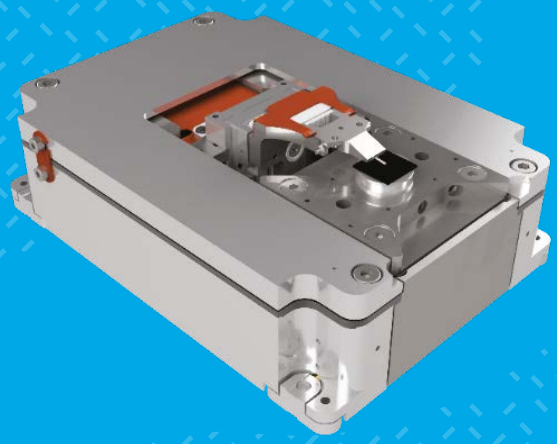
NenoVision

AFM-in-SEM LiteScope™

- **Complex and correlative** sample analysis
- **In-situ** surface characterization
- **Precise localization** of the region of interest



Measurement Modes

LiteScope™ is an innovative plug & play solution for in-situ AFM-in-SEM measurement providing a huge range of possible application techniques.

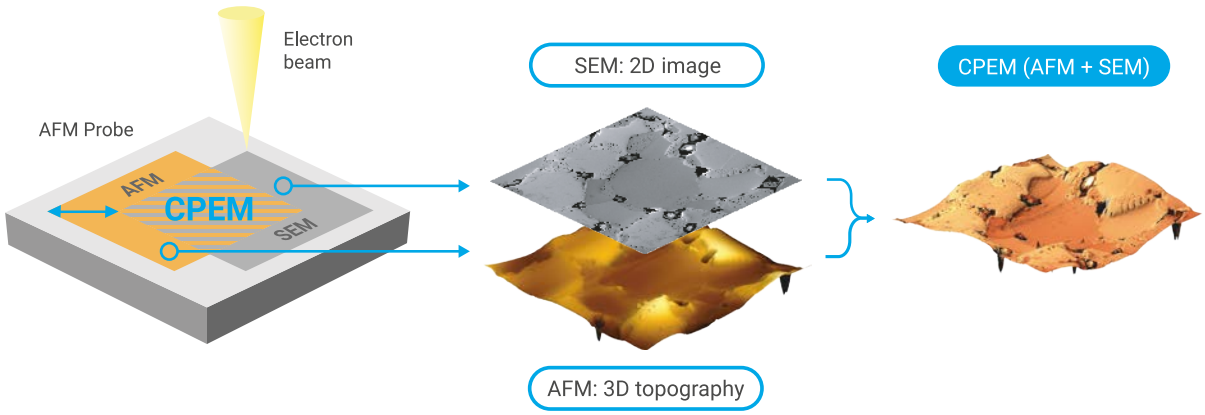
Due to the complex control system of LiteScope, it is possible to measure a variety of SPM techniques when proper electrical connections are set up.

Available modes

- **Topography:** AFM
- **Mechanical:** Energy Dissipation, FMM, Nanoindentation
- **Electrical:** C-AFM, KPFM
- **Magnetic:** MFM
- **Electro-mechanical:** PFM
- **Spectroscopy modes:** F-z curves, I-V curves

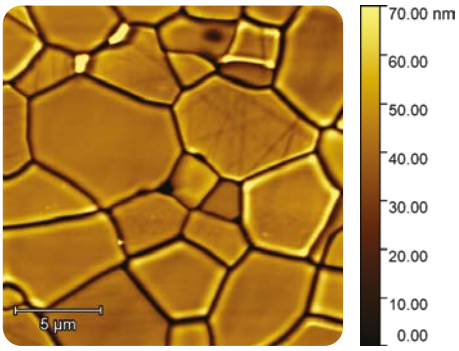
Correlative Probe & Electron Microscopy (CPEM)

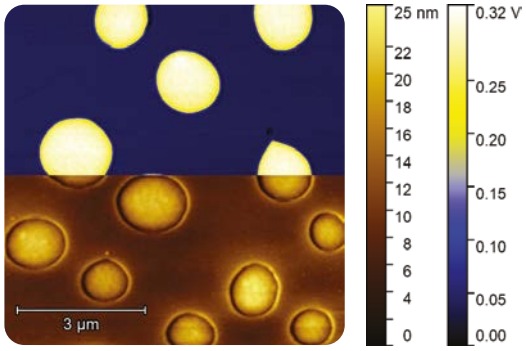
CPEM enables simultaneous detection and acquisition of AFM and SEM signals at the same time and in the same place. The obtained data are directly correlated into a resulting 3D image that extends the SEM images with the AFM measurement techniques. The unique scanning system enables very accurate multi-modal image correlation.



Atomic Force Microscopy (AFM)

AFM allows high-resolution topography measurements of a wide range of samples. Different types of self-sensing probes can be used. Measurements can be made in contact or tapping mode.



