Two microscopes are better than one – A unique new inspection tool for micro/nanostructures by combination of AFM and SEM

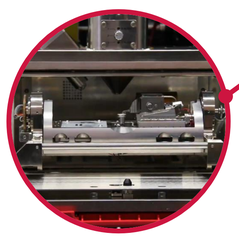
Quantum Design MICROSCOPY

C.H. Schwalb[1], H. Frerichs[1], L. Stühn[1], S. Seibert[1], M. Wolff[1]

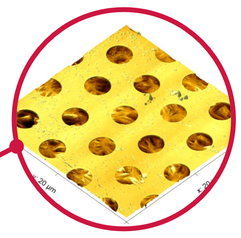
[1]Quantum Design Microscopy GmbH, Darmstadt, Germany

The FusionScope

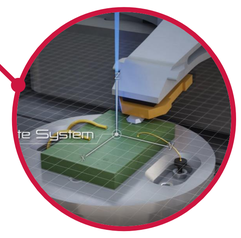
Correlative AFM & SEM
- Acc. Voltage 3.5 – 10 kV
- Schottky Emitter



Compact Vacuum chamber:
Pumping time < 5 min

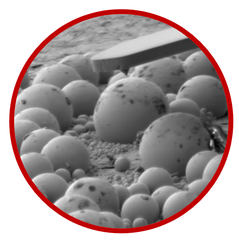


AFM
- Scan Range XY: 22 x 22 μm
- Scan Range Z: 15 μm
- Cantilever: Piezoresistive

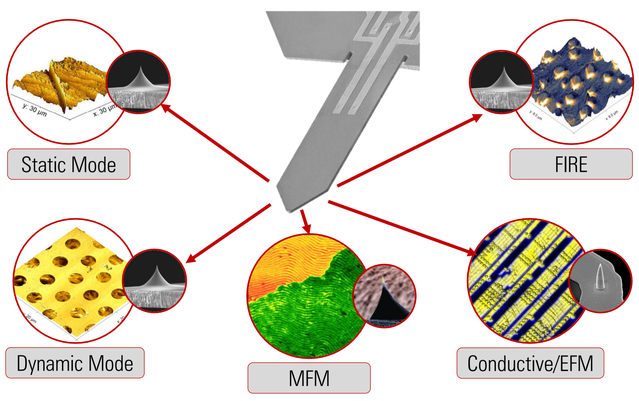


Joint coordinate system

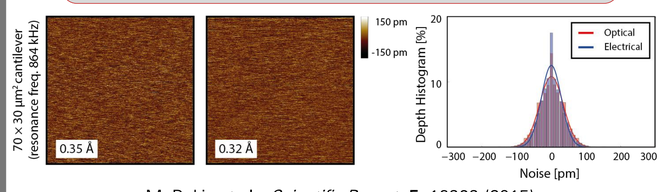
Main benefits of correlative AFM & SEM microscopy:
- FusionScope is an easy-to-use correlative microscopy platform designed from the ground up to add the benefits of AFM and SEM
- Position the AFM precisely at your region of interest, even on complex and challenging sample surfaces
- Perform a complete suite of characterization techniques by analyzing topographical, nanomechanical, chemical, electrical, and magnetic properties with the power of correlative AFM & SEM microscopy



Self Sensing Cantilever



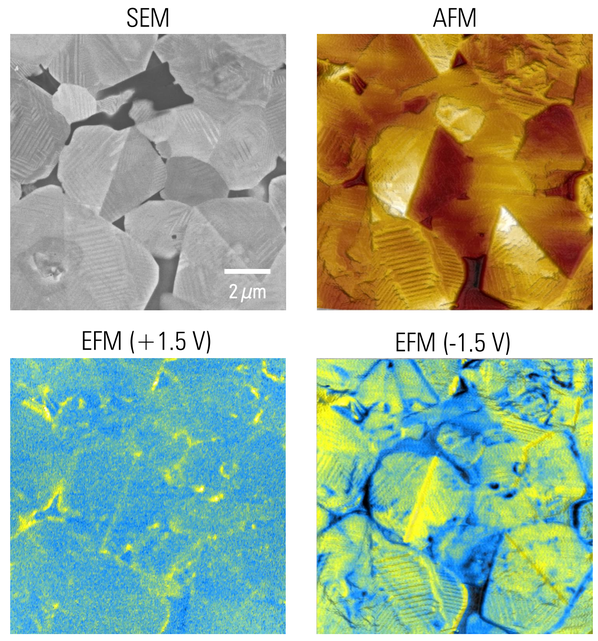
Electrical Noise Level of 0.32 Å for Self-Sensing Cantilever **equals** Optical Noise Level



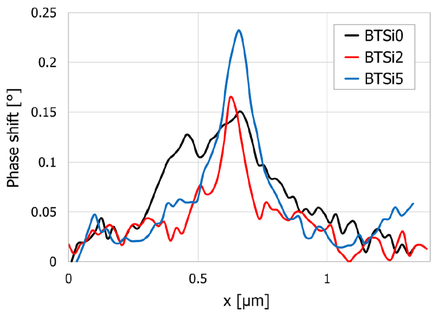
M. Dukic et al., *Scientific Reports* **5**, 16393 (2015)

