

SURFACE

nano-Lab **nano-Lab**

We determine properties of...

...surfaces, thin films, and layer structures

- **Hardness**
- **Young's modulus**
- **Scratch, friction, and wear tests**
- **Topography**
- **Mapping of thermal, magnetic, and electronic properties**

***Please allow us to demonstrate our capabilities and
test us testing your samples!***

SURFACE Nanolab

Rheinstrasse 7 41836 Hückelhoven Phone +49 2433 970 304 Fax +49 2433 970 302
www.surface-tec.com nanosupport@surface-tec.com

About Us



Dr. rer.-nat. Dennis Bedorf
Head of Nanolab

Understanding and characterizing the behavior of surfaces and interfaces with high lateral resolution has become an important key to exploring new materials and technologies. The mechanical behavior of micro structures, thin films, and coatings is found to be completely different from that in bulk materials.

SURFACE Nanolab offers a variety of quantitative characterization methods for metrology, electronic, thermal and mechanical surface properties.

Within the last thirteen years, our lab has tested a variety of materials such as metals, ceramics, semiconductors, polymers, and biomaterials. Together with our customers from science and industry we have investigated various topics such as:

- ✓ mechanical properties of aerospace alloys
- ✓ dynamic and temperature dependent properties of polymer surfaces
- ✓ characterization of MEMS
- ✓ multilayers and low- κ materials in semiconductor industry
- ✓ scratch resistance of resins and paint
- ✓ fiber reinforced materials
- ✓ high precision indentation on grains and microelectronics
- ✓ thin film characterization



Dipl.-Min. Martin Knieps
Lab Scientist

Let us demonstrate our capabilities and test us testing your samples!

Mechanical Testing



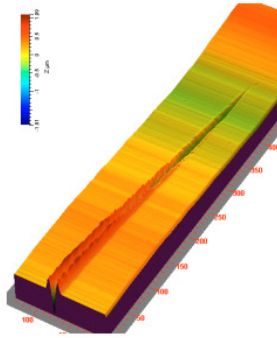
Nanoindenter XP

Two high performance Nanoindenters are available for testing at loads up to 10 Newton at nm displacement and nN force resolution.

The instrumentation provides access to:

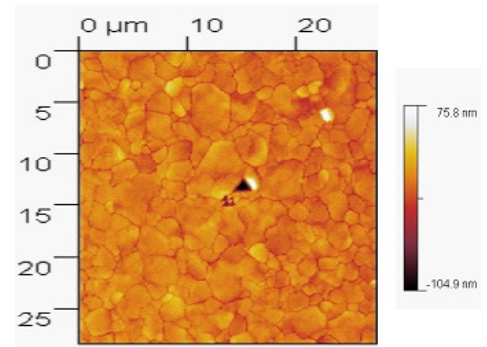
- nanohardness and modulus as a function of indentation depth
- scratch and wear testing
- adhesion of films on substrates
- micro bending and compression
- dynamic testing of polymers
- temperature dependent tests

The patented *continuous stiffness technique* (CSM) yields the respective values for each point of the measurement throughout the whole loading cycle and enables dynamic experiments to characterize the time dependent mechanical behavior of the sample.



Scratch profile

Scratch tests provide information about the wear resistance of surfaces as well as the interfacial adhesion between coatings on a substrate. Interactive scanning allows characterizing the indent and scratching geometries in the nanometer scale and to position indents within several nanometers.



Indents on grains

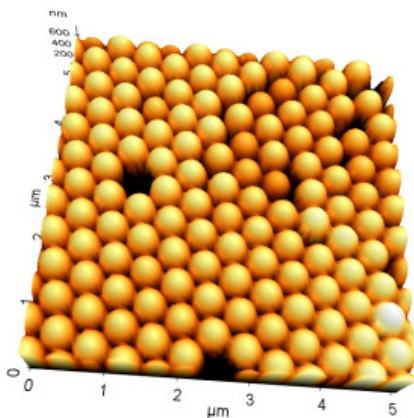
Scanning Probe Techniques



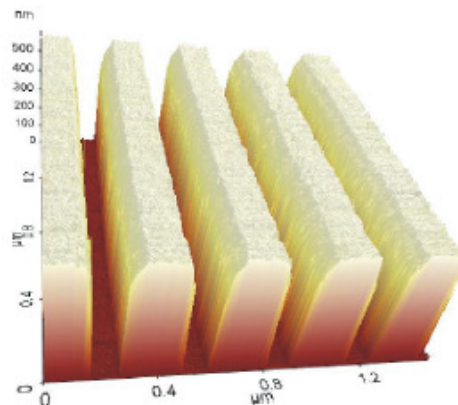
Park Instruments AFM setup

Our laboratory is equipped with a set of SPM devices to determine the topography down to subnanometer resolution as well as thermal and electronic properties.

