



University  
of Basel

Swiss Nanoscience Institute



Swiss Nanoscience Institute  
Center of Excellence supported  
by the University of Basel  
and the Canton of Aargau

# Nano Fabrication Lab

Our facilities and expertise  
for the fabrication of your  
micro and nano devices



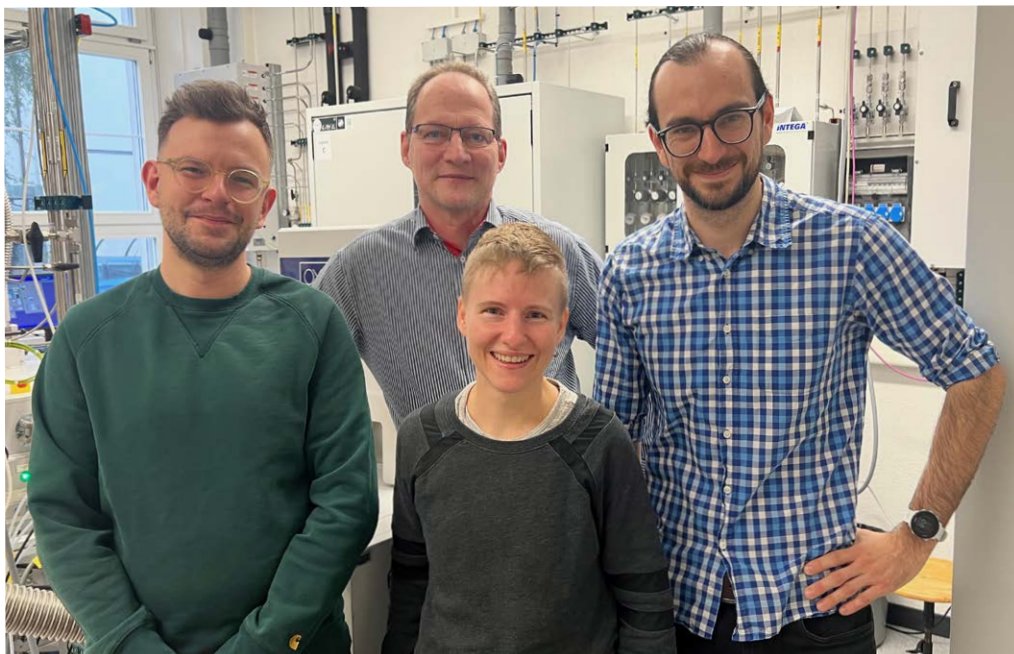
# Nano Fabrication Lab

Based at the University of Basel, the SNI's Nano Fabrication Lab (NF Lab) provides the equipment, environment and experience required for the fabrication and prototyping of state-of-the-art micro and nano materials and devices.

The NF Lab offers you access to its equipment and facilities as well as support and advice on designing your process and on optimal use of our tools. Our facilities are ideally suited to highly flexible processing and fast prototyping, while maintaining a high level of fabrication quality. Our users are able to obtain sub-100 nm features in a wide range of materials.

The NF Lab spans over 500 m<sup>2</sup>, with isolated clean room sections of ISO class 5 to 7 devoted to high-resolution optical and electron beam lithography.

Currently supported by four staff members, the NF Lab features more than 40 nano-fabrication tools for lithography, deposition, etching and characterization. These are used routinely by our users to produce micro and nano structures for application in the research of nanoscale phenomena, quantum computing and thermal transport, among other fields.



The four members of the Nano Fabrication Lab, Xavier Wildermuth, Arnold Lücke, Juri Herzog and Gerard Gadea (from left to right), are happy to support your micro and nano fabrication projects.

**From the wafer to your device**



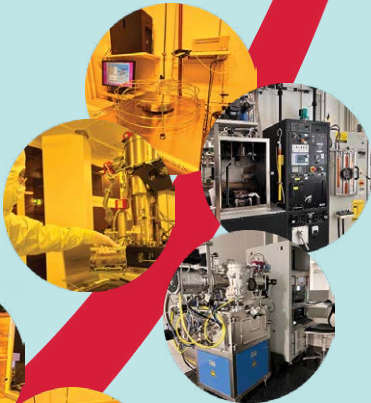
**Integration  
and characterization**



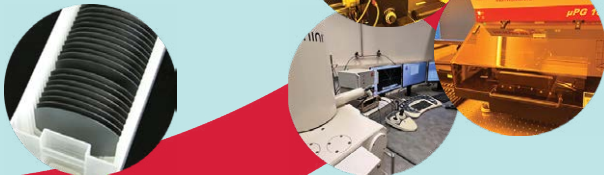
**Etching**



**Deposition**



**Lithography**





# Technologies available at the Nano Fabrication Lab

## Clean room facilities and labs

The Nano Fabrication Lab offers a clean room measuring 30 m<sup>2</sup> (ISO class 7) in the Department of Physics at the University of Basel and a clean room measuring 60 m<sup>2</sup> (ISO class 5) in the new building of the Department of Biosystems Science and Engineering at the ETH in Basel. In total, we offer lab space of more than 500 m<sup>2</sup> devoted to nano fabrication.



