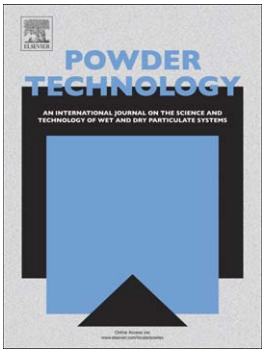

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Abstract

Today the modeling of the process dynamics and the complex two-phase flows in mills still remain a challenging task. In this study the dynamic comminution process in a fluidized bed opposed jet mill is investigated. For this purpose, well-defined model glass beads were ground in a lab-scale mill. The particle size distributions (PSDs) inside the mill and at the outlet, solid concentrations and the holdup of the mill were recorded. By comparing the morphology of the ground material with that of particles examined in single particle stressing experiments, we conclude that the predominant stressing mechanism in the mill is determined by a high number of low intensity stressing events. Furthermore, the grinding kinetics is strongly influenced by the solid holdup within the mill and the initial PSD of the feed material. A higher holdup leads to a higher product mass flow rate with slightly finer particles. The determined high solid concentration in the transport section of the mill indicates a high loading of the classifier which increases with the holdup. Our study shows that the internal recirculation is crucial for the overall performance of the mill:

Due to imperfect classification, particles accumulate inside the mill which is further enhanced by a high holdup of fine particles. Our results clearly show that the classification and transport processes must be studied in detail for any in-depth understanding of dry fine grinding in fluidized bed opposed jet mills.

Keywords: fine dry comminution, process dynamics, fluidized bed opposed jet mill, first order kinetics

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