

Scanning Probe Microscopes

NTEGRA Spectra



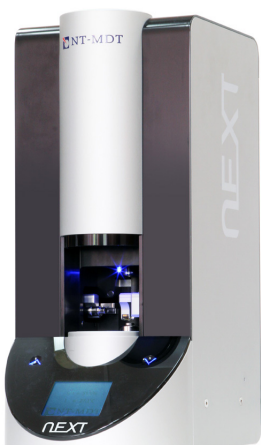
NTEGRA Prima



Nano



NEXT



NT-MDT: Customer, Technology, Integrity

Our primary goal is customer success in exploring the nanoworld with our innovative microscopes. We combine our strong motivation, fundamental knowledge, multi-year experience, hard-working ethics, and full integrity to make this possible.

The NT-MDT Way

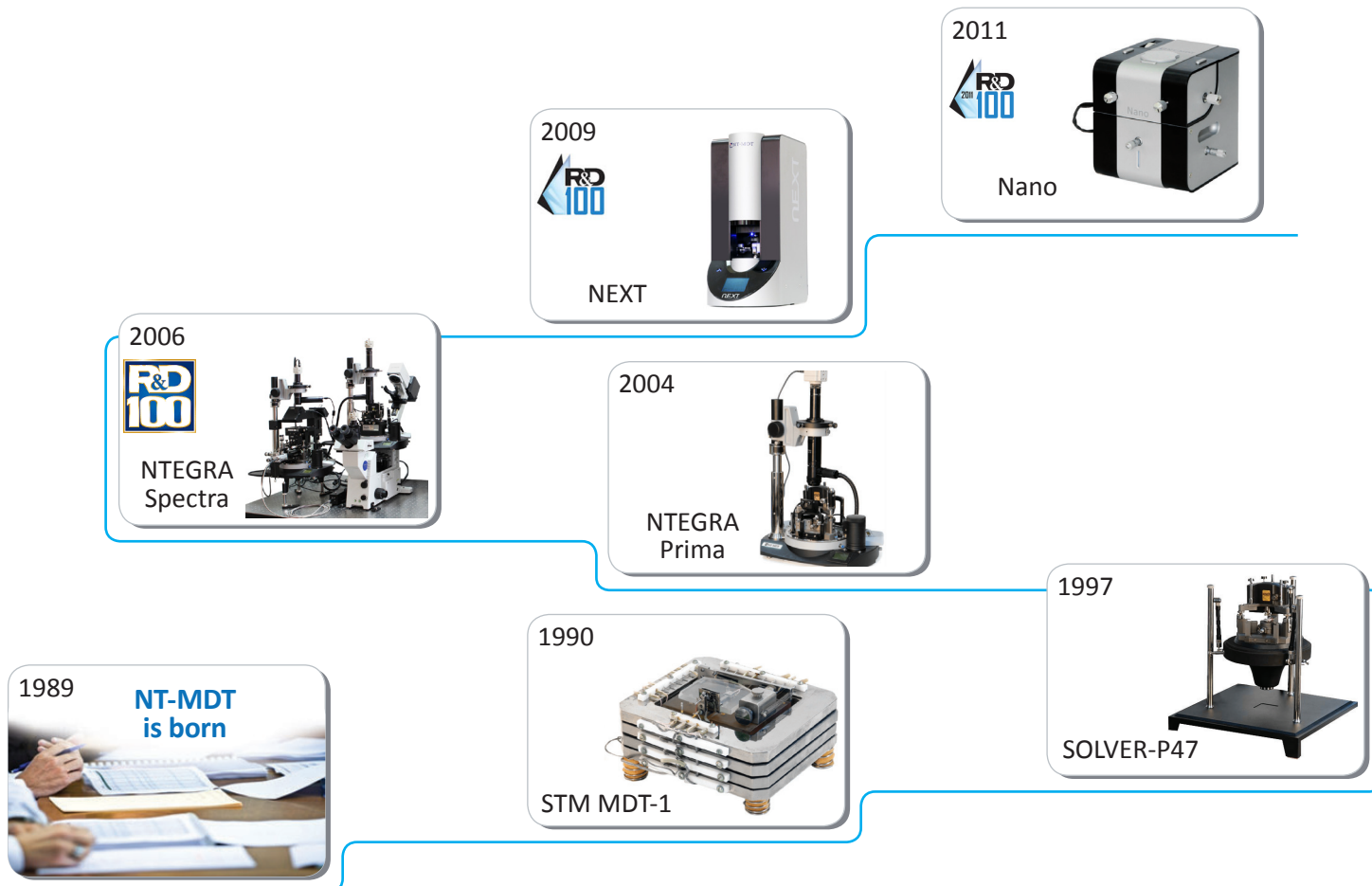
Over the last 25 years, NT-MDT has been involved in the development, production, and support of research instrumentation, primarily, scanning probe microscopes for nanotechnology and its applications. Our pathway has been marked by a creation of a few thousand different devices, whose functions and capabilities cover the broad range of customer needs in different areas: university education, academic and industrial research. NT-MDT pioneering efforts led to the impressive combination of scanning probe microscopy with Raman spectroscopy.

