Cold plasma type reactors and sources suitable for medical applications

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The cold plasma reactors are more often used in the last decades for diverse activities such: the pollutant treatment from air or from solutions, for plastic or metallic surfaces treatment, for improving the combustion or for treatments with biological applications. The requirements imposed to these multiple applications of the cold plasma are very different, so we have proposed to realize an appreciation of the these requirements to be able to identify the “preferences” for each type of the cold plasma reactor from the multitude of the constructive variants which can be founded in the specialized laboratories today.
Thereby, for surfaces treatment or for implant materials treatment to ensure the bio-compatibility with the human tissue, there can be used reactors with Corona discharges, DBD or especially GlidArc. The last ones are benefitting by the flexibility of operation offered by the command device with auxiliary electrodes, because the useful action of the electrical discharge is depending on its power, eventually on the specific energy on the volume unit of the blown gas (J/l).

In the case of treatments on the living tissues (human tissue), targeting the blood coagulation or wound healing, in the first is placed the problem of how the avoid the electrocution - which means that the plasma power supply parameters have to be conveniently chosen, especially the working frequency, but also the constructive type of the reactor, being preferred the one which work with a floating potential electrode. Also very important is that the action on the living tissues cells (which fortunately has been proved that is selective) should not be very intense; the power/surface unit (W/cm^2) should have reasonable values. So, it can result the possibility to enounce characteristics and typical constructive variants for cold plasma type reactors for different medical applications which made the subject of some interesting researches in our days.

In the second part of this paper are presented two power supplies used to produce cold plasma discharges, one suitable for GlidArc discharges and one for DBD discharges. The first one is based on a microcontroller and can provide trains of pulses with the frequency of 100 Hz, pulses which can have variable width and phase. The second one, used for DBD discharges, can provide control pulses with variable frequency (between 10 and 20 kHz) used to command a high voltage ferrite core transformer. To be able to compare the two discharges, we have treated distilled water using a GlidArc reactor and a DBD reactor measuring the pH modifications in time. Also we have done spectroscopic analysis of the plasma produced by the DBD torch using an iCCD camera and we have determined the rotational temperature of the plasma using a method based on the comparison between experimental and theoretical rotational structure of the molecular emission spectra of the OH band at 306.357 nm, by identification of the optical apparatus function.