Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Investigation of ambient air species diffusion into the effluent of an atmospheric pressure plasma jet by measurements and modeling ANSGAR SCHMIDT-BLEKER, STEPHAN REUTER, JÖRN WINTER, HARTMUT LANGE, KLAUS-DIETER WELTMANN, Leibniz Institute for Plasma Science and Technology (INP) Greifswald, LEIBNIZ INSTITUTE FOR PLASMA SCIENCE AND TECHNOLOGY (INP) GREIFSWALD TEAM — The diffusion of ambient air species into the effluent of a cold atmospheric pressure plasma (CAP) jet operated with pure argon is quantified using both experimental methods and theoretical estimations by a convection-diffusion approach. In the effluent of CAP jets operated in ambient air, reactive oxygen species (ROS) and reactive nitrogen species (RNS) are generated. ROS and RNS are believed to play a central role in biomedical applications of low temperature atmospheric pressure plasmas. The inflow of atmospheric oxygen is determined by a novel absorption technique in the VUV spectral range, where emission originating from within the discharge is used as light source. An analytic expression for the estimation of the on-axis density of ambient species was obtained assuming a stationary drift-diffusion equation and is compared to complete numerical results. The easy to use expression correlates well with the experimental results obtained.

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Date submitted: 29 Aug 2011 Electronic form version 1.4