Investigation on O_3 and NO_x Production in a Surface DBD

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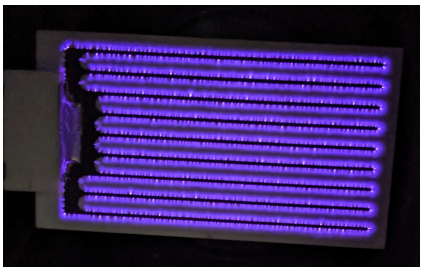
The usage of Surface Barrier Dielectric Discharges (SDBD) is increasing in different application fields, such as the removal of volatile organic compounds or pathogenic organisms from air. However, the composition of the reactive species in the plasma and their role in treatments are not well understood.

The aim of this work is to evaluate the production of O_3, NO_2 and NO_3 in a static condition by a SDBD [1] as well as their correlation with the temperature.

Absorption spectroscopy is used to determine the reactive species densities n. We placed the SDBD (Fig. 1 Left) in a vacuum box sealed at two opposite sides by quartz windows and at the other two ends by open-close valves. In front of one of the quartz window we placed the lamps, while at other side the radiometric detectors. We estimated the species' production according to the Lambert-Beer law: $n = -\frac{\frac{I}{I_{\text{no plasma}}}}{Lc}$ where I is the intensity when the plasma is on, $I_{\text{no plasma}}$ is the intensity when the plasma is off, L is the distance between the lamps and the probe, and c is the absorption coefficient.

A simplified 0D kinetic model has been implemented to study the time-evolution of the main neutral species produced by the discharge. The results are compared with the performed measurements, as in Fig. 1 Right.



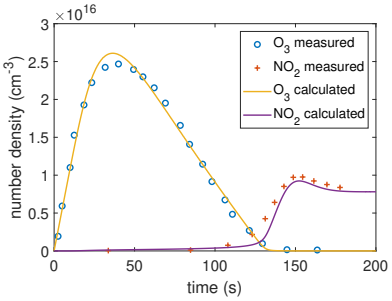


Figure 1: *Image of the used plasma device (Left); measured and computed number densities of O_3 and NO_2 (Right).*

References

[1] C. Piferi, R. Barni, H. E. Roman, C. Riccardi, Applied Sciences **11**, 5 (2021)