# CHARACTERIZATION OF COPLANAR SURFACE BARRIER DISCHARGE

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Low-temperature barrier discharges working at atmospheric pressures are becoming an important tool for processing temperature sensitive surfaces. These discharges produce large concentrations of active radicals, which can clean the surfaces from contaminants and increase the number of polar components, leading to improved wettability of the surface. In the case of flat surfaces, coplanar surface barrier discharges (CSBD) are especially useful due to the uniform distribution of plasma and high plasma density, which allows using short treatment times [1].

The aim of the study was to determine the radical and ozone production efficiencies of a CSBD device made by Kyocera, as well as to test the application of the device to the treatment of surfaces (silicon, plastics, wood). The device consists of a number of linear electrodes at 1 mm apart, immersed in a dielectric barrier. For measurements in a flow-through system, a quartz plate covered the barrier at the height of 2 mm. The efficiency of nitrogen radical production of the reactor was determined by using NO:$N_2$ mixtures with variable NO concentration (200-800 ppm); the efficiency of ozone production was tested by using $O_2$:$N_2$ mixtures. The production of ozone and different nitrogen oxides was also evaluated for an open system without gas flow by using optical absorption spectroscopy in UV and IR ranges.

Results obtained with a volume barrier discharge (VBD) reactor with coaxial configuration were used for comparison. At the same input power, the CSBD reactor had 6 times higher power density per volume and considerably higher nitrogen radical production efficiency, when compared to the VBD reactor. At the same time, ozone production efficiency remained lower than with the VBD reactor. The results can be explained by higher reduced electric field values and higher power density for CSBD. The surface treatment experiments demonstrated an increase of wettability, the latter having been determined by the contact angle of a water droplet.

References

1. M. Šimor, J. Ráhel’, P. Vojtek, M. Černák, A. Brablec, 2002, *Applied Physics Letters*, 81, 2716-2718.

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