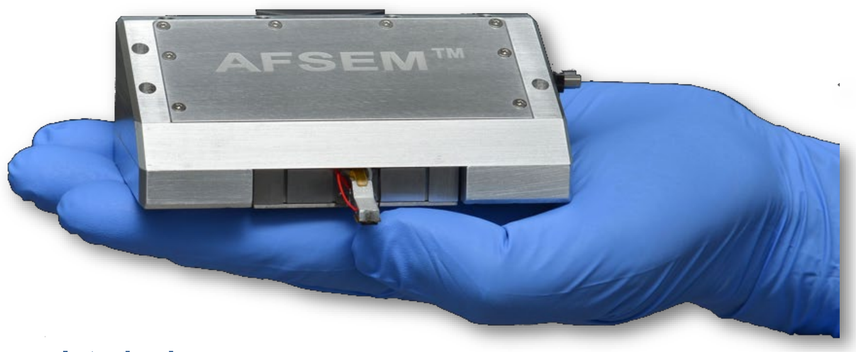
Quantum Design ITALY

The AFSEM™ - Improved Understanding of Material Behavior using Correlative In-Situ Techniques

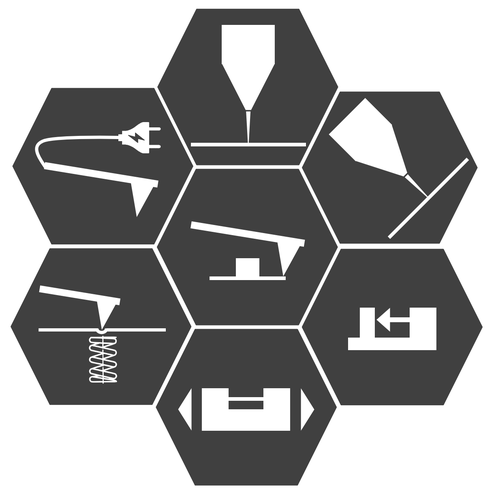
Quantum Design MICROSCOPY

The AFSEM™ concept



AFSEM™ correlated microscopy

AFSEM™ is a novel AFM platform specifically designed and developed for integration into other host systems, such as SEM or Dual-beam (SEM/FIB) microscopes. Its open design allows to simultaneously operate SEM/FIB and AFSEM™ inside the SEM/FIB vacuum chamber.



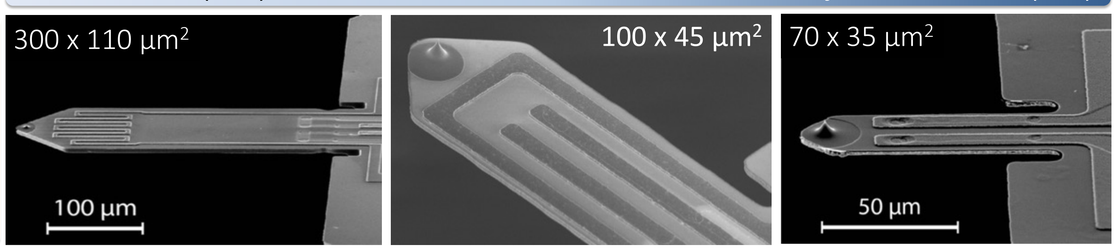
Main benefits:

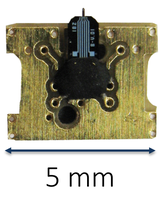
- **Direct 3D information** with sub-nanometer resolution
- **Correlative Microscopy** at highest SEM resolution of exactly the same sample position by SEM/FIB, EDX and AFSEM™
- **No air exposure of the sample** during interactive analysis by different methods
- **Nanometer Scale Analysis** before SEM sample contamination
- **Ease of Use –** No AFM laser alignment due to self-sensing cantilever technology
- AFSEM™ accepts **any Sample** the host system accepts

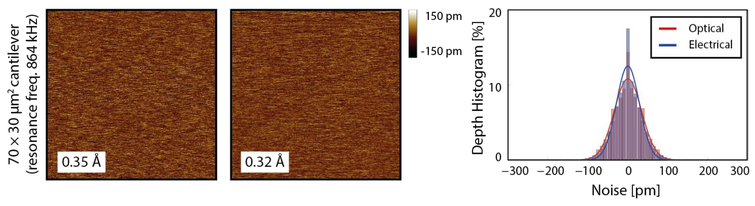
Self-Sensing Cantilever Technology

Static Modes (soft) | Dynamic Modes (stiff)

Cantilever





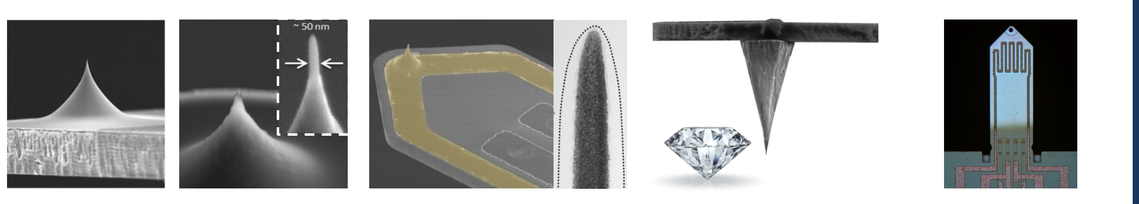


Electrical Noise Level of 0.32 Å for Self-Sensing Cantilever **equals** Optical Noise Level