The fundamental knowledge and continued thirst for innovation of our team members stems from being educated at the highly regarded Moscow Institute of Physics and Technology (MIPT) and other top schools. This has created a solid background for advanced company activities. Strong NT-MDT/MIPT ties throughout many years provide the influx of young and motivated intellectuals to our company, which has proven invaluable to our progress.

This is one of many important factors that make the company successful. The others include strong team integrity and personal accountability in all segments of our company from creative design work, to the precise engineering and manufacturing, the quality control, and customer support at all levels. The excellence of our microscopes has been proven in numerous applications many of which were developed and demonstrated by NT-MDT scientists, who strive to expand the SPM capabilities for comprehensive and quantitative analysis of material surfaces and properties down to the molecular and atomic scales.



Prof. Victor Bykov - the founder of NT-MDT



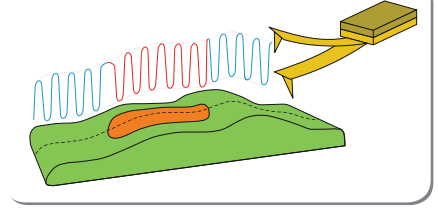
Unique NT-MDT SPM Features

We are now proud to provide NT-MDT microscopes with the most advanced features, which include but not limited to the following:

- An expanded set of resonance oscillatory AFM modes:

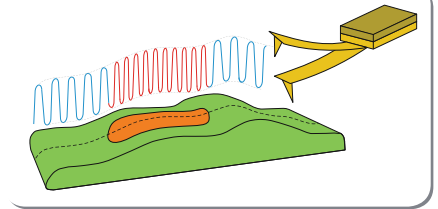
- Amplitude modulation with Phase Imaging

The surface profile and probe phase changes are detected and mapped while the probe frequency and amplitude are fixed.



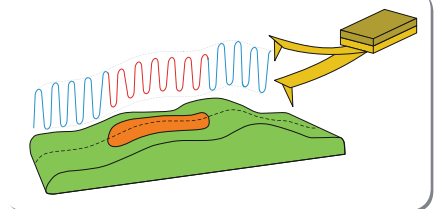
- Amplitude modulation with Frequency Imaging

The surface profile and probe frequency are detected and mapped while the probe amplitude and phase are fixed.

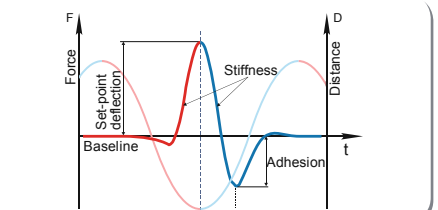


- Frequency modulation

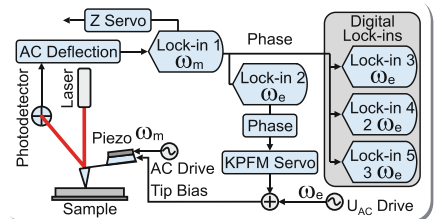
The surface profile and probe amplitude are detected and mapped while the probe frequency shift and phase are fixed.



