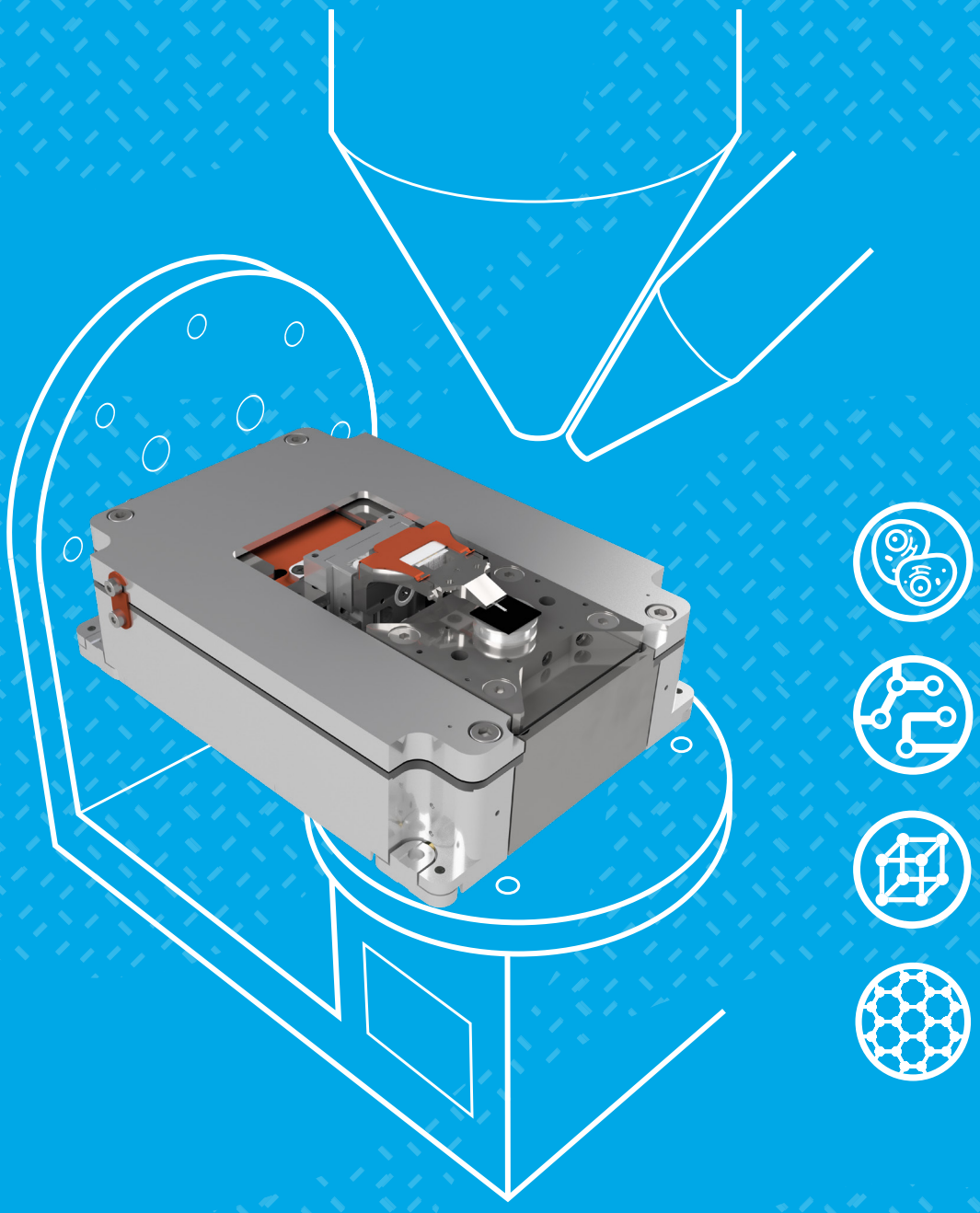
NenoVision

Next level of imaging



LiteScope 2.0

AFM designed **for** integration into **SEM**

LiteScope™

LiteScope is a compact Atomic Force Microscope designed for integration into a variety of Scanning Electron Microscopes.

