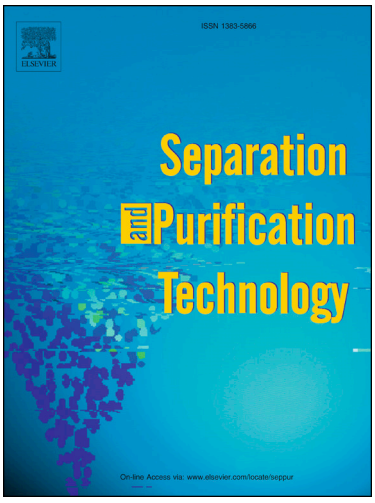

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Hydrodynamic Study of Three-phase Flow in Column Flotation using Electrical Resistance Tomography Coupled with Pressure Transducers

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Abstract

Bubble size distribution, bubble rise velocity, gas and solids hold-up are the extensively used hydrodynamic parameters apart from floatability data for column flotation design and performance evaluation. In the current work, the combined solids and gas hold-up distribution characteristics are studied using non-intrusive electrical resistance tomography (ERT) coupled with pressure transducers (PT) in a laboratory column flotation. The effect of superficial gas velocity, slurry feed flow rate and slurry height in the column on mean gas hold-up, combined solids-gas hold-up and its radial distribution is analysed for both two-phase and three phase slurry systems. Slurry experiments are conducted for three different solids concentrations. Using the modified sensitivity back projection (MSBP) algorithm the measured raw voltage data has been reconstructed into conductivity data and thereby estimating the equivalent phase concentration values by adopting Maxwell principle.. Mean gas and solids hold-ups extracted from ERT have been critically assessed for the column operating in various flow regimes. The ERT measured mean gas hold-up and solids hold-up values are in close agreement with the data estimated from pressure difference measurements. The results show an increment in the gas hold-up with an increase in the superficial gas velocity, whereas solids hold-up distribution is almost homogeneous for high gas velocities. The gas hold-up reduces with solids content at the fixed gas and slurry flowrates. The presence of solids render the bubble rise velocity thereby decreases the local gas hold-up with the solids percent. Further feed slurry flow rate and frother dosage effects on column hydrodynamics have been studied and the change in the phase hold-ups is quantified.

Keywords

Column Flotation, Hold-up, Electrical Resistance Tomography, Multi-phase flow, Hydrodynamics