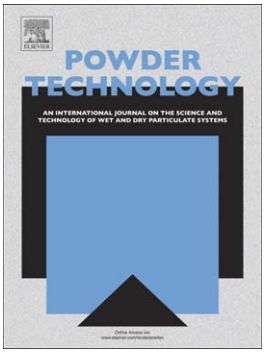

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Study of the particle motion induced by a vortex shaker

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Abstract The behaviour of a traced alumina particle lying on limestone powders with similar features has been studied in a test tube agitated by a vortex shaker aiming at studying dust emissions from powders. PEPT (Positron Emission Particle Tracking) was used for measuring the particle's position. Population densities were computed as the frequency of the particle's presence in different regions dividing the two horizontal axes and the vertical axis, respectively. The velocities of the particle were calculated by filtering out all displacements inferior to a critical distance d_{crit} so as not to consider spurious movements caused by experimental noise. After its validation, the methodology was applied to the standard condition of a vortex shaker experiment ($\omega = 1500$ rpm, 2 g of powder and open test tube). While the horizontal coordinates and velocity components follow a symetric distribution, the vertical coordinate is characterised by a large asymetrical plateau. The heights reached by the particle (up to 24.3 mm) are small in comparison to that of the test tube (150 mm). The greatest velocities are found near the inner wall of the test tube and at the highest heights where the population densities are the lowest. The median velocity of the particle is 0.0613 m.s^{-1} whereas its median kinetic energy is 8.4E-12 J. The method explicated in the present study is directly applicable to any other sets of data obtained through PEPT, especially if the system is of small dimension.

1. Introduction

One necessary condition for reaching a better theoretical understanding of dust emission in a tester is a good understanding of the detached particle's motion within the system. This prompted us to undertake the present work where the motion of a single particle has been followed in a test tube agitated by a vortex shaker for several hundreds of seconds. Dust aerosols are small solid particles, conventionally taken as those particles below 75 μm in diameter,

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