In situ measurements of radical and reactive species densities in non-equilibrium atmospheric pressure plasmas jets.

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Non-equilibrium atmospheric pressure plasma jets (APPJs) have been extensively investigated during the last two decades in view of heat sensitive surface treatment applications. These APPJs usually are generated in noble gases such as He and Ar with small admixtures of O_2, N_2, air or H_2O. The jets typically operated in an open-air environment which introduces concentration gradients of air in the jet due to air entrainment in the effluent. These APPJs produce a large amount of radicals, ionic species and UV photons which can contribute to disinfection and wound healing [1,2]. Due to the non-equilibrium properties of the plasma operating at high pressure, the strong collisionality and quenching of excited states and the complex chemistry and electron kinetics, plasma diagnostics of APPJs are rather challenging [2,3].

In this contribution, we will present diagnostics on an RF driven Ar plasma jet [4] and a MW driven He plasma jet [5]. The electron temperature and density and the gas temperature are measured by a combination of laser scattering and emission spectroscopy. The (humid) air chemistry is investigated by the in situ measurements of reactive species such as OH, NO, O and O_3 which are believed to be key to the plasma induced biological effects. Several examples of density measurements by absorption spectroscopy and (Two-photon) laser induced fluorescence will be shown [6-11]. The obtained plasma parameters and measured species concentrations are used to discuss the plasma induced air chemistry in the two investigated APPJs.

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