Bubble characteristics in a dual circulating fluidized bed reactor using optical fiber probe

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Hydrodynamics of a bubbling fluidized bed in a dual circulating fluidized bed reactor are mainly affected by bubble properties. The bubble flow pattern in a bubbling fluidized bed plays an important parameter to govern the overall hydrodynamics. Effects of gas velocity to the riser (3.5–4.25 m/s), to the bubbling fluidized bed (0–0.3 m/s), and solid circulation rate (0–100 kg/m^{2}s) on the bubble characteristics (chord length, rising velocity, frequency and fraction) have been determined in a dual circulating fluidized bed reactor. Silica sand particle (d_p = 276μm, ρ_s = 2466 kg/m^3) was used as the bed material. The optical fiber probe and pressure fluctuation by the wavelet transform analysis were used to identify the bubble characteristics. The average bubble chord length and bubble rising velocity increase with the gas velocity and the bed height in the bubbling fluidized bed. Bubble frequency and fraction increase with the gas velocity and decrease with the bed height. With increasing solid circulation rate, the bubble rising velocity decreases due to the increasing downward solid flow. The pressure fluctuations were analyzed by the wavelet transform to compliment the determination of bubble properties by the optical fiber probe.