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Bubble growth as a means to measure dissolved nitrogen concentration in aerated water[1] KEITA ANDO, TATSUYA YAMASHITA, Keio University — Controlling the amount of dissolved gases in water is important, for example, to food processing; it is essential to quantitatively evaluate dissolved gas concentration. The concentration of dissolved oxygen (DO) can be measured by commercial DO meters, but that of dissolved nitrogen (DN) cannot be obtained easily. Here, we propose a means to measure DN concentration based on Epstein-Plesset-type analysis of bubble growth under dissolved gas supersaturation. DO supersaturation in water is produced by oxygen microbubble aeration. The diffusion-driven growth of bubbles nucleated at glass surfaces in contact with the aerated water is first observed. The observed growth is then compared to the extended Epstein-Plesset theory that considers Fick's mass transfer of both DO and DN across bubble interfaces; in this comparison, the unknown DN concentration is treated as a fitting parameter. Comparisons between the experiment and the theory suggest, as expected, that DN can be effectively purged by oxygen microbubble aeration.

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