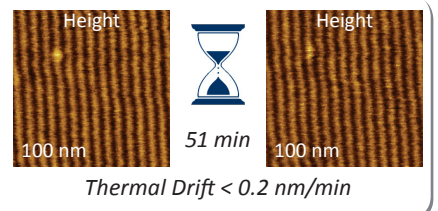
- A non-resonant oscillatory HybriD mode allowing direct and fast force detection for quantitative and high-resolution mapping of local sample properties



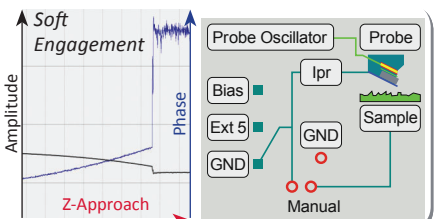
- A suite of AFM-based electric modes that includes single and double pass techniques for measuring surface potential and capacitance gradients and unique thermoelectric imaging



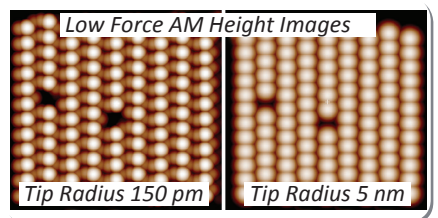
- The exceptional low-noise and low thermal drift enclosure for stable imaging for a variety of applications



- An open architecture software with multiple ways for controlling and monitoring the electronic signals during experiments starting with soft probe engagement



- Computer simulation tools for theoretical evaluations of tip-sample interactions and their manifestation in most experimental AFM modes



NT-MDT microscopes are equipped with closed loop scanners and are compatible with a wide range of accessories and a temperature stable enclosure providing exceptional noise protection.

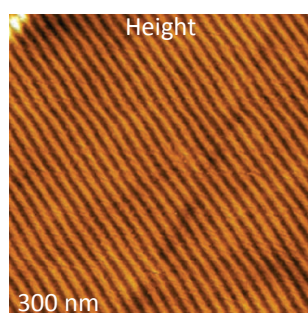
Nano – Effective Solution for Education and Research



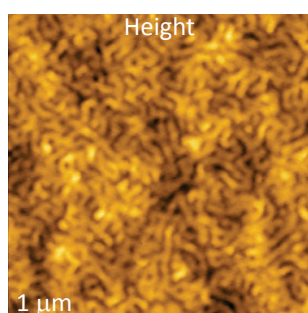
- SPM heads for novice and expert users
- Apprentice toolkit
- Flexible choice of probes
- Compact design and affordable cost

NT-MDT Nano is a robust, small footprint SPM with a wide range of features:

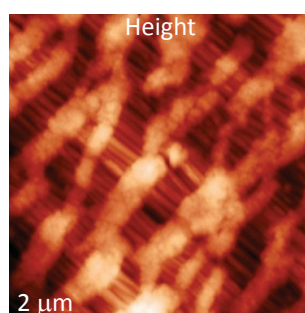
- Educational head for STM & AFM intermittent contact mode by user made tips.
- Student toolkit to etch probes.
- Research head for most common AFM modes with commercially available tips.
- Routine imaging of nanoscale structures.



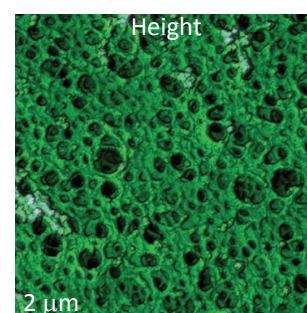
$C_{60}H_{122}$ alkane on HOPG



Block copolymer



Microporous membrane Celgard



Nitrocellulose membrane

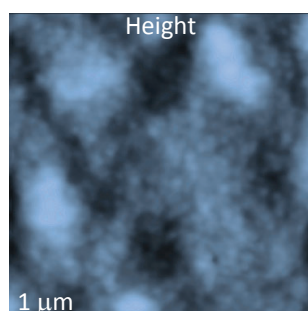
NTEGRA Prima - Flexible Device for Routine and Advanced Applications



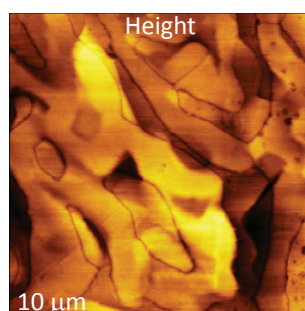
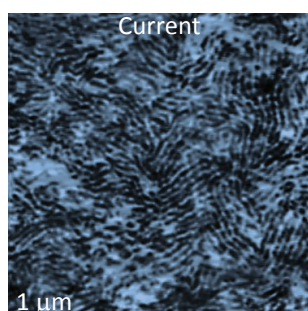
- Open architecture
- Tip/sample scanners
- Wide range of configurations/heads
- Broad temperature range

NTEGRA Prima – an Open-Architecture Modular Device for Advanced Research:

