Environmental Engineering and Management Journal

May/June 2008, Vol.7, No.3, 217-225
http://omicron.ch.tuiasi.ro/EEMJ/

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TRIPHASIC EXTERNAL-LOOP AIRLIFT REACTORS. HYDRODYNAMIC AND DISPERSION STUDIES

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Abstract

Considering that three-phase dispersions are common in chemical engineering and biotechnology, and with increasing airlift reactor applications to chemical and biotechnological processes, a experimental study was undertaken in order to investigate the liquid phase hydrodynamics and dispersion in an external-loop airlift reactor on laboratory scale.
Experiments were conducted in order to find a relationship between relevant hydrodynamic and mixing parameters of a solid-suspended external-loop airlift reactor of laboratory scale, and operating variables such as gas velocity, solids loading and solids density, which should be the basis for extending the study to larger scale contactors. It was found that these parameters affect the hydrodynamic characteristics of the investigated external-loop airlift reactor and empirical correlations for gas holdup and liquid circulation velocity were obtained as functions on the above-mentioned operating variables. The lateral and axial mixing of dispersed particles in a circulating fluidized bed were measured by using the phosphor tracer technique. The dispersion model satisfactorily described the measured residence time distribution.

Keywords: airlift, Bodenstein number, external-loop, hydrodynamics, liquid circulation, gas hold-up, solid loading, axial mixing

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