

Effect of particles on hydrodynamics and mass transfer in a slurry bubble column: Correlation of experimental data

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Abstract

The effects of particle concentration and size on hydrodynamics and mass transport in a slurry bubble column were experimentally studied. With increasing particle concentration, the averaged gas holdup, gas holdup of small bubbles and gas-liquid volumetric mass transfer coefficient decreased, while the gas holdup of large bubbles increased slightly. With increasing particle size, the averaged gas holdup and k_{La} remained unchanged when the particle size increased from 55 to 92 μm , but decreased significantly when the particle size was further increased to 206 μm . A liquid turbulence attenuation model which could quantitatively describe the effects of particle concentration and size was first proposed. Semi-empirical correlations were obtained based on extensive experimental data in a wide range of operating conditions and corrected liquid properties. The gas holdup and mass transfer coefficient calculated by the correlations agreed with the experimental data from both two-phase and three-phase bubble columns

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