Numerical investigation on particle behavior in a bubbling fluidized bed with non-spherical particles using discrete hard sphere method

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Abstract

In this work, a hard sphere particle method for non-spherical particles is applied to study particle behaviors in a bubbling fluidized bed. The influence of the non-spherical particle method and the restitution coefficient are examined. The particle behavior, including the overall fluidization state (distributions of particle translational and rotational velocities, void fraction, etc.), bubble and particle fluctuations (particle and bubble granular temperatures), are studied. Specific variation rules which are difficult to measure experimentally are presented. As the bubble boundaries in the non-spherical particle system are not as clear as in the spherical case, there is a stronger fluctuation movement of bubbles, which also dominates the particle turbulent movement. The absolute values of particle translational and rotational velocities increase when the restitution coefficient decreases. And it affects the periodic fluctuation characteristics of gas-solid interactions. The variation rules for bubbles and particles as a function of the restitution coefficient are different.

Keywords: Non-spherical particle; Hard sphere method; Granular temperature; Particle behavior; Bubbling fluidized bed

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