- Fast, plug and play integration into SEMs
- **Can be used with FIB, GIS, EDX** and other standard SEM accessories
- Compatible with most SEMs

Measurement modes

Mechanical properties

- topography
- local elastic properties (tapping mode)
- local elastic properties (contact mode)
- local sample hardness (non-topographic)
- depth-dependent material characterization
- various in-situ operations

Magnetic properties

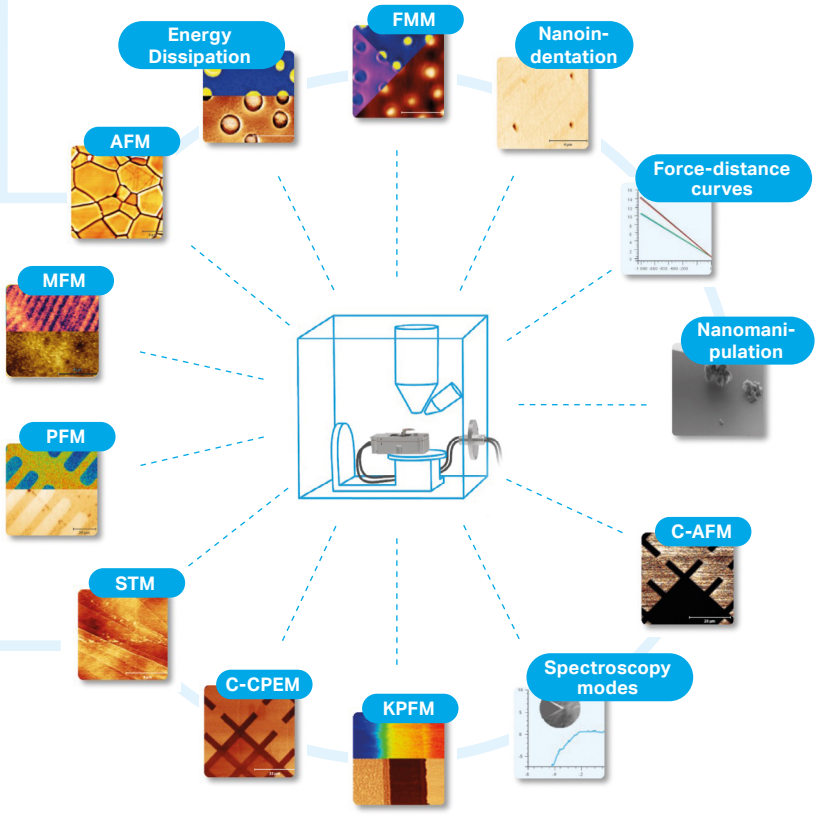
- magnetic domain imaging

Electro-mechanical properties

- piezoelectric domain imaging

Electrical properties

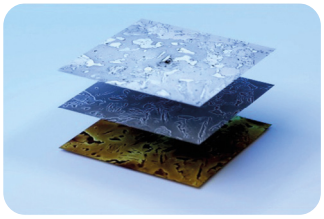
- conductivity map
- conductivity map including insulated areas
- local surface potential
- local electrical properties (non-topographic)
- sub-nanometer topography



Why AFM-in-SEM?

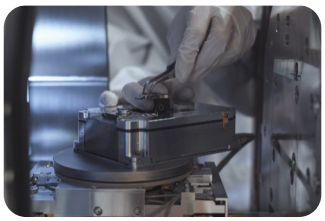
Scanning electron microscopy and atomic force microscopy are the two most used, and **complementary techniques**, for sample analysis in the (sub)nanometer range. The integration of AFM into SEM **merges the strengths of both techniques**, resulting in extremely **time-efficient workflow** and enables **complex sample analysis** that was difficult or readily impossible by conventional, separate AFM and SEM instrumentation.

Key technology benefits



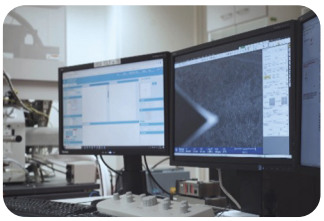
1 Complex and correlative sample analysis

Unique CPEM technology enables **simultaneous acquisition of AFM and SEM channels** and their seamless **correlation into 3D** images.



