Nanofabrication process for ex- and in-situ TEM heating and biasing chips

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Abstract.

In-situ transmission electron microscopy is a powerful technique which allows performing experiments in real time with atomic resolution thereby enabling to correlate, structural and compositional characteristics of materials with their physical properties.[1, 2]
In the current work, we present a process to fabricate heating and biasing chips in order to correlate ex-situ and in-situ transmission electron microscope (TEM) studies. Unlike the commercial chips, [3] ours do not have a SiO_2 or Si_3N_4 support membrane, but a trench for the electrons to pass through. The membrane absence helps avoiding problems related to their poor mechanical properties (brittleness). It also enables their use in liquid or atmospheric pressure environments, as well as high voltage bias measurements or studies at high temperature.
In addition, one of the most promising aspects of these chips is their ability to be used as a sample support in other analytical tools such as: electrical probe station, scanning electron microscope (SEM) or atomic force microscope (AFM), Raman spectroscopy, etc. This means that we can correlate different characterization techniques on a same nano-object.
In this talk, we will discuss the fabrication as well as the application of these chips into 1D [4] and 2D samples.

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a) b)

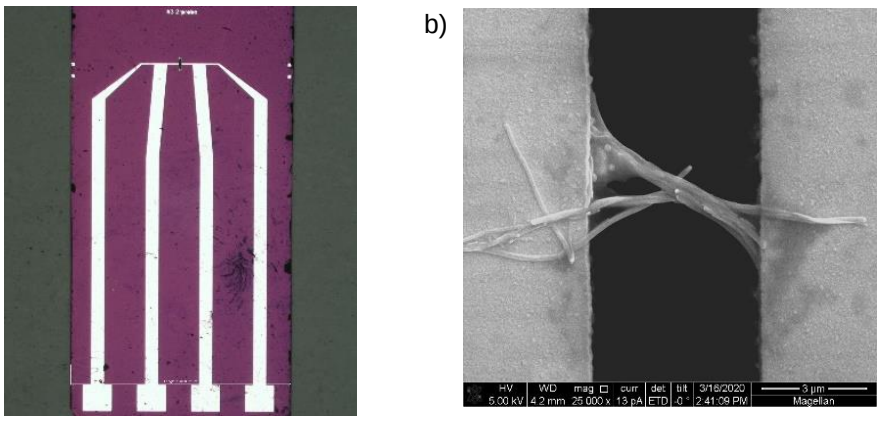

Figure 1: Optical a) and SEM Images b) of a 2 point-probe home-made chip. b). SEM image of drop-casted carbon nanotubes between electrodes