

Title: Growth or dissolution of surface nanobubble in competition with other nanobubbles

Abstract:

The growth or dissolution of a surface nanobubble in the presence of other nanobubble on a chemical heterogenous surface is studied by Molecular Dynamics (MD) simulations of binary mixtures consisting of Lennard-Jones (LJ) particles. Our simulations show that one surface nanobubble grows at the expense of other nanobubble, which is very similar to the behaviour observed during crystallisation, also known as Ostwald ripening. Surprisingly, the rate of growth of a nanobubble (or the rate of dissolution of other nanobubble) is much faster than the diffusive time scale of the gas particles in the bulk liquid. It has been found that, the faster growth rate is attributed to the diffusivity of gas particles near the surface which is much larger than the diffusivity of gas particles in the bulk liquid. We have performed simulations at various pressures and the rate of growth of surface nanobubble is found to be directly correlated with the diffusivity of gas particles near the surface.