DESCRIPTION OF NANOLAB EQUIPMENT IN ZARAGOZA AND FIRST TESTS

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In this contribution we describe the new NanoLab equipment just installed in the Institute of Nanoscience in Zaragoza and the first tests. This equipment is a "dual beam" system by FEI (Nova NanoLab 200) that integrates a 30 kV field-emission electron column and a Ga-based 30 kV ion column set at 52º. The equipment is very flexible allowing for multiple tasks in the domains of visualization, chemical analysis, nanolithography and nanodeposition. For visualization, the NanoLab has several detectors able to image via secondary electrons, backscattered electrons and secondary ions. Also, the transmitted electrons can be in-situ detected in thinned samples via a retractable STEM detector able to produce bright- and dark-field images. For chemical analysis, the equipment relies on an EDX detector that analyses the x-ray signal produced in the sample by the incoming electrons. For nanolithography, patterning can be produced either through Ga ion milling or through electron-beam lithography in combination with our facilities in a clean room. The RAITH Elphy Plus hardware and software have been implemented in the machine to facilitate this purpose. In optimal conditions, lateral resolution in lithography down to 20 nm can be expected in this kind of equipment, which paves the way for multiple applications in a large variety of working fields in Nanotechnology. The NanoLab has 5 gas injectors: Iodine, Pt, W, TEOS, Co. Whereas the first one (Iodine) enhances milling rates, the other four ones allow nanodeposition of the corresponding materials via the breaking of the precursor-gas molecules with the ion or the electron beams. Deposition of Co is certainly a novelty in dual-beam commercial systems. The equipment can also be used for lamellae preparation for in-situ and ex-situ TEM imaging. The Omniprobe system installed in the machine will provide in-situ lift-out of the lamellae. Finally, 4-probe electrical measurements are also possible in-situ by means of four microprobes. The range of movement of the sample stage is 50 mm x 50 mm on the x-y axis. Reviews on the vast applications of dual-beam systems can be found in references [1-3]. The access to the instrument is open and will be provided through service to external users by the technician in charge of the equipment (R. Córdoba, rocorcas@unizar.es) and through scientific collaboration with the involved researchers. A few preliminary tests with the equipment will be shown in the poster, in particular those obtained on epitaxial oxide-based thin films such as Fe_3O_4.

References:

[1] S. Reyntjens and R. Puerts, *J. Micromech. Michroeng.* **2001**, *11*, 287.
[2] S. Khizroev and D. Litvinov, *Nanotechnology* **2004**, *15*, R7.
[3] A. Tseng, *J. Micromech. Michroeng.* **2004**, *14*, R15.

Figures:

Figure 1 Inside part of the chamber where one can see the electron and ion columns at 52º, the electrons and ions detectors, the gas injectors, and the Omniprobe lift-out probe.

Figure 2 External aspect of the chamber with several accessories.