

Entropy Analysis in a Bubble Column Based on Ultrafast X-Ray Tomography Data

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Abstract : By means of the ultrafast X-ray tomography facility, data were obtained at different superficial gas velocities U_G in a bubble column (0.1 m in ID) operated with an air-deionized water system at ambient conditions. Raw reconstructed images were treated by both the information entropy (IE) and the reconstruction entropy (RE) algorithms in order to identify the main transition velocities in a bubble column. The IE values exhibited two well-pronounced minima at $U_G=0.025$ m/s and $U_G=0.085$ m/s identifying the boundaries of the homogeneous, transition and heterogeneous regimes. The RE extracted from the central region of the column's cross-section exhibited only one characteristic peak at $U_G=0.03$ m/s, which was attributed to the transition from the homogeneous to the heterogeneous flow regime. This result implies that the transition regime is non-existent in the core of the column.

Keywords : bubble column, ultrafast X-ray tomography, information entropy, reconstruction entropy

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