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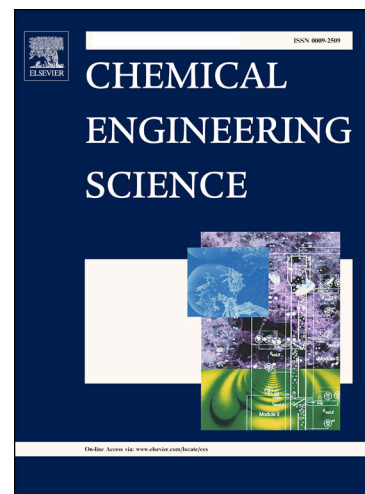
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A Study on the Influence of the Tube Layout on Sub-channel Hydrodynamics in a Bubble Column with Internals

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Keywords

Bubble column, heat exchanger internals, sub-channel analysis, local hydrodynamics, ultrafast X-ray tomography.

Abstract

In this work, the hydrodynamics of a bubble column with vertical heat exchanger internals in a narrow bubble column of $D_i = 0.1$ m inner diameter with a clear liquid height of $L_c = 1.1$ m was comprehensively studied. We applied ultrafast X-ray tomography to obtain hydrodynamic parameters, such as, gas holdup, bubble size distribution, bubble number flux and flow patterns at hitherto inaccessible positions within the sub-channels of the tube bundles. To investigate the influence of the tube bundle patterns, square and triangular pitches were considered. Tubes of $d_o = 8$ and 13 mm outer diameter were installed to study the effect of tube size, while maintaining approx. $A_c = 25\%$ coverage of the cross-sectional area, which is typical for e.g. Fischer-Tropsch process operated in bubble column reactors. The superficial gas velocity was varied from $u_g = 2$ to 20 cm s^{-1} to cover homogeneous and heterogeneous flow regimes.

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