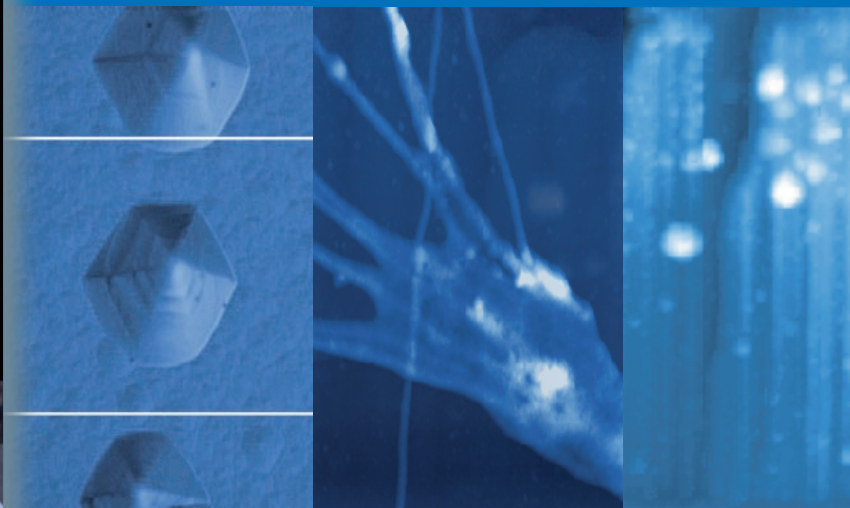
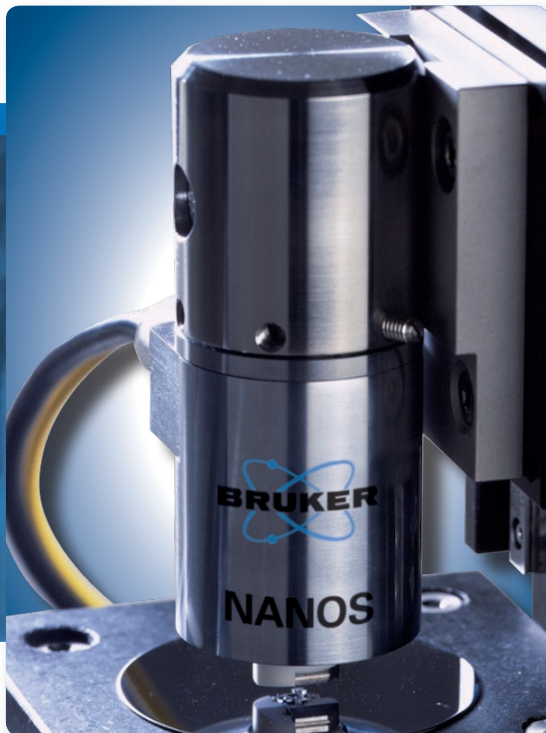


Bruker Nano



NANOS N8 Series

● Scanning Probe Microscopes

think forward

AFM/SPM

Scanning Probe Microscopy



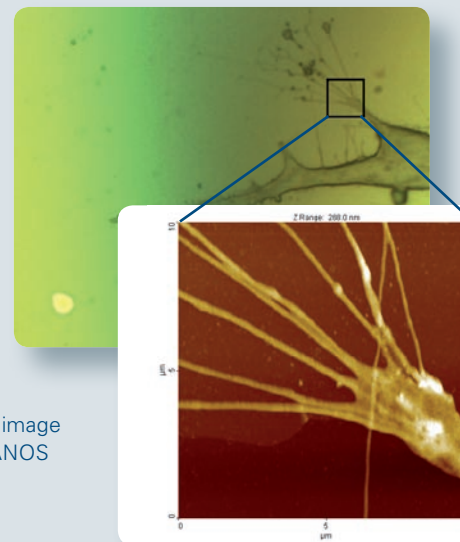
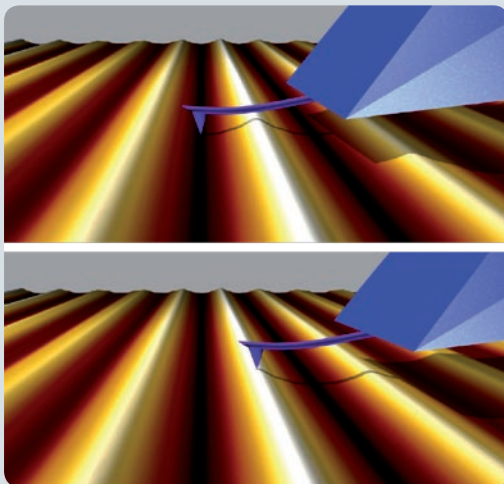
Down to the finest Details