Measurements are performed with latest technology: Using decoupled closed loop feedback xy -stage and z -scanner, artefacts typical for tube scanner AFMs are avoided. Highly sensitive sample surfaces are measured in true non-contact mode to prevent any mechanical damage of the specimen from AFM tip. By using functionalized tips, electronic, magnetic and thermo mechanical properties are obtained as a function of the surface coordinates.

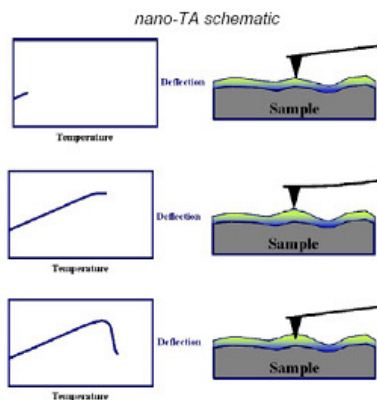


Topography scan on polymer beads



3D image of trenches

Nanothermal Analysis



Nanothermal analysis (nano-TA) is a technique to gain laterally resolved information about thermal transitions in samples by using a standard scanning probe microscope with the addition of a heated tip. Initially the setup is used in normal AFM (atomic force microscopy) mode to identify areas of interest on the sample. Then the probe is moved to the identified points and brought into contact with the surface. The temperature of the tip is ramped up. At the point of a phase transition, the material beneath the tip softens. This leads to a penetration of the tip into the sample, which is easily detected by the AFM setup. Thus the temperature of a thermal transition can be determined locally with nanoscale lateral resolution.

Our Anasys Nano-TA system in conjunction with the Park Systems XE-100 scanning probe microscope allows to characterize thermal transitions in polymers at nanoscale resolution. Hence the transition points can be measured individually for different microscopic domains or layers in a multilayer system. Additional modes provide a powerful tool for imaging gradients in thermal conductivity or sample temperature and allow local heating experiments. Imaging at different temperatures yields additional information about the thermo-mechanical behavior of the tested specimens.

Nanolab Services

Based on extensive lab experience, SURFACE Nanolab offers a wide range of services:

- service measurements and simulation of indentation experiments
- consulting
- development of custom tailored testing setups and methods
- instrument demonstrations, test measurements and technical support for equipment purchased from SURFACE
- participation in research projects

Turnaround times range from standard (four weeks) to express (three business days). Please contact us to discuss your specific needs.

How to find us

Coming from Aachen

A44 direction *Düsseldorf* to junction *Jackerath*

change to *A61* direction *Venlo*

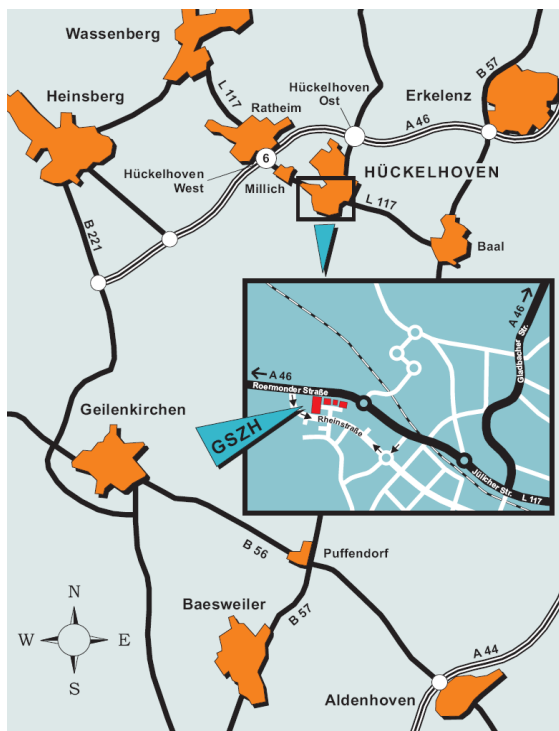
Autobahnkreuz *Wanlo* → *A46* direction *Heinsberg*

Coming from Duisburg, Cologne

Take *A57* to junction *Neuss-West*

at junction *Neuss-West* change onto *A46* (direction *Aachen*)

at junction *Holz* change *A46* direction to *Heinsberg*



in both cases

leave *A46* at *Exit 6 Hückelhoven* and turn right onto *Millicher Straße*

turn right at the first traffic light onto *Rheinstraße* (*GSZH*)

after 500 m turn left at *Rheinstraße 7*.

We are located at:

Surface Nanolab

Rheinstraße 7 (Building 5)

D-41836 Hückelhoven

Phone +49 2433 970 305

Fax +49 2433 970 302

Latitude/longitude: 51.052892, 6.211199