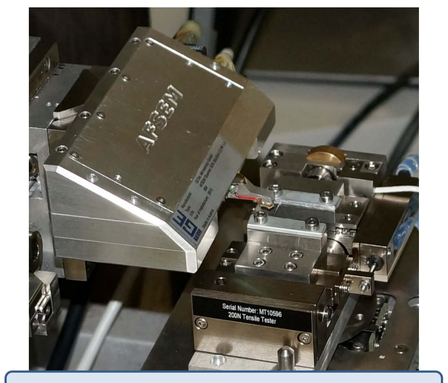
M. Dukic, J. D. Adams and G. E. Fantner. *Scientific Reports* **5,** 16393 (2015)

Functional Tips

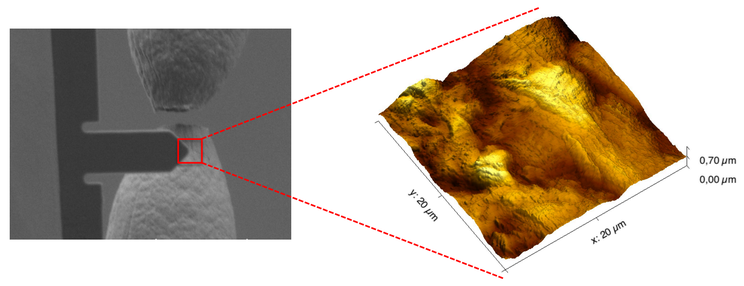
Topography | Conductivity | Hard Materials | Magnetism



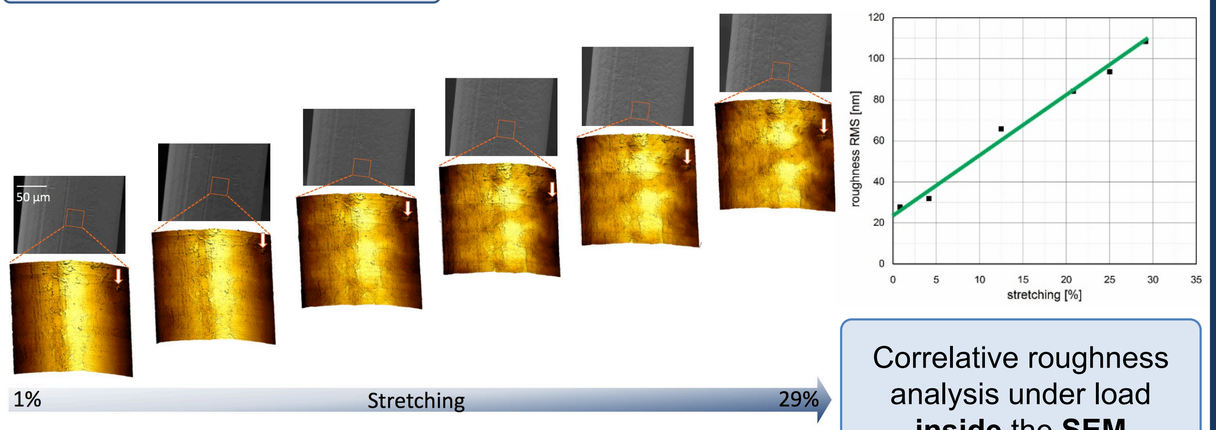
In-Situ Micro-Mechanical Testing



Combine **SEM**, **tensile stage** and **AFSEM™**



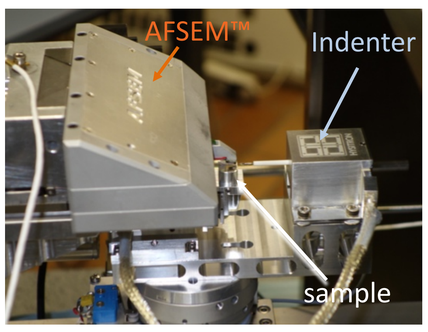
Observe sample changes with **SEM**, measure details with **AFSEM™**

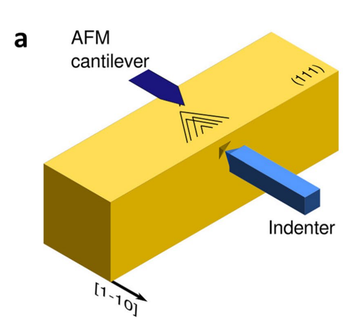


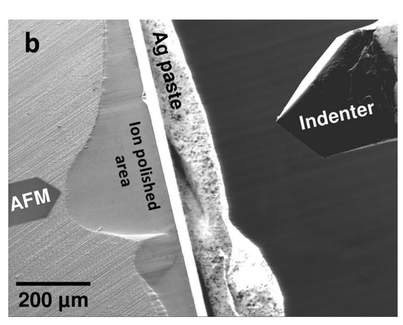
Correlative roughness analysis under load **inside** the **SEM**

