
Characteristic comparison between positive and negative nanosecond pulsed discharges

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The environmental improvements by non-thermal plasma have been actively studied all over the world. Generally, a pulsed discharge with long duration consists of three phases including the streamer, glow and arc discharge. It is also well known that the propagation phenomenon of streamer head between electrodes is strongly influenced by the applied voltage polarity. On the other hand, in recent study, the nanosecond pulse power generator with a short pulse duration of 5 ns was developed and showed the higher energy efficiency for exhaust gas treatment and ozone generation than that of the general discharge method. However, the effect of voltage polarity on the nanosecond pulsed discharge is still unclear. In the present study, the discharge propagation process under the different polarity and amplitude of the applied nanosecond pulsed power was observed using a high-speed gated ICCD camera. In the experiment, the exposure time of ICCD camera was fixed at 420 ps and the time difference between continuous frames was fixed at 100 ps for observe the detail behavior of the streamer head propagation. The results show the velocity of the positive streamer propagation was faster than that of negative streamer. This can be explained by the difference of each physical characteristic of positive and negative streamers.