# Making Microbubbles with Spiral Method

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Microbubbles, tiny bubble smaller than 50 μm in diameter, have advantages over normal bubbles and are utilized in many fields. Among the various methods for producing microbubbles, we focused on the spiral method in the present study. The aims of this study were (1) to produce microbubbles easily and inexpensively, and (2) to clarify how the spiral method produces microbubbles. We created two devices that produce two different water streams, a straight stream and a spiral stream, and conducted a preliminary experiment to verify the effect of the spiral stream. Results confirmed that the spiral stream contributed to the production of microbubbles and that the more the rotation speed is, the smaller bubbles are. But this device cannot make microbubble. To attain sufficient rotational speed of the spiral water stream, we equipped the device with an electric router, which enabled the propeller to rotate at more than 10,000 rpm.This enhanced device was able to produce microbubbles successfully. However, there was a drastic decrease in the production of microbubbles when the rotational speed exceeded 10,000 rpm. The relationship between the retention of bubbles in the device and microbubble production indicates that the decrease in the production of microbubbles is caused by chain reaction of bubbles disappearing and propeller power increasing. And we assume that the principle of spiral method is stretch and division by regarding water stream as vector field. Based on these findings, we have succeeded in building a cost-effective device to produce microbubbles and analyzed the device.