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Behavior of Pulsed Streamer Discharges in Flowing Water

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Underwater streamer discharges produced by pulsed power have applications for water treatment such as an algae treatment at dam, clean of water and sewage and so on. Streamers propagation, bubble formation along streamers, bubble collapse, generation of shock waves and extinction of bubbles were observed by previous work. In this work, a target situation is flowing water from a moving rod electrode. The moving rod electrode in water is used to simulate flowing water. This water conductivity is 100 μS/cm. A pulsed power generator using MPC (Magnetic Pulse Compression) circuit generates a maximum output of 5 J/pulse and maximum repetitive rate is 250 pps (pulses per second). The high voltage electrode is needle tungsten, and the ground is plate copper. The high voltage electrode is moved by a robot at rates up to 1 m/s, and the moving distance is 30 cm along the longitudinal direction. The voltage and current waveforms were measured by a high voltage probe and a current monitor, respectively. Pictures of plasmas form moving rod electrode were taken by a single lens reflex camera or a high speed camera. Research methods were generation of plasmas or not from pictures. The results and conclusions, electrode velocity was important condition for generation of plasmas, discharges depend on the applied voltage also applied energy, and small bubbles were important for generation of plasmas. Those experiments showed 0 cm/s of electrode velocity is 100 % of discharge ratio and 100 cm/s is around 70 %, and 22 kV of peak voltage is 0 % of discharge ratio and 29 kV is 97 to 100 %.

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