

Application News

Nano Particle Size Analyzer: SALD-7101

No. 6

Size Measurement of Microbubbles and Nanobubbles – 2

Although referred to as microbubbles and nanobubbles, such bubbles are basically gas bubbles that are present in a liquid. Moreover, as air bubbles are almost always present in water, if these microbubbles and nanobubbles demonstrate any sort of effect, it can be attributed to their small size, with the bubble diameter being the most important characteristic.

When microbubbles and nanobubbles are to be used in such applications as water purification and for cleaning of electronic components, continuous generation of large quantities of bubbles is required, and therefore, bubble generators are used.

Bubble diameter is dependent on several factors, such as liquid and gas flow rate, pressure, as well as temperature, and to obtain the maximum effect, it is necessary to adjust the bubble generator to control the bubble diameter at the desired level. For this reason, bubble diameter measurement or monitoring must be conducted.

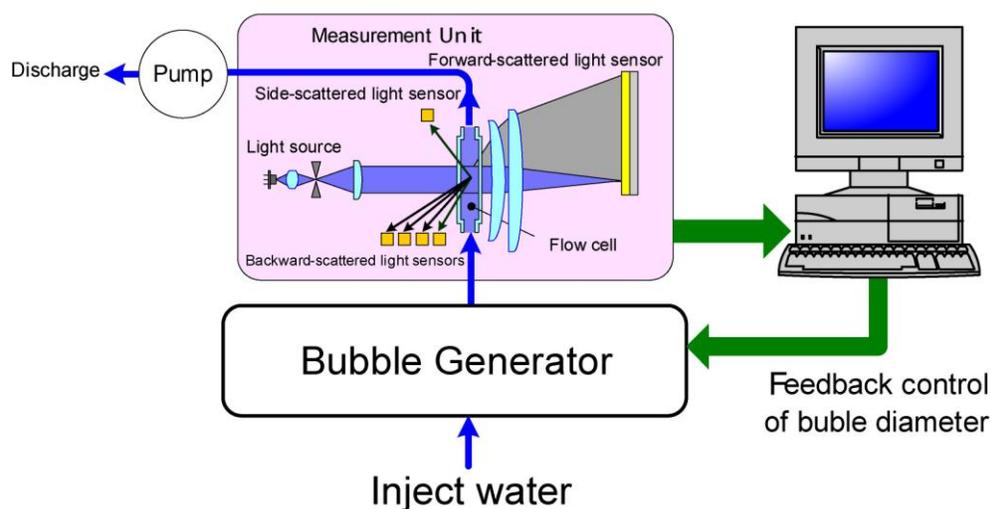


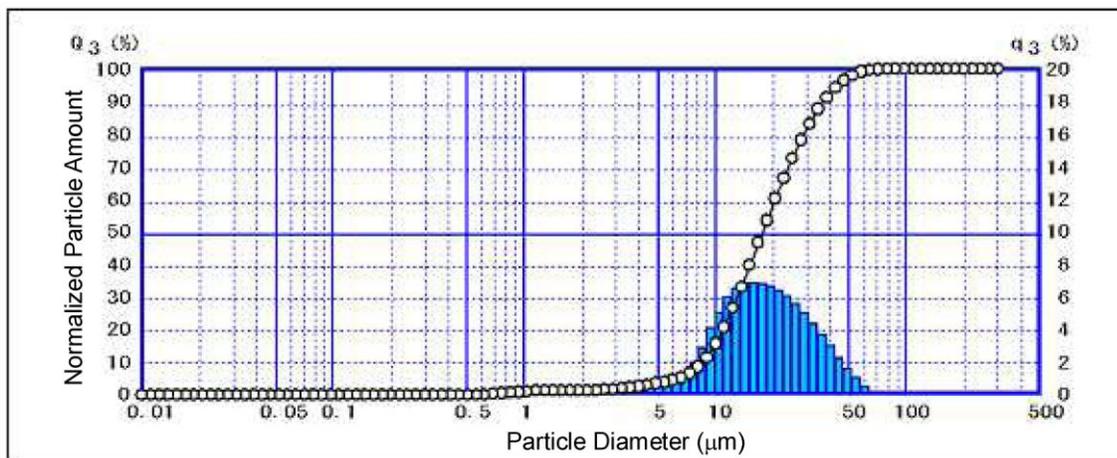
Figure 1: Flow Cell Connected to Bubble Generator for Measurement and Feedback Control of Bubble Diameter

Using the SALD-7101, the flow cell and bubble generator can be directly connected to the instrument to allow online, real-time bubble diameter measurement of generated microbubbles and nanobubbles, which allows the possibility of obtaining bubble diameter feedback.