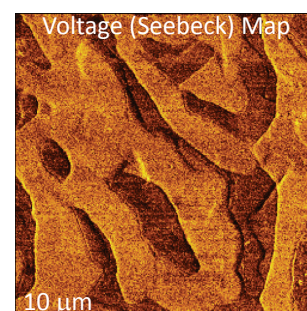
- Environmental and high-temperature measurements
- Specialized measurements with external magnetic fields
- Combination with Near-Field Optical Microscopy and Raman Spectroscopy
- Scanning in liquids with temperature control and flow-through capabilities
- Flexible scanning geometries and ranges



Polymer blend P3HT/PCBM



Metallic alloy Bi/Sn

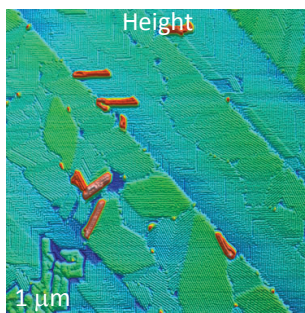


A powerful software package provides our users with flexibility to monitor and control a broad range of operational signals, starting with those used for “soft probe engagement”.

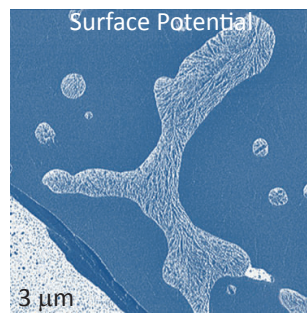
NEXT – Prime Automated Microscope

- Easy to use microscope with advanced capabilities
- Automated head exchange
- Automated laser/photodetector alignment
- Superscan and stitching capabilities

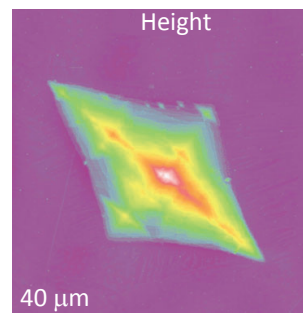
NEXT is a unique system that provides researchers with outstanding performance and a wide range of capabilities. Specifically, it removes gap between optics and SPM by offering the users surface imaging from mm range down to the atomic scale. The exceptional functioning and automation of the alignment routines of this microscope make it the best candidate for high throughput studies in multi-user environments.



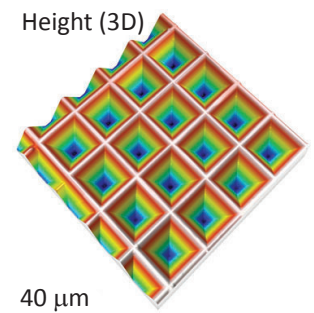
F14H20 fluoroalkane on HOPG



Polymer blend PVDF/PVAC



Crystal of $C_{242}H_{486}$

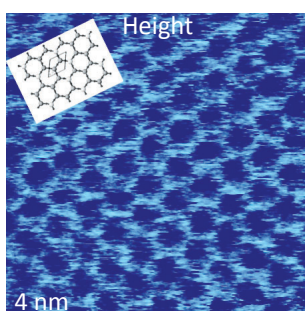
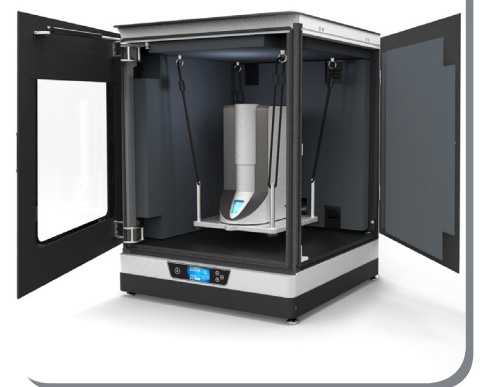


Etched Si

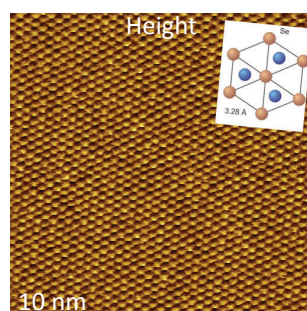
Thermal Cabinet for NT-MDT Microscopes

- Unique solution for high-performance microscope environment
- Exceptional temperature stability
- Low-thermal drift medium
- Excellent acoustic and vibrational isolation

This new fan-free enclosure provides NT-MDT microscopes the capability to operate at conditions of extraordinary temperature stability within 5 millidegree °C. This guarantees the exceptionally low thermal drift of less than 0.2 nm/min. The cabinet also protects the positioned microscope from external acoustic and vibrational noises with passive and active means of damping.

