中国化学工程学报 2002 10 (2): 142-148 ISSN: 1004-616x CN: 44-1063/R

RESEARCH PAPERS

鼓泡床内气液两相流动的二阶矩模型与代数应力模型的模拟比较

周力行[a], 杨玟[a], 廉春英[a], L. S. Fan[b], D. J. Lee[b]

[a] Department of Engineering Mechanics, Tsinghua University, Beijing 100084, China

[b] Department of Chemical Engineering, The Ohio State University, USA

收稿日期 修回日期 网络版发布日期 接受日期

摘要 A full second-order moment (FSM) model and an algebraic stress (ASM) two-phase turbulence
modelare proposed and applied to predict turbulent bubble-liquid flows in a 2D rectangular bubble column. Predictiongives the bubble and liquid velocities, bubble volume fraction, bubble and liquid Reynolds stresses and bubble-liquidvelocity correlation. For predicted two-phase velocities and bubble volume fraction there is only slight differencebetween these two models, and the simulation results using both two models are in good agreement with the particleimage velocimetry (PIV) measurements. Although the predicted two-phase Reynolds stresses using the FSM are insomewhat better agreement with the PIV measurements
than those predicted using the ASM, the Reynolds stressespredicted using both two models are in general agreement with the experiments. Therefore, it is suggested to usethe ASM two-phase turbulence model in engineering application for saving the computation time.

关键词 second-order moment model two-phase turbulence bubble-liquid flow bubble column

分类号

DOI:

Comparison of a Full Second-Order Moment Model and an Algebraic Stress Two-Phase Turbulence Model for Simulating Bubble-Liquid Flows in a Bubble Column

ZHOU Lixing[a], YANG Min[a], LIAN Chnying[a], L. S. Fan[b], D. J. Lee[b]

[a] Department of Engineering Mechanics, Tsinghua University, Beijing 100084, China

[b] Department of Chemical Engineering, The Ohio State University, USA

Received Revised Online Accepted

Abstract A full second-order moment (FSM) model and an algebraic stress (ASM) two-phase turbulence modelare proposed and applied to predict turbulent bubble-liquid flows in a 2D rectangular bubble column. Predictiongives the bubble and liquid velocities, bubble volume fraction, bubble and liquid Reynolds stresses and bubble-liquidvelocity correlation. For predicted two-phase velocities and bubble volume fraction there is only slight differencebetween these two models, and the simulation results using both two models are in good agreement with the particleimage velocimetry (PIV) measurements. Although the predicted two-phase Reynolds stresses using the FSM are insomewhat better agreement with the PIV measurements than those predicted using the ASM, the Reynolds stressespredicted using both two models are in general agreement with the experiments. Therefore, it is suggested to usethe ASM two-phase turbulence model in engineering application for saving the computation time.

Key words second-order moment model; two-phase turbulence; bubble-liquid flow; bubble column

通讯作者:
周力行
作者个人主页: 周力行[a]; 杨玟[a]; 廉春英[a]; L. S. Fan[b]; D. J. Lee[b]