

Dear cleanroom user,

We are pleased to present the third combined newsletter of Else Kooij Laboratory and Kavli Nanolab. In this newsletter, we will keep you informed about all activities within the shared TU Delft cleanroom infrastructure, including updates on new equipment, procedures, introductions to new colleagues, and other exciting developments.

We hope you enjoy reading it!

On behalf of the EKL and Kavli Team,

Pieter Telleman, Bruno Morana, and Marc Zuiddam



New staff member

We are extremely happy to announce that Esther Pot will join the Campus baseline lab starting July 1st. After her bachelor end project where she investigated the growth of indium from liquid phase (See results down here) she will start as a junior process engineer at Kavli. She knows already quite some equipment in both Kavli and EKL, since she also worked as a Flex Delft student in EKL. If you want to know Esther, please visit here at Eugene and Brians office (@VLL) or check out the last newsletter, where she introduced herself already.



(Avoiding) EBPB problems

During last months, both our EBPB systems have been down quite often and sometimes long due to unexpected additionally showing up problems. Sometimes, we just had bad luck of hardware breaking down (e.g. EBPB5200 clamp motor, SPLC vacuum controller and turbo pump), but also user-induced or -avoidable problems showed up.

EBPB5200 holders are quite large and heavy, and the backside sapphires sometimes are damaged, possibly by jamming holders onto the alignment microscopes or just letting flip the holder locking mechanism of the Confovis alignment microscope. Also sometimes side or bottom wheels got lost when fixating pins become loose or get lost spontaneously. Lost wheels or sticking out pins can account for (un)loading or clamping problems.

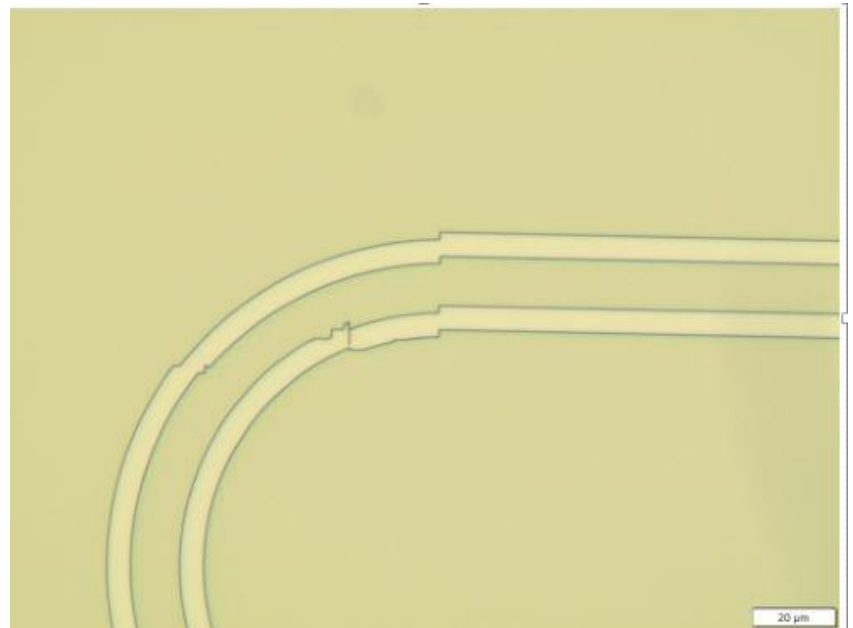
On EBPB5000Plus, more prone to user errors, several holders were reverse-loaded or too high to unload from stage to load lock due to loose (especially 2" wafer) clamping screws.

Of several holders calibration marker plates “just” got damaged, tilted, or “just” disappeared.

Also there was much contamination of the 400 micron final aperture, seen by large measured low-current spots, which could have been caused by poorly baked resists being exposed with large beam currents. The preventive maintenance in December, cured this, but a lot of other problems, also due to aging electronics, mechanics, and water and air hoses, showed up on EBP5000plus.

During last months, BOTH EBPGs suffered from broken beam current meter preamplifiers. In 2019, on EBP5000Plus, this happened due to a Quartz wafer that accidentally wasn't covered with a conductive Elektra92 layer. Especially during long exposures with large beam current charge can pile up on the substrate and suddenly discharge to the holder and go via the beam current meter to ground.

