Interdigitated micro-and nano-electrodes for DNA hybridization detection using electrochemical techniques

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Interdigitated gold microelectrodes are widely used as bio-sensors by combining the properties of the electrodes design (fabrication process, number of electrode pairs, electrodes width, length and space, coating properties, etc.) with customized electrochemical techniques that allow to measure and analyze the electrical signal of the electrodes response to specific biological compounds [1-4].

The aim of this work is to develop and characterize a micro sensor based on interdigitated electrodes manufactured by photolithography method able to detect DNA hybridization. Sensors were fabricated on SiO_2 wafers covered with a thin titanium adhesion layer and gold top layer deposited by e-beam PVD-sputtering technique (fig. 1).

Ti/Au microelectrodes with different geometries were exposed to thiolated DNA and then to the complementary DNA chain. Hybridization process is detected by Surface Plasmon Resonance and electrochemical techniques such as impedance spectroscopy and potentiostatic-potentiodynamic measurements in PBS solution.

As a further step to achieve higher sensitivity [1], nanointerdigitated electrodes with submicron widths were also fabricated via nanoimprint lithography. Preliminary fabrication results will be presented (fig. 2).

References

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Figures

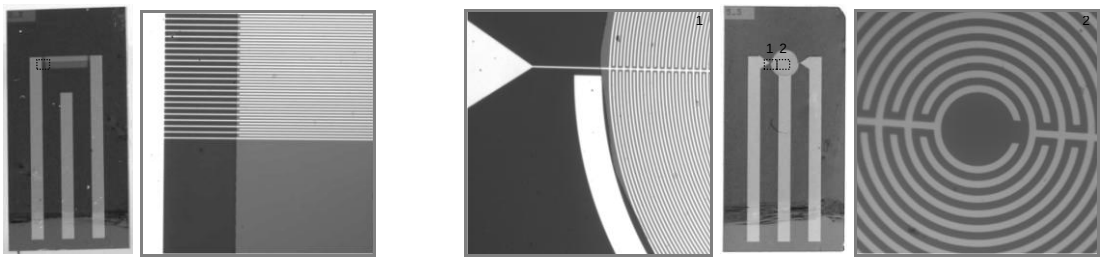

Figure 1. Sample pictures of microelectrodes used in this work: linear geometry (left), 2 μm width and 2 μm gap; and circular geometry (right), 5 μm width and 5 μm gap.

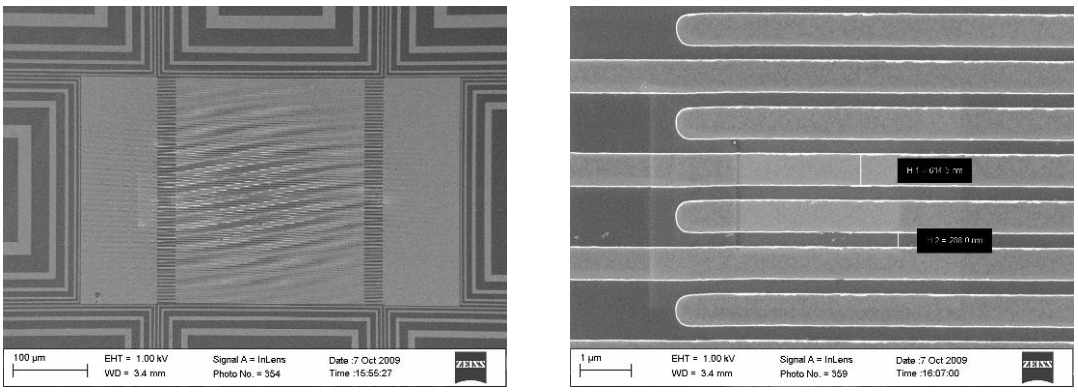

Figure 2. Micrographies obtained by scanning electron microscopy showing the interdigitated nanoelectrodes.