

SURFACE-WAVE-SUSTAINED ARGON PLASMA TORCH FOR BIOMEDICAL APPLICATIONS

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Plasma sustained by electromagnetic wave traveling along a dielectric-plasma interface can operate in broad range of discharge conditions: gas pressure from a few mTorr to several atmospheres; wave frequency from 10 MHz to above 10 GHz; plasma radius from 0.5 mm up to 12.4 cm produced till now; plasma length depends on the wave power and can reach several meters but also microplasma of a few millimetres length is in use. Surface-wave-sustained discharges (SWD) can operate in rare gases, molecular gases and gas mixtures. In most of the cases the plasma is non-thermal one – the electron temperature is much higher than the gas temperature even at atmospheric pressure.

These advantages give opportunities for applications in environmental protection, sterilization, treatment of living tissue, seeds, water, etc.

The surface-wave plasma torch operating at room temperature can be used for water treatment and activation as well as for direct treatment of seeds, products, living tissues, temperature sensitive materials, etc. In the direct plasma treatment several agents are included in the same time: UV radiation, electric field, charged and excited chemically active particles. If it is necessary plasma can operate in room temperature without heating the treated material but it is also easy to choose regime of operation with gas temperature above 1000 K using the heating as an additional treatment agent.

In this study the Argon SWD is applied for treatment of Gram positive and Gram negative bacteria in agar and in suspension. The treatment time is less than 1 min, the wave power up to 20 W and the plasma gas temperature is less than 36 degrees in order to avoid the thermal effects. At such conditions good sterilization effect is observed even at very short treatment time as 5 s. The plasma is also applied to other model biological systems.

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