Radial gas mixing in a riser of circulating fluidized bed

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Gas mixing characteristics should be determined to predict conversions and selectivities of chemical reactions in fluuidized bed reactors. In a circulating fluidized bed, gas concentration profiles of the core region are different from those of the wall region in the bed. Thus, the degree of chemical conversion depends on gas exchange rate between these two regions. In the present study, the effects of gas velocity (1.5-3.4 m/s) and solid circulation rate (0-170 kg/m^{2}s) on the radial gas mixing coefficients (D_r) of gas dispersion between the core and wall regions were determined in a circulating fluidized bed (5 cm-i.d. × 6.7 m-high). Helium gas as a tracer was steadily injected into the center of the riser and the collected gas from the sampling probes were measured by a gas chromatograph with TCD detector. Based on the core-annulus model, the gas dispersion is predominant in the core region when solid circulation. Also, the radial gas mixing coefficient increases with increasing solid circulation rate (G_s) and decreases with increasing gas velocity (U_g) in the riser. The radial dispersion coefficients in the present and previous studies have been correlated based on the isotropic turbulence theory.