

BACTERIA INACTIVATION EFFECT OF IONS GENERATED BY DC CORONA DISCHARGE

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Non-thermal plasma generated at atmospheric pressure produces a complex effect caused by reactive molecules, charges, electric fields, and ultraviolet radiation. The role of these components has been studied, and it was noticed, that inactivation efficiency highly depends on presence of charged species for room air conditions, but radiation effect in air plasma is almost always negligible [1]. To study the role of plasma-produced charged particles, we have used DC corona discharge, where stable and uniform generation of various neutral active species and ions is possible.

Here we present the results of experimental study of the effect of DC corona discharge produced ions on inactivation of bacteria on the surface of agar. Both positive and negative corona discharges in various gases at varied humidity were studied.

The measurements in N_2 - O_2 - H_2O mixtures show that there is no inactivation in pure N_2 , pure O_2 , and N_2 - H_2O . Contrary, in the mixtures containing O_2 and H_2O simultaneously (humid air, O_2 - H_2O mixture) the same inactivation efficiency was achieved. These results show that neither UV radiation, ozone, H_2O_2 , nor other neutral active species alone produced by corona in dry oxygen, dry nitrogen or nitrogen-water mixtures have an effect on bacteria viability. Also, it is shown that charged particles alone do not provide visible bacteria inactivation. From the other hand estimations show that in O_2 - H_2O mixtures it is required $\sim 10^3$ ions/bacteria for 5-log inactivation.

1. D. Dobrynin et al., "Physical and biological mechanisms of direct plasma interaction with living tissue", 2009 New J. Phys. 11 115020 (26pp)