



基于双截面ERT对鼓泡床气含率分布的可视化测量

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摘要：

鼓泡床以其结构简单、效率高，广泛应用于化工、制药等领域。鼓泡床中气/液分布受诸多因素影响，如筛板构型、气/液混合比、温度等，而气/液分布直接影响反应效率。因此，气含率分布的实时检测成为过程控制及鼓泡床优化的重要依据。通常，传统检测手段，如压差法及电导探针法，仅能测得集总或局部信息。将电阻层析成像（ERT）技术引入鼓泡床测量，可获得2D/3D电导率分布及流速分布图像。通过对数据/图像后处理，可提取整体和局部流动参数。试验结果显示，ERT结果与传统方法符合，测量误差 $\leq 5\%$ 。

关键词：电阻层析成像；气含率；鼓泡床

Visual Measurement of the Gas Volume Fraction Distribution in Bubble Columns based on Dual Plane Electrical Resistance Tomography

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Abstract:

Bubble columns have been widely used in chemical and pharmacy industries for its simplicity and efficiency. In bubble column, air distribution depends on various factors, e.g. sieve plate pattern, air and liquid volumes, temperatures etc., which in turn determine the efficiency of the reaction. Real-time measurement of air volume fraction distribution is of significant importance for process control and further optimization of the reactor. Therefore, great attentions have been paid to this problem in recent studies. Generally, conventional methods, e.g. conductivity probe and differential pressure method, can only obtain a lumped parameter or local information. Hence, electrical resistance tomography technique has been introduced to provide real-time measurement of air volume fraction distribution within its sensing region. With a dual-plane sensor, the electrical resistance tomography system could generate 2D/3D conductivity images as well as flow velocity maps. Moreover, both global and local information of the flow can be obtained by data/image post-processing. Experimental results show that test results from electrical resistance tomography are in good accordance with those from conventional methods, and superior to 5% deviation.

Keywords: Electrical Resistance Tomography; Gas Volume Fraction; Bubble Column

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