

Experimental Study on the Mixing Process of Binary Mixtures in Three-dimensional Fluidized Beds Using Capacitance Probe

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Abstract

Measuring the particle mixing parameters at multi positions in three-dimensional fluidized beds continuously remains a challenging task. A novel measurement method for the mixing and segregation of particles inside three-dimensional fluidized beds is developed based on capacitance probe. The measurement error is generally below 7%. The particle mixing parameters and dispersion coefficients at multi-positions of the three-dimensional fluidized bed are acquired. The effect of convection and diffusion mechanism on particle mixing is discussed. Results show that the governing mechanism of particle mixing at center and top of the bed is convection; meanwhile the governing mechanism for particle mixing at bottom and near the wall is diffusion. The radial dispersion coefficient at half-radius of the bed is mainly between 0.0038 and 0.026 m²/s, which is about 1.5 times that near the wall. The axial dispersion coefficient is mainly between 0.004-0.056 m²/s, which is about 2.3 times that in radial direction.

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