Abstract Submitted
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Simulations of pulsed gas breakdown between pin-to-pin electrodes[1] STEPAN ELISEEV, St Petersburg University, St Petersburg, Russia, VLADIMIR KOLOBOV, CFD Research Corporation, Huntsville, AL, USA, ANATOLY KUDRYAVTSEV, St Petersburg University, St Petersburg, Russia — Peculiarities of gas breakdown depend on many factors including gas type, geometry of electrodes, time-dependence of the applied voltage, etc. Effects of these factors on the breakdown dynamics and transitions from Townsend (diffuse) to streamer mechanisms remain not fully understood. This paper is devoted to simulations of Helium breakdown in a pin-to-pin electrode geometry using recently developed Adaptive Mesh Refinement (AMR) capabilities for plasma simulations [V.I. Kolobov & R.R. Arslanbekov, J. Comput. Physics, 231 (2012) 839]. AMR enables high resolution of ionization fronts with sharp gradients of plasma properties developing on fast (electron) scale. We study dynamics of the breakdown phenomena depending on the voltage wave form (rise time), the product of gas pressure and the distance between the electrodes, and geometry of the electrode tip. Starting from a minimal plasma model (immobile ions, drift-diffusion transport of electrons, local ionization, and Poisson solver), we investigate effects of electron thermal diffusion, and background ionization on the development of ionization fronts. Results of simulations are analyzed using previously developed 1D theory of pulsed breakdown and compared with available experimental data for pulsed gas breakdown in similar geometries.

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