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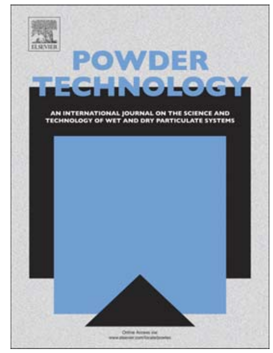

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Discrete Element Method for the Prediction of the Onset Velocity in a Spouted Bed

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Abstract

Spouted Bed Reactors (SBRs) are currently receiving a lot of attention due to their properties: thanks to the enhanced mass and energy transfer rates and the unique configuration of these reactors, solid particles can be handled with very high efficiency, making them suitable for several applications, such as biomass gasification. Spouted Bed Reactors can also give positive responses to the problem of segregation, which strongly compromises the efficiency of processes involving the handling of heterogeneous mixtures.

The aim of this work is to study the behaviour of a spouted bed facility, both experimentally and via simulations performed with the CFD program ANSYS FLUENT, in view of a possible employment of it to assess the scale up criteria or segregation phenomena in spouted beds. The solid phase is simulated enabling the DDPM-DEM model (Dense Discrete Phase Model - Discrete Element Method), commonly known as the Eulerian-Lagrangian approach. The influence of the following physical properties of the particles on the onset velocity was assessed: diameter, sphericity and density. The results of the simulations were compared with those obtained experimentally, for a single solid phase using three different types of inert material (glass, sand and PET) and also for a binary mixture. The model has been proved to be a useful tool to evaluate the performance and estimate the onset gas velocity of the spouted bed.

Keywords: computational fluid dynamics, discrete element method, Euler-Lagrange model, spouted bed, fluidization, ANSYS FLUENT

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