Particle-scale characteristics of the three distinct regions in the multi-chamber slot-rectangular spouted bed

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The particle-scale characteristics of the solid phase in the three distinct regions of the dual-column slot-rectangular spouted bed are studied, along with the effects of operating parameters and scaling up, via the computational fluid dynamics coupled with discrete element method (CFD-DEM). Results demonstrate that: (i) the spout-annulus interface expands from the bottom initially and then shrinks to a neck; (ii) the majority of the particles are in the annulus and the solid residence time (SRT) patterns are distinctly different in the three regions; (iii) the collision force is much larger than the fluid force, with the greatest magnitudes in the spout region and bed surface; (iv) significantly different solid dispersion patterns are observed among three directions; and (v) scaling up the capacity of the multi-chamber spouting system by horizontally aligning more chambers negligibly alters the flow pattern or the particle-scale information (e.g., SRT) during steady spouting.