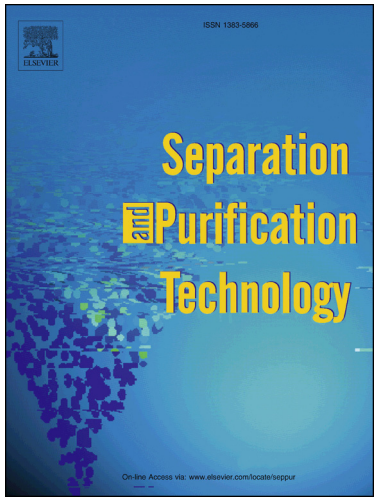

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Hydrodynamic study of two phase flow of Column Flotation using Electrical Resistance Tomography and Pressure Probe techniques

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Abstract

Gas dispersion characteristics are very important to design and selection of flotation process for the fine particle separation. Although the separation of flotation process heavily depends on hydrophobicity of given solid particles, but their rate of attachment and detachment depends on local gas dispersion characteristics. In this work, gas dispersion characteristics in a 100 mm laboratory column flotation have been investigated by exploring the flow behavior in terms of the local and mean gas hold-up, bubble rise velocity and bubble size distribution across the column. This experimental data has been used to demonstrate the validation of the two-fluid CFD model predictions in the column flotation. The column hydrodynamics are estimated by using high speed dual plane Electrical Resistance Tomography (ERT) system and pressure transducers. In all the experiments, water is used as the liquid phase and air (bubbles) as the disperse phase. Using the ERT system, measurement of two phase distributions are examined for a wide range of design and operating conditions of the column including different spargers and frother dosage, where the flow changes from homogenous to transition bubbly flow. It is confirmed by ERT that the gas-holdup increases with an increase in the sparger porosity, air superficial velocity, liquid height and liquid feed flow rate. To test the reliability of ERT measurements, simultaneously a set of pressure transducers is used to obtain the sectional average gas holdup and validated. It is observed that bubble density occupancy is more at center region of the column and gas holdup value increases with the increase of gas superficial velocity. Dynamic gas disengagement technique is utilized to measure bubble rise velocity and sauter mean bubble diameter. At end this ERT data has been used to validate two-fluid CFD model (modified with suitable drag and lift forces via user defined functions) predictions in the column and found a close agreement.

Keywords: Gas hold-up, Column flotation, Electrical resistance tomography, Image processing, Pressure transducers