In general optical microscopy is the most common tool for surface characterization and it is widely used in R&D and quality control.

However, due to the physical limitations, optics can not fulfill the growing demand for higher magnification. The NANOS addresses this issue through its unique ability to combine with conventional microscopy and other optical techniques.

The NANOS is a Scanning Probe Microscope (SPM). With a SPM, no direct optical images are produced (in contrast to optical microscopes). Images are generated by reading the output signals from the scanning probe. The term SPM characterizes all microscopes which record image information from a sample surface, using a point-to-point rastering motion. The probe measures, at each point, one or more variables in its near field, which are then translated into image information. With adequate probes and measuring modes it is possible to record a wide variety of different sample characteristics. You may see other terms in association with SPM techniques, such as AFM (Atomic Force Microscopy), STM (Scanning Tunneling Microscopy), etc. The Bruker Nano NANOS is capable of all of these techniques.

The AFM/SPM uses a tip that is scanned in a rasterlike fashion across the surface. The vertical motion of the tip induced by the sample topography is measured and reflects the surface structure.



Observation of a melanocyte cell
top figure: optical image
bottom figure: NANOS AFM image

NANOS

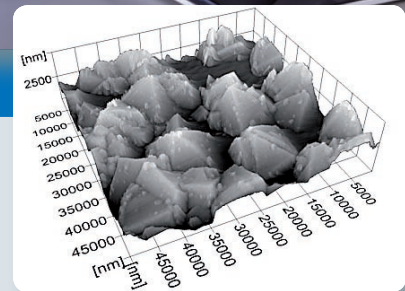
Nanometer Resolution - Results within Minutes

The NANOS is the only SPM head that approximates the size and shape of a standard optical objective. As such, it fits any commercially available microscope, e.g. Zeiss, Nikon, Olympus or Leica.

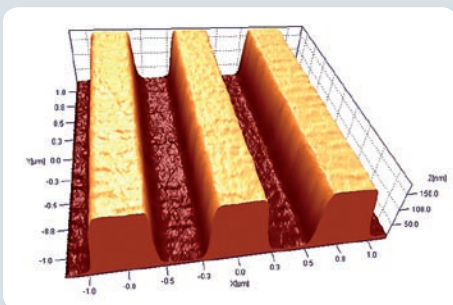
With a simple turn of your microscope turret, the NANOS provides full access to the power of a complete AFM/SPM.

This unique combination of high quality optical inspection together with the NANOS offers you completely new possibilities for surface structure analysis. There is no compromise; research quality optics together with research quality AFM/SPM.

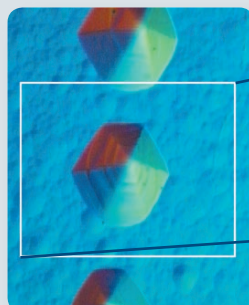
The procedure is simple. First locate your Region of Interest as you usually would. Then switch to the NANOS to measure precisely on that Region of Interest. The automatic approach brings the probe of the NANOS safely into measuring position. Now you can obtain quantitative, three dimensional measuring data (or a variety of other surface information) at magnifications of better than 500 000 x. Characterizing your samples at the nanometer scale is now possible within minutes.



