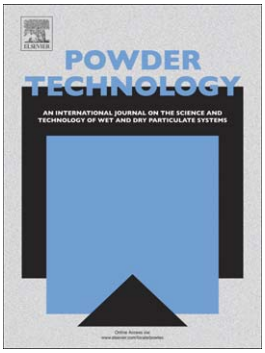

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Particle movements in near field induced by thick-wall effect in a dense gas-solid coaxial jet

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ABSTRACT

A particle entrainment phenomenon in the near field is observed in a dense gas-solid coaxial jet due to the thick-wall effect. Particle movements induced by annular gas backflow in the recirculation region are experimentally studied using high-speed digital photography. The experimental results reveal the tendency of the entrained particle velocity with annular gas velocity increasing and $Re_g = 2.9\times10^4$ is proposed to determine the emergence of the largest entrained particle velocity. An increase of nozzle wall thickness is proved to enhance the recirculation of annular gas stream and accelerate entrained particles to collide with the nozzle wall. Additionally, the particle mass flow rate has a slightly influence on the entrained particle velocity. In the particle entrainment phenomenon, interactions between gas and particles greatly depend on drag force of annular gas backflow on entrained particles. Base on the gas-solid dynamic model and the drag model modified by the wake effect, a correlation of the entrained particle velocity is proposed.

Keyword: entrained particle velocity, near field, thick-wall effect, drag force, gas-solid coaxial jets

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