Recently used insulating substrate materials include glass/quartz, lithium niobate on top of silicon and high resistive silicon. In spite of conductive layers underneath non-conductive resists, charging still can occur, showing up as displacements in patterns, alignment markers being found difficultly or at wrong places, and worst-case damaged beam current meter preamps. Example of pattern displacements (L.Scarpelli)



What users should do:

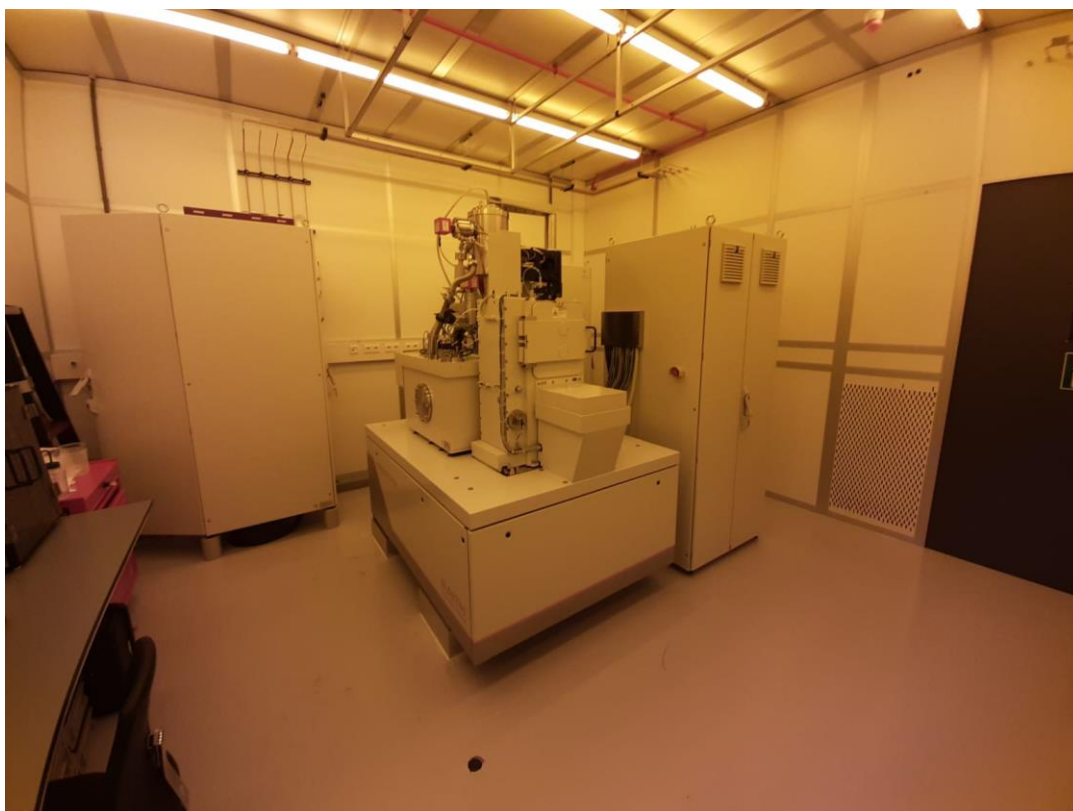
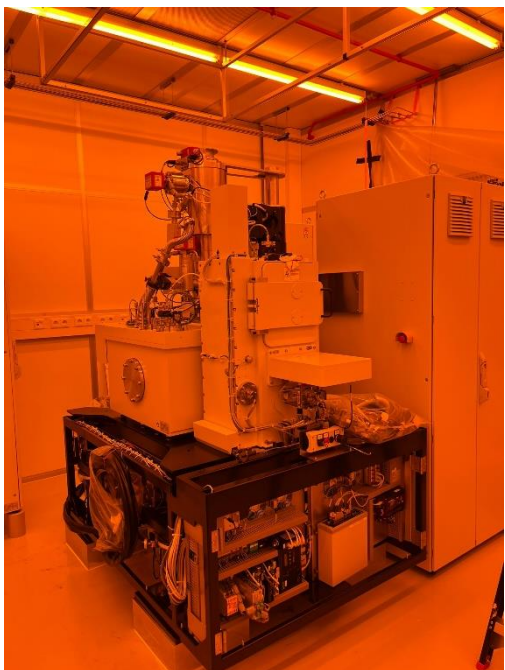
- To avoid degassing and aperture contamination:
 - o bake resists long and hot enough
- To avoid charging:
 - o use a conductive top layer (Elektra92, chromium,...)
 - o be sure it's conducting to the holder table
- Handle holders with care:
 - o when taking holders from rack, or placing them back
 - o on alignment microscopes
 - o check for missing wheels, missing or sticking out other parts
 - o be careful with calibration marker block and plate
- When loading holder in load lock:
 - o mind holder orientation
 - o check holder, screw and clip heights

FFU unit replacement (@VLL)

Over the last six months, more than 300 filter fan units have been replaced in the Kavli cleanroom due to the end of their lifecycle. During the replacement and calibration, the involved module was not accessible to users. We are aware of the impact this had on the users and are happy to announce that the full replacement has been completed!

