Dear cleanroom user,

This is the 27th edition of **Kavli Nanolab News**. In this issue you can find news on plans, new procedures and investments.

New staff

For the start-up of our two new systems (ICP-PECVD and ICP Chlorine etcher) we appointed two interns from "De Haagse Hogeschool". They (Daniel and Jelte) will introduce new users to the systems, develop etch- and deposition recipes and more. We also have a new logistic student assistant, Sylvie.

My name is **Daniel van der Plaats** and from February until June you can find me either in room D117 or in the cleanroom to prepare and write recipe documentation for the new PlasmaPro 100 ICPCVD system from Oxford Instruments. My internship mentor, Roald van der Kolk, tells me that this new system has the ability to deposit high quality SiO2, Si3N4, a-Si, and SiC layers at lower temperatures than the current PECVD operates. Deposition of SixNyOz and SiOF are also possible, as well as deposition reactions involving pure oxygen. I will do my best to provide a comprehensive user manual so all users can capitalize on these deposition options. Feel free to contact me with questions about deposition recipes that you expect the ICPCVD to be particularly suitable for, so I can make sure the answers are included in said manual.

Among all of the mentioned deposition chemistries, I will focus especially on characterizing (a-)SiC films deposited with the ICPCVD. This will contribute to Ass. Prof. Iman Esmaeil Zadeh's research and also be the main topic of my graduation thesis, which will be the culmination of my internship here at Kavli Nanolab Delft. I started this internship two weeks ago and have already learned a lot about various nanofabrication techniques (not just CVD!) as well as inspection techniques such as ellipsometry. I have also met several of you during coffee and lunch breaks, which is a great way to relax (by talking about hobbies such as D&D, brewing mead or Norse mythology) while simultaneously learning about the day-to-day goings-on in the lab.

In any case, I look forward to meeting more of you and to actually start working with the ICPCVD system!
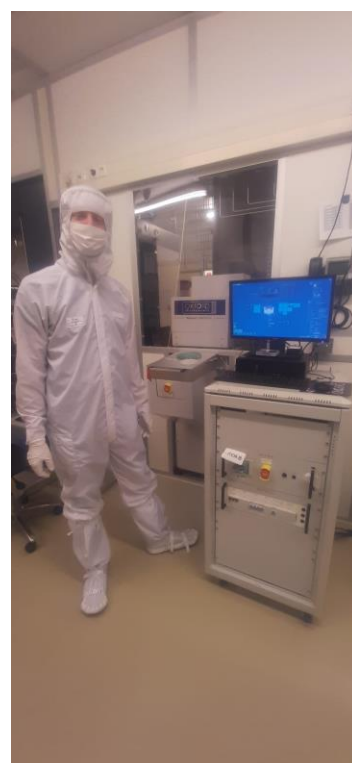
My name is **Jelte Markus**, I am a fourth year applied physics student at the Hague University in Delft. During my study I specialize in nanotechnology with a personal interest in quantum physics. For my third year internship (from February to July) I am tasked to assist with characterizing the new chlorine plasma etcher of Oxford instruments. Not only will I be characterizing it, I will also develop new recipes for etching III-V material, i.e. gallium arsenide (GaAs) and indium phosphide (InP), and other materials such as diamond and siliconcarbide (SiC). In my spare time I enjoy cooking, (solo)travelling and reading manga, Japanese comic books, (mainly horror with classics such as Uzumaki by Junji Ito, and Oyasumi punpun by Inio Asono). If you ever need my assistance you can recognize me by my weird t-shirts.


I'm **Sylvie Bohnenn,** a 24 year old Applied Physics master student at TU Delft. Alongside my graduation thesis, I'll be working in the cleanrooms so that I'm not always glued to my laptop and I'll get some hands on experience in the lab. In my free time, I like to cycle and sail, and you can also spot me in the gym from time to time. I'm looking forward to seeing you in the cleanroom!

