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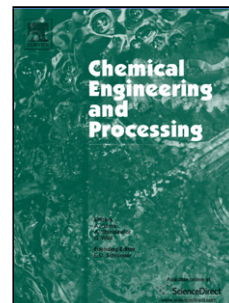
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Gas-solid fluidized beds in vortex chambers

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Abstract

This review deals with gas-solid fluidized beds in vortex chambers. High-G fluidization can be achieved in a static geometry and allows significant process intensification. Thin, dense and more uniform particle beds can be obtained at high gas-solid slip velocities, intensifying interfacial transfer of mass, heat and momentum and reducing the gas-solid contact time. Existing fluidized bed processes can be carried out more efficiently and novel processing routes can be developed, e.g. involving cohesive particles or a dispersed liquid phase in relatively high concentrations.

A first section of the review discusses the unique hydrodynamic characteristics of gas-solid fluidized beds in vortex chambers. The flow pattern, flexibility in the operating conditions and stability conditions are explained.

The design of vortex chambers is dealt with in a second section and is critical for processing both larger and fine particles. The influence of the gas and solids in- and outlet design is focused on and insight is gained from recent theoretical, experimental and CFD studies.

In a third section, (potential) applications are discussed and process intensification and novel processing routes demonstrated. A fourth and last section presents extensions of the concept. Multi-zone operation and the integration of other technologies in vortex chambers are considered.

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