A visualized investigation of bubble breakup in a swirl-venturi bubble generator

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Abstract

The dynamics and breakup of bubbles in swirl-venturi bubble generator (SVBG) are explored in this work. The three-dimensional movement process and breakup phenomena of bubbles are captured by one high-speed camera system with two cameras while the distribution of swirling flow field are recorded through Particle Image Velocimetry technology. It is revealed that bubbles have two motion trajectories, which are deeply related to bubble breakup. One trajectory is that mother bubble moves upward in an axial direction of the SVBG to the diverging section, and the other trajectory is that mother bubble rotates obliquely upward to another side-wall along the radial direction. Meanwhile, binary breakup, shear-off-induced breakup, static erosive breakup and dynamic erosive breakup are observed. For relatively high liquid Reynolds number, vortex flow regions are extended and the bubble size is reduced. Furthermore, it is worth noting that the number of microbubbles increases significantly for intensive swirling flow.

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