平衡质量含气率表示的脉动工况界限范围。

关键词 [不稳定性](#) [压力降型脉动](#) [流量漂移](#) [微通道](#) [流动沸腾](#)

分类号

Flow boiling instability in microchannel with low aspect ratio

ZHANG Binglei, XU Jinliang, XIAO Zejun

Abstract

Flow boiling instabilities in a single microchannel with a low aspect ratio were studied by taking account of the effects of inlet temperature, mass flux, heat flux and inclination with methanol as the working fluid. Three types of instabilities were found over wide parameter ranges: flow excursion static instability, pressure-drop type oscillation, and superimposed instability of pressure-drop type and density wave type oscillations. Due to the large ratio of the channel length to the hydraulic diameter and the upstream compressible volume, the pressure-drop type oscillation occurred in the negative gradient region of the demand curve of pressure-drop *versus* mass flux. The influences of inlet temperature, inclination, mass flux and heat flux on flow instability were analyzed. It was demonstrated that whether the pressure-drop type oscillation occurred or not depended on inlet temperature, mass flux and heat flux. The range in which the pressure-drop type oscillation occurred was presented with outlet mass quality as control parameter.

Key words

[instability](#) [pressure-drop type oscillation](#) [flow excursion](#) [microchannel](#) [flow boiling](#)

DOI:

通讯作者 徐进良 xujl@ms.giec.ac.cn

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(14357KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [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“不稳定性” 的相关文章](#)
- ▶ [本文作者相关文章](#)

- [张炳雷](#)
- [徐进良](#)
- [肖泽军](#)