

SURFACE DISTRIBUTION OF ELECTRIC CHARGE IN A SURFACE DBD

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The volume dielectric barrier discharge (DBD) has been extensively studied because of its ease to create a non-equilibrium plasma and its various industrial applications [1]. Over the past ten years, the surface DBD became a widespread research topic, whether in air pollution control [2] or in aerodynamic applications [3, 4]. The electric charge of the dielectric surface has an important role in the physics of the surface DBD, the mechanism of propagation of the discharge and the interaction between plasma and air in the vicinity are not yet clearly identified. Many experimental studies [5] or simulation works [6] have been done on this research subject.

We present here a study of the distribution of the electric charge on the dielectric surface of a surface DBD in air. The DBD was driven with a 50 Hz sinusoidal high voltage power supply. The electrode connected to the high voltage was exposed to the air and the ground electrode was covered by a dielectric layer to avoid the creation of discharge on this side. The ground electrode was segmented. This configuration makes it's able to measure the electric charge on the dielectric surface. The charge distribution during one discharge current pulse was measured experimentally, which allows the mapping of the charge distribution. It is correlated with the morphology of the discharge studied by a fast ICCD camera. Fig. 1 shows the measurement of one discharge current pulse at the different positions, and the distribution of charge transferred by the current pulse discharge on the dielectric surface showed in Fig. 2.

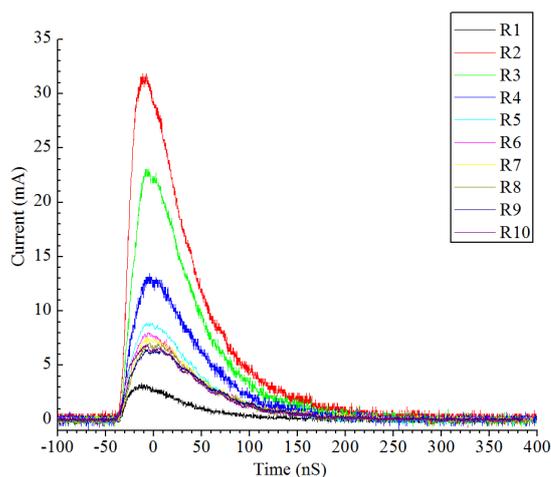


Fig.1: Measured discharge currents at different positions

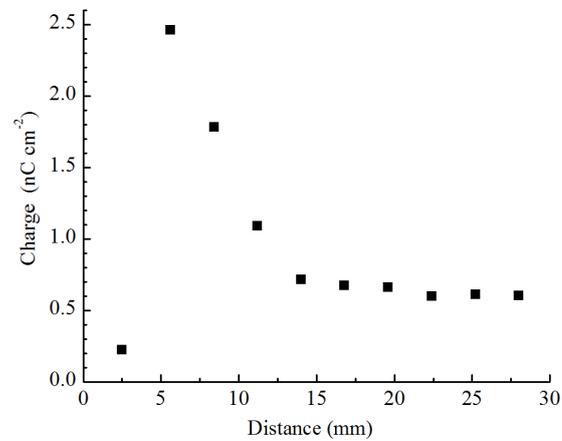


Fig. 2: Distribution of the electric charge by one discharge current pulse on the dielectric surface.

The velocity of the filaments ramping onto the surface can also be deduced from the dynamic of the current peaks recorded at different position and compared to results obtained by fast imaging.

Reference

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