

Bed voidage characteristics of circulating fluidized beds

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Voidage plays an important role in defining the performance of a gas-solid fluidized bed. In this study, voidage of a dense bed has been investigated in a fluidized bed of 0.1 m I.D and 2.2 m height of plexi-glass equipped with 12 differential pressure transducers to measure axial pressure drop along the riser to measure axial voidage profile. Four different groups of particles (fluid catalytic cracking (FCC) catalyst, glass bead, particle A and particle C) were used as bed materials with variation of static bed height for each material. The effects of variables (gas velocity, particle properties and static bed height) were analyzed on axial voidage and pressure fluctuation along the riser. The axial voidage profile showed a typical trend, a dense bed in the lower part followed by a transition in the splash zone and a lean phase in the freeboard as height from the distributor increased. Bed expansion and dense bed voidage increased with an increase of gas velocity as usual. In case of fine particles fluidized with high gas velocities, the dense bed unusually formed at the return height of the entrained particles. The trend of bed voidage exhibits a good agreement with a model correlation of Choi et al. (1999).