Characterization of memory effects in DBDs by spatially and temporally resolved Electrical and Optical Diagnostics

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Dielectric Barrier Discharges (DBD) have great popularity for atmospheric pressure applications including thin-film coating, sterilization, treatment of flue and toxic gases, aerodynamic flow control, and energy-efficient lighting devices. Depending on the gas, electrical parameters, and electrode configuration, these discharges can operate in the classical filamentary mode or in a homogeneous mode. Due to their simplicity, electrical measurements and optical emission spectroscopy are widely used to study and characterize the DBDs. For example, electrical measurements can easily be used to determine the discharge regime, to calculate the temporal development processes of all internal electrical quantities in the discharge gap or to calculate the discharge power. Optical emission spectroscopy can be used to determine the plasma temperatures and species densities. Then, the correlation of electrical and optical measurements is a powerful tool to improve understanding of DBD physics.

Therefore, these measurements are of considerable interest for the study of homogeneous discharge at atmospheric pressure like Atmospheric Pressure Townsend Discharge (APTD) obtained in nitrogen. As the discharge is homogeneous (by opposition to the classical filamentary discharges) most often discharge current and optical emission are measured as an integral over the entire electrode area, assuming that the discharge is the same in any point of the electrode. However, due to gas flow circulation, to self-organization phenomenon, *etc.* this assumption is never perfectly true. This talk will review electrical and optical diagnostics used for the study of DBDs. Particular emphasis will be placed on the local behavior of a homogeneous DBD in nitrogen with small admixtures of impurities.