

**New high-voltage pulsed structures,
generating cold atmospheric plasma jets,
with bio-medical applications**

- ABSTRACT -

The project aims at obtaining cold atmospheric plasma jets using structures stimulated by high voltage pulses.

The novelty of this project: the first device generating cold atmospheric plasma jets was presented at the end of 2005 [Laroussi M, Lu X, Appl. Phys. Lett. 87, 113902 (2005)].

The advantages of this device as compared to that generating atmospheric radio-frequency plasma are:

- fine temperature control;
- the elimination of the catastrophic overheating risks.

The high voltage pulses generator which is to be built and used for this project must deliver 10 – 30 kV amplitude pulses, lasting hundreds of nanoseconds, with repetition frequency of tens-hundreds pulses per second. These pulses are applied to metallic electrodes of different shapes. The electrical discharge takes place in a cavity through which an inert gas flows at normal atmosphere. The discharge plasma is pushed out through an aperture. In optimal conditions, plasma is emitted as centimeter-long jets, millimeters in diameter. The temperature of the jet (25 – 40 degree Celsius) is essential to bio-medical applications.

To make the gas chemically active, substances generating active chemical agents will be introduced in the flow of the main inert gas. These substances, the manner they are introduced in the flow of the main gas and their concentration will make up the main points of this research. Solutions to these problems will be the strong points of the project.

During the final stages of the project, we will study the effects of the cold atmospheric plasma jets on living cells. We will determine the optimal conditions so that the plasma jets to maximize the apoptotic effects, as compared to the necrotic effects.

The final conclusions will be an estimation of the applicability of this interdisciplinary research in various socio-economic areas.