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Bubble dynamics in a micro-channel with a virtual check valve[1]
ROU CHEN, LIKUN ZHU, HUIDAN (WHITNEY) YU, Mechanical Engineering Department, Indiana University-Purdue University Indianapolis — Bubble dynamics plays a critical role in the design of a self-circulation and self-regulation gas generator with little or zero parasitic power consumption (Zhu *et al*, Microfluidics and Nanofluidics, 2011). We numerically study bubble dynamics in the micro-channel with a virtual check valve using lattice Boltzmann method. The lattice Boltzmann model has been validated through several static cases with a bubble sitting inside a liquid and on a solid surface with a triple contact among bubble, liquid, and solid. In this work, we simulate bubble transport driven via unbalanced capillary forces. Focus will be on the bubble merging phenomena between the moving bubble and a static bubble prior siting downstream in the channel with same and different sizes. By varying the size of the check valve, we study the effects of channel ratio between the check valve and channel on the dynamics of bubble-driven liquid circulation and seek for an optimal channel ratio to support experimental design.

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