DAMOP15-2015-000938

Abstract for an Invited Paper
for the DAMOP15 Meeting of
the American Physical Society

Linking plasma kinetics to plasma-bio interactions

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Cold non-equilibrium atmospheric pressure plasmas have received a lot of attention in the last decade due to their huge potential for biomedical applications. In my group, we have characterized an RF driven APPJ in great detail. The characterization includes electrical measurements, imaging, optical emission spectroscopy, (two photon enhanced) laser induced fluorescence, Thomson scattering, Rayleigh scattering, Raman scattering and mass spectrometry. This led to a detailed knowledge of the electron density, electron temperature, gas temperature, NO, O, OH, O3 densities, ionic species and air concentrations in the plasma effluent [1-3]. Living organisms for in vitro studies are typically kept in complex solutions or culture media. Plasma-bio interactions involves not only the production of reactive species in the plasma gas phase but also transport to the liquid phase and plasma induced liquid phase chemistry and its impact on the living organisms. Reactive nitrogen and oxygen species have been identified as the key reactive species [4]. Recent results of my group show that controlling the gas phase plasma chemistry can lead to significant different biological responses of the living organisms corresponding to different chemical pathways [5]. The effect of plasma jet interaction with liquids containing mammalian cells, bacteria and virus will be discussed. The outcomes of these studies allow unraveling chemical pathways responsible for plasma-bio interactions and linking plasma kinetics to plasma-bio interactions.

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