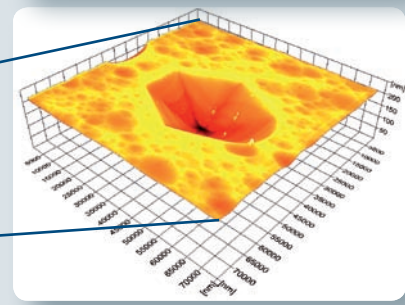
A diamond film produced with CVD (Chemical Vapour Deposition).



The 3D representation of the data gives an immediate impression of the surface structure.



Optical image of an etched GaAs crystal (DIC).



3D image of etch pit in GaAs, measured in non-contact mode with the N8 NEOS.

N8 NEOS



Flexible and versatile - ideal for varying tasks

The N8 NEOS combines optical microscopy and Scanning Probe Microscopy in a single, optimized set-up. The combination of the NANOS and a powerful optical microscope allows unequalled productivity in performing high-resolution surface inspection. By allowing you to use research quality optics to pre-select interesting structures (and thus avoiding transferring, marking or scribing samples), the N8 NEOS saves you time and sample material.

The N8 NEOS has been optimized to reduce vibration and thermal drift and can be expanded or modified to suit your needs.

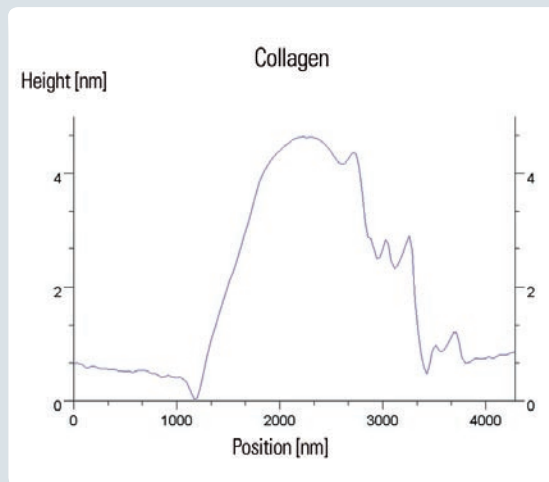
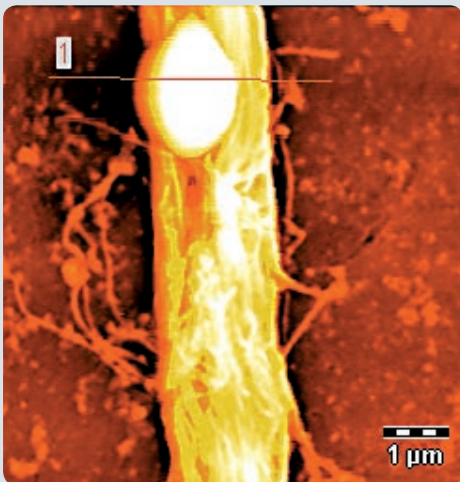


Image of a collagen fiber.

Left figure: image data of the AFM measurement.

Right figure: profile along line 1.

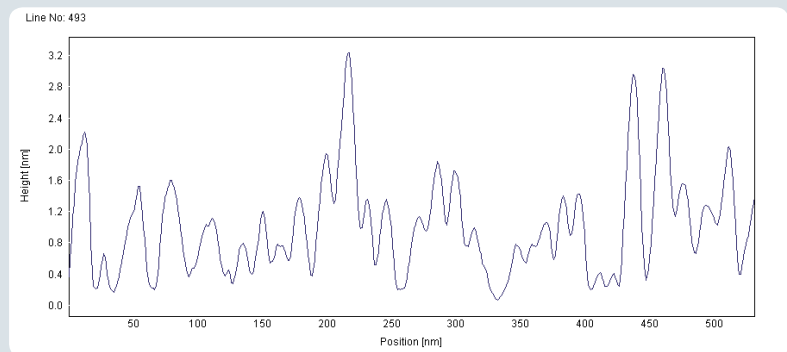
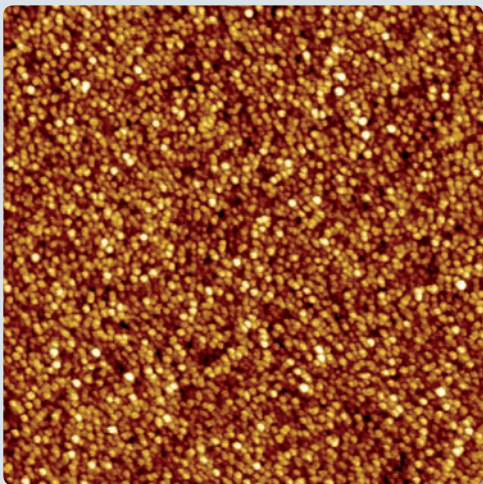
N8 RADOS

