

TRANSPORT PHENOMENA & FLUID MECHANICS

通过速度-时间数据的小波变换研究筛板式鼓泡塔中的湍流结构

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**摘要** Hydrodynamic and turbulent structures in the trayed bubble column with 1.2m inner diameter have been characterized from liquid-phase velocity-time series data obtained by the hot-film anemometer. Wavelet transform analysis was used for denoising the measured data and also for evaluating quantifiers of turbulence, viz., local intermittency measure, intermittency index and flatness factor. These quantifiers help in detecting the passage of bubbles and reveal the hidden structures and patterns in data. Also, the wavelet scalewise analysis of the turbulence at various locations in the column and under different operating conditions could be used to build a direct relationship between the local gas holdup and flatness factor. The methodology is therefore suitable for online evaluation of the trayed bubble column performance and shows promise for developing strategies for improving process performance.

**关键词** 鼓泡塔 板式 筛板 研究 湍流结构 时间 小波变换

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Wavelet Transform of Velocity-Time Data for the Analysis of Turbulent Structures in a Trayed Bubble Column

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**Abstract** Hydrodynamic and turbulent structures in the trayed bubble column with 1.2m inner diameter have been characterized from liquid-phase velocity-time series data obtained by the hot-film anemometer. Wavelet transform analysis was used for denoising the measured data and also for evaluating quantifiers of turbulence, viz., local intermittency measure, intermittency index and flatness factor. These quantifiers help in detecting the passage of bubbles and reveal the hidden structures and patterns in data. Also, the wavelet scalewise analysis of the turbulence at various locations in the column and under different operating conditions could be used to build a direct relationship between the local gas holdup and flatness factor. The methodology is therefore suitable for online evaluation of the trayed bubble column performance and shows promise for developing strategies for improving process performance.

**Key words** wavelet transform; trayed bubble column; hydrodynamics; turbulence structures; hot film anemometer

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