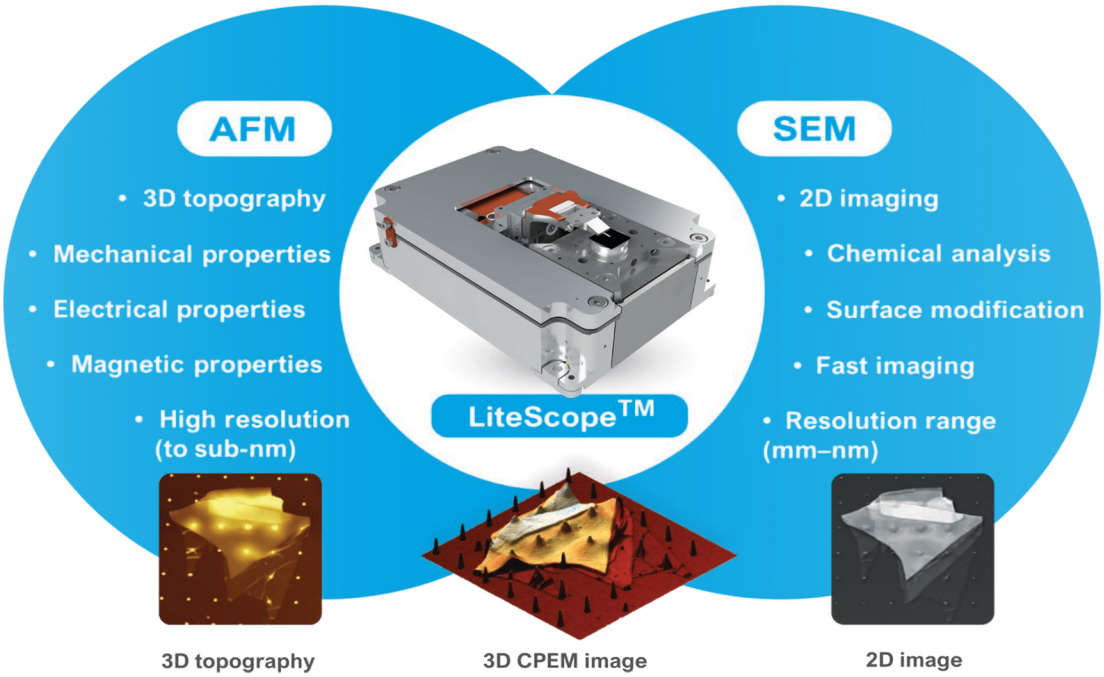
2 In-situ sample characterization

In-situ conditions inside the SEM ensure sample analysis at the **same time**, in the **same place** and under the **same conditions**.



3 Precise localization of the region of interest

Extremely precise and time-saving approach **uses SEM to navigate the AFM tip** to the region of interest, enabling its fast & easy localization.



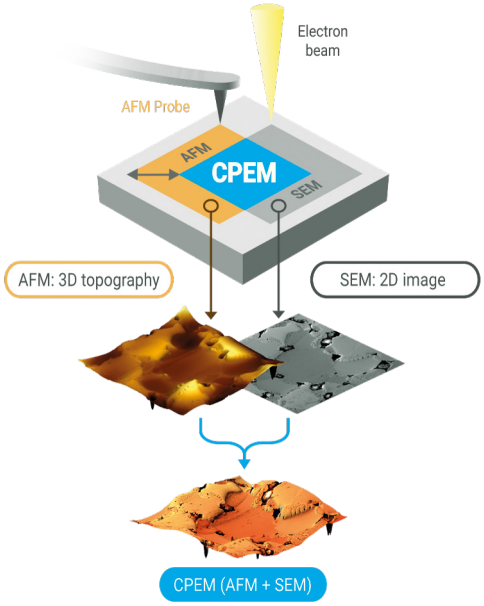
Correlative Probe and Electron Microscopy

Next level of imaging

Correlative Probe and Electron Microscopy (CPEM) is a unique technique, which was introduced and patented by NenoVision. It represents a hardware correlative technology, enabling **simultaneous acquisition of SEM and AFM data**, and their **seamless correlation** into one 3D image.