The perfect tool for automated optical & AFM Sample Inspection

With a typical laboratory setup, you localize and identify your defects (or Regions of Interest) with optical inspection tools, then you scribe or mark them, and finally transfer them to an AFM/SPM, which is often in a different lab and often operated by a different user. Increasingly, Regions of Interest also cannot be resolved with standard AFM optics. Getting a single AFM scan of your sample can take quite a while.

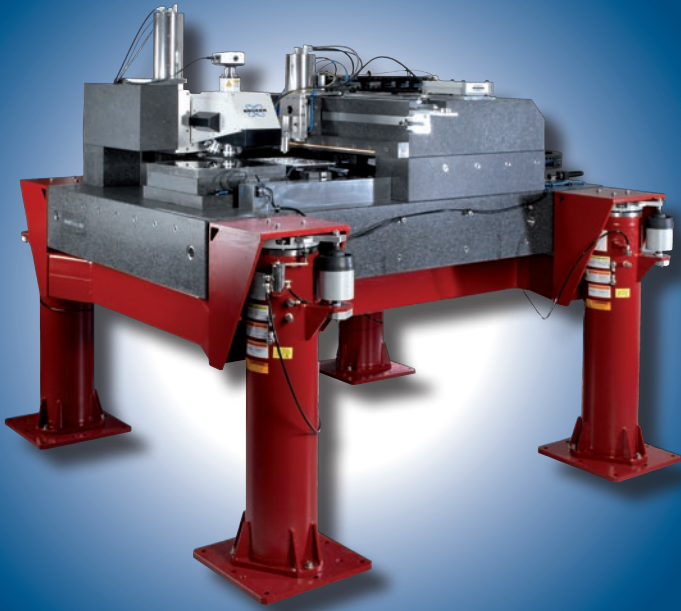
The N8 RADOS performs all of these steps on one platform. The N8 RADOS combines a high quality research microscope, a scribe and our NANOS AFM on a single automated platform.

The result? After locating a position on your sample, you can press one button to move the sample to the AFM and then begin your scan. After scanning, you can press another button to scribe the location on your disk. High quality AFM scans, on a system that is simple to use and, most of all... very fast. (When benchmarked against traditional AFM set-ups, the N8 RADOS is 2 × to 3 × faster.)



High resolution image (left) of textureless hard disk. The scan range is 1 μm \times 1 μm , the surface roughness is < 0.5 nm. A profile is shown in the image above.

N8 TITANOS

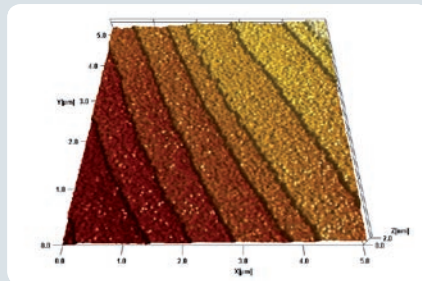


The N8 TITANOS provides sub-nanometer resolution on a fully automated, in-line capable tool. Single-plane architecture and a rigid granite base provide significant advantages over multicomponent metal-made translation systems. Higher strength, smaller thermal expansion, and our air-bearing stage enable faster positioning with greater accuracy.