New mounting location samples EBPG

To avoid contamination issues and spreading of airborne particles we have designated locations with point exhaust availability. We also implemented this around our EBPG's. Sample mounting on the EBPG holders should be done within the areas indicated with tape, see attached photo. These areas are provided with an exhaust especially for working with III/V materials. Also a vacuum cleaner is positioned close by this area. Please vacuum clean the holder tables and the desk below after using III/V materials and tighten the mounting clips and screws first to prevent them from being sucked up by the vacuum cleaner.
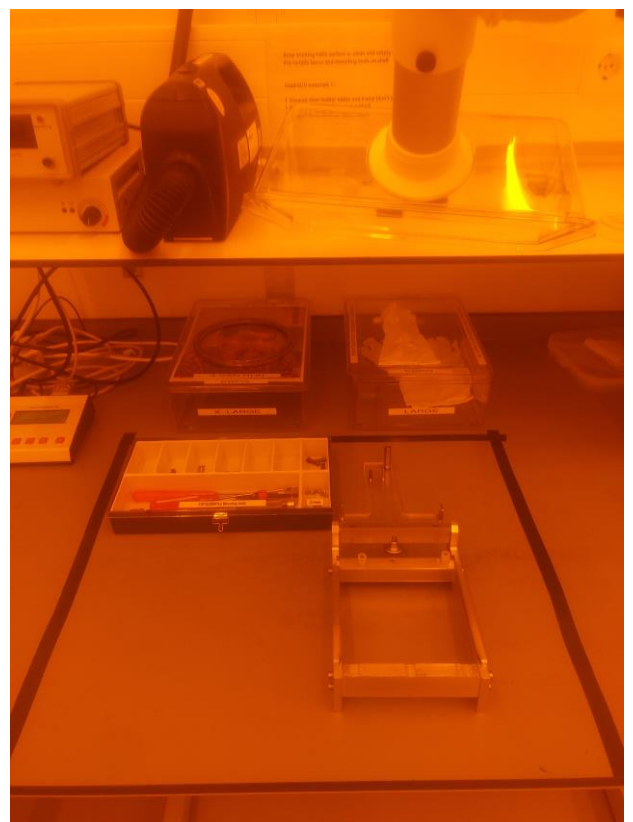
Periodic air sampling and surface wipe results

On different locations in the cleanroom wipe tests have been done to investigate the accumulation of dangerous elements like Gallium, Antimony, Arsenic, Indium etc. Microsoft performed also measurements with personal air sampling systems. Some of their staff members carried an air sampler unit during one day to investigate the work environment. Both measurements shows that almost all measured elements were below detection level and all elements were far below limit value. This is in line with previous tests done by our safety department, indicating that our work protocols are sufficient.

For more details please contact me (Marc Zuiddam).
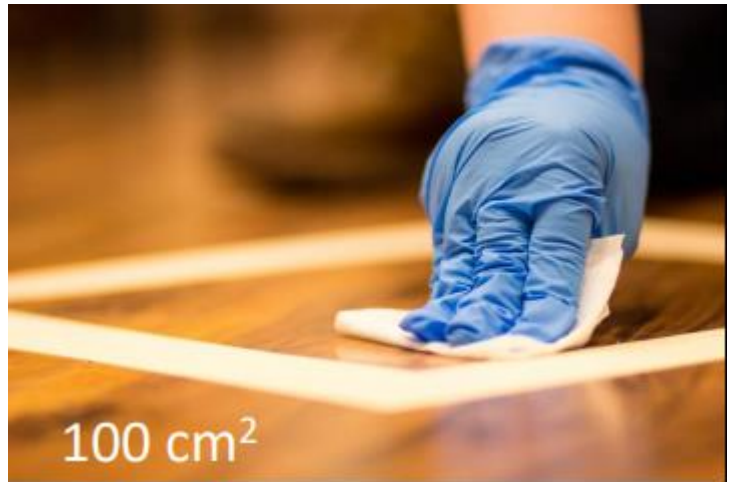
III-V Protocol

The KN staff upgraded the procedure how to deal with III/V samples and their possible contamination. In case of breakage we need to clean up the polluted area ASAP, to avoid any possible pollution. In case you are working with III/V please update yourself on the procedures which can be found here:

https://www.tudelft.nl/en/faculty-of-applied-sciences/about-faculty/departments/quantum-nanoscience/kavli-nanolab-delft/safety

User data safety on our e-beam lithography tools

Kavli Nanolab provides a full-service and *open-access* infrastructure for R&D in nanotechnology. As a result, user data safety gained less attention than might have been necessary with respect to intellectual property (IP).

With the world-wide availability of internet access, research (and its funding) became more competitive. Also more commercial third parties are using our cleanroom facilities. Therefore IP protection becomes more important and this requires protection of user data against unauthorized access.

