Kavli Nanolab Delft
Enabling nanodevice fabrication

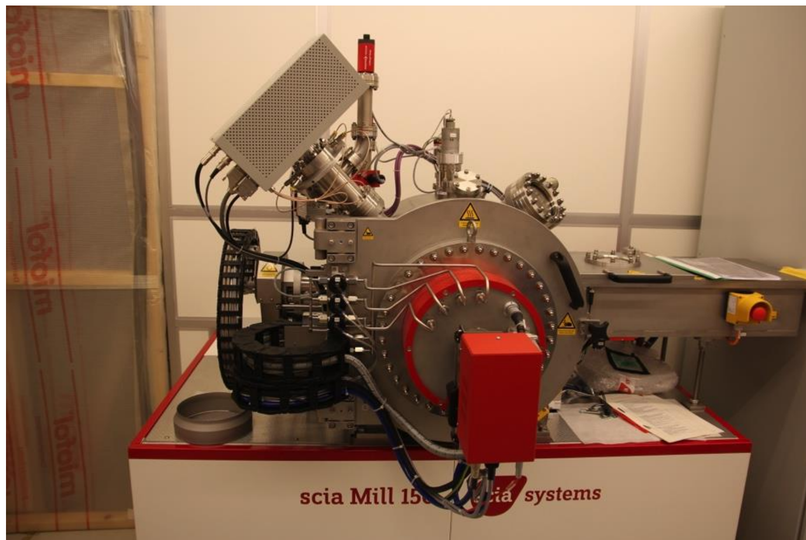
Dear cleanroom user,

This is the 16th edition of **Kavli Nanolab News**. In this issue you can find some general news on the cleanroom and about newly installed equipment and expected installations in 2017.

SCIA Ion Beam Etcher

The SCIA Ion Beam Etcher is a flexible tool for dry etching materials that cannot be processed by Reactive Ion Etching. The system has SIMS End Point Detection and He wafer backside cooling to enable etching with resist masks. The system was accepted with a standard process for etching SiO_2 and is now ready for use for other materials. Experiments with etching Au and Pt are planned. Ion Beam Etching can be used for materials which are hard to etch by Reactive Ion Etching because no volatile reaction products are formed and can be an alternative for lift-off in some cases.

Please contact Marco van der Krogt for more information.



HMDS primer process in Delta RC80

Recently we installed a HMDS primer process (the left unit) on the Delta RC80 machine, which is operating independently from the spin coater part.

The advantage of this vapour phase unit in comparison to the regular spin coating is not only to reduce the chemicals consumption but also to create a thinner layer of HMDS which minimizes the possible decomposition that is seen often in case of thicker layers (decomposition usually happens during the baking step).

HMDS increases the surface adhesion of the silicon substrates by binding of the silicon atoms of HMDS to the oxygen atoms of the silicon surface. This will result in a higher contact angle (more hydrophobic surface) and good resist wettability. Therefore, it is very important to have a proper pre-heat treatment for silicon substrates in order to get rid of the water residues. This is usually done by 10 min heating the substrate on the chuck at the temperature of 150 °C. The results as depicted in the images below show that the contact angle of the sample treated by HMDS unit is quite similar to the one treated by regular spin coating. In this process, HMDS vapour has been deposited on the silicon wafer for 45 sec. All process conditions can be adjusted depending on the user wishes.

a)

b)

c)

a) Vapour process - pre-treated silicon for 10 min at 150 °C, then 45 sec HMDS (recipe 3)
b) Spin coated silicon with HMDS at 4000 rpm, baked 2 min at 200 °C
c) Untreated silicon wafer with much lower contact angle.

Please contact Ashkan Tavakoli for more information.

New equipment in 2017

Four new machines will become availble to users in the course of 2017.

- High-resolution X-ray diffraction, Bruker AXS D8 Discover, machine is installed (F-wing, TN building) and is expected to be ready for users soon.
- Atomic Layer Depostion, Ultratech Fiji F200 Gen 2 with ICP plasma source and substrate bias, dedicated for nitride films, ionclusding TiN and NbN based super conductros. Installation of the tool is in CR TU-15 and is planned in Februay.
- FIB/SEM, FEI Helios G4 CX. Tool is for nano-fabrication (Ga milling, IBID, EBID), TEM lamellae fabrication with highly automated workflow and 3D image reconstruction by auto slice and view mode. Among the many options on the system is a low energy ion source for damage removal and sample cleaning. The sytem is expected in May and will be installed in VLLAIR in the D-wing.
- Cryo/Boch deep silicon etcher, Oxford Instruments PlasmaPro 100 Estrelas. The system is capable of running cryo and Bosch processes with automatic change-over between the two modes. The Bosch process mode will include fast etching with etch rates till 20 µm/min and smooth side wall processes with reduced scalloping. The machine will be installed in the CR in TU14, and is expected to arrive in Delft in April.
- RIE F2 will move to the open postion between F1 and SCIA. This creates the space needed for the new Cryo/Bosch etcher.

Functions of wet benches

This year we realized a splitting of functions of the wet benches. The benches are marked accordingly in clear lettering. Please note the separation of inorganic and organic processing, as well as the (NEW!) separation of photo resist processing (TU07-02) and EBL resist processing (TU01-02, TU01-03, TU01-04).

Changes in Living Data Base

As of 9 Januari 2017 several changes will implented in the LDB reservation manager.

- The remaining time of a reserved slot can be deleted, also when the starting time has passed.

- If a user has not used a tool for more than 1 year the status of the user change to trainee. To re-activate the user has to contact the equipment owner for re-training or to get updated.
- User will receive a yearly enquiry on safety matters (all users) or on working with chemicals (wet bench users only). The date will depend on the starting data in the CR. You will need a 100% score to continue your status as active user.
- The equipment status *under suspicion* was not unambiguous. Therefore it will be split into two new ones: *suspected down*, to be activated by the user, and *partially up*, to be activated by the equipment owner indicating that some functions may not work.

Year Calendar 2017

The year calendar for this year of KN is published on our website:
http://www.tnw.tudelft.nl/en/about-faculty/departments/quantum-nanoscience/kavli-nanolab-delft/new-users/