

Plasma + Bio – Basics and applications

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The list of possible applications of technical plasmas at low and atmospheric pressure in medical and pharmaceutical branches is still large. It spans from sterilization in ambulances and hospitals to in-line decontamination and sterilization in pharmaceutical production. In addition, wound healing, skin treatment and disinfection of large areas is also an important issue.

From a physical point of view there are some common and some completely different characteristics of low and atmospheric pressure plasmas. For example in most cases ions are absent at atmospheric pressure while in low pressure plasmas their influence is crucial. On the other hand the radical particles concentrations are very often one or two orders of magnitude higher at atmospheric conditions. Looking at VUV (vacuum UV) radiation, both types of plasmas may irradiate treated substrates in this wavelength range depending on gas mixture and the gas channel between the heated plasma zone and the remote or effluent part.

All applications of different plasmas in medical and/or pharmaceutical practice are similar in so far that an extensive and time and money consuming evaluation and certification procedure is necessary in order to transfer them into market. To gain an approval from the American FDA (Food and Drug Administration) or the European EMEA (European Medicine Agency), it is absolutely necessary to understand the basic mechanisms and correlations to the treated objects.

Therefore this talk will show some very basic aspects and results in low pressure plasma treatment as well as in atmospheric situation. From the perspective of plasma technology some principles of plasma diagnostics will be shown in order to reveal the fundamental plasma parameters and the corresponding particle and photon fluxes. From the biology perspective following the *dogma* of cell biology the talk will show on which parts of cell proliferation and growth those particles and photons may attack or influence their behavior.

As a success story of this approach, the world wide first prototype of a low pressure plasma sterilizer in pharmaceutical production will be shown. In addition, many aspects for applying atmospheric plasmas will also be given.