

多相流

## 基于遗传算法的快速X射线计算机层析成像多相流测试技术(II)静态实验验证

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**摘要** 采用静态实验模型和一套X射线测试系统模拟了二值多相体系多角度同时投影的X射线CT测量过程。静态实验模型模拟空气-水两相体系,截面相浓度分布满足0-1特征。X射线测试系统由一台工作电压为150 kV的闪光X射线机、一台X射线平板检测器和一套数据采集单元组成。通过旋转静态实验模型,分步实现不同角度的投影数据采集。基于模拟的多角度“同时”采集的投影数据,使用本系列研究所构建的基于遗传算法的快速X射线CT多相流测试技术(GA-XCT)对截面图像进行重建,测试结果表明:在3~24个有限角度实测投影数据的情况下,GA-XCT表现出了明显优于传统CT图像重构算法(滤波反投影算法)的图像重构能力,且具有良好的抗噪声能力。

**关键词** [多相流测试技术](#); [X射线计算机层析成像](#); [有限数据层析成像](#); [遗传算法](#); [实验验证](#)

分类号

## Genetic algorithm based fast X-ray computed tomographic method for multiphase flow measurement (II) Validation by real experiments

### Abstract

Simultaneous measurements of X-ray projection data from several angles around a static experimental model were implemented by rotating the model between an X-ray tube and a flat plate detector. The static model simulated a two-phase system with water and air inside, forming four bubbles at the cross-section. The measurement system consisted of a Model 150-I Mobile X-ray Unit operated at the potential of 150 kV, a MiniX-1 X-ray flat plate detector, and a data acquisition system. By using the measured instantaneous projection data from different angles, the cross-sectional image was reconstructed with the established genetic algorithm based fast X-ray computed tomographic method (GA-XCT). A series of real experiments clearly demonstrated the feasibility and capability of the GA-XCT in the application of “bubbles” reconstruction compared with the conventional CT reconstruction algorithm using limited projection data. Meanwhile, the GA based image reconstruction is robust to the noise.

**Key words** [multiphase flow measurement](#) [X-ray computed tomography](#) [limited data tomography](#)

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