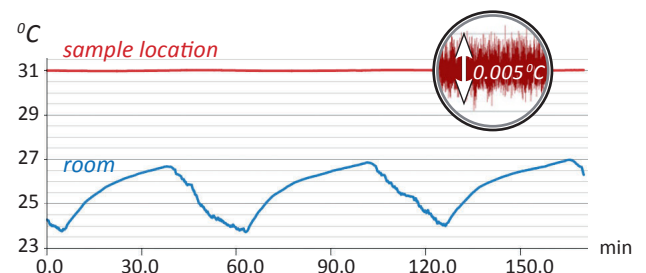


Mica



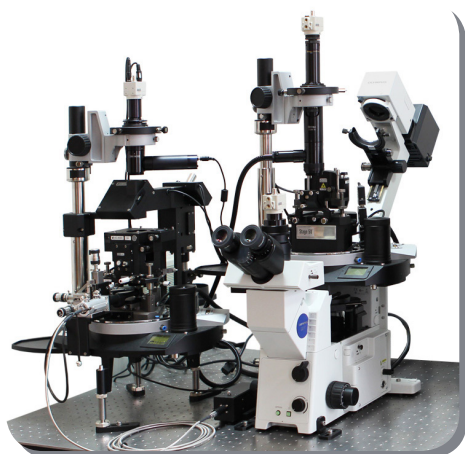
MoSe₂

Time Plot of Temperatures of Sample Location and Room

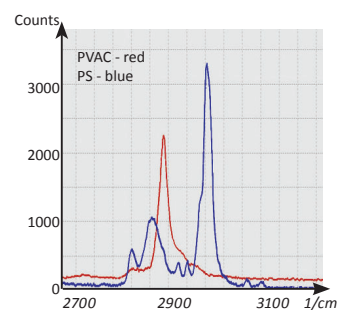
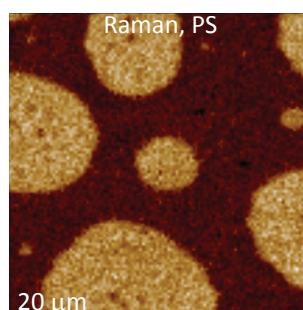
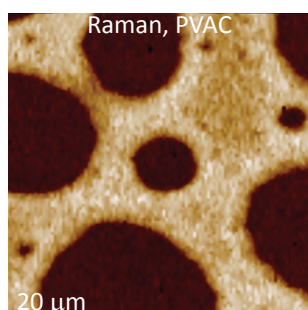
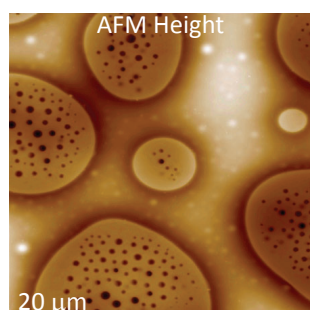


NTEGRA Spectra – Enables AFM/Optics Synergy

- Co-localized AFM and optical measurements
- Near-field Optical Microscopy (SNOM/NSOM)
- Tip Enhanced Raman Scattering (TERS)
- With NT-MDT, Thermo Scientific, Renishaw and other spectrometers
- Focus track for optical measurements

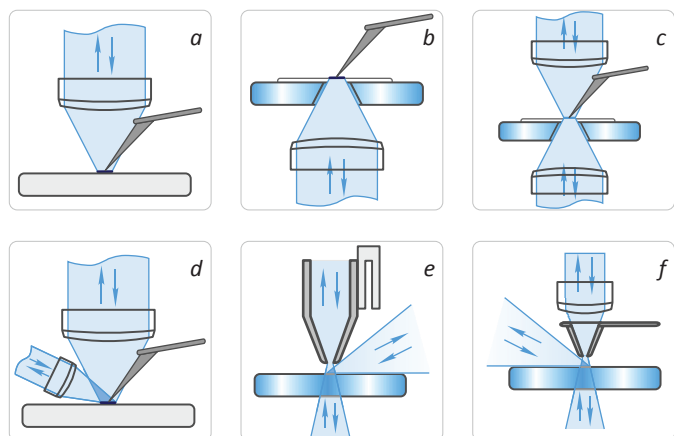


NTEGRA Spectra is an integrated solution for simultaneous AFM and Confocal Raman, Fluorescence, SNOM, TERS measurements. The instrument supports multiple AFM/Optics geometries enabling studies both in air and liquid. Comprehensive characterization of materials is achieved in combined mapping of chemically specific Raman bands and local mechanical and electrical properties. Raman mapping with nanometer resolution can be obtained by means of TERS. Similar resolution can be achieved for studies of plasmonic materials.



