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Gas-liquid two-phase flows in an upward square pipe with sudden expansion[1] YEWON KIM, HYUNGMIN PARK, Seoul National University — The bubble dynamics and consequent changes in the liquid-phase flow characteristics in an upward bubbly square pipe with sudden expansion (expansion ratio of 2.0) are experimentally studied in this work. The experiments are conducted under two Reynolds numbers of 600 (laminar) and 6600 (turbulent), respectively, based on the inlet bulk velocities of the single-phase (without bubbles) flow. The mean volume void fraction and averaged bubble size considered are 1% and 3.5 mm, respectively, and we use the high-speed two-phase particle image velocimetry and the shadowgraphy to measure the gas and liquid phases simultaneously. In addition, the particle tracking velocimetry is performed using two cameras to track the three-dimensional paths of each bubble. It is observed that lateral void fraction distribution change to core peak from wall peak after sudden expansion and peak at near the wall again after 3 times of inlet pipe width. Also, the reattachment length in the two-phase flow decreases compared to that of a single-phase flow, while smaller bubbles tend to migrate into the recirculation region and being trapped. Further discussions on the turbulence statistics and Reynolds number effects will be given.

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Hyungmin Park
Seoul National University

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