Measurement of plasma-generated OH radicals delivered area using a gel containing terephthalic acid

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A non-thermal atmospheric pressure plasma (NTAPP) has been used in biomedical researches. To analyze NTAPP-cells interactions, we have developed a microdevice, *Plasma-on-Chip*[1-3]. To analyze responses of cells during the *Plasma-on-Chip* device operation, it is necessary to measure NTAPP-generated reactive oxygen species (ROS). In the previous study, we used a chemical probe (disodium terephthalate) to detect OH radicals which exert oxidative stress on cells [4]. However, as far as using reactions in liquid phase, it was difficult to determine OH radical delivered area in a cell culture system. In this study, we measured OH radical delivered area using a gel film containing telephtalic acid (TA).

We used a chip of Teflon having a through-hole (ϕ1 mm) to simulate plasma-generated ROS delivery during *Plasma-on-Chip* device operation (Fig. 1). In the setup, a gel film containing TA was formed on the chip. The through-hole was irradiated with a NTAPP jet. Thus, plasma-generated OH radicals were delivered to the liquid held in a reservoir. When OH radicals reacted with TA in the gel film, formed was reaction products which emitted fluorescence (λ: 425 nm) under UV light excitation (λ: 310 nm) [5].

NTAPP was generated under He gas flow of 1.4 slm and sinusoidal wave voltage of 8 kV and 10 kHz, and incident onto the through-hole. Under UV light excitation, fluorescence area was observed. After 30 s plasma-irradiation, the fluorescence was observed around the through-hole as shown in Fig. 2.

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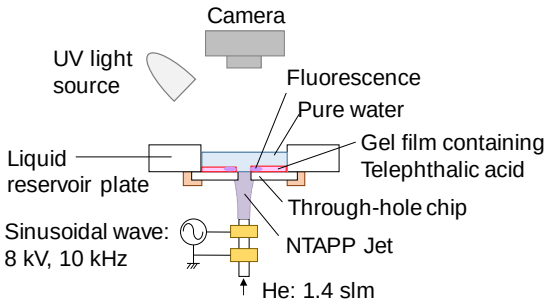

Figure 1: Experimental Setup.

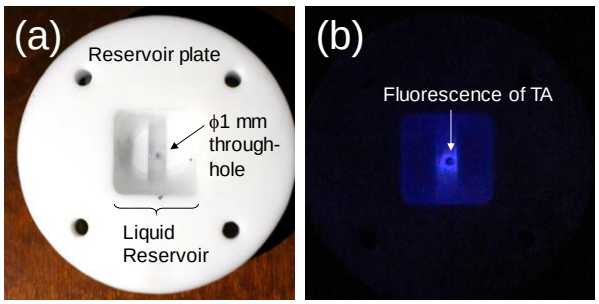

Figure 2: (a) Measurement setup. (b) Fluorescence of TA after 30 s plasma- irradiation.

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