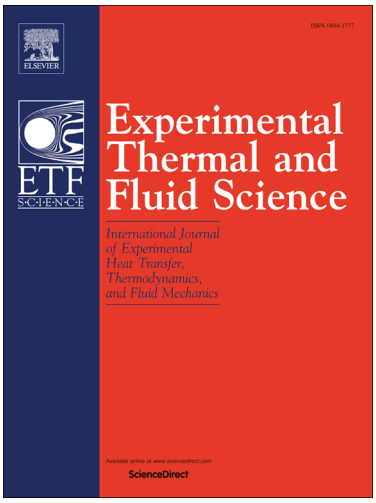

Experimental study on the bubble breakage in a stirred tank Part 2: Local dependence of breakage events

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Experimental study on the bubble breakage in a stirred tank Part 2: Local dependence of breakage events

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Abstract

Experimental observation of the local breakage behavior of a single bubble injected in different locations in a stirred tank was carried out using high speed imaging method. The bubble was injected in six positions located at different radial and tangential distances from a Rushton turbine impeller. The effect of relative location from the impeller on the breakage probability and the number of daughter bubbles (fragments) was investigated and discussed. The effect of power input (or Reynolds number) and mother bubble size on the breakage events for each injection position was studied. Trajectories of the bubbles were analyzed and quantified. It was found that the breakage probability and the number of produced daughter bubbles were large close to the impeller but decreases sharply when injecting the bubble away from the impeller, i.e. at r/R= 0.64 (where r is the distance from the impeller center and R is the tank's radius) or more from the impeller blade. The presence of baffles affected the breakage probability and the number of daughter bubbles in the regions around them. The breakage events were observed to occur in different sub-regions between the impeller and the wall after the bubble had exhibited different degrees of local deformation. For low Re, most of the bubbles injected close to the impeller were found to approach the impeller and then get pushed toward the tank's wall by the flow current ejected from the blades tip. For high Re, a considerable percentage of bubbles were found to be driven into the impeller by highly rotating flow currents and turbulent eddies. This led to an increase in the breakage probability in the impeller vicinity.

Keywords: bubble, breakage, local, stirred tank, trajectory.