

Abstract Submitted
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Influence of ion transport on discharge propagation of nanosecond dielectric barrier discharge plasma actuator WEIZHUO HUA, FUKAGATA KOJI, Keio University — A numerical study has been conducted to understand the streamer formation and propagation of nanosecond pulsed surface dielectric barrier discharge of positive polarity. First we compared the result of different grid configuration to investigate the influence of x and y direction grid spacing on the streamer propagation. The streamer propagation is sensitive to y grid spacing especially at the dielectric surface. The streamer propagation velocity can reach 0.2 cm/ns when the voltage magnitude is 12 kV. A narrow gap was found between the streamer and dielectric barrier, where the plasma density is several orders of magnitude smaller than the streamer region. Analyses on the ion transport in the gap and streamer regions show the different ion transport mechanisms in the two different region. In the gap region, the diffusion of electron toward the dielectric layer decreases the seed electron in the beginning of voltage pulse, resulting that ionization avalanche does not occur. The streamer region is not significantly affected by the diffusion flux toward the dielectric layer, so that ionization avalanche takes place and leads to dramatic increase of plasma density.

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