FIB processing using Elphy: some examples

Albert Guerrero
Jordi Llobet, Marta Gerbolés, Xavier Borrisé and Francesc Pérez-Murano

IMB-CNM (CSIC), Carrer dels Til·lers s/n, Barcelona, Spain

albert.guerrero@imb-cnm.csic.es

Abstract

The Barcelona Microelectronics Institute (IMB) is the Barcelona location of the National Microelectronics Center (CNM). It belongs to the Spanish Research Council (CSIC).

IMB-CNM holds the largest Integrated Clean Room for Micro and Nano fabrication in Spain. It is a Large Scale Facility (ICTS) dedicated to the development and application of innovative technologies in the field of Microelectronics together with other emerging Micro/Nanotechnologies, and it is equipped with state of the art equipment for micro and nanofabrication.

In this work we are presenting some of the activities performed with our focus ion beam (FIB) system. It is a 1560XB CrossBeam system from Zeiss equipped with Ga^+ ions, gas injection system (GIS) for enhanced etch and local deposition, three nanomanipulators for electrical probing and TEM lamellae preparation and an ELPHY Quantum attached system for lithography purposes.

With the ELPHY Quantum system is possible to control the ion beam for nanofabrication of devices by ion implantation and/or milling by fine tuning the dose and precise control of beam positioning [1][2].

References

[1] J Llobet, M Sansa, M Gerbolés, N Mestres, J Arbiol, X Borrisé and F Pérez-Murano, Nanotechnology, Patterning and Nanofabrication (2014), Vol. 25 Number 13

[2] J Llobet, M Gerbolés, M Sansa, J Bausells, X Borrisé and F Pérez-Murano, J. of Micro/Nanolithography, MEMS, and MOEMS, Special Section on Alternative Lithographic Technologies IV (2015), Vol. 14 Number 3

Figures

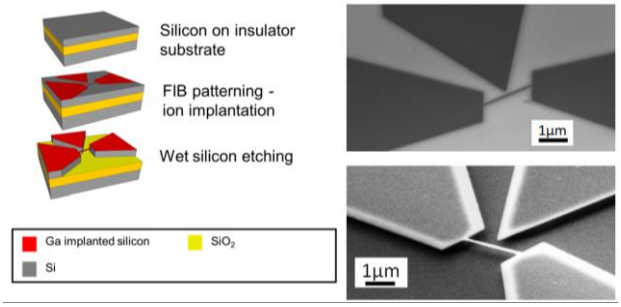

Figure 1: *Left*: definition of structures by means of Ga^+ ion implantation and subsequent wet etching of the silicon to form the final structure.
Right: SEM images previous to the wet etching and after the wet etching.
As can be seen in the first image the substrate is exposed with Ga^+ ions using ELPHY Quantum software, obtaining a patterned substrate with our desired design. In the second image, it can be observed the released structures after the wet etching. Big exposed areas are still attached to the bulk substrate (darker areas) but the smaller resonator is just hanged by the bigger areas. The fine dose tuning and the correct energy selection allows to create these structures very precisely.