NT-MDT
Molecular Devices and Tools for NanoTechnology

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Unmatched stability and surpassing temperature control

THead system for thermal measurements

Seeing atoms and molecules by AFM is not a trick. But how long can you observe the same molecule? Does your current AFM system stand by it for 20 minutes? For an hour? What about changing the temperature? We offer you to forget about time and focus just on your measurements.

NT-MDT Co. proudly presents a new generation system for **thermal measurements** and **firm stability**. Achieving of incredible stability - **10 nm/K** (at changing T) and less **2 nm/hour** (at constant T)- establishes new standards for SPM quality.

THead system – is a revolutionary solution for thermal measurements. It combines years of our experience in SPM engineering and the latest developments in the field of thermal investigations.

The world-lowest thermal drift ensures

- Solid running of long term experiments (hours of duration and even more),
- Studying of temperature dependent properties of material down to atomic resolution while heating or cooling,
- Precisely high scanning repeatability.

The exceptional stability of the system is provided by **unique design solutions**:

- very accurate geometry including high level symmetry; thermal expansion or compression of any single system's part is fully compensated by the other parts
- very skilful and well-proved combination of materials; it prevents heating/cooling transfer to the scanner which is always kept at constant temperature.
- chamber's design provides the sample temperature to be equal to the probe temperature. Thus almost no thermal gradient occurs within the chamber.

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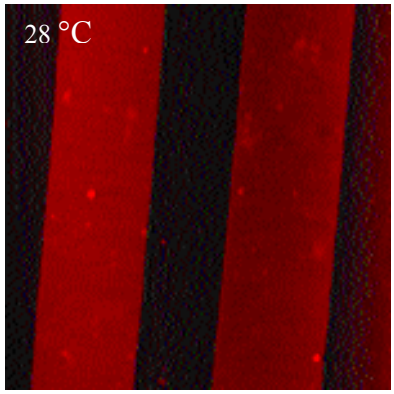
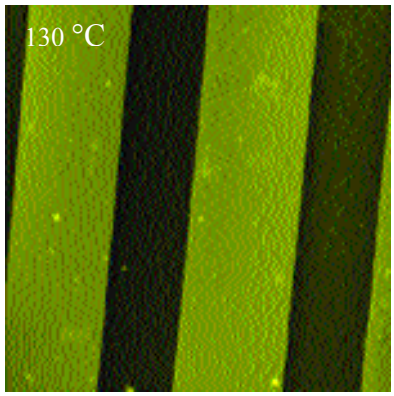
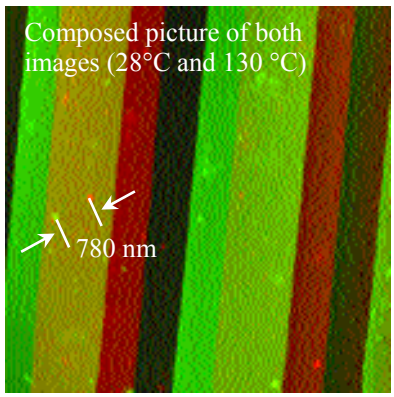
Silicon wafer. Topography images. Scan size: 7x7 μm. White arrows indicate initial (28°C) and final (130°C) position of the same feature. Thermal drift is less then **8 nm/°C**







Benefits:

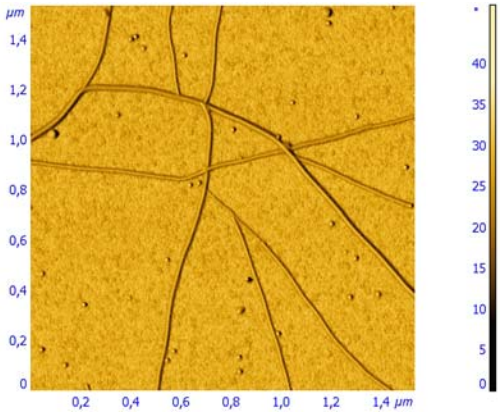
- **The lowest drift**
- **Unprecedented high resolution, for long term experiments**
- **Additional protection of SPM system**
- **Extremely accurate temperature's maintenance**
- **Automation of measurements**
- **Rapid settling time**

Specification:

- Solid thermal stability – thermal drift about **10 nm/C**.
  Extra low mechanical drift – less than **2 nm/hour**.
- **Atomic** resolution imaging at **extreme** temperatures
- Very **proof** against low-frequency vibrations
- The sample temperature always equals to the probe temperature
- Top-down optics access, water cooling options
- Thermal controller with temperature control stability up to **0.005C**
- Self-compensation system
- Macro-language Nova PowerScript – **pre-defined** scripts

Technical Details:

Parameter	Value
Average thermal drift	
XY	15 nm/°C
Z	10 nm/°C
Average mechanical drift	
XY	<2 nm/hour
Z	<1 nm/hour
Scan range	10x10x5 um, 2x2x4 um
Nonlinearity XY	0.8% peak to peak/2
RMS noise Z	<0.02 nm (with Z 5 um)
Temperature	-30 C – 300 C
Stability	0.005 C
Overshoot	< 0.1 C



Carbon nanotubes visualized on Si surface. Because of high repeatability nanomanipulations (e.g. with nanotubes) become much easy and precise