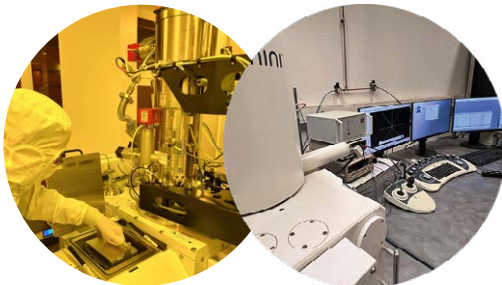
Our clean rooms ensure the reliability, yield and quality of your micro and nano fabricated structures and devices.



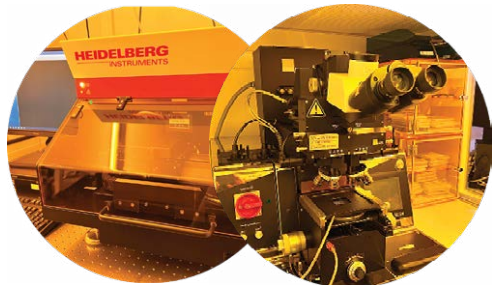
Our established facilities are available for dry and wet etching processes.

## Lithography

Lithography allows the precise transfer of patterns onto semiconductor wafers. The process uses radiation (light or an electron beam) to transfer a geometric pattern to a sensitive chemical resist on the wafer surface. We have devices available for different applications.



We use our electron beam lithography systems for fine writing of structures < 100 nm.



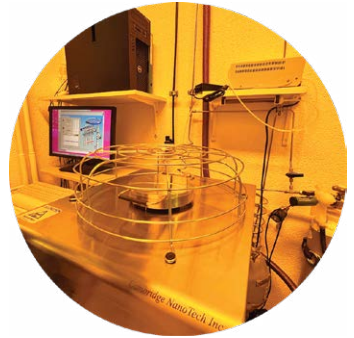
Optical lithography systems (laser writer and mask aligner) are applied for fast writing of broader structures between 1 and 100  $\mu\text{m}$ .

## Deposition

We offer different deposition methods that allow the creation of thin films with a thickness in the nm order with optimized electrical, optical or mechanical characteristics.



Electron beam evaporators are used to deposit metals and pure elements such as gold, titanium, platinum, palladium or chromium.



Atomic layer deposition reactors are used to deposit very thin layers of high quality dielectric films (e.g.  $\text{Al}_2\text{O}_3$ ,  $\text{HfO}_2$ ).

## Etching

Applying different etching techniques, we selectively remove material from a substrate to create patterns or structures with precise dimensions at the nanoscale level. There are two main types of etching processes: wet etching and dry etching (also known as plasma etching).



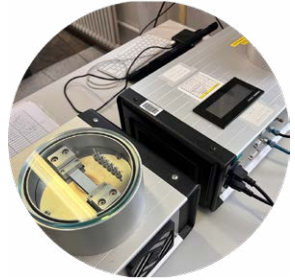
Dry etchers (CCP- and ICP-RIE) are used to obtain anisotropic (vertical) micro and nano trenches on, for example, Si, C, Ge,  $\text{SiO}_2$ ,  $\text{SiN}_x$ .



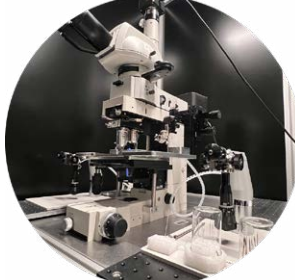
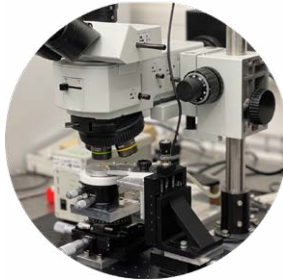
The Nano Fabrication Lab also provides a wet etching lab for depassivation and etching using selective acid and base chemistry.

