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Micro-channel fabrication in an e-tongue system

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Abstract – Micro-channels fabricated in a PDMS matrix were sealed onto gold interdigitated electrodes, trying to integrate an electronic tongue sensor with a lab-on-a-chip system. A detailed study involving design and experimental conditions was made, as it was the first time that microfluidics is applied in this sort of sensor. The low volume used in the analysis and the faster and more efficient flow measurements inside the channels might pave the way to several new applications.

In this work the lab-on-a-chip (LOC) and electronic tongue concepts were gathered in a unique device that we are calling tongue-on-a-chip (TOC). To that, microfluidic is an essential tool as it allows the integration of complex and highly miniaturized systems for the realization of uncountable fast, parallel experiments with low consumption of reagents and samples [1]. To illustrate, paper based devices are being developed foreseeing point-of-care analysis [2].

Micro-channels were fabricated in a PDMS matrix and further sealed onto gold interdigitated electrodes, with a detailed analysis of the experimental conditions involved, envisaging our final goal (tongue–on-a-chip device). Microchannels, inlet and outlet were recorded in a negative photoresiste and further replied in a PDMS matrix using a rigid mould fabricated using SU-8 onto a glass slide. Sequentially, gold interdigitated electrodes (IDEs) were produced onto glass slides and then both the PDMS sample containing (microchannels + inlet + outlet) and the glass slide containing the IDE microelectrodes were exposed 20s to plasma oxygen (PLAB SE80, Plasma Technology, Wrington, England) at 120 mTorr and 70W. Immediately after the plasma exposition both PDMS plate containing (microchannels + inlet + outlet) and gold interdigitated electrodes were faced each other and slightly pressed to seal the device. The whole experimental set-up to build up our tongue-on-a-chip prototype was made at Microfabrication Laboratory (LMF) in Brazilian Synchrotron Light Laboratory (LNLS / Campinas), which was fundamental in the development of this research.

Flow measurements in the micro-channels shown to be faster and more efficient than the previous one taken in the e-tongue system (see Figure 1), presenting also high reproducibility. Nevertheless, despite the low amount of sample (uL) used in the analysis, the presence of ultra-thin films onto de interdigitated electrodes hamper the sealing of the device. Ongoing measurements are being taken to overcome such difficulty.

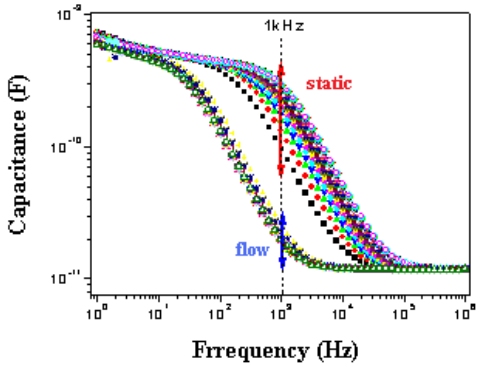

Figure 1 – Static and flow measurements in a TOC device

References

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