

多相流和计算流体力学

大颗粒三相环隙气升式环流反应器流体力学行为

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摘要

研究了大颗粒体系气升式环流反应器的流体力学行为, 考察了表观气速和颗粒质量分数对床层膨胀高度、循环液速和固含率分布的影响。实验结果表明, 按颗粒的运动状态不同可以将反应器内的流动分为3个区域, 即固定床区域、膨胀床区域和循环床区域, 各流动区域内的流动行为存在显著差异。随着颗粒质量浓度的增大, 起始流化气速和最小循环气速均显著增大。基于三相流化床的流化模型和环流反应器的特点建立了相应的数学模型, 对大颗粒三相气升式环流反应器的起始流化气速和最小循环气速进行了预测, 模型预测值与实验测量值吻合良好。

关键词

[气升式环流反应器](#) [流动区域](#) [固含率](#) [循环液速](#)

分类号

Hydrodynamics of three-phase internal-loop airlift reactor with large particles

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Abstract

The hydrodynamics of a three-phase internal loop airlift reactor with large particles was experimentally investigated. Effects of superficial gas velocity and solid concentration on the expanded bed height, circulation liquid velocity and distribution of solid holdup were studied. The results suggest that the flow in the reactors can be divided into three regimes, namely the fixed bed regime, fluidized bed regime and circulating fluidized bed regime. The flow character in each regime is quite different. Both the minimum fluidization gas velocity and the minimum circulation gas velocity increase significantly with the increase in solid concentration. A mathematical model based on the existing model for a three-phase fluidized bed and the characters of the airlift reactor was proposed to predict the minimum fluidization gas velocity and the minimum circulation gas velocity in the three-phase airlift reactor, and a good agreement between the calculated and measured values was obtained.

Key words

[internal-loop airlift reactor](#) [flow regime](#) [solid holdup](#) [circulation liquid velocity](#)

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