Advantages

- **Simultaneous acquisition** of AFM and SEM data
- Absolute **correlative precision**
- Multimodal correlation of multiple AFM and SEM images
- **In-situ conditions** – same time, same place, same conditions
- Extremely **time efficient** with respect to other correlative techniques



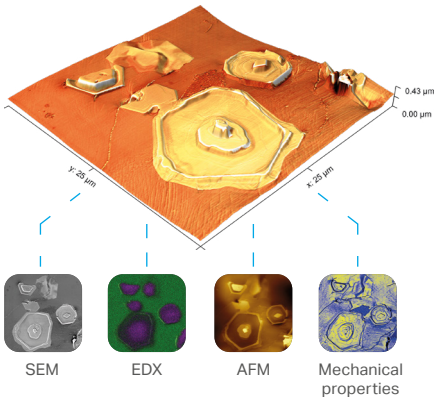
How does it work?

On the sample, the **electron beam points close to the AFM tip with a constant offset**. They both remain static, while the sample is scanned with the LiteScope's piezo scanner.

This way, data from both microscopes can be acquired at the same time, in the same place, and under the same conditions.

LiteScope's unique applications

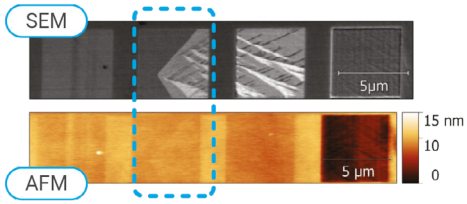
LiteScope's unique applications represent measurements, where the **simultaneous utilization of SEM and AFM** is either completely i**ndispensable or vastly superior to** the use of conventional, **separate** SEM and AFM instruments in terms of measurement feasibility or its overall cost.



Complex analysis of 2D materials

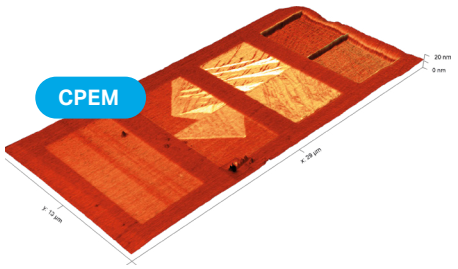
Analysis of molybdenum carbide
Complex correlative imaging of an identical spot on the Mo_2C sample includes topography, EDX, conductivity and mechanical properties.

- **CPEM:** precise correlation of chosen AFM and SEM data
- **SEM-EDX:** fast nanostructure localization and elemental analysis
- **AFM:** topography, conductivity, mechanical properties

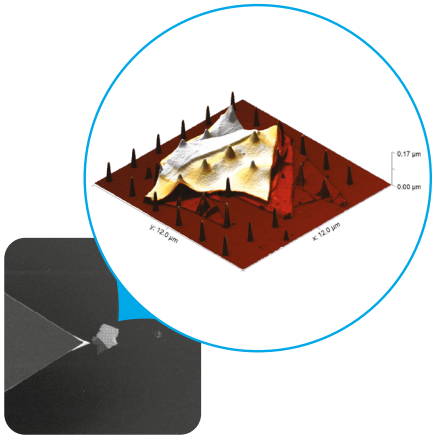


In-situ characterization of sensitive samples

Magnetic nanopatterning
In-situ AFM-in-SEM was necessary to selectively changethe sample by Focused Ion Beam and immediately characterize magnetic properties of metastable $Fe_{78}Ni_{22}$ thin films.



- In-situ conditions – **FIB-induced transformation** of a sensitive sample had to be **characterized by AFM and SEM in in-situ conditions**.
- **Immediate and precise ROI identification** – small structural change at the FIB induced interface had to be analyzed by AFM.



