

A NEW FORMULATION OF BUBBLE DYNAMICS FOR SONOLUMMESCENCE

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A new model of bubble dynamics is constructed for the study of the recently discovered singlebubble sonoluminescence (SBSL)¹⁾. In the model, effect of non-equilibrium evaporation and condensation at bubble wall and that of thermal conduction both inside and outside a bubble are taken into account^{2,3)}. Numerical calculations are performed under a condition of SBSL and that of non-light-emission. The most important point in this study is the calculation including the effect of non-equilibrium evaporation and condensation at bubble wall for the first time in the studies of SBSL. The results reveal that the effect is considerable on bubble dynamics. It is clarified that the partial pressure of water vapor in a bubble differs considerably from the saturated vapor pressure at collapses of the bubble. It is also clarified that the liquid temperature at bubble wall increases considerably at collapses due to the thermal conduction and the latent heat of intense condensation³⁾. It means that chemical reactions take place not only inside a bubble but also outside a bubble. Rates of chemical reactions in a bubble are also numerically calculated including the effect⁴⁾. The results of this study are also important in the study of sonochemistry.

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