多相流和计算流体力学

摩擦-动力应力模型研究喷动床内气固两相流动过程

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摘要

考虑颗粒滑动的半持续性接触应力和颗粒碰撞瞬时接触应力对颗粒相应力的贡献，建立了喷动床内气体颗粒两相流动计算模型。采用颗粒动理学和Johnson 等的摩擦应力模型，数值模拟喷动床颗粒流动过程，获得了喷动床喷射区、环隙区和喷泉区内颗粒流动特性。模拟计算与He等的实验结果进行了对比。同时分析了摩擦应力模型对颗粒相黏度变化的影响，表明中速颗粒流的颗粒相摩擦应力模型将直接影响喷动床气体颗粒两相流动的预测。

关键词

喷动床　颗粒动理学　摩擦-动力应力模型　数值模拟

分类号

Simulation of gas-solids flow in spouted beds from frictional-kinetic stresses model

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Abstract

Flow behavior of gas and particles was simulated in the spouted beds by using an Eulerian-Eulerian two-fluid model on the basis of kinetic theory of granular flowThe frictional-kinetic constitutive model for dense assemblies of solids was incorporatedThe kinetic stress was modeled by using the kinetic theory of granular flow, while the friction stress was from the combination of the normal frictional stress model proposed by Johnson *et al*to account for strain rate fluctuations and slow relaxation of the assembly to the yield surfaceAn inverse tangent function was used to provide a smooth transition from the plastic and viscous regimesThe distributions of concentration, velocity and granular temperature of particles were obtained in the spouted bedCalculated particle velocities and concentrations in spouted beds were in agreement with experimental data obtained by He *et al*Simulated results indicated that prediction of flow behavior of particles was affected by

Key words

spouted bed　kinetic theory of granular flow　frictional-kinetic stresses model　numerical simulation

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