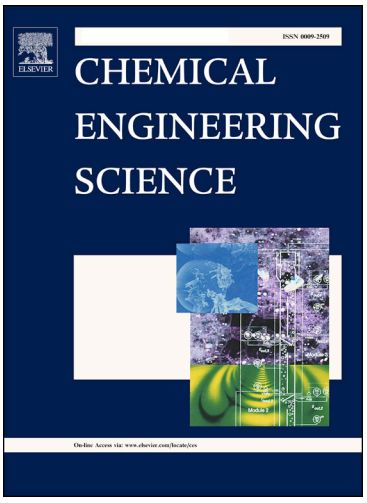

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PII: S0009-2509(18)30640-7
DOI: https://doi.org/10.1016/j.ces.2018.08.061
Reference: CES 14476

To appear in: *Chemical Engineering Science*

Received Date: 4 May 2018
Revised Date: 28 July 2018
Accepted Date: 31 August 2018

Please cite this article as: X. Li, D. Gao, B. Hou, X. Wang, A mass-conserving Lattice Boltzmann method for bubble behavior estimation, *Chemical Engineering Science* (2018), doi: https://doi.org/10.1016/j.ces.2018.08.061

A mass-conserving Lattice Boltzmann method for bubble behavior estimation

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Abstract

The Lattice Boltzmann Method (LBM) has been known as a promising approach for simulating the deformable moving interface of multiphase fluid phenomena due to its mesoscopic nature in organizing and executing distribution functions. However, LBMs are limited in simulating real gas-liquid bubbly flows, where the numerical inaccuracy and instability may significantly increase due to the high surface tension force and the large density ratio. In this paper, a mass-conserving LBM model is developed. The proposed model introduces a conserving correction step and an effective surface tension formula to improve physical accuracy, and utilizes a Multiple-Relaxation-Time (MRT) D3Q19 (three-dimensional and 19 discrete direction) operator to increase numerical stability. The proposed model was applied to estimate bubble behaviors, dimensionless parameter correlations, and drag force