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Pulsed Helium Discharge In Synchronized Bubble Generated In Water[1] YUCHEN LUO, PETER BRUGGEMAN, University of Minnesota-Twin Cities — Plasma generation in bubbles is intensively studied in the context of developing a plasma-based advanced oxidation technology for water treatment. We report a study of discharges in helium bubbles generated at 5 Hz in a sodium solution with an electrical conductivity approximately 40 μs/cm using a solenoid valve system through quartz capillary. A voltage pulse synchronized with the bubble generation with an amplitude of 5 kV is used to generate a time-synchronized discharge. The morphology of the discharge is systematically studied by time-resolved imaging during the evolution of the bubble dynamics and the discharge from the first to the tenth pulse. The discharge is diffuse in the voltage rising edge and transits to a more filamentary discharge for voltage pulses in excess of 1 μs. This transition is more pronounced in the first discharge in a newly formed bubble compared to subsequent discharges in the same bubble. In addition, the power deposition in the first discharge is higher compared to the ones in subsequent discharges when the pulse repetition rate is more than 800 Hz in the positive polarity and 2000 Hz in the negative polarity. The reason for this remarkable effect relates to the presence of the capillary used for bubble generation and will be discussed in detail.

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