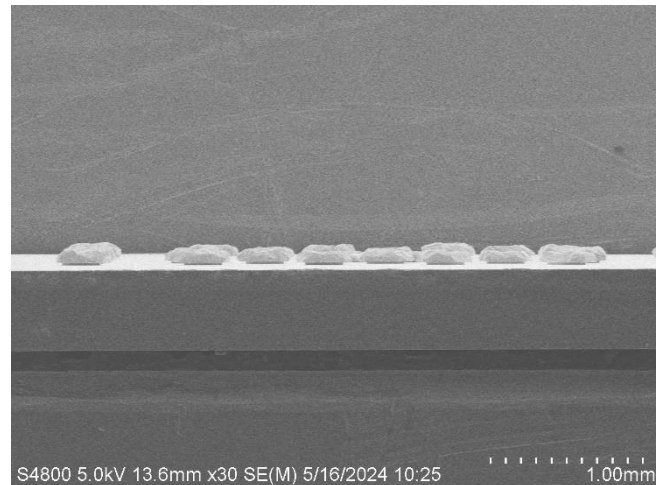
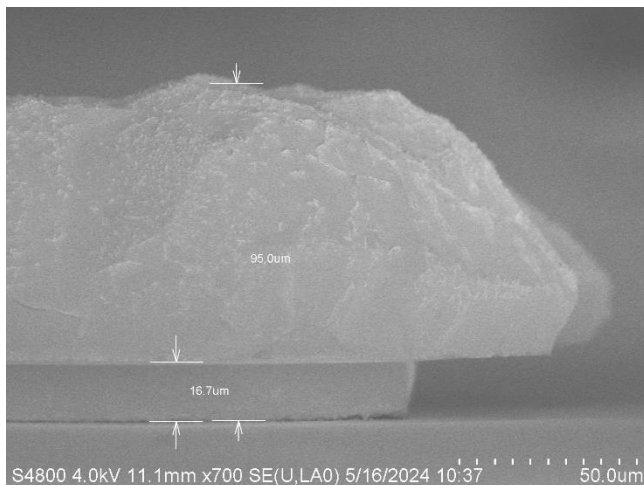
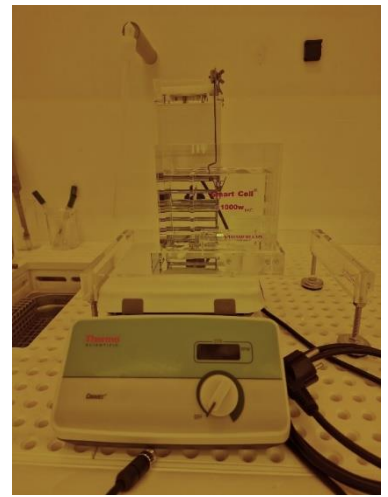
New EBPB arrived (@VLL)

Tuesday May 14th, the new EBPB 5200 plus arrived. Currently the installation is ongoing, interrupted every now and then due to issues with the other EBPB's. We have suffered quite some downtime on the EBPB's lately. We are sorry for that and we will do our utmost best, together with Raith, to increase the uptime again. Once the new EBPB is operational we will remove the EBPB 5000 from the cleanroom. The system will serve Raith for spare part of other old systems in the world.



Indium electroplating setup (@VLL)

We have a new electroplating setup for depositing Indium on your samples. See the picture for the setup. This setup enables more controlled growth of Indium compared to the old setup, by maintaining a constant flow inside the system and shaking your sample within the liquid. Still a lot of testing is required, but so far we have been able to make Indium bumps of 95 microns thick. See the SEM pictures for an overview of the created bumps.



Ethos Lean setup (@VLL)

We invested in a “chemical microwave heating oven” in the wet bench area for small samples (Diamond community). The oven can simultaneously accommodate approximately 6-14 Teflon cylinders. The acid is fully enclosed within a Teflon cylinder to prevent the release of acid gases, ensuring safety. Even if vapor were to escape, the oven has an exhaust tube that would remove the vapor from the duct when the oven is installed in the wet bench. The system is expected to allow us to surpass the current temperature limitations (for instance for triacid). Acid cleaning at higher temperatures would provide enhanced cleaning capability in a shorter time. Since there is no need to use a hot plate as before, both the heating and cooling rates are faster, reducing waiting time.

