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Comparison of Bubbles due to Frequency Change and Electrode Direction in High Repetitive Plasma in Water

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Underwater discharges are applied in industrial fields. However, phenomena of underwater discharges have not been completely clarified. The purpose of our study is to clarify characteristics of underwater discharges. In high repetitive underwater discharges, bubbles generated by discharges are gathered to the tip of an electrode. Discharge plasma forms under the influence of the bubbles may change to a ball shaped bubble. Our study focused on bubbles and investigated the movement of bubbles generated by discharges. Experimental environments are as follows: pulse discharge by MPC method with maximum output 1 J/pulse, the water conductivity of about 110 $\mu\text{S}/\text{cm}$, the electrode made of copper with a diameter of 0.8 mm, the repetition frequency of up to 500 pps (pulses per second), a high speed camera with the frame rate of 57000 fps (frames per second) and image processing software.

This paper has three contents: comparison of the movement of bubbles on 250 and 500 pps, observation of discharge plasma forms every 10 pps on 150 to 500 pps and comparison of discharge plasma forms on 250 and 500 pps when the direction of the electrode was changed.

The bubbles in high frequency were easy to be gathered to the tip of the electrode. As the frequency rises, the discharge plasma forms tend to be ball shaped bubble. The downward electrode is easier to gather bubbles than the upward electrode.

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