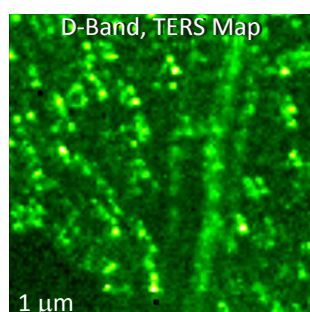
Polymer blend PVAC/PS

AFM/Optics Configurations for Illumination/Collection

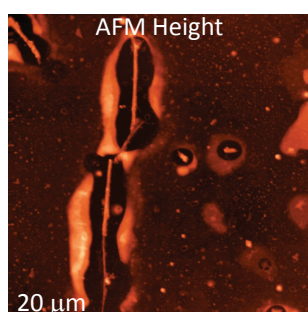


- Upright (a)
- Inverted (b)
- Full transmission (“4- π ”) (c)
- Side-Illumination (d)
- SNOM: Optical fibers (e) and “smart” probes (f)

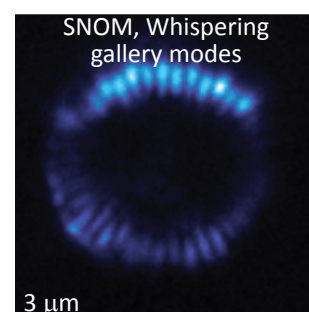
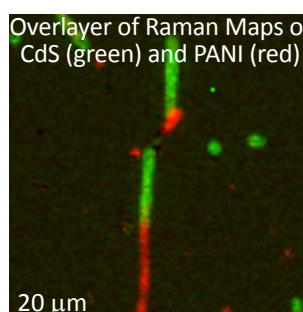
The open-design of NTEGRA Spectra facilitates a broad spectrum of AFM/Optics applications for characterization of local chemical content, dielectric and plasmonic features in complex samples of various origins. They include polymers, carbon-based compounds, bio-materials, semiconductors etc. Spatial resolution of such measurements has approached the nanometer scale.



Graphene oxide



CdS & polymer nanowires



Semiconductor microdisc

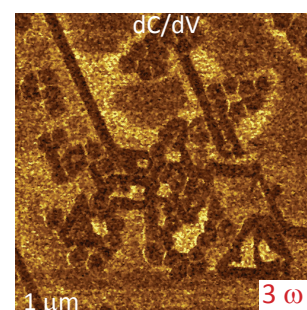
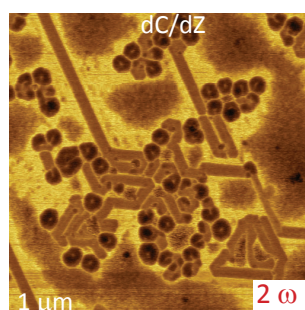
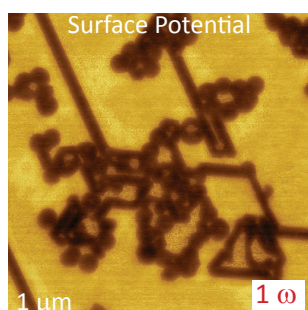
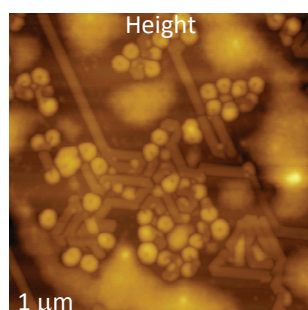
PX Controller – the Core for High-Quality & Advanced SPM

- Built-in 5 lock-in amplifiers
- Detection channel up to 5 MHz
- Modular design
- Support all NT-MDT microscopes



Our powerful PX digital controller incorporates a low-noise high voltage generator (< 1 mV/600 V), five lock-in amplifiers and sensitive detection electronics (up to 5 MHz) enabling measurements with negligible deflection noise (~25 fm/VHz).

The latter helps to make imaging in the atomic-scale as the routine procedure. The controller features provide a microscope user with a large spectrum of imaging and in single- and multi-frequency operations, which tremendously expand the research capabilities for visualization of surface structures and local quantitative studies of materials' properties down to the nanoscale.