## Integration and other methods

We offer pre- and post-processing ancillary methods for improving, transferring or integrating the fabricated micro and nano devices.



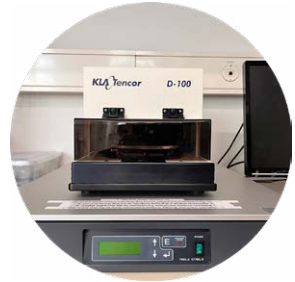
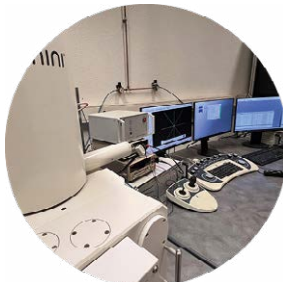
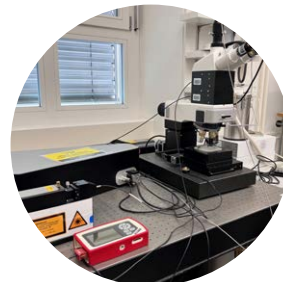
Pre- and post-processing is done via plasma ashing (left and middle) and annealing (right).



The Nano Fabrication Lab offers equipment for different micro and nano integration and transfer methods (from left to right: wire bonding, 2D material transfer stage and nano manipulator).

## Characterization

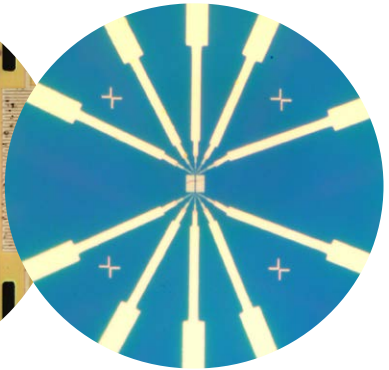
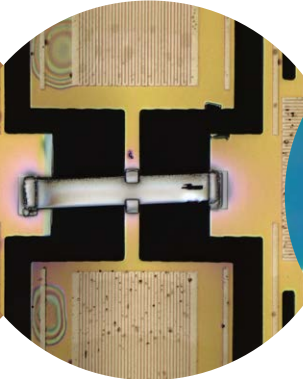
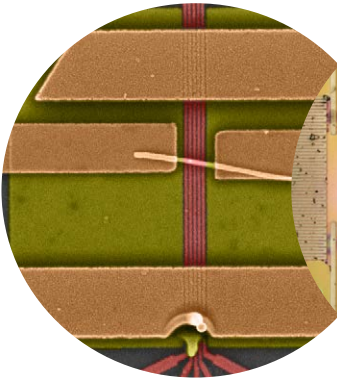
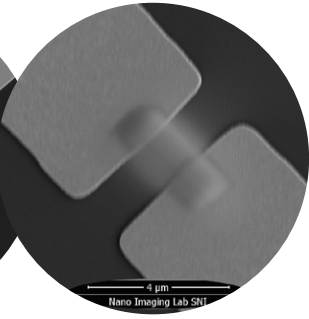
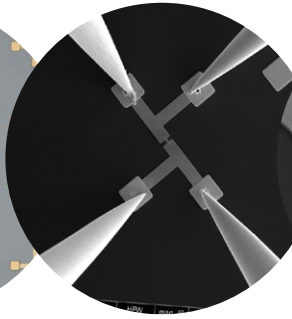
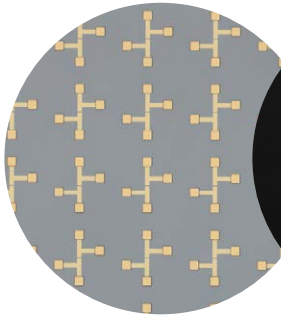
Applying state-of-the-art characterization techniques, the NF Lab provides valuable insights into the structure-property relationships of your nano materials and thus guides the development and optimization of nanotechnology-based products and devices across a wide range of applications.



For the characterization of micro and nano structures, we use optical and Raman microscopy, scanning electron microscopes and a profilometer. In collaboration with the SNI's Nano Imaging Lab, we can provide advanced optical, electron, spectroscopic and mechanical characterization.

## Your products

The devices obtained in the SNI's Nano Fabrication Lab leverage the unique properties and functionalities of nano materials and nano structures to support technological advancements and innovations across a wide range of industries such as electronics, healthcare, energy and environmental sustainability.



**The Nano Fabrication Lab team looks forward to fruitful collaborations. Please get in touch if you have any further questions or for more information.**

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