EFM analysis of $BaTiO_3$ ceramics

Study grain boundary interfaces and energy barriers as a function of Silica content



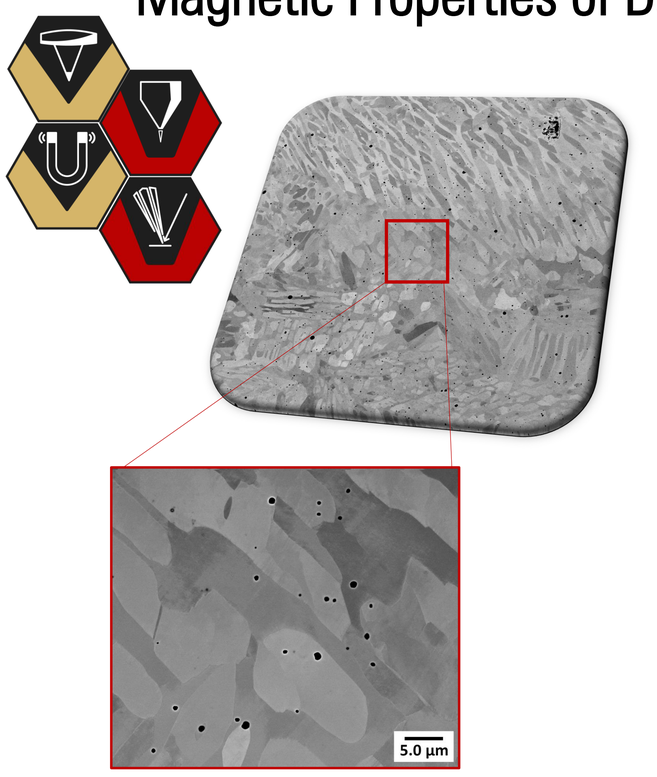
	C–V [µm]	EFM [µm]
BTSi0	0.89 ± 0.04	0.92 ± 0.13
BTSi2	0.47 ± 0.02	0.50 ± 0.08
BTSi5	0.53 ± 0.03	0.52 ± 0.08



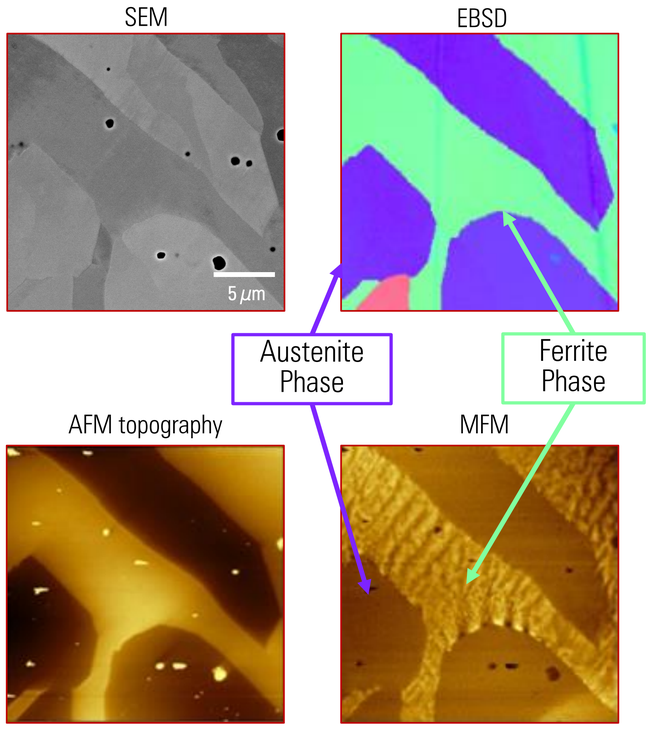
Silicon rich phase exhibits smaller energy barrier

Prohinig et al., *Scripta Materialia* 214 (2022) 114646

Magnetic Properties of Duplex Steel



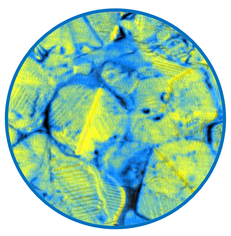
Use SEM to locate different magnetic domains on Duplex Steel surface



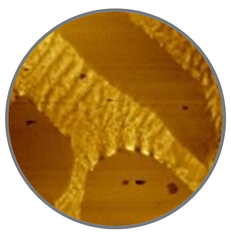
Combine SEM, EBSD, AFM topography, and MFM information for true correlative analysis!

Summary

FusionScope
Unique combined AFM & SEM tool for interactive correlative analysis on the nanoscale



Analyze electrical properties
Perform in-situ EFM characterization at grain boundaries of $BaTiO_3$



Analyze magnetic properties
Perform in-situ MFM characterization of duplex steel

www.fusionscope.com