# Optical emission spectroscopy in a VHF-CCP: Influence of a polymeric discharge chamber

M. Fiebrandt[1]*, Katharina Stapelmann[1], Nikita Bibinov[1], Peter Awakowicz[1]

[1]*Ruhr-University Bochum, Institute for Electrical Engineering and Plasma Technology, Bochum, 44801, Germany*

**Contact e-mail:* fiebrandt@aept.rub.de

## 1. Motivation

Plasma based sterilization and decontamination is a promising alternative to conventional methods (e.g., Autoclave, e-Beam, ETO) as it is can be used for sterilization of sensitive materials. To investigate the applicability of plasma sterilization in hospitals and medical practices, a small setup was designed with a polymeric discharge chamber serving as sterile container [1-2]. As process gas, mixtures of hydrogen (for a high amount of UV radiation) and oxygen (for etching and oxidation) are used. Due to interaction of the plasma and the polymer, several impurities influencing the process are present (Fig. 1).

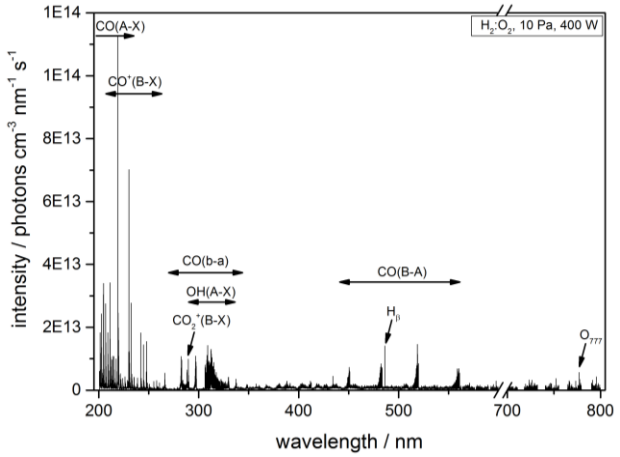


Fig. 1: *Echelle spectrum showing CO and $CO_2$ impurities*

## 2. Optical Emission Spectroscopy

To study the plasma, optical emission spectroscopy was performed with an absolutely calibrated broadband echelle spectrometer (LLA Instruments ESA 3000) from 200 nm to 800 nm [3]. The spectral resolution ($\Delta\lambda$ = 0.02 nm at 200 nm and $\Delta\lambda$ = 0.06 nm at 800 nm) allows investigating the vibrational and rotational bands. By adding 10 % nitrogen, analysis of electron density, temperature, and gas temperature is possible. Furthermore, densities of CO, $CO_2$, H, and $H_2O$ were determined.

However, emission of the impurities overlaps with the observed transitions of $N_2$(C-B), $N_2^+$(B-X), and OH(A-X) why careful examination is necessary.

Furthermore, variation of the UV-C, UV-B, and UV-A dose with varying gas mixture, important for biological inactivation, is studied.

## References

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