Enhancement of Oxygen Transfer in Three-Phase Swirling Fluidized Beds

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Characteristics of oxygen transfer have been investigated in the riser of a three-phase swirling fluidized bed, whose diameter is 0.102 m (ID) and 3.5 m in height. It is understood that the information on the oxygen transfer have been recognized as one of the essential factors for the design, scale up and operation of the environmental and biochemical reactors or contactors employing the three-phase fluidized beds. Effects of gas (0.01-0.09 m/s) and liquid (0.035-0.172 m/s) velocities, particle size (1.7-6.0 mm) and swirling ratio(0-0.5) on the oxygen transfer coefficient in the bed have been examined. A glass bead whose density is 2,500 kg/m3, compressed filtered air and tap water were used as a fluidized solid particle, gas phase and tap water, respectively. The dissolved oxygen concentrations in the liquid samples, drawn from six axial locations by means of solenoid valve were measured with a dissolved oxygen meter(Do meter). Recycled liquid from the separator at the top of the bed was fed to the purge tank were the dissolved oxygen in the liquid was desorbed by pure compressed nitrogen gas. The oxygen transfer coefficient has been well correlated in terms of dimensionless groups within these experimental conditions.