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WITHDRAWN (G) (POS-69) Coupling of microfluidic devices with a reference cold plasma jet

Plasma-liquid interaction is a field of increasing interest among the plasma research community. Liquids being ubiquitous in living organisms, plasma-liquid interaction is of high relevance for applications of plasma science such as water decontamination, agriculture and medicine [1]. A promising diagnostic tool for plasma-liquid interaction is the microfluidic device. Microfluidic devices, often referred as lab-on-a-chip (LOC) technologies, have been used to reproduce standard chemical and biological experiments on a very small footprint. Three-dimensional cell culture embedded on a microfluidic device have been found very useful for studying different cancer treatments such as chemotherapy and radiotherapy [2]. The high parallelization potential of LOCs makes the technology ideal for testing different treatments and selecting the optimal one rapidly. With the objective of using LOC technologies for studying the treatment of cancer by plasma, we develop a platform that enables the coupling of microfluidic devices with an atmospheric pressure plasma jet.

The plasma device is based on the COST reference microplasma jet [3]. It uses a capacitively coupled discharge excited at 13.56 MHz with two stainless steel electrodes clamped between a glass plate and a microfluidic device. The plasma channel has a volume of 30 x 1 x 1 mm3. The feed gas is helium with variable admixture of O_2, N_2 and H_2O. The 3D printed microfluidic canals allows high control on the position of the plasma-liquid interface and on the velocity of the liquid. The microfluidic device can be operated with a continuous liquid flow or with a gas-liquid flow where the gas is sucked out of the active plasma channel.

The developed plasma-microfluidic platform is to our knowledge the first demonstration of the coupling of a reference biomedical application-focused plasma jet with a microfluidic device. The platform provides high control over the delivery of plasma-produced reactive oxygen and nitrogen species and is a very powerful diagnostic tool for tailoring plasma reactivity in biomedical applications.

[1] : P. J. Bruggeman *et al. Plasma Sources Sci. Technol.* 25 053002 (2016).
[2] : Patra, B., Lafontaine, J., Bavoux, M. *et al. Sci Rep 9*, 2214 (2019).
[3] : J. Golda *et al. J. Phys. D: Appl. Phys.* 49 084003 (2016).

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