

Accepted Manuscript

CFD simulation of gas-liquid-solid flow in slurry bubble columns with EMMS drag model

Rongtao Zhou, Ning Yang, Jinghai Li

PII: S0032-5910(16)30667-2
DOI: doi: [10.1016/j.powtec.2016.09.083](https://doi.org/10.1016/j.powtec.2016.09.083)
Reference: PTEC 11993

To appear in: *Powder Technology*

Received date: 8 June 2016
Revised date: 6 September 2016
Accepted date: 30 September 2016



Please cite this article as: Rongtao Zhou, Ning Yang, Jinghai Li, CFD simulation of gas-liquid-solid flow in slurry bubble columns with EMMS drag model, *Powder Technology* (2016), doi: [10.1016/j.powtec.2016.09.083](https://doi.org/10.1016/j.powtec.2016.09.083)

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.

CFD simulation of gas-liquid-solid flow in slurry bubble columns with EMMS drag model

Rongtao Zhou^{a,b}, Ning Yang^{a,*}, Jinghai Li^a

^a State Key Laboratory of Multiphase Complex Systems, Institute of Process Engineering,

Chinese Academy of Sciences, P.O. Box 353, Beijing 100190, P. R. China

^b University of Chinese Academy of Sciences, Beijing 100049, China

(*Corresponding Author's E-mail: nyang@ipe.ac.cn; Tel: +86-10-82544913;

Fax: +86-10-62558065)

Abstract

The drag models reflecting the complex phase interactions are of critical importance in the CFD simulation of gas-liquid or gas-liquid-solid flows. In this study, we demonstrate that the Dual-Bubble-Size (DBS) drag model based on the Energy-Minimization Multi-Scale (EMMS) concept, is capable of effectively predicting the distribution of gas holdup in slurry bubble columns. For solid-free or low solid loading systems, a thorough comparison of the DBS-Global and other drag models indicates that, without any fitting parameters, the DBS-Global drag model prediction on the radial distribution of gas holdup and solid hydrodynamics is in conformity with experiments over a wide range of superficial gas velocities. The three-fluid and two-fluid models are also compared in this work, indicating that the three-fluid model in combination with the DBS-Global drag model gives the best prediction. Previous experiments show that the effects of solid presence on hydrodynamics become pronounced at high solid loading conditions. The prediction of the original DBS-Global drag model deviates from the experiments at high solid loading conditions, and the solid effects need to be taken into account. This work then proposes a modified drag model for simulating three-phase systems at high solid concentration. The new model is capable of accurately predicting the local gas holdup for the systems of solid loading of 25% or 40%. Further fundamental study of the solid effect on the change of flow structure and dominant mechanisms in gas-liquid flow is required.

Keywords: Multiphase flow; CFD; Slurry bubble columns; EMMS; Drag; Meso-scale.

Download English Version:

<https://daneshyari.com/en/article/4910491>

Download Persian Version:

<https://daneshyari.com/article/4910491>

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