

Characterization and Simulation of Plasma Chemistry Produced by Surface Micro Discharge

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The surface micro-discharge (SMD) plasma source has been used to study the bactericidal effect of cold atmospheric pressure plasma [1-2]. To understand the responsible mechanisms and agents, the key is to derive chemistry of delivered plasma to microorganisms.

The plasma source consists of a mesh electrode, a Teflon board with a thickness of 0.5 mm and an Aluminum foil. The plasma is produced in ambient air by applying a high voltage (HV) signal between the mesh and foil. The pick-to-pick value of HV signal is about 10 kV with various frequency between 1-10 kHz.

In this contribution, we present a zero-dimensional model of plasma chemistry produced by SMD source. The chemistry of nitrogen and oxygen is included in the model and the role of other species presented in ambient air is neglected. The major creation and loss terms for different species are determined by tracing the reactions from the very beginning till equilibrium. Dependency of species densities on some of the plasma parameters are studied. Electrical characterization and optical emission spectroscopy is used to validate the results of simulation. However, density of dominant species are measured by mass spectrometer.

References

- [1] Yang-Fang Li, Julia L Zimmermann and Gregor E Morfill, *New Journal of Physics* (2012), **14**, 023058.
- [2] T Shimizu *et al.*, *New Journal of Physics* (2011), **13** 023026