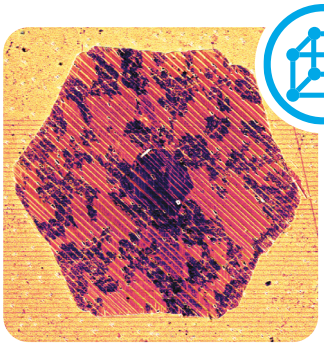
Precise localization of the region of interest

WSe_2 flakes on silicon nanopillars
A certain shape of a WSe_2 flake monolayer over nanopillars creates a single-photon emitter.

- **Fast ROI localization by SEM**
- Difficult sample for AFM – combination of 1D and 2D materials
- **CPEM:** correlation of topography with monolayer resolution (AFM) and material contrast (SEM)

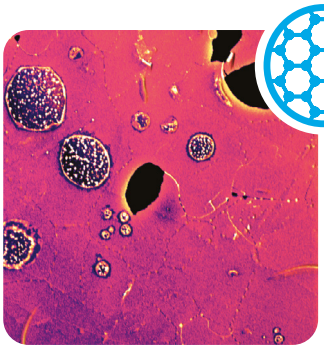
Application areas

LiteScope offers users unprecedented possibilities in sample analysis and **advanced 3D correlative imaging** with **unparalleled accuracy of image alignment**. The versatility of LiteScope proves its applicability in a variety of fields such as Material Science, Nanotechnology, Semiconductors, Solar cell development, Life Science and other areas of research as well as industry applications.



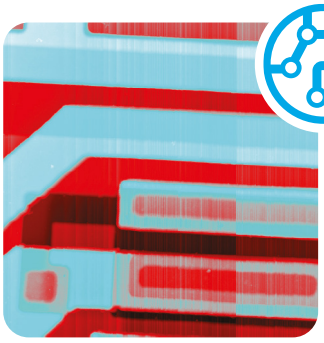
Material Science

- 1D / 2D materials
- Steel & metal alloys
- Batteries
- Ceramics
- Polymers & Composites



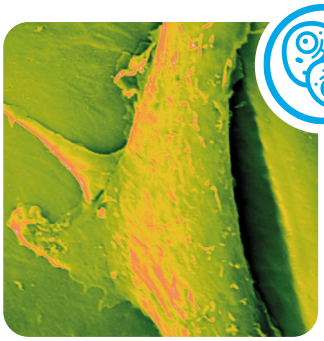
Nanostructures

- Modified surfaces FIB/GIS
- Quantum dots
- Nanostructured films
- Nano-patterning
- Nanowires



Semiconductors

- Integrated circuits
- Solar cells
- MEMS / NEMS
- Failure analyses
- Dopant visualization
- Current leakage localization



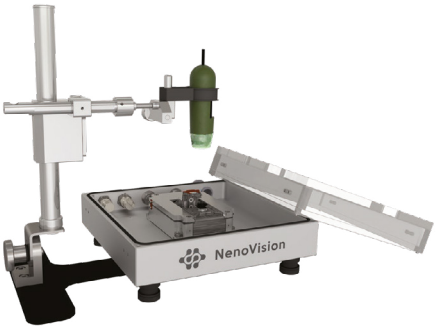
Life Science

- Cell biology
- Marine biology
- Protein technology

Optional accessories

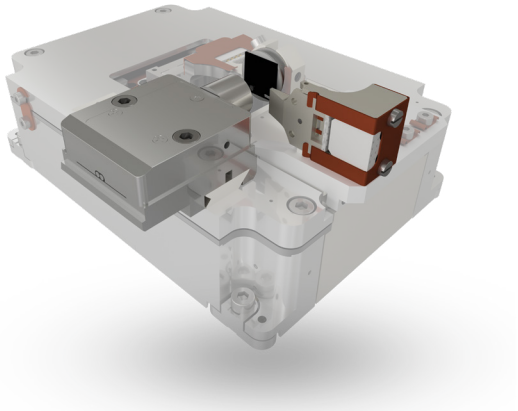
External nanoindentation module

Nanoindentation module enables **micromechanical experiments** to be performed while observing the specimen with superb SEM magnification and analyzing the indented specimen with sub-nanometer resolution using LiteScope.



