

多相流和计算流体力学

T形微通道中互不相溶两相流数值模拟

董贺飞, 张德良, 赵玉潮, 陈光文, 袁权

中国科学院力学研究所, 北京 100080; 中国科学院大连化学物理研究所, 辽宁 大连 116023

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摘要

采用摄动有限体积 (PFV) 算法和水平集 (level set) 技术对T形微通道内互不相溶两相流动进行了数值模拟研究。考察了两相界面张力和微通道壁面润湿性对流动的影响, 精确地捕捉到了油水两相流动的界面。对一些典型的T形微通道油水两相流动进行了数值计算, 模拟结果和实验结果吻合较好。分析总结出了微通道内两相流动过程中的一些基本规律, 为微通道内的液液两相流动实验设计和工业应用提供了新的数值预测手段。

关键词

[微通道](#) [摄动有限体积](#) [两相流](#) [微反应器](#) [微混合器](#) [油-水](#)

分类号

Numerical simulation of immiscible two-phase flow in T-shaped microchannel

DONG Hefei, ZHANG Deliang, ZHAO Yuchao, CHEN Guangwen, YUAN Quan

Abstract

The immiscible two-phase flow in a T-shaped microchannel was simulated by using the perturbational finite volume (PFV) method and level set technique. The effects of the oil-water interfacial tension and the surface wetting angle between water phase and microchannel wall on the characteristics of oil-water two-phase flow were investigated and the accurate interface configuration of the oil-water flow was also obtained. Some typical oil-water two-phase flow patterns in the T-shaped microchannel were calculated. The numerical results were in good agreement with the experimental data. The discussions of numerical results help to understand the flow mechanisms of oil-water two-phase flow in the microchannel. That provides a new means of numerical prediction for the experimental design and industrial application of liquid-liquid two-phase flow in the microchannel.

Key words

[microchannel](#) [PFV](#) [two-phase flow](#) [micro-reactor](#) [micro-mixer](#) [oil-water](#)

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通讯作者 张德良 dlzhang@imech.ac.cn

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