Eugene Straver and Takashi Yamamoto can provide more information.



Keyence microscope (@VLL)

Quantware invested in a Keyence microscope which is also allowed to be used by the cleanroom community. The system will be located in the wet bench area, and will be delivered beginning of June. On the website of Keyence they describe the system as follows: The VHX-7000 Series is a fully-automated digital microscope system that enables even novice users to capture high-resolution images that rival an SEM. The Optical Shadow Effect Mode features a combination of specially designed high-resolution lenses, a 4K CMOS, and high-performance lighting that enables minute surface details to be observed and analyzed. The seamless transition in magnification from 20x to 6000x using a motorized turret offers a stress-free observation environment. The VHX-7000 Series 4K industrial digital microscope offers the highest level of automation and best picture quality in the VHX Series. All these features and more add up to make it the best digital microscope on the market.



Cleanroom Information Display

A feature of the NanoLabNL Information System (NIS) is the possibility to display an Information page via a webbrowser. It can show a selection of Equipment Statuses and other actual information, for example upcoming 'Out of office' regime.

This week a first 'Information Display' was installed on the walking route to the VLL cleanroom at the end of the D-wing (near the Kavli Nanolab coffee corner).

If you have any ideas what to show, please drop us a [mail](#). For example: a picture of a nice fabrication result, a quote of the day, or ... ?

Important information will also (still) be communicated via NIS notifications and Whatsapp groups.

Kavli Nanolab Delft
Enabling nanodevice fabrication
www.tudelft.nl/cleanrooms
 Else Kooi Laboratory

visit <http://www.tudelft.nl/cleanrooms>

Equipment states

- Microscopes_Olympus
- Oxford CI Cobra Diamond
- Oxford Estrelas DSE
- Bosch_Estrelas
- Oxford Estrelas DSE
- Oxford_CI_ICP
- Plasmalab80+ PECVD
- Plassys MEB550
- Probe Station Automated
- Probe Station MicroXact SPS-1000
- Renishaw Raman
- RTP
- SCIA Ion Beam Etcher
- SEKI SDS6300 Diamond CVD

i week 26 (24-28 June 2024): KN cleanroom closed for 'maintenance week'

Permanent markers at glassware

In the user box, you will find a "permanent" marker that is removable in our dishwashers. We have observed that permanent markers from other brands, or markers of the same brand but with different pen thicknesses, may not always be removed from glassware marked in the wet bench area. We strongly urge you to use the markers provided by us for labelling glassware. If you have lost your permanent marker or if it is no longer working, please ask us for a new one instead of using your own.



Status of new Tempress furnace stacks (@EKL)

The first new Tempress furnace stack has been installed in the CR100 (@EKL) and set-up for use. This stack (to be named either "stack O" or "stack T") is meant for wet and dry oxidation and annealing wafers.

The system is almost ready for users to receive training. The equipment training course will be made available on NIS soon. For more information about the new oxidation furnace stack, contact Francesco Stallone.

Removal of the remaining old oxidation furnace stacks as well as one of the LPCVD stacks (so stack C, D, and E) is postponed until July / August. The exact schedule is still being finalized, but we will notify all of you as soon as possible.

After the above furnace stacks are removed, installation of the 2 new LPCVD stacks can begin. Note that LPCVD stack F will remain available during this time, for nitride / carbide depositions. However, no LPCVD polysilicon or LPCVD-TEOS depositions will be available until the 2 new LPCVD stacks have been installed and completed their acceptance tests. Also furnace stack at VLL will be removed to free space there somewhere this summer. All oxidations, LPCVD Nitride and anneal processes will be performed @EKL from that moment on.



Status of the Oxford Polaris oxide etcher (@EKL)

The Polaris etcher (located in the CR100 @EKL) has finished its commissioning.

After addressing some issues with its cooling system, the system is due for further testing of its etching recipes.

Meanwhile work continues on a user manual and equipment training course. Contact Dylan Loozen for more information regarding this system.



New TePla plasma asher (@EKL)

A new plasma asher from TePla has been delivered. This will be installed in the CR100 (@EKL), next to the cleaning line.

This system will replace the current TePla plasma asher, which has stripped photoresist from wafers rather diligently for us but is nearing the end of its usable lifespan.

Due to a different wafer loading mechanism, the new TePla is positioned sideways to allow wafer loading with a table surface below the loading mechanism.

The new TePla plasma asher still needs to be connected and set-up. Until that time, the old TePla will continue to be available.

