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Characteristics of micro plasma generated on the nanoscale electrode in water TOMONARI AOYAMA, Department of Electronic Engineering, Tohoku University, HIDEMASA FUJITA, TAKEHIKO SATO, Institute of Fluid Science, Tohoku University, TOSHIRO KANEKO, Department of Electronic Engineering, Tohoku University — Discharges in water are anticipated for various applications such as nano material processing, organic compounds degradation, and bio-medical treatment. Especially, for the bio-medical application, there is a demand to generate micro scale plasma which is smaller than a cell to have an effect only on the selected cell. In this work, the electrodes with curvature radius of less than 1 μm are used and the streamer development from the electrode tip is observed. To characterize the streamers from the electrode tip, the relations among the discharge time, voltage, current, shadowgraph imaging, and optical emission are investigated. The shadowgraph imaging has the maximum time resolution up to 5 ns at resolution of 12 pixel/ μ m using a high magnification lens and a high speed camera. In the shadowgraph imaging, the streamers are observed at the minimum pulse voltage amplitude of 4 kV. Prior to the streamer development, the precursor of the streamer is formed around the tip of the nanoscale electrode. The maximum size of the precursor region is found to be 20 μ m which corresponds to the typical cell size. These results show the feasibility of affecting a specific cell with micro scale discharge.

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