

多相流

## 垂直圆管内湍流泡状流的数值研究

顾汉洋, 郭烈锦

西安交通大学动力工程多相流国家重点实验室, 陕西 西安 710049

收稿日期 2002-12-17 修回日期 2003-5-12 网络版发布日期 2008-9-1 接受日期

**摘要** 在经典Euler/Euler型水动力模型基础上, 引入考虑不同直径气泡的种群平衡方程来描述气液两相泡状流, 对液相和气相分别建立了基本方程, 通过对气泡的受力分析并考虑气泡之间聚合和破碎效应后给出了本构方程, 建立了封闭的双流体模型并用于垂直管道湍流泡状流的三维数值模拟. 模型预测值与实验数据的比较结果表明该模型能较好地模拟垂直管道湍流泡状流中的相含率分布、速度分布、湍动能分布、气泡直径分布以及气泡直径分布的演变过程.

**关键词** [湍流泡状流](#) [双流体模型](#) [气泡聚合和破碎](#)

分类号

## NUMERICAL SIMULATION OF TURBULENT BUBBLE FLOW IN VERTICAL PIPE

GU Hanyang, GUO Liejin

### Abstract

Population balance equations with different bubble diameters are combined with classical Euler/Euler hydrodynamic simulation to investigate turbulent bubble flow in a vertical pipe in the present work. The universal basic averaged equations for bubble flow are developed by applying the volume-averaging operator to the local instantaneous flow equations. Based on the analysis of the motion of the bubbles in the flow field and the influence of bubble coalescence and break-up, the constitutive relation is determined. Comparison of the available experimental data with the present model prediction shows that the model can be used to predict the local volume fraction, radial velocity profiles, turbulence kinetic energy, mean bubble diameter and the evolution of mean bubble diameter due to the reasonable consideration of the interaction between the two phases and the influence of bubble coalescence and break-up.

**Key words** [turbulent bubbly flow](#) [two-phase flow model](#) [bubble coalescence and break-up](#)

DOI:

通讯作者 郭烈锦 [lj-guo@mail.xjtu.edu.cn](mailto:lj-guo@mail.xjtu.edu.cn)

### 扩展功能

本文信息

▶ [Supporting info](#)

▶ [PDF\(601KB\)](#)

▶ [\[HTML全文\]\(0KB\)](#)

▶ [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“[湍流泡状流](#)”的  
[相关文章](#)

▶ 本文作者相关文章

· [顾汉洋](#)

· [郭烈锦](#)