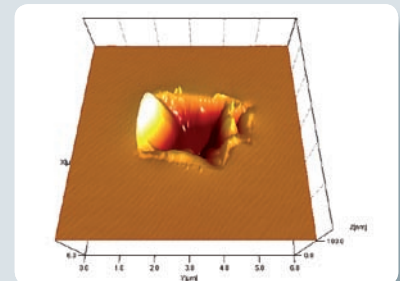
The open architecture accommodates the Bruker Nano AFM/SPM inspection head, while allowing various optical measuring devices or microscopes to be added to the system. The integrated combination of different characterization systems on one stage system makes the N8 TITANOS the most cost-effective ultrahigh precision stage for inspection of samples like wafers, masks, LCD displays and solar panels. High-speed precision positioning allows sample translation between different measurement devices without loss of productivity.

Contactless linear motors with optical encoders provide a 10 nm stage positioning resolution with a $\pm 1 \mu\text{m}$ absolute accuracy. Repeatability is better than $\pm 250 \text{ nm}$.

Resolution $< 0.05 \text{ nm}$ (Z) (with passive vibration isolation), optimized for samples up to $300 \text{ mm} \times 300 \text{ mm}$, automated motion to all sample positions, air-bearing stage, different levels of automation available, total system dimensions: $2600 \text{ mm} \times 1680 \text{ mm} \times 1317 \text{ mm}$, 2000 kg



The mono-atomic steps on a silicon (111) surface demonstrate the high stability of the N8 TITANOS. The vertical resolution is better than 0.04 nm .



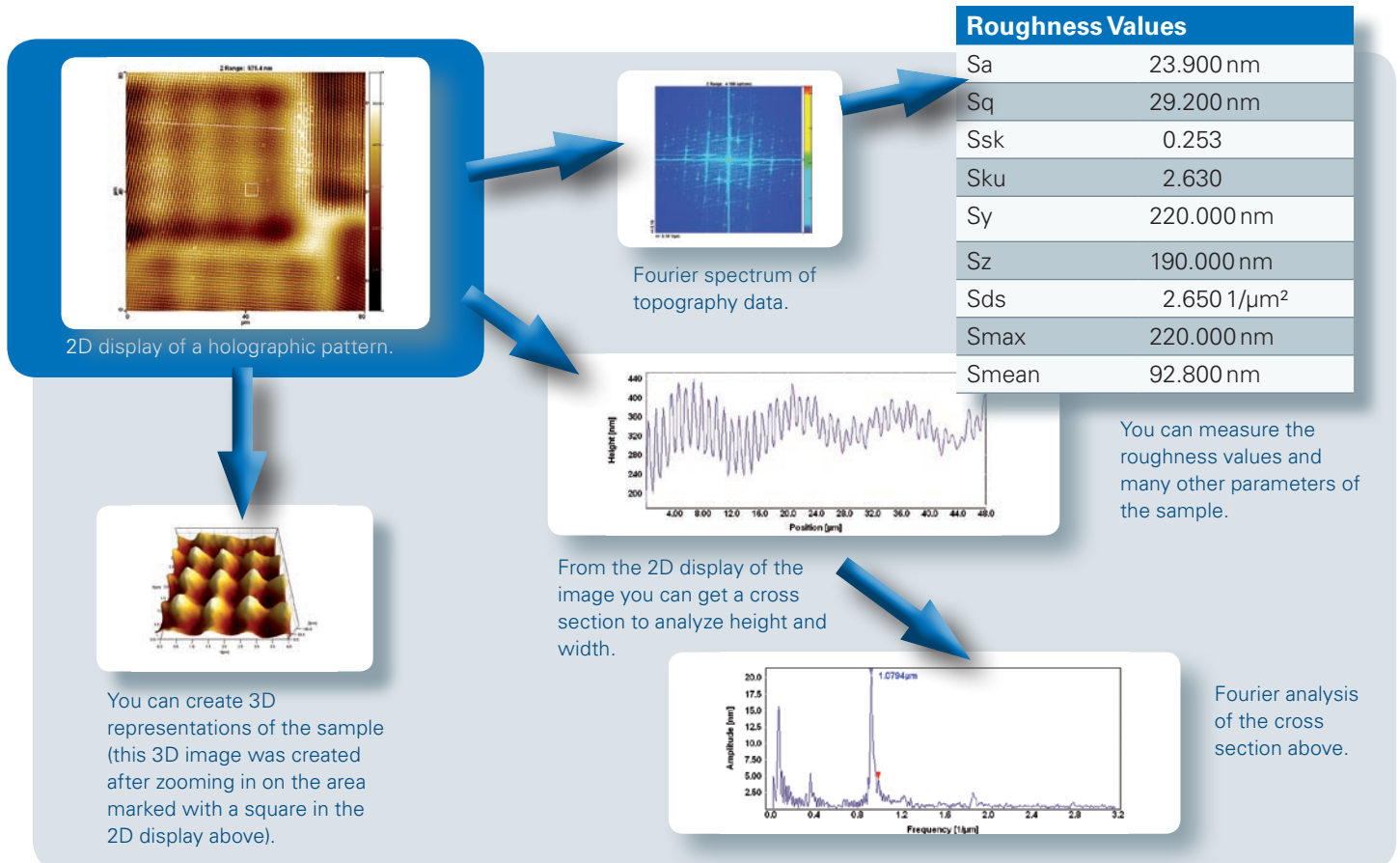
Nano indentation inspected on the N8 TITANOS on silicon. Besides the indentation structure, the atomic terraces on silicon can be seen.

