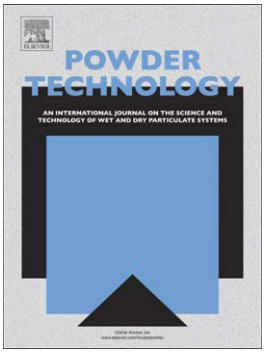

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Predictions of granular temperatures of particles in a flat bottomed spout bed

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Abstract: The configurational temperature and translational and rotational granular temperatures of particles are simulated using CFD-DEM in a flat bottomed spout bed. The distributions of velocity and volume fraction of particles are obtained in the bed. The translational and rotational granular temperatures are calculated from simulated instantaneous translational and angular velocities of particles. The statistical framework is proposed to define the configurational temperature or compactivity of particles in a flat bottomed spout bed. The configurational temperatures of particles are calculated from simulated instantaneous overlaps of particles. The configurational temperatures are larger at high solids volume fraction than that at low solids volume fractions. The simulated translational and rotational granular temperatures decrease with the increase of solids volume fractions. The predicted configurational temperatures are larger than that translational and rotational granular temperature, indicating that the rate of energy dissipation does contribute by deformation of elastic particles in a flat bottomed spout bed. The lower rotational granular temperature means the translational mechanism dominates the flow behaviors of particles. The influence of air jet velocity on granular temperatures and configurational temperature is analyzed. Increasing air jet velocity, the translational and rotational granular temperatures and configurational temperature are increased.

Keywords: DEM (Discrete Element Method); gas-solid flow; configurational temperature; translational granular temperature; rotational granular temperature; numerical simulation.