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Stability of gas supersaturation in water: Implication of the existence of bulk nanobubbles? TATSUYA YAMASHITA, KEITA ANDO, Department of Mechanical Engineering, Keio University — While nanobubbles sitting at solid surfaces are well known to exist for hours or even days, the existence of nanobubbles in the bulk of water is yet under discussion. However, recent molecular dynamics simulations suggest that the thermodynamic stability of bulk nanobubbles can possibly be supported by gas supersaturation in the liquid phase by having bubbles closely populated. Here, we demonstrate the production of supersaturated water by a commercial fine bubble generator. Micron and submicron bubbles are continuously injected in the system of tap water circulation for the water to be gas saturated through bubble dissolution. Dissolved oxygen measurements show gas supersaturation in the water which stays for a couple of days. To further support this observation, we examine the diffusion driven growth of millimeter-sized gas bubbles nucleated at glass surfaces. The growth rate is found to agree with the (extended) theory of Epstein and Plesset, meaning that the water is indeed supersaturated with gases. We speculate that a large number of nanobubbles in the bulk or attached at the surface of floating particles may possibly exist in the supersaturated tap water.

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