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Nanosecond-pulsed DBD in atmospheric air and methane-nitrogen mixtures[1] DANIL DOBRYNIN, CHONG LIU, ALEXANDER FRIDMAN, Drexel University — Dielectric barrier discharges (DBDs) are non-equilibrium low-temperature discharges. Uniform dielectric barrier discharges have many potentially transformative industrial applications, including uniform thin-film deposition, surface modification of polymers, sterilization of biological samples, treatment of living tissues and cells for their advantages of low gas temperature, moderate power density, uniform energy distribution, controllability of chemical composition and so on. Uniform DBDs are traditionally generated at special conditions (e.g., low pressure, rare gases), and in atmospheric air are of filamentary nature. Recent developments in pulsed power generation technology allowed controllable application of fast-rising short (nanosecond) high voltage pulses for generation of pulsed discharges. In our preliminary studies we have been able to perform fast imaging of the discharge development on nanosecond time scales in atmospheric air, and show transition of DBD from filamentary to uniform mode. We show that the discharge uniformity may be achieved in the case of strong overvoltage (provided by fast rise times), when anode-directed streamers are formed. Here we present our results on fast ICCD imaging of DBD in atmospheric air and methane-nitrogen mixtures for uniformity analysis, as well as temperature and local electric filed measurements using OES.

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