

Summary

The solid suspended - bubble columns are widely used as a three-phase slurry reactor in industrial chemical processes.

In the column of liquid-solid batch operation, the liquid is a fluidizing medium and the solid particles are suspended by bubble agitation. To design such a column, two main variables should be taken in consideration, the gas-hold-up (ϵ_g) and liquid phase mass transfer coefficient (K_{La}).

The present study includes the effect of gas velocity, column dimensions, liquid-phase properties, solid-particles concentration and the static liquid height on both (ϵ_g) and (K_{La}).

It was found that increasing gas velocity will increase both (ϵ_g) and (K_{La}), but increasing the solid particles concentration, static liquid height, viscosity and surface tension of liquid phase will reduce both (ϵ_g) and (K_{La}).

Empirical correlations were found for (ϵ_g) and (K_{La}) in case of presence or absence of solid particles by changing correlations found by Koid and for $U_g < 0.1$ m/sec.

$$\frac{\epsilon_g}{(1-\epsilon_g)^4} = A * \left[\frac{U_g \cdot \mu_L}{\sigma_L} \right]^{0.92} \left[\frac{g \cdot \mu_L^4}{\rho_L \cdot \sigma_L^3} \right]^{-0.22} \text{ without solid - particles}$$