Nanobubble: Generation and Applications

Lin, Bo-Han

This study provides a low-cost and high-yield method for fabricating nanosized gas bubbles. By purging pure nitrogen gas into de-ionized (DI) water together with a sonication treatment, I successfully fabricate gas bubbles having a radius as small as 23 nm that last for a considerably long period in solution. A long lifetime for the nanobubbles makes applications possible. Surprisingly, the treatment period of sonication acts as the key parameter in providing the environment in solution for best supporting a specific size of nanobubbles. In other words, I find that sonication time can be used as the key parameter for controlling the size of the nano-bubbles generated in the solution. Dynamical correlation coefficient from light scattering is calculated to extract the mean size and uniformity of the nanobubbles in the solution. Nano-bubbles having a mean radius as small as 23 nm are generated in DI water after nitrogen purging for 20 minutes followed by sonication for 30 minutes. Surprisingly, incorporation of NBs dramatically increases the effective refractive index of the solution. And when a denser solution diffuses to a lighter solution, the presence of NBs in a lighter solution will slow down the diffusion coefficient as large as 40%. Moreover, NBs also increase the efficiency of solution flowing into hair follicles and the interior of the pig skin for further applications.

Awards Won:
Second Award of $2,000