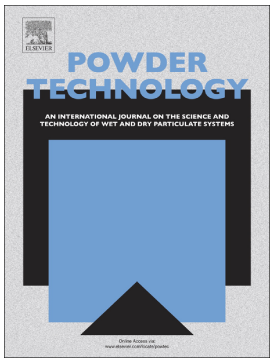

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Effect of adding Geldart group A particles on the collapse of fluidized bed of hydrophilic nanoparticles

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Abstract

Particle mixing is a cost-effective assisted fluidization technique that significantly enhances the fluidization hydrodynamics by eliminating bed nonhomogeneities, suppressing hysteresis, and promoting nanoparticle deagglomeration. The addition of Geldart group A particles, which have superior fluidization behavior, can improve the poor fluidization of ultrafine hydrophilic nanoparticles. In this study, we investigated the collapse behavior of fluidized beds to characterize the hydrodynamic effect of particle mixing. To this end, we carefully monitored the bed dynamics by recording the local and global pressure transients in addition to video recording the bed fall. Adding Geldart group A particles even at only 2.3 vol% substantially slowed the bed dynamics and promoted nanoparticle deagglomeration. Compared with previously reported models, the size of nanoparticle agglomerates in this study showed significant reduction as a result of particle mixing.

Keywords: Nanoparticles; fluidization; particle mixing; bed collapse; hydrodynamics; deagglomeration