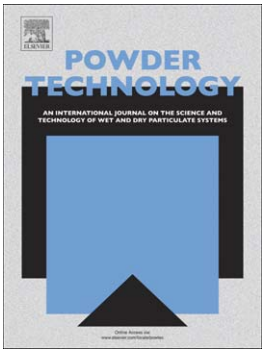

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CFD-PBE SIMULATION TO PREDICT PARTICLE GROWTH IN A FLUIDIZED BED MELT GRANULATION BATCH PROCESS

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ABSTRACT

The fluidized bed spray granulation process unites the steps of solid formation and product formulation in one apparatus and is used to produce granulate products out of a liquid. According to different applications of granules, a specific product particle size distribution is required. Thus, the ability to predict the development of the particle size distribution is crucial for process design, optimization and scale-up. For this reason, population balance equations can be solved where the knowledge of particle size-dependent growth rates are the important quantities, which are difficult to obtain by experiments.

Using a computational fluid dynamics multiphase model with one nozzle at its center, an advanced two-fluid model with five fluid phases is solved for short process times (~ s) considering a high local and temporal resolution of the granulation process (including fluid dynamics, drop deposition and energy equations) to evaluate size-dependent growth rates, as a function of the current state of the process. By transferring particle growth rates to population balance equations, the development of particle size distribution can be finally predicted for long process times (~ min).

The present work applies the predictive model to an industrial melt spray granulation process in batch mode. Experimental data show that this model could be implemented successfully.

Keywords: computational fluid dynamics; population balance equations; fluidized bed spray granulation; industrial scale; particle size-dependent growth rate.