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Positive & negative streamers in uniform dielectric barrier discharge in atmospheric air CHONG LIU, A. J. Drexel Plasma Institute. Electrical and Computer Engineering Department, Drexel University, ALEXANDER FRIDMAN, A. J. Drexel Plasma Institute. Mechanical Engineering and Mechanics Department, Drexel University, DANIL DOBRYNIN, A. J. Drexel Plasma Institute
— One of the most promising and exciting applications of atmospheric air plasmas is medicine. Nanosecond-pulsed Dielectric Barrier Discharge is uniquely suited because, on the one hand, it can be applied directly to the biological target delivering all active species that non-equilibrium plasma can produce, and it produces highly uniform plasma independently of the features of the biological target which permits effective characterization and control of the plasma. Currently, there is no adequate model of the uniform dielectric barrier discharge development in atmospheric air. Here we show that DBD uniformity strongly depends on applied electric field in the discharge gap. We show that the discharge uniformity may be achieved in the case when : 1) strong over voltage (provided by fast rise times), when positive streamers are formed, and 2) short pulse duration that prevents discharge overheating due to rising conductivity which leads to formation of filaments. In the case of strong over voltage on the discharge gap, there is transition from filamentary to uniform DBD mode which may be fundamentally explained by transition from positive to negative streamers.

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