Type Transition in Onset Condition of Turbulent Fluidization

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The next to the bubbling or slugging regime is called turbulent regime in gas fluidized beds as gas velocity increases. The turbulent regime is often realized to represent a dramatic breakdown of bubbling or slugging, and the predominance of bubble breakup over bubble coalescence.

Chehbouni et al. (1995) reported that the onset velocity of turbulent fluidization Uc decreased with an increase of temperature in the bed of FCC particles (Geldart's group A; 78 μm, 1450 kg/m3). However, the Uc increased with temperature for Geldart's group B particles. According to the study of Peeler et al. (1999) as temperature increased, the Uc decreased after an initial increase in the bed of sand particles (Geldart's type B; 130 μm, 4400 kg/m3) using N2 as fluidizing gas and decreased in the bed of alumina particles (Geldart's type A; 70 μm, 2800 kg/m3) using N2 or He as fluidizing gas. Choi et al. (2010) explained those complicated trends successfully with their model.

This study is to discuss the model of Choi et al. (2010) more. The type transition in onset condition of turbulent fluidization was found to occur at Archimedes number (Ar) 21.