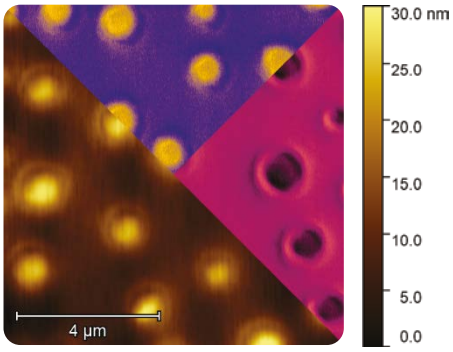


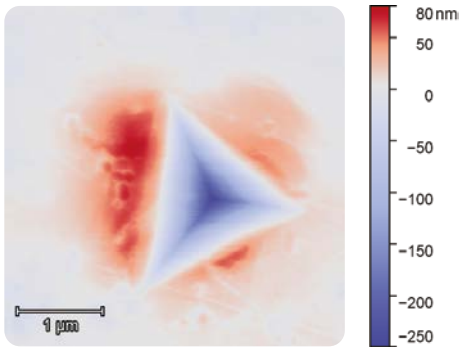
Energy Dissipation

Energy dissipation provides imaging of the local elastic properties of the material. An alternative to FMM, that provides similar information while requiring almost no change from the basic topography measurement setup.

Force Modulation Microscopy (FMM)

FMM allows imaging of the local elastic properties of the sample. An oscillating downforce is applied on the tip during a contact mode measurement. Amplitude and phase of the demodulated response signal contain information about local elasticity.



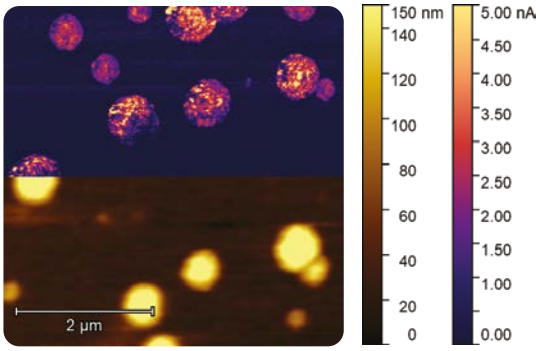


Nanoindentation

A widely used method for material hardness characterization. LiteScope's dedicated nanoindentation module from Alemnis enables local hardness and elasticity measurement with supreme control over experiment conditions inside SEM.

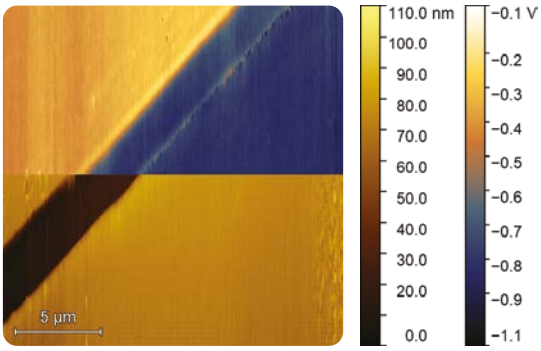
Conductive AFM (C-AFM)

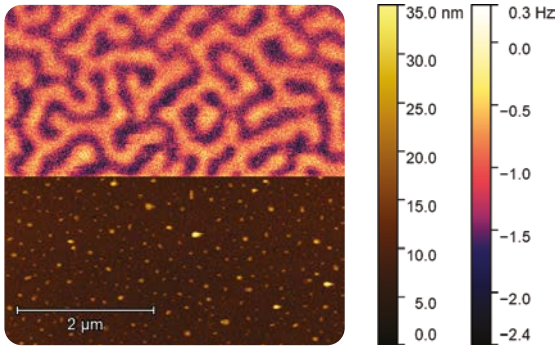
Conductive AFM provides a high-resolution local conductivity map of the sample. A bias voltage is applied between the tip, and the sample and the tip-sample current flow is measured during contact AFM topography measurement.



Kelvin Probe Force Microscopy (KPFM)

KPFM is a two-pass technique, estimating the local distribution of surface potentials. In the first pass, the topography in contact mode is measured. The probe is then lifted and repeats its trajectory in the second pass. The electrical interaction between the tip and the sample is then recorded without the influence of topography.



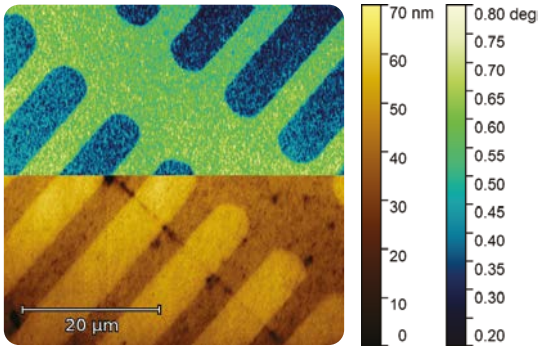


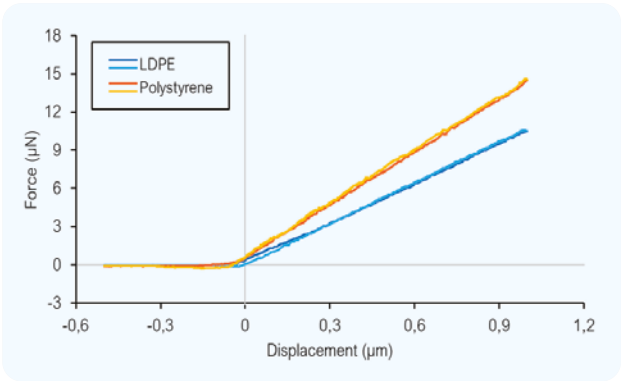
Magnetic Force Microscopy (MFM)

MFM maps the magnetic force gradient above the sample surface. Similarly to KPFM, the topography and magnetic signals are measured in two separate passes over each line.

