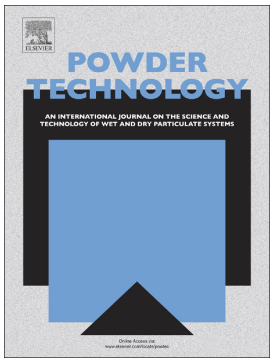

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PII: S0032-5910(18)30588-6
DOI: doi:10.1016/j.powtec.2018.07.090
Reference: PTEC 13572

To appear in: *Powder Technology*

Received date: 29 January 2018
Revised date: 18 July 2018
Accepted date: 24 July 2018

Please cite this article as: Xu Wang, Shuyan Wang, Ruichao Tian, Ruichen Wang, Lili Liu, Qiji Sun, Jiawei Fan , Numerical study on flow behavior of multi-component particles in a fluidized bed using a TFM-DEM hybrid model. Ptec (2018), doi:10.1016/j.powtec.2018.07.090

Numerical study on flow behavior of multi-component particles in a fluidized bed using a TFM-DEM hybrid model

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Abstract

Flow behaviors of multi-type particles are investigated by TFM-DEM hybrid model coupled with kinetic theory of granular flow in a gas-solids bubbling fluidized bed. The flow behaviors of different discrete particles and continuum solids phase are analyzed. The effects of drag models, coefficient of restitution and friction coefficient on the flow behavior are predicted. Simulated results reveal that the higher restitution coefficient and friction coefficient give rise to higher velocities and lower solids volume fractions. The Huilin-Gidaspow drag model provides a better correspondence with the experiments. The influence of Coulomb friction coefficient on hydrodynamics is considered to simulate the flow of discrete particles, and the simulated results with Coulomb friction coefficient are in better agreement with experiments, comparing to results without Coulomb friction coefficient.

Key words: Hybrid model; multi-component particles; drag force model; restitution coefficient; friction coefficient

1. Introduction

Fluidized beds are widely used in chemical, petroleum, and power generation industries [1-2]. The complex hydrodynamics of gas-solids fluidized beds have been studied by computational fluid dynamics (CFD) [3-6]. The mono-component particle flow is a simplified method in the numerical simulation, which ignores the different interactions of particles species, and lost complicated flow