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## SPH方法对气液两相流自由界面运动的追踪模拟

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### Numerical tracking of interface in multiphase flows with smoothed particle hydrodynamics

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**摘要** 气液两相流动是自然界中常见的流动现象, 对其进行数值模拟时要求必须能够准确跟踪界面运动变形。本文利用光滑粒子流体动力学方法, 结合微可压缩模型(SCM), 引入界面控制方法XSPH速度修正以及Van Der waals状态方程修正, 对典型的气液两相流动如二维溃坝、气泡上浮等问题进行了数值模拟, 分析了空气和水相互作用机理以及界面运动规律, 并同实验结果和其他数值计算结果进行了比较。结果表明, 该方法在模拟多相介质界面运动问题准确有效, 可用于处理更为复杂的多相流动工程问题。

**关键词:** 多相流 自由界面 SPH方法 微可压模型

**Abstract:** Multiphase flows are common problems in hydrodynamics. In these problems the deformations of interface are hard to track with conventional numerical methods. In this paper, smoothed particle hydrodynamics method is used to solve the multiphase problem, combining with slightly compressible model. To control the shape of interface, XSPH method and Van der waal correction were used. A dam breaking case and bubble rising case were presented in order to validate the method. Compared to the experiment results or other numerical results, some good agreements were obtained. It is demonstrated that the SPH method can be easily used to track the deformations of interface in multiphase flows.

**Keywords:** multiphase flow, free interface, smoothed particle hydrodynamics (SPH), SCM

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