**Bulk Nanobubble Generation from Laser Heated Gold-Nanoparticles**

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**Abstract**

In the past decades, there has been a surge in claims supporting the existence of stable nano-sized gaseous domains in bulk liquids. However, they remain controversial due to the lack of objective evidence confirming their gaseous nature. The majority of studies rely on laser scattering techniques such as Dynamic Light Scattering (DLS) and Nanoparticle Tracking Analysis (NTA) for measuring the size distribution and number density of nanobubbles. However, these techniques are limited in their ability to differentiate between gaseous nanobubbles and other light-scattering entities such as nanoparticles or nanodroplets. This limitation raises concerns about the reliability of these techniques in detecting nanobubbles.

Rosselló and Ohl (2021, 2023) have proposed a new method for generating and detecting nanobubbles using collimated pulsed-laser illumination followed by a tension wave-induced expansion. This approach provides an unambiguous way to confirm the gaseous nature of nanobubbles. There is currently no good understanding how the bubbles are generated, and how to stabilize them. The hypotheses of heating of contamination in the liquid is tested by adding well controlled concentrations of light absorbing nanoscale particles and counting the increase nanobubbles. The laser energy is related to the number of nanobubbles generated. Interestingly, the rarefaction wave amplitude has very little effect on the number of detected bubbles. Additionally, we report on the effect of size of nanoparticles on the resulting nanobubble size.

[J. M. Rosselló and C.-D. Ohl. “On-Demand Bulk Nanobubble Generation through Pulsed Laser Illumination”. Physical Review Letters 127, 044502 (4 2021).](https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.127.044502)

J. M. Rosselló and C.-D. Ohl. “Clean production and characterization of nanobubbles using laser energy deposition”. Ultrasonics Sonochemistry. 94. 106321 (2023).