

# Absolute ozone density measurement by two-beam UV-LED absorption spectroscopy in low-temperature atmospheric pressure plasmas

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## Abstract

Low-temperature atmospheric pressure plasmas are efficient sources for the generation of reactive species at atmospheric pressure and ambient temperature. This complex non-equilibrium chemical environment enables a multitude of technological applications, ranging from novel biomedical techniques (e.g. cancer treatment or anti-microbial techniques) to applications in green chemistry (e.g. the efficient conversion of CO<sub>2</sub> into value-added products). In oxygen-containing compositions, ozone (O<sub>3</sub>) plays a key role in the chemical kinetics and acts as an effective species in applications among the reactive oxygen species (ROS). Precise measurements of absolute densities of ozone are crucial in quantifying underlying mechanisms. In this work, UV absorption spectroscopy has been developed in Mach-Zehnder configuration to study absolute ozone densities in a 13.56/40.68 MHz radio-frequency driven capacitively-coupled atmospheric pressure plasma [1]. The plasma volume of 30 x 11 x 1 mm<sup>3</sup> was operated with 10 slm He as carrier gas and ≤1% O<sub>2</sub> or CO<sub>2</sub> admixtures, generating a homogeneous glow-mode plasma at gas temperatures close to ambient temperature (measured by molecular optical emission spectroscopy). The measured ozone densities exhibit a strong correlation with the gas temperature. This dependence is in very good agreement with a simple model of the plasma chemical kinetics [2]. This model allows us to investigate details of the reaction kinetics and its influence on the density of other ROS, under variation of different plasma control parameters, including power delivery and pulse-modulation techniques.

## References

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