# EFFECTS OF SOLUTION VISCOSITY ON THE GROWTH RATE OF OVERCRITICAL GAS BUBBLES

**E.V. Aksenova**[1], **A.K. Shchekin**[1], **A.E. Kuchma**[1]

[1]*Saint Petersburg State University, Saint Petersburg, Russia*
*e.aksenova@spbu.ru, www.spbu.ru*

An analytical and numerical study of diffusion growth of overcritical gas bubbles at degassing of the supersaturated-by-gas solution with the explicit full-scale influence of viscous forces on internal pressure in the bubbles has been presented. At degassing of supersaturated-by-gas solution, we need to describe not only the dependence of the gas bubble growth rate on the bubble radius and gas supersaturation, but also control how the capillary and viscous effects change the concentration profile of the dissolved gas in supersaturated liquid solution around the growing bubble [1]. Using the approach, presented in [2] we have found how the growth rate of overcritical bubbles depends on gas supersaturation, its diffusivity and solubility in solution, solution viscosity, and surface tension at bubble surface.

We have derived analytical formulas for the bubble growth rate and the correction function (which takes into account the balance in the number of gas molecules that have left the liquid solution and came into the growing bubble) of small overcritical gas bubbles at strong viscosity of the solution and full account of capillary pressure in the bubbles as a function of the bubble radius. We have found the asymptotic formulas for the case of low viscosity and small radius. Finally, we obtained the formulas for the bubble growth rate and the correction function at large overcritical radius.

We numerically evaluated the effects of viscous forces on the rate of gas bubble growth at any radius of the overcritical bubble within the wide range of viscosities of the supersaturated-by-gas solution and confirm all the asymptotic analytical results.

## References

[1] C.E. Brennen *Cavitation and Bubble Dynamics*. University Press, Oxford, (1995).