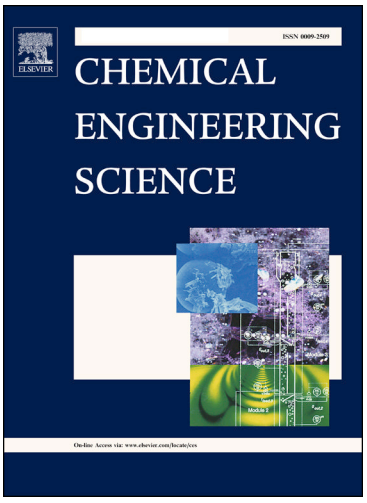

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Solids mixing in a shallow cross-flow bubbling fluidized bed

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Abstract

Gas-solid, gas-catalytic and physical applications in a fluidized bed require a strict control of the solids residence time and a limited back-mixing for a required conversion. Since conversion proceeds with residence time, this residence time and its distribution (RTD) are essential design parameters in fluidized bed modeling. The experiments of the present research investigate the use of a shallow cross-flow bubbling fluidized bed as reactor. A tracer stimulus response technique was used to determine the RTD, in a fluidized bed with and without internals.

Experimental results were compared with fittings from several models. Although a cascade of perfectly mixed reactors or a plug flow with dispersion model can be applied, the latter is preferred, and the dispersion parameter, expressed as Peclet number, exceeds ~25.

The results are moreover used in a test case design of hexane devolatilization from rice bran cake. With the RTD model of the horizontal fluidized bed, and with batch kinetic experiments, the size of the desolventizer can be designed on the basis of the required residence time. The superficial fluidization velocity applied is normally 3 to 4 times U_{mf}. A similar RTD-approach can be used for alternative physical processes (e.g. drying) and for chemical reactions (e.g. calcination of dolomite)