ABSTRACT

Gas holdup, solids accumulation, and backmixing were studied in a tall, cold-flow bubble column in support of the design of the dissolver for the SRC-II Demonstration Plant. Both two and three-phase systems were examined to determine the effect of liquid/slurry and gas superficial velocities, solids concentration, solids particle size, liquid surface tension, and the presence of a solids withdrawal system on gas holdup. It was found that: (1) gas holdup was nearly independent of variations in liquid/slurry superficial velocity and the presence of a solids withdrawal system, (2) gas holdup varied significantly with changes in liquid surface tension, and (3) the variation of gas holdup with gas superficial velocity follows that predicted by existing correlations in the literature.

Solids accumulation of large particles was simulated and examined as a function of gas and slurry superficial velocity. It was found that both gas and slurry velocity had an influence on the tendency of solids to accumulate, the latter having the strongest effect.

Qualitative tests are performed to characterize the degree of backmixing using a methyl-orange dye tracer. It was concluded that backmixing in the column may not be as high as predicted by existing correlations. Additional tests to quantify the level of backmixing are necessary to establish correlations for use in scale-up.