Numerical model for single film bubble with double liquid-gas interfaces by particle methods

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ABSTRACT

Single-film bubble in the air/gas has a special geometry that a very thin layer of liquid film infolds a certain quantity of gas under the surface tension which acts both on the inside and outside of the bubble surface. Conventional surface tension model cannot calculate this phenomenon directly since the two liquid-gas interfaces are too close to each other.

In this paper, a meshless moving particle semi-implicit method (MPS) was used to propose the surface tension model for the double liquid-gas interfaces condition. The surface tension force on the inside and outside liquid-gas interfaces were calculated respectively by surface free energy model. Special hypotheses and treatments were introduced according to the differences between these two interfaces. A high density ratio interface smoothing function was established to improve the convergence property of the model. The oscillation of square single liquid film bubbles has been calculated and relative behaviours of the single liquid film bubble were studied and analyzed.

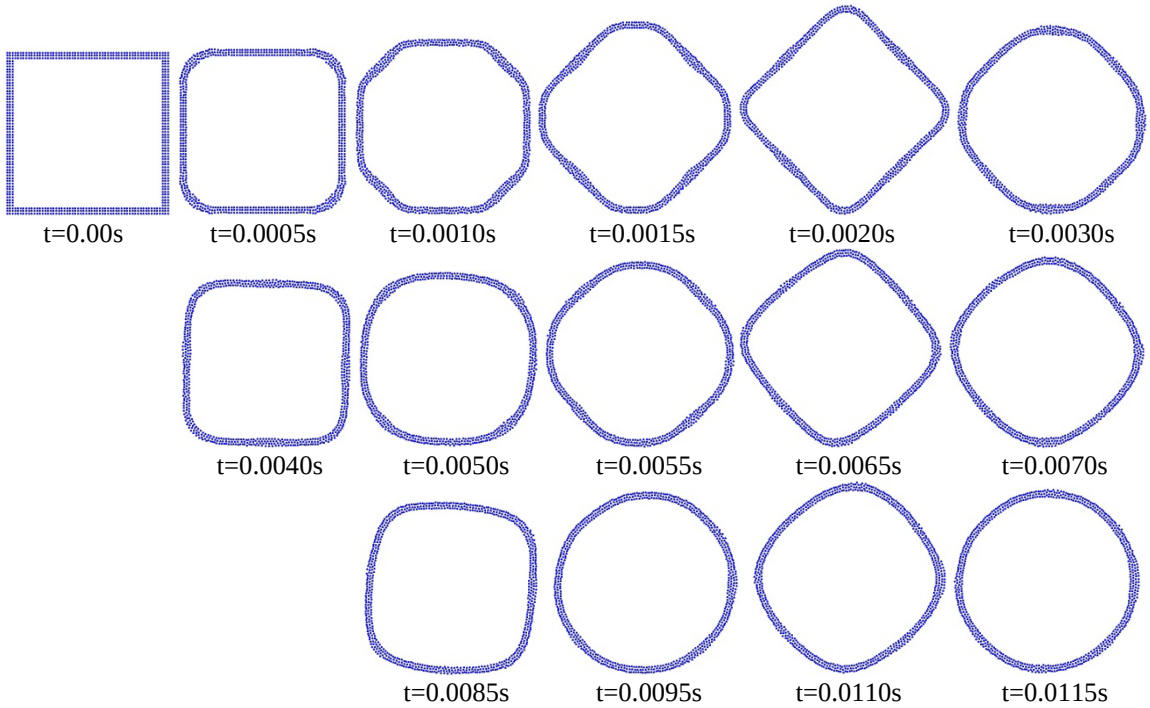

Fig.1 The oscillation of square single film bubble by surface tension in 2 dimensions

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