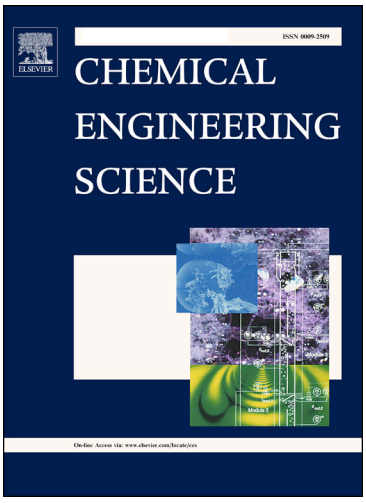

Assessment of the impact of bubble size modelling in CFD simulations of alternative bubble column configurations operating in the heterogeneous regime

Zibin Huang, Dale D. McClure, Geoffrey W. Barton, David F. Fletcher, John M. Kavanagh

PII: S0009-2509(18)30232-X
DOI: https://doi.org/10.1016/j.ces.2018.04.025
Reference: CES 14157

To appear in: *Chemical Engineering Science*

Received Date: 31 January 2018
Revised Date: 29 March 2018
Accepted Date: 13 April 2018

Please cite this article as: Z. Huang, D.D. McClure, G.W. Barton, D.F. Fletcher, J.M. Kavanagh, Assessment of the impact of bubble size modelling in CFD simulations of alternative bubble column configurations operating in the heterogeneous regime, *Chemical Engineering Science* (2018), doi: https://doi.org/10.1016/j.ces.2018.04.025

Assessment of the impact of bubble size modelling in CFD simulations of alternative bubble column configurations operating in the heterogeneous regime

Zibin Huang [a], *Dale D. McClure* [b], *Geoffrey W. Barton* [b],

David F. Fletcher[1 b] *and John M. Kavanagh* [b]

[a] State Key Laboratory of Chemical Engineering, East China University of Science and Technology, Shanghai 200237, P.R. China

[b] School of Chemical and Biomolecular Engineering, The University of Sydney, NSW 2006, Australia

Keywords: CFD, single bubble size models, MUSIG, bubble column, airlift column, churn turbulent flow

Abstract

Modelling bubble columns operating in the churn turbulent flow regime is a considerable challenge due to their complex and transient behaviour. A key modelling decision is how best to model the bubble size distribution, with a range of approaches existing from the relatively simple option of using a single, representative bubble size to more complex population balance approaches. In this comparative study, we have examined various approaches (i.e. constant and variable single bubble size models, dual bubble size models, and both homogenous and inhomogeneous MUSIG models). Model predictions were compared with experimental data from three different configurations of a pilot-scale column (0.39 m in diameter and 2 m in height) operated at industrially relevant superficial gas velocities of 0.16 and 0.25 m/s. The

[1] Corresponding author: Professor David F. Fletcher, (david.fletcher@sydney.edu.au, +61 2 9351 4147), School of Chemical and Biomolecular Engineering, Building J01, The University of Sydney, New South Wales, 2006, Australia.