# Evaluation of Microbubble Particle Size Distribution, Number and Concentration through Regulation of Bubble Forming Pressure

## Overview

Microbubbles are expected to be applicable to various fields (fishing, agriculture, environment, industry, etc.), and numerous cases of their use in washing and purification have been reported. Methods available for generation of microbubbles include compressive dissolving, cutting, two-phase flow rotation, ejector technique and so on. The size and number of bubbles formed vary depending on the pressure, rotation rate, mixed gas and fluid temperture control. Here, we will present cases where particle size distribution and changes in particle number were evaluated by image analysis at varying pressure levels for microbubble generation, using a bubble generator of the compressive dissolving type.

## Microbubble Measuring Method

Figure 1 shows the composition of the apparatus used for this evaluation. The microbubbles formed in the water tank were aspirated with the tubing pump installed behind the image analysis type particle size distribution measurement system S3500 SI. The bubbles aspirated into the water tank were guided through the resin tube and, during passage through the S3500 SI, the CCD camera focused on the bubbles entering its visual field to collect bubble data.

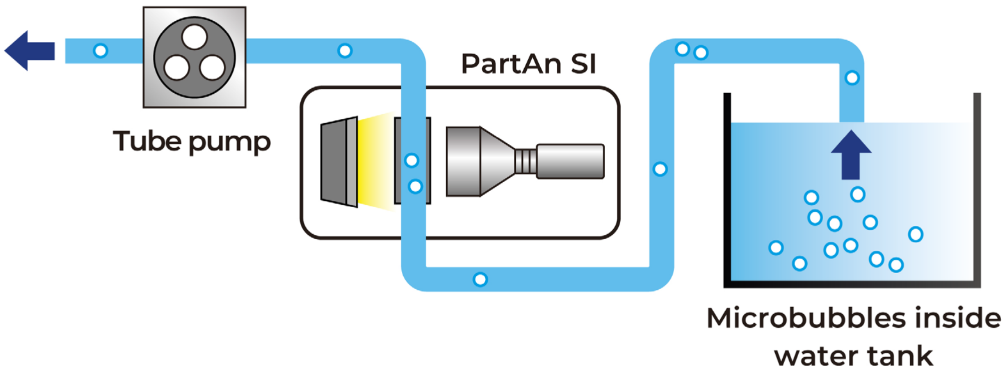



**Fig. 1** System configuration

## Test for Confirming Bubble Size and Number at Varying Bubble Forming Pressure Levels

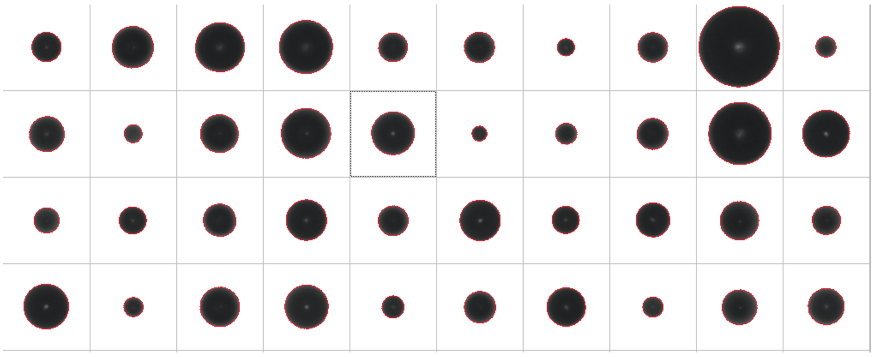
While the bubble forming pressure was changed from 0.1MPa to 0.5 MPa at intervals of 0.1MPa, measurement was conducted for one minute with the use of a S3500 SI.

As shown in Table 1, the bubble size became smaller and a larger number of bubbles were formed as the pressure rose. It was additionally confirmed that the change in bubble size and count tended to converge at a certain level, at pressure levels ≥ 0.3MPa. Figure 2 compares the overall images and individual bubbles between two pressure levels (0.1 MPa and 0.3MPa). The number of bubbles constituting the overall image tended to be larger at a higher pressure level while the particle size tended to be smaller at a higher pressure level.

Figure 3 illustrates the particle size distribution at each pressure level. The particle size was shifted to a smaller size range as the pressure rose. At pressure levels ≥0.3 MPa, there was little difference in particle size distribution.

**Table 1** Relationship between pressure level and particle size / number



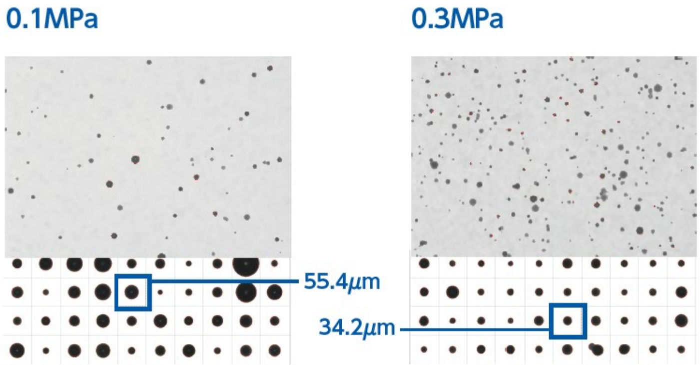



**Figure 2** Images taken during measurement

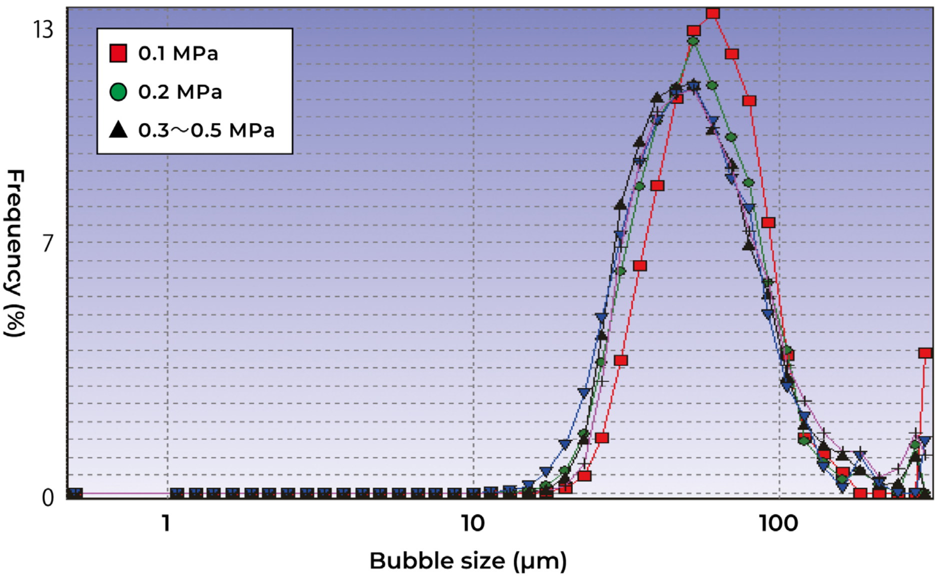



**Figure 3** Particle size distribution at each pressure level

## Discussion

Regarding the performance of the compressive dissolving type bubble generator evaluated in this study, it was confirmed that bubble generation was most efficient when the pressure level was set to 0.3 MPa.

## Apparatus

Image Analysis Type Particle Size Distribution Measurement System S3500 SI
Range of measurement: 5-1,500 µm
Camera: Monochrome CCD camera (5 million pixels)
Light source: LED strobe light



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