Combination of AFM and Raman spectroscopy

With the NANOS the topography of any sample can be measured at molecular or even atomic level. The chemical composition of it can be analyzed by Raman spectroscopy. In order to combine these techniques, the N8 NEOS is also available with the Raman microscope SENTERRA. This combined AFM-Raman system facilitates to study the region of interest of any sample by AFM and Raman subsequently, without a translocation of the sample in-between. Many different laser excitation lines (830, 785, 532 and 488 nm) are available for the SENTERRA which provides a very high sensitivity and wavelength stability.



Application Examples



Modes and Specifications

Available Modes

- Contact Mode
- Oscillation Modes (Non-Contact, Intermittent Contact)
- Phase Contrast
- Magnetic Force (MFM)
- Electrostatic Force (EFM)
- Friction Force Mode (FFM)
- Force Modulation (SFM)
- Spreading Resistance (SSR)
- Conductive AFM (C-AFM)
- Surface Potential, Kelvin Probe (SSPM)
- Scanning Capacitance (SCM)
- Scanning Tunneling (STM)
- Frequency Modulation and Self-Excitation, Q-Control
- Spectroscopy, Force vs Distance, I-V Curves
- Lithography/Surface Manipulation
- Liquid Compatible Version

General Specifications

Scan Range	20 μm \times 20 μm \times 3 μm 40 μm \times 40 μm \times 4 μm 80 μm \times 80 μm \times 5 μm 100 μm \times 100 μm \times 8 μm (16 μm) 200 μm \times 200 μm \times 8 μm (16 μm) 300 μm \times 300 μm \times 16 μm 400 μm \times 400 μm \times 16 μm hardware linearized scan motion in X-Y-direction (optionally available in Z-direction)
Noise Level	< 0.05 nm rms in vertical direction (Z)
Lateral Accuracy	typically within 1 % closed loop scanning
Scan Speed	0.1 to 10 Hz
Detection Principle	fiber optical interferometry
Tips	silicon tips, various types
Tip Change	adjustment free
Output Voltage	\pm 165 V, with 2 μV rms
Input Channels	max. 8 simultaneous
External Input	max. 3 high speed
Image Size	freely selectable, from 128 to 4096 pixels, even rectangular sizes
Computer Interface	USB (standard universal serial bus)
Automation	motorized stages available for N8 RADOS and N8 TITANOS
Samples Sizes	
NANOS	depending on optical microscope
N8 NEOS	130 mm \times 130 mm
N8 RADOS	\varnothing 95 mm (R- θ version), 100 mm \times 100 mm (X-Y version)
N8 TITANOS	300 mm \times 300 mm

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