So far, our EBPG's and their data preparation systems have been very, some would say too, open-access for all users: everybody works on the same general login accounts, because of that everybody has access to each other's job and pattern data files. On the other hand: this way of working made maintenance easy.

A multi-login account environment for EBPG and CAD systems has been prepared, as well as adapted versions of the commands like "dirp5200", "putp5k" and "getpcad" to transfer pattern (.gpf) and job (.cjob) files between our various computer systems.

Also a multi-login account EBPG exposure environment for foreground job execution and batch job scheduling has been prepared and will (soon) be installed, first on the EBPG5200. The environment is compatible with the current general account setup.

On term, when more users transfer to "group" login accounts, the EBPG's the general and privileged "pg" account will become staff only. Instead of this, Arnold van Run expects to create another general account for logging in on the desktop screen of the workstation at the EBPG's and likely you will have to log in on your group account when opening a terminal window. When logging in remotely to an EBPG or CAD system using ssh you'll have to use the command "ssh –Y <group>@<internet_address_of_system>".

Please contact Arnold van Run (a.j.vanrun@tudelft.nl) if you have questions or suggestions.

NIS update

Now that we all have been working with NIS for a few months, we are more or less used to the new software interface. Most of the questions we get are related to the renewal of the safety course. In case your safety course expires (and as a consequence you cannot reserve equipment anymore) feel free to apply for the safety course, and we will grant it again. Later this year Drenso will implement the examination module to refresh your safety skills.

Suit reservation

As most of you already now, we have the option for groups to reserve their week suits in NIS. Just to refresh your memory, we have the following possibilities to get access to the cleanroom:

a) Week suit reservation by your PI or a representative of your group; Week suits are reserved from Thursdays till next Wednesday.
b) (Few) day suit. Reservation is only allowed by suit user him/herself for personal use. One reservation is allowed per 7 days. Reservation can be from one to 4 working days.
c) New cleanroom users will have a one-time suit available for a period of four weeks
d) Visitors, constructors and other external users are only allowed if they have a written permission of the KN- staff. For these people we have constructor suits available (reservation by KN-staff only).

Periodical Olympus microscopes calibration

All four of our Olympus BX-series optical microscopes, that run with Stream Essentials imaging software, are calibrated regularly by the machine owner. As often as four times a year, but at least twice a year (during maintenance weeks) as the absolute minimum.
A typical Thorlabs calibration target is used for every objective, to calibrate the known distance.

On top of that, a service engineer is invited once a year, to clean the optics, replace grease where necessary, to check for damage, and replace parts when needed.
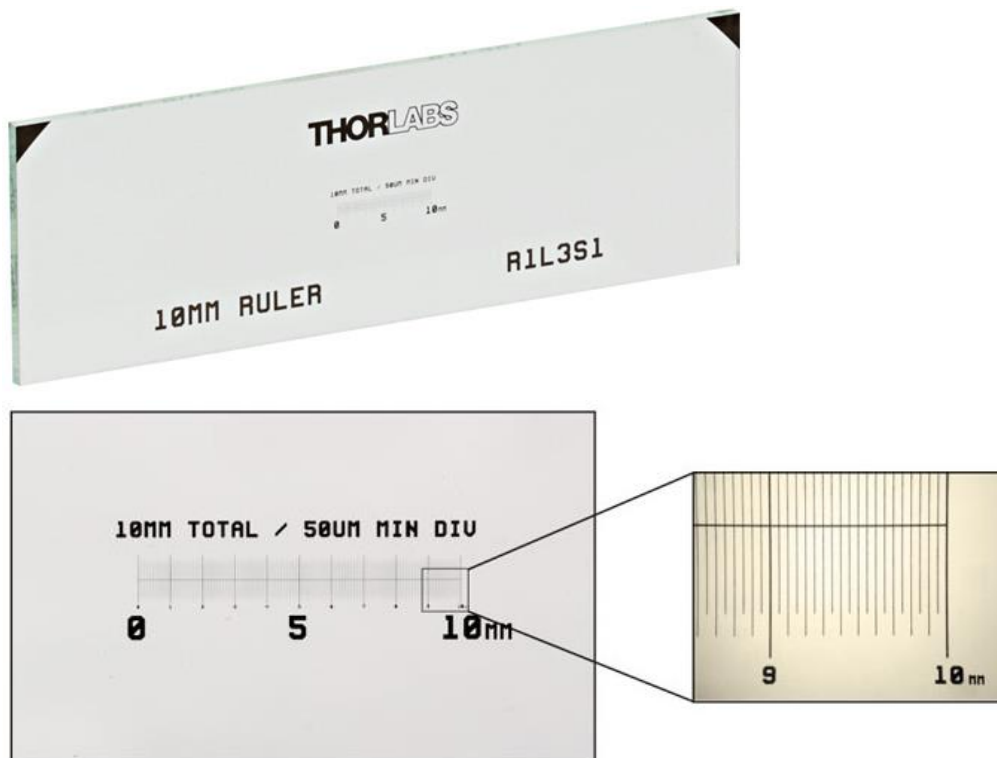
The 5x objective fits approximately 2 mm across the field of view. The 100x objective fits approximately 100 µm across the field of view. If you are interested in the accuracy, please contact the machine owner.

