Low-cost and accessible rapid-prototyping of microfluidic devices

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Introduction & Objectives

Microfluidics allows to perform laboratory operations in micrometer-sized channels using low volumes and in decentralized way. Besides, another great advantage is that such devices can be coupled and/or integrated with all sort of transducers ranging from: electrodes to smartphones. Therefore, It is of great interest the development of faster, easier and cheaper fabrication techniques that can be implemented directly on lab and could even replace clean-room techniques. For this purpose, the use of pressure sensitive adhesives (PSA) tapes has been explored in several steps of the process: creation of the mold patterns, bonding of PDMS and thermoplastic support layers and as microfluidic substrate. The devices produced with these techniques were coupled to electrochemical transducers.

Experimental

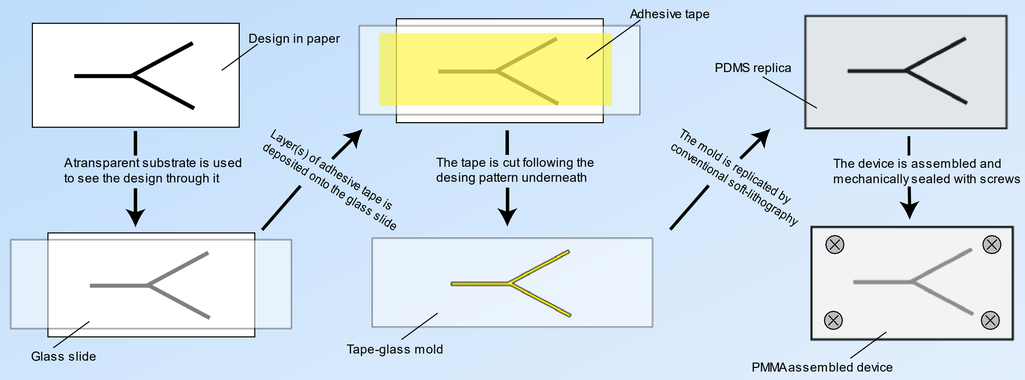

Fig 1. Scheme of the **tape-assisted hand-crafted lithography** for microfluidic device fabrication

Results

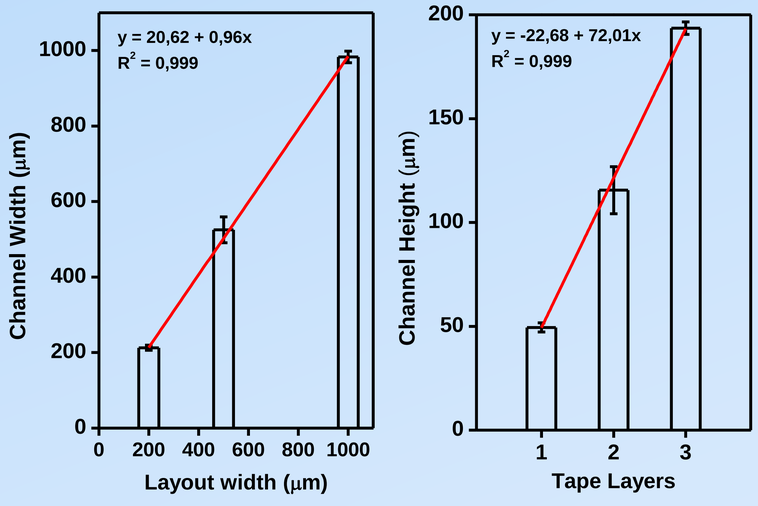

Fig 2. Accuracy of the mold dimensions in the X-Y according to the design (left) and PDMS replica channel height as a function of the number of tape layers (right).

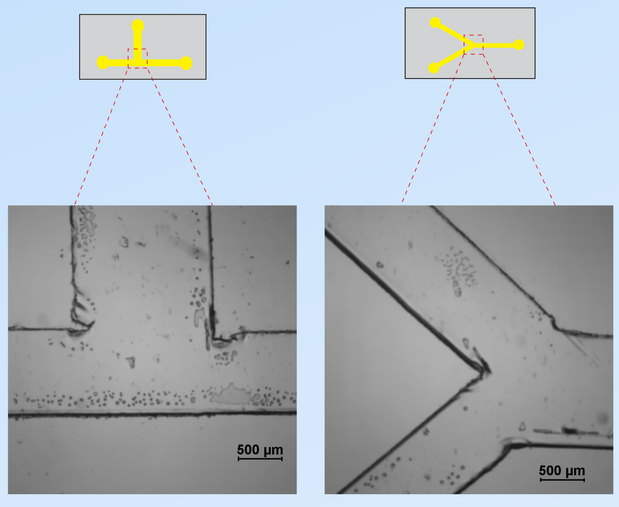

Fig 3. Microscopic images of fine details of molds: T-junction (left) and Y-junction (right).

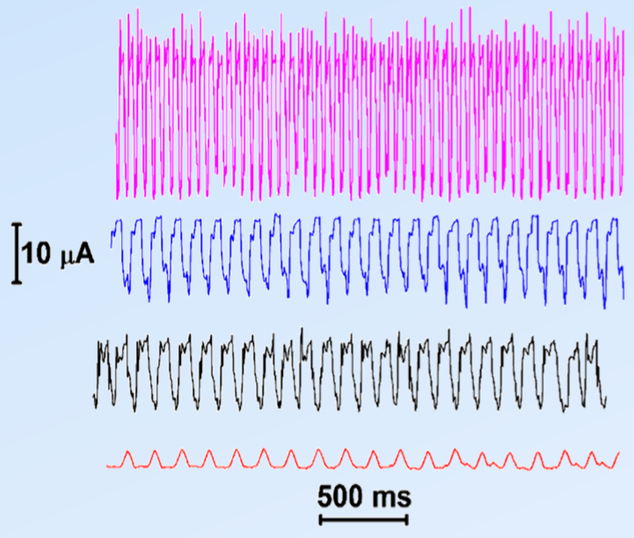

Fig 4. Chronoamperograms for $[Fe(CN)_6]^{3-/4-}$ electrochemical detection in segmented flow at flow rates of 50 (red), 75 (black), 150 (blue) and 250 (magenta) μL min^{-1}.

Conclusions

- Low-cost, and rapid-prototyping method has been developed to fabricate PDMS microfluidic devices.
- T-junction microfluidic device was employed for on-line electrochemical detection coupled to miniaturized Pt-based electrochemical flow cell.
- The extremely user-friendliness of this microfluidic rapid-prototyping method and its coupling with electrochemical detection accelerates the inclusion of microfluidics in the everyday workflow of any laboratory.

References

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