

Accepted Manuscript

Experimental and numerical investigations of scale-up effects on the hydrodynamics of slurry bubble columns

Zhaoqi Li, Xiaoping Guan, Lijun Wang, Youwei Cheng, Xi Li

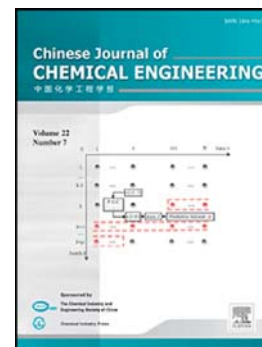
PII: S1004-9541(16)30436-0
DOI: doi: [10.1016/j.cjche.2016.05.009](https://doi.org/10.1016/j.cjche.2016.05.009)
Reference: CJCHE 562

To appear in:

Received date: 4 June 2015
Revised date: 15 November 2015
Accepted date: 23 February 2016

Please cite this article as: Zhaoqi Li, Xiaoping Guan, Lijun Wang, Youwei Cheng, Xi Li, Experimental and numerical investigations of scale-up effects on the hydrodynamics of slurry bubble columns, (2016), doi: [10.1016/j.cjche.2016.05.009](https://doi.org/10.1016/j.cjche.2016.05.009)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



2015-0276

Graphic Abstract**Fluid Dynamics and Transport Phenomena****Experimental and numerical investigations of scale-up effects on the hydrodynamics of slurry bubble columns***

Zhaoqi Li(李兆奇), Xiaoping Guan(管小平), Lijun Wang(王丽军)** , Youwei Cheng(成有为), and Xi Li(李希)
Department of Chemical and Biological Engineering, Zhejiang University, Hangzhou 310027, China

Article history:

Received 4 June 2015

Received in revised form 15 November 2015

Accepted 23 February 2016

* Supported by the National High Technology Research and Development Program of China (2011AA05A205) and the National Natural Science Foundation of China (U1162125, U1361112).

** Corresponding author. E-mail address: wang_lijun@zju.edu.cn

Abstract: Experiments and simulations were conducted for bubble columns with diameter of 0.2 m (180 mm i.d.), 0.5 m (476 mm i.d.) and 0.8 m (760 mm i.d.) at high superficial gas velocities (0.12-0.62 m·s⁻¹) and high solid concentrations (0-30 vol.%). Radial profiles of time-averaged gas holdup, axial liquid velocity, and turbulent kinetic energy were measured by using in-house developed conductivity probes and Pavlov tubes. Effects of column diameter, superficial gas velocity, and solid concentration were investigated in a wide range of operating conditions. Experimental results indicated that the average gas holdup remarkably increases with superficial gas velocity, and the radial profiles of investigated flow properties become steeper at high superficial gas velocities. The axial liquid velocities significantly increase with the growth of the column size, whereas the gas holdup was slightly affected. The presence of solid in bubble columns would inhibit the breakage of bubbles, which results in an increase in bubble rise velocity and a decrease in gas holdup, but time-averaged axial liquid velocities maintain almost the same as that of the hollow column. Furthermore, a 2-D axisymmetric k - ε model was used to simulate heterogeneous bubbly flow using commercial code FLUENT 6.2. The lateral lift force and the turbulent diffusion force were introduced for the determination of gas holdup profiles and the effects of solid concentration were

Download English Version:

<https://daneshyari.com/en/article/4764303>

Download Persian Version:

<https://daneshyari.com/article/4764303>

[Daneshyari.com](https://daneshyari.com)