Bubble holdup structure in a bubble column with external liquid circulation

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Bubble holdup structure was examined in a bubble column with external liquid circulation. For the first time, three kinds of holdups of bubbles such as large, small and fine bubbles in bubble column with external liquid circulation were classified by employing the static pressure drop (SPD) and dynamic gas disengagement (DGD) methods simultaneously. Effects of gas (U_G) and liquid (U_L) velocities on the three kinds of bubbles were determined. A sudden change of pressure drop fluctuations during the elapsed time in the gas disengaging state was one of criteria to discriminate between the fine and the small bubble holdups. The holdups of fine and small bubbles increased with increasing U_G and U_L, while the holdup of large bubbles increased increasing U_G bet decreased with increasing U_L. The values of three kinds of bubble holdups were correlated in terms of operating variables.