

## Improvement of solid particle dispersion in a shaking vessel with pole

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The high shear stress around the agitated impeller is no good for the cell culture in stirred bioreactors. To Improvement of solid particle dispersion in a shaking vessel, we have reported that the shake mixing can avoid the high shear stress in the reactor. The shear stress increases with increasing shaking speed. Therefore we developed a method to decrease the critical circulating frequency without reducing the advantage of low shear stress. The main aim of our work was the improvement of particle dispersions in shaking vessel for application to bioreactors for plant cells. A cone is usually installed at the vessel bottom to improve particle dispersion in impeller mixing. The mass transfer between suspended particles and liquid is one of the most important factors in chemical and biochemical processes. Center pole which is referred to as a "pole" was fitted at the axis of the shaking vessel, and its effects on particle dispersion, power consumption, and the solid-liquid mass transfer coefficient were examined experimentally. The optimal diameter of current Pole is about one-fourth of the vessel diameter, regardless of the insert length from the free surface.