Piezoresponse Force Microscopy (PFM)

PFM allows imaging of piezoelectric material domains. This method measures the mechanical response of the material to the applied alternating voltage together with topography. Amplitude and phase of the demodulated signal contain information about the local piezoresponse.



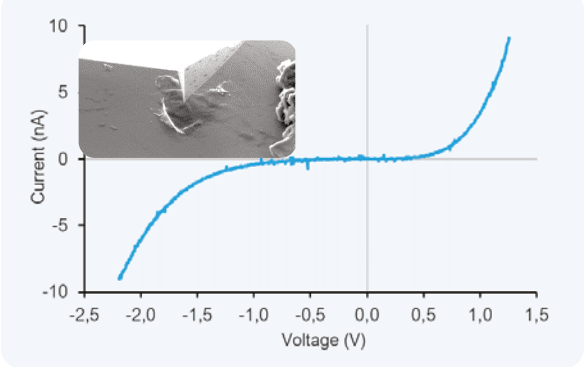


Force-distance curves

F-z spectroscopy is a valuable tool for precise local sample characterization. Spectroscopy is used for many purposes like a sample stiffness analysis, detailed surface-tip force progress or local elasticity/plasticity determination.

I-V curves

I-V curves give detailed information about the electrical properties of the sample. The AFM-in-SEM configuration provides precise tip navigation and other possibilities for experiment design.

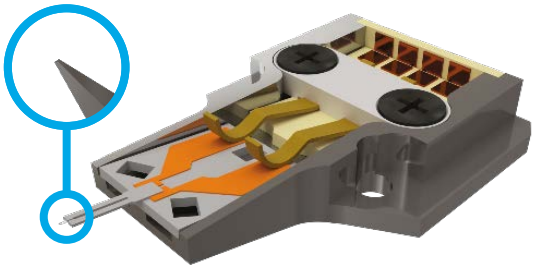


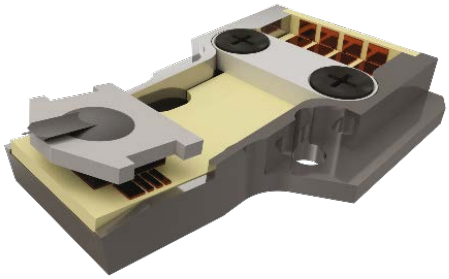
Available probes and probe holders

Akiyama sensor

Techniques: AFM, energy dissipation

Description: The go-to probe for CPEM measurements thanks to its visible tip. Capable of measuring AFM topography and energy dissipation signal at the same time.





PRS/A

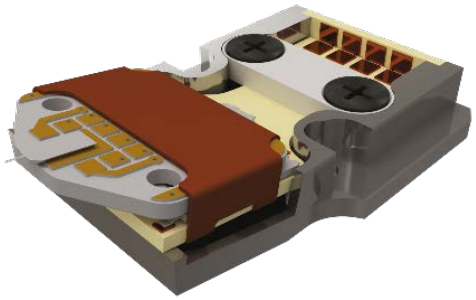
Techniques: AFM, F-z spectroscopy

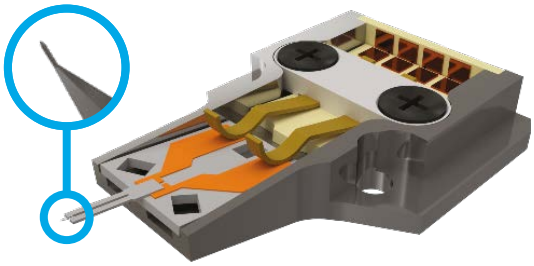
Description: AFM probe suitable for both dynamic and contact mode topography measurements and F-Z spectroscopy.

Nenoprobe Electric

Techniques: AFM, I-V spectroscopy C-AFM, KPFM, PFM

Description: Our own AFM probe with a conductive tip, capa ble of performing C-AFM, KPFM, PFM and I-V spectroscopy.





Nenoprobe Magnetic

Techniques: Topography, MFM

Description: Magnetic-sensitive probe based on the Akiyama sensor, that can be used in SEM thanks to its visible tip. It uses the same probe holder as regular Akiyama.

Berkovich tip

Techniques: Nanoindentation

Description: One of the standard tips used for nanoindentation to test the hardness of materials. Its use requires an additional nanoindentation module for LiteScope.

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