Bruker DektakXT, profilers

There seems to be some confusion about the stylus diameter and stylus force, on the DektakXT profilers. The stylus tip diameters, available from Bruker, range from 0.05 µm to 25 µm. The first being the most fragile and the most expensive.

We use 12.5 µm for best price vs quality. To check which stylus is mounted, look in the logbook and check on the stylus. At the 90-degree bend on the stylus, there should be a drop of paint. Red is 12.5 µm. There is a table above the machine, with all colours and diameters.

The best force settings, on your sample, during a measurement, depend on your sample material. But also on the stylus diameter, since the force on the sample equals the force on the stylus. And both stylus and sample, need to be protected from damage.

Vision Software allows, for the 12.5 µm stylus, a force range of 1 to 15 mg, typically 3 mg.

If you have a very soft sample, choose a lower value. If you have a very hard sample, choose a higher value, to reduce noise. Keep in mind, to protect the stylus from damage, especially with high features, never use high force at high velocities.

If you want to learn more:
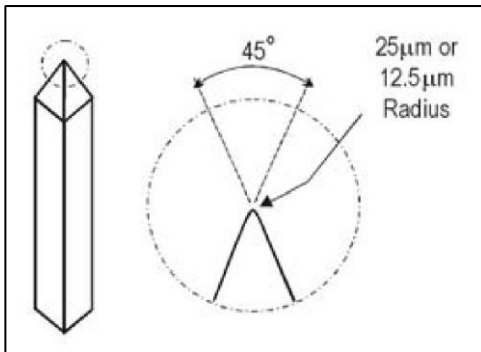
[Image: Schematic view of Bruker stylus shape.]
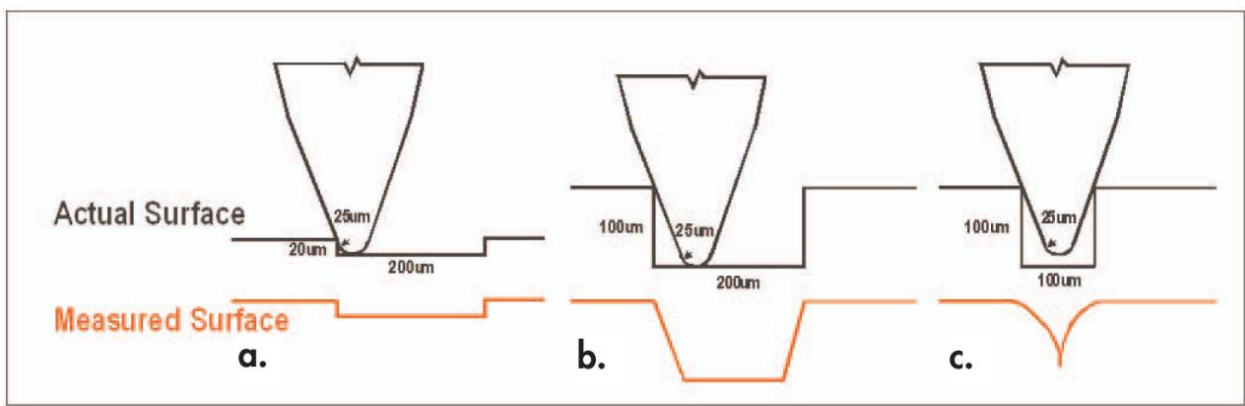
[Image: The geometry of the stylus must be considered for each measurement.]

Contact machine owner if you have questions or suggestions please.