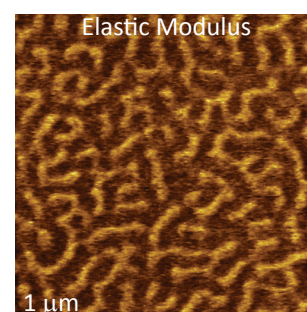
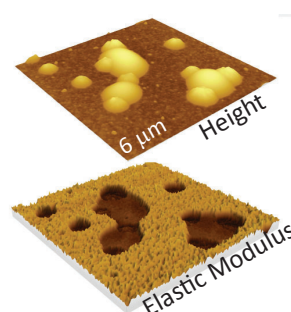
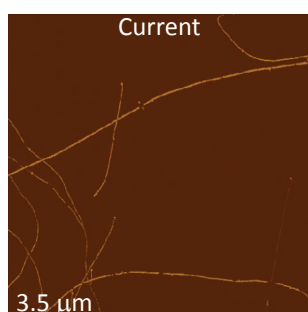
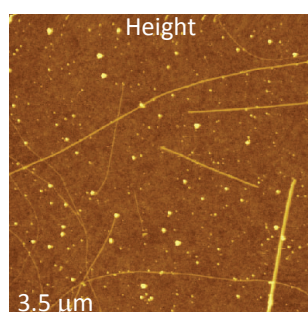
$F_{14}H_{20}$ fluoroalkanes on HOPG

Hybrid Controller – the True Gateway to New SPM Generation

- Fast signal detection and FPGA processing
- PLL and multiple digital broadband lock-in amplifiers
- Full synergy with Px controller



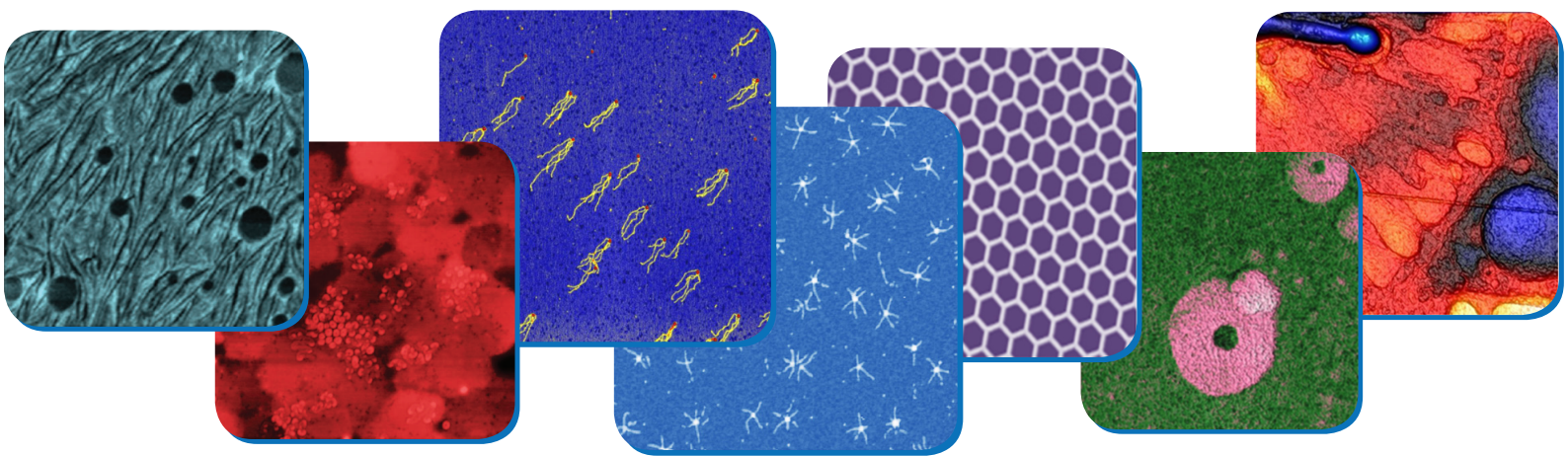
Recently, NT-MDT microscopes were enhanced by the new Hybrid controller, which expands their instrumental and application capabilities by employing a high-speed (20 MHz) data acquisition and fast real-time data processing with FPGA at 80 MHz. New modes and applications are emerging with quantitative nanomechanical analysis in Hybrid mode being already routinely applied for elastic modulus mapping with 10-nm resolution. The expanded set of the oscillatory modes and other newly developed features (e.g. thermoelectric measurements) make the NT-MDT user the most powerful researcher compared to the practitioners of other SPM devices.



