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Streamer Initiation and Propagation in Water with the Assistance of Bubbles and Electric Field Initiated Rarefaction[1] WEI TIAN, MARK J. KUSHNER, University of Michigan — Mechanisms for streamer initiation and propagation are of great interest to applications of discharges in liquids. One of the possible mechanisms, bubble-assisted discharges, has received attention in view of its analogy to gas phase discharges. In this paper, we report on a computational investigation of the initiation and propagation of streamers in water with macroscopic and microscopic bubbles having contact with and in vicinity of the powered electrode. In propagation of the streamer, a phase-like transition due to highly intense electric fields is also considered. These simulations were performed using nonPDPSIM, which solves Poisson's equation and transport equations for charged species and electron temperature. The water is treated as a condensed phase plasma with an appropriate charged particle reaction mechanism. Computed results are compared to experiments for a pin-plane geometry with a gap of 400 μm and applied voltages of 20-50 kV [1]. In the bubble mechanism, our results show that electron impact ionization within bubbles and photo-ionization in liquid water both contribute to breakdown.

[1] K. Schoenbach, J. Kolb, S. Xiao, S. Katsuki, Y. Minamitani and R. Joshi, Plasma Sources Sci. Technol. **17,** 024010 (2008).

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