Micro/nanotechnologies for sensing and cell analysis

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Abstract

Over the past decades microfluidics technologies have enabled the realization of a large variety of Lab on Chip systems. Many of these systems make use of the relatively straightforward PDMS molding technique. However, new technologies are always under development and here we present a few new techniques to make nanostructured SERS surfaces, ion-selective electrodes on microneedles, gold nanodots, nanotubes and to make microstructures for cell analysis.

In all cases we follow the top-down strategy, with an accent on using simple, standard microfabrication methods to realize new micro and nanostructures with new functionalities. In the case or the SERS surfaces, the novelty lies in the combination of Raman surface enhancement and electrochemical conversion, for the ion-selective electrodes it is the new interfacial polymer layer, while for the gold nanodots and nanopores use is made of nanocrystallization as well as surface transport of SiO2 along gold surfaces at elevated temperatures. Finally, the printed protein spots are new as a method to partly immobilize moving sperms cells in a controlled way. We also present microstructures to capture and analyse single sperm cells. For all techniques, possible applications will be discussed.

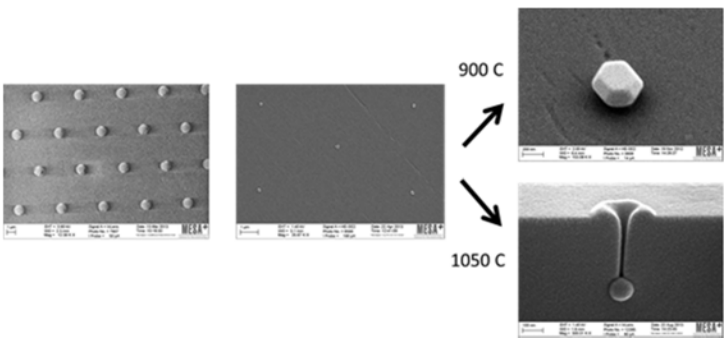

Fig. 1 Formation of gold nanodots from thin film gold spots, and subsequent nanocrystallization (top) and nanopore formation (bottom)

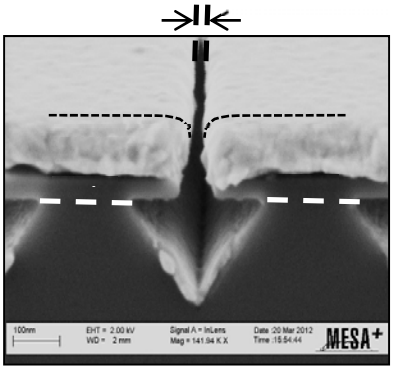

Fig. 2 Nanogap formation for SERS structures. Gap size (arrows) varies from 5-20 nm.