NanoFABs – as a nearest future for nanotechnology instruments for electronics

Bykov V. A.[1]

[1] **NT-MDT Co. 124460, Moscow, Zelenograd, tel. +7 535 03 05, vbykov@ntmdt.ru**

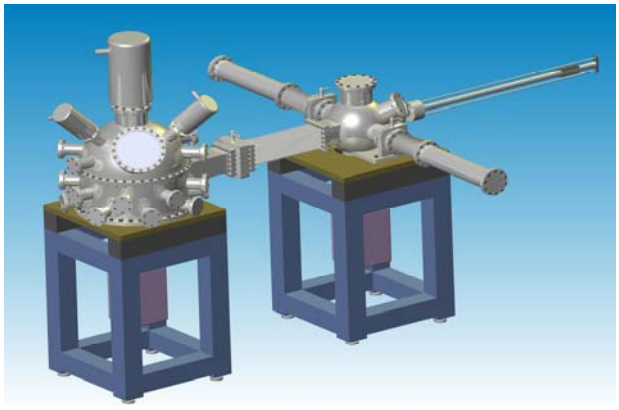

Fig. 1 The design of NTF “NANOFAB”

The nanotechnology facility (NTF) ‘NANOFAB’ will be developed to be the most powerful Nanotechnology R&D and technological facility in the World for the next 3 – 5 years. ‘NANOFAB’ is based on SPM, SEM and FIB technologies, compatible with MBE & CVD systems for 1”– 4” wafers – that is a grate “alloy” of NANO in the plate and NANO under the plate technologies. ‘NANOFAB’ is to be developed and produced under international partnership of three companies: ‘Nanotechnology-MDT’ (Zelenograd, Moscow, Russia), ‘Orsay Physics’ (FUVEAU, Provence, FRANCE) and ‘SELMI’ (Sumy, Ukraine).

‘NANOFAB’ is two UHV chamber system. It consist from the beams (upper part) & probes (ground part) chamber (B&PC) (P up to 10^{-9} torr) with SEM system, FIB systems (up to three columns) and SPM heads (up to 6 different heads – STM, AFM, SNOM, tuning fork DFM/STM, SCM, nanoindentor head or any other). Second UHV chamber is planned for sample preparations, transportation between MBE, CVD or any other system and as lock-chamber. NTF "NANOFAB" contains more than one (up to three) FIB columns, that will allow making local nanoobjects of complex structure, modifying quantum dots, making necessary priming. For every SPM head it will be possible to approach any allocated place on a plate and to make required measurements. Two-coordinate CLOSED-LOOP Stage with moire gage sensors will provide necessary accuracy of positioning, and SEM - additional visualization. SPM heads will be located by a ring. There will be a scanner with capacitance gages in the Stage. SPM probes are situated in the central area of the chamber that provides an opportunity of the SEM control. Fast, not destroying scanning in NTF ‘NANOFAB’ is carried out by SEM electron beam, with use of a column with electronic optics on the basis of a microscope of model SEM-106 (SELMI, Ukraine), which is installed on the top central flange. Changing the energy and size of an e-beam it is possible to switch the device in the lithography mode with an opportunity of polymerization, destruction or growth of required structures.

NTF "NANOFAB" design allows its equipment by three types of FIB systems for etching and growth the dots and extended nanoobjects, that are capable to play an independent functional role, and to be the catalysis centers for growth nanostructures in MBE or CVD systems. This considerably expands technological opportunities of system. If necessary NTF ‘NANOFAB’ can be equipped with the systems of the analysis widely used in HV and UHV systems:

- - X-ray microanalyzer;
- - Mass-spectrometer;
- - Systems Auger and SIMS spectroscopy, EXAVS spectroscopy, electronic spectroscopy for the chemical analysis.