Design and optimization of a radio frequency plasma jet for biomedical applications

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In the context of plasma medicine, the most widespread tools are represented by small plasma jets operating at atmospheric pressure and very low power, so as to avoid thermal effects on the treated substrate [1]. These devices typically use helium or argon as main process gas, with the elements required for the production of active chemical species provided by small amount of oxygen or nitrogen mixed to the main flow or, more commonly, just by the interaction of the plasma with the surrounding air. The most commonly used technology for the production of such jets is that of Dielectric Barrier Discharge (DBD), powered by sinusoidal or pulsed high voltage waveform. There are however also several examples of jets powered by radio frequency (RF) voltage, including a well known certified device [2]. In this contribution we describe a novel RF plasma jet developed by our group, and we investigate the impact of the applied voltage waveform on the jet characteristics. In particular, the effects of frequency change and of duty cycle are documented, both in terms of electrical and optical measurements. Operation in helium and argon is analyzed, highlighting the differences in discharge features. The effect of the jet on surfaces is described in terms of contact angle change.

References

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