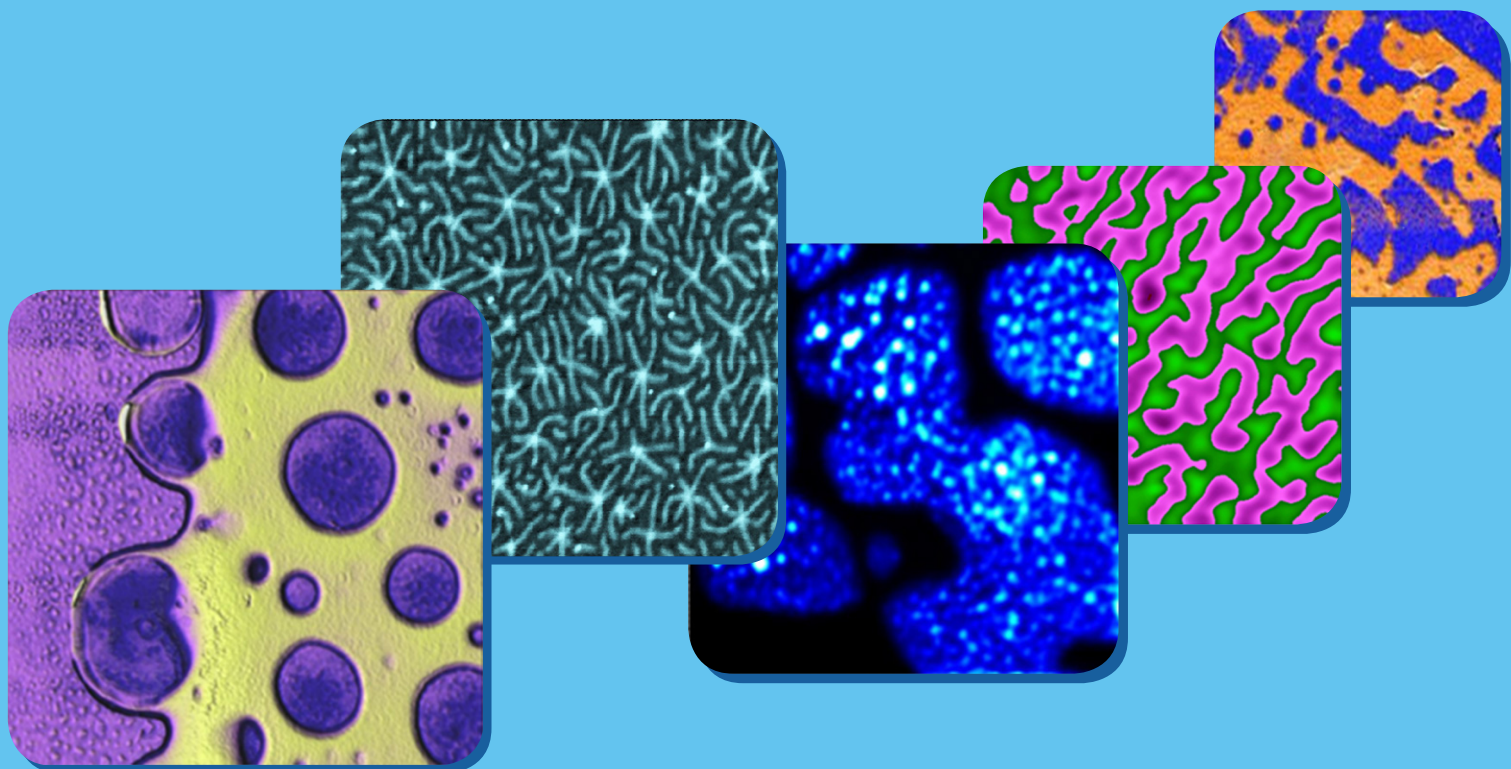
Carbon nanotubes on Si

Polymer blend PVDF/SPS

Blockcopolymer PS/PMMA



NT-MDT



NT-MDT America Inc.
7910 S Kyrene Rd, #107-108, Tempe, AZ 85284
602-606-2092
info@ntmdt-america.com

www.ntmdt.com

NT-MDT Head Office
Building 100, Zelenograd, Moscow, Russia 124482
+7 (499) 735-7777
spm@ntmdt.ru