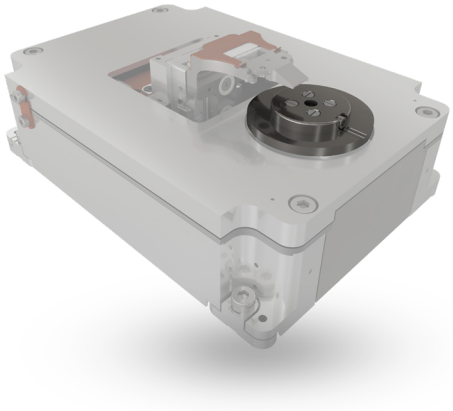
Sample rotation module

The module is extremely **useful for FIB milling procedures followed by an AFM analysis**. It also allows simultaneous **mounting of several samples** into the SEM chamber and performing their AFM and SEM correlative measurements without opening the chamber.



NenoCase and digital camera

Use LiteScope as a stand-alone AFM in ambient conditions or under **different atmospheres** and **navigate the AFM probe precisely** with our digital camera.



NenoView software

NenoView is user-friendly, web-based software, which **allows full control of measurements**, data acquisition and data processing. NenoView supports CPEM technology and **enables utilization of correlative imaging directly and internally**.

- Automatically **saves the setup and the data**
- Integrated data processing, analysis and export features
- **Remote experiment control** and access to the user data

NenoVision

Next level of imaging

LiteScope technical specification

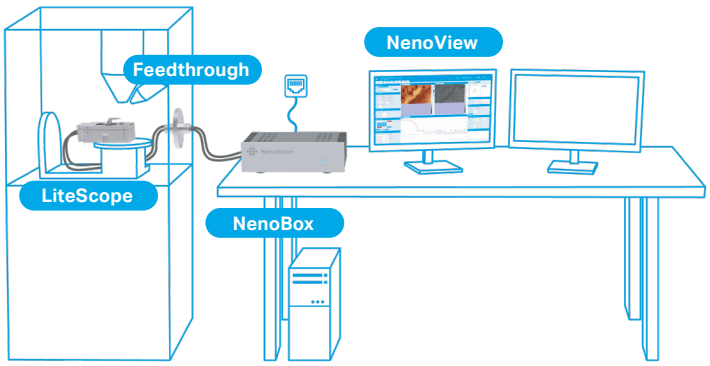
Dimensions XYZ	118 mm x 84 mm x 35.7-48.4 mm	**Scan range in open loop XYZ (±10%)**	100 µm x 100 µm x 20 µm
Total weight	460 g	**Scan range in closed loop XYZ**	80 µm x 80 µm x 16 µm
Vacuum working range	105 Pa to 10-5 Pa	**Resolution XYZ up to**	0.2 nm x 0.2 nm x 0.04 nm
Operating temperature	+10 °C to +35 °C	**Maximum sample height**	8 mm
Maximal scanned sample area XYZ	21 mm x 11 mm x 8 mm	**Maximum sample weight**	100 g

Measurement modes

- **Topography modes:** AFM and surface roughness
- **Mechanical modes:** Energy dissipation (tapping mode), FMM (contact mode), nanoindentation
- **Electrical modes:** C-AFM, KPFM
- **Magnetic modes:** MFM
- **Electro-mechanical modes:** PFM
- **Spectroscopy modes:** F-z curves, I-V curves

SEM compatibility

Thanks to its small dimensions and light weight, AFM LiteScope is compatible with the majority of SEM systems produced by Thermo Fisher Scientific, TESCAN, ZEISS, Hitachi, and Jeol.



What do you get?

LiteScope package

- LiteScope – scan head
- NenoBox – control unit
- NenoView – control software
- Feedthroughs
- SEM adaptor
- Cabling

2021 / 12

NenoVision combines tradition and expertise with unique solutions in nanoscale microscopy and correlative imaging using proprietary Correlative Probe and Electron Microscopy (CPEM) technology. Our company is located in Brno, Czechia – the center of electron microscopy with a long tradition in the development of scientific instruments.

Contact us!
info@nenovision.com

www.nenovision.com
NenoVision