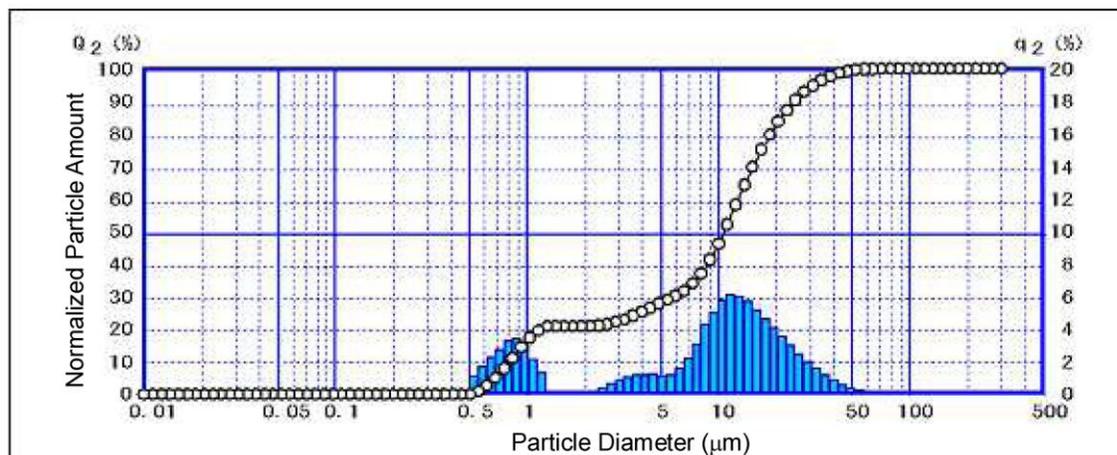
Figure 2 shows the bubble diameter measurement results of bubbles actually generated by the bubble generator. The figure shows the results in three different displays, that is, the same results are displayed according to the volume dimension, the area dimension and the number dimension, respectively.

Looking at the volume dimension results, microbubbles are generated in the range of 5 to 50 μm , and it is clear that the influence of these size microbubbles has the greatest effect on the total volume. Moreover, looking at the number dimension results, it is evident that extremely large numbers of nanobubbles are generated in the range of 0.5 to 1 μm (500 to 1000 nm).

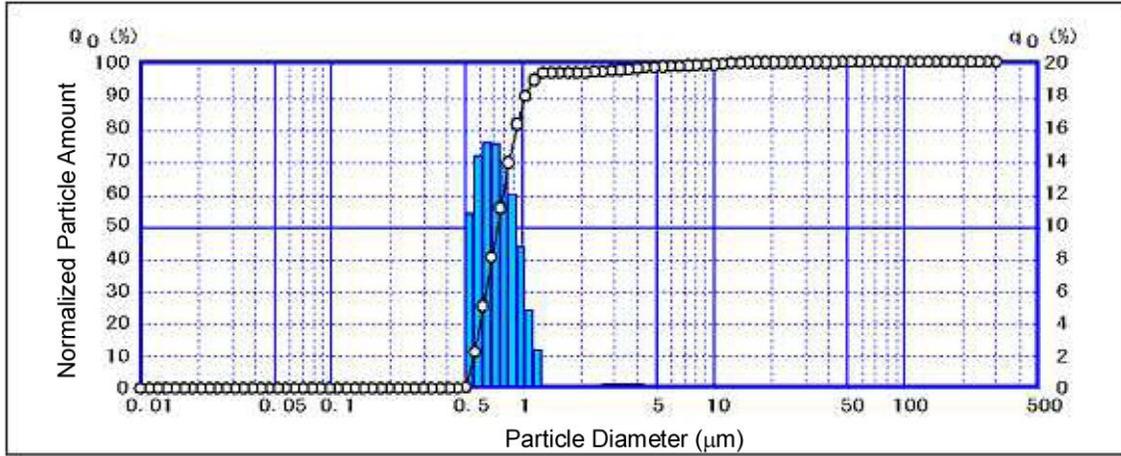
In addition, the display based on the area dimension is effective for evaluation when the effect of the bubbles depends on the surface area. In this case, it is clear that besides the bubbles in the ranges of 5 to 50 μm and 0.5 to 1 μm , the effect associated with bubbles from 2 to 5 μm also cannot be disregarded.



(a) Display According to Volume Dimension



(b) Display According to Area Dimension



(c) Display According to Area Dimension

Figure 2: Bubble Diameter Measurement Results for Microbubbles and Nanobubbles