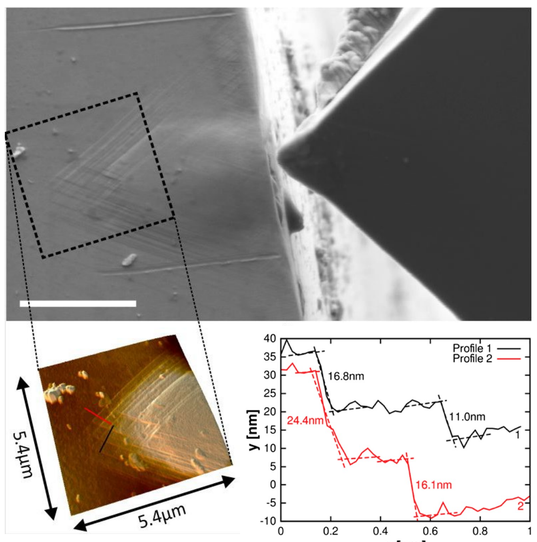
Correlative Nanoindentation Analysis

Combine **SEM**, **nano-indenter** and **AFSEM™** for **correlative *in-situ*** experiments







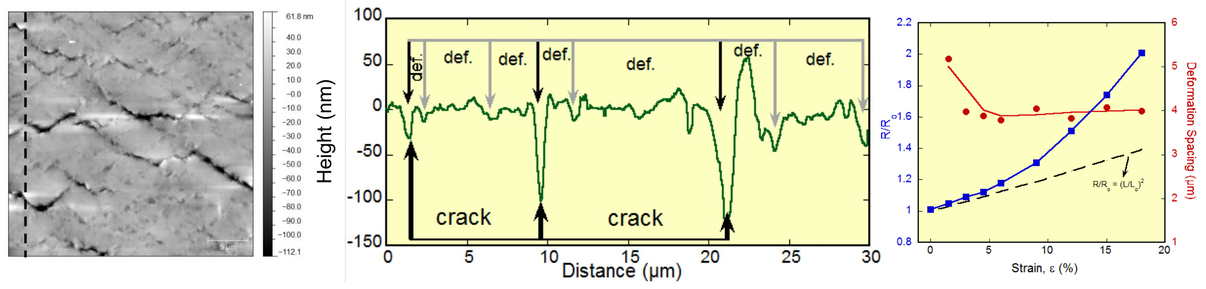


- Investigate evolution of slip-step dynamics with sub-nanometer resolution
- Analyze your sample before SEM contamination or oxidation effects
- Quantify the number of emitted dislocations exactly at the area of interest

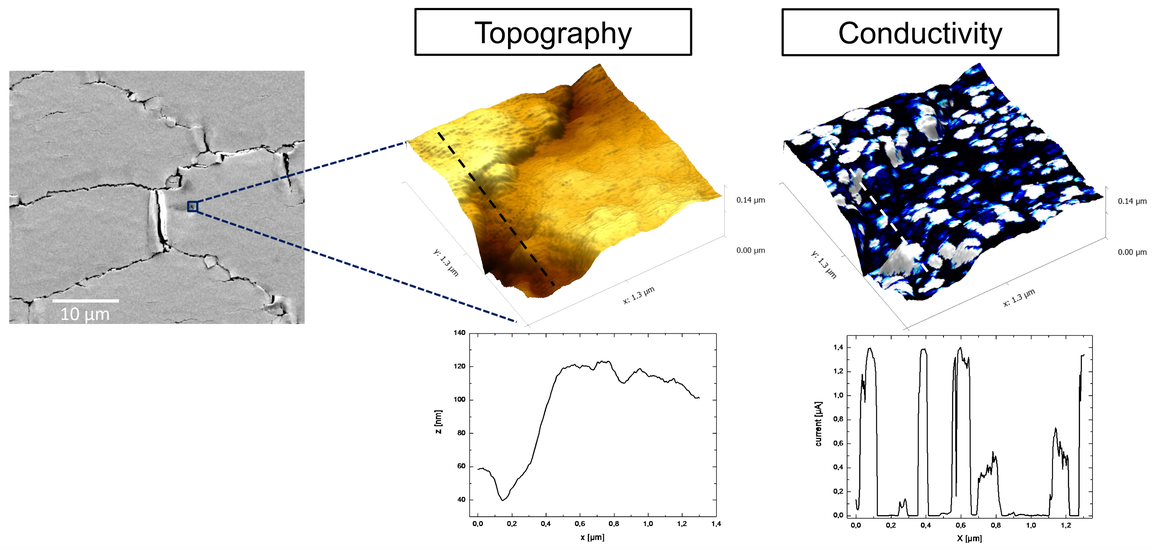
J. Kreith et al., *Rev. Sci. Instrum.* **88,** 053704 (2017)

Mechanical Testing of Flexible Electronics

Combine **SEM**, **AFM** and **in-situ** **4-point-probe** measurements to study flexible electronics during straining



Measure **in-situ 3D-topography** AND **conductivity**



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