Correlative in-situ AFM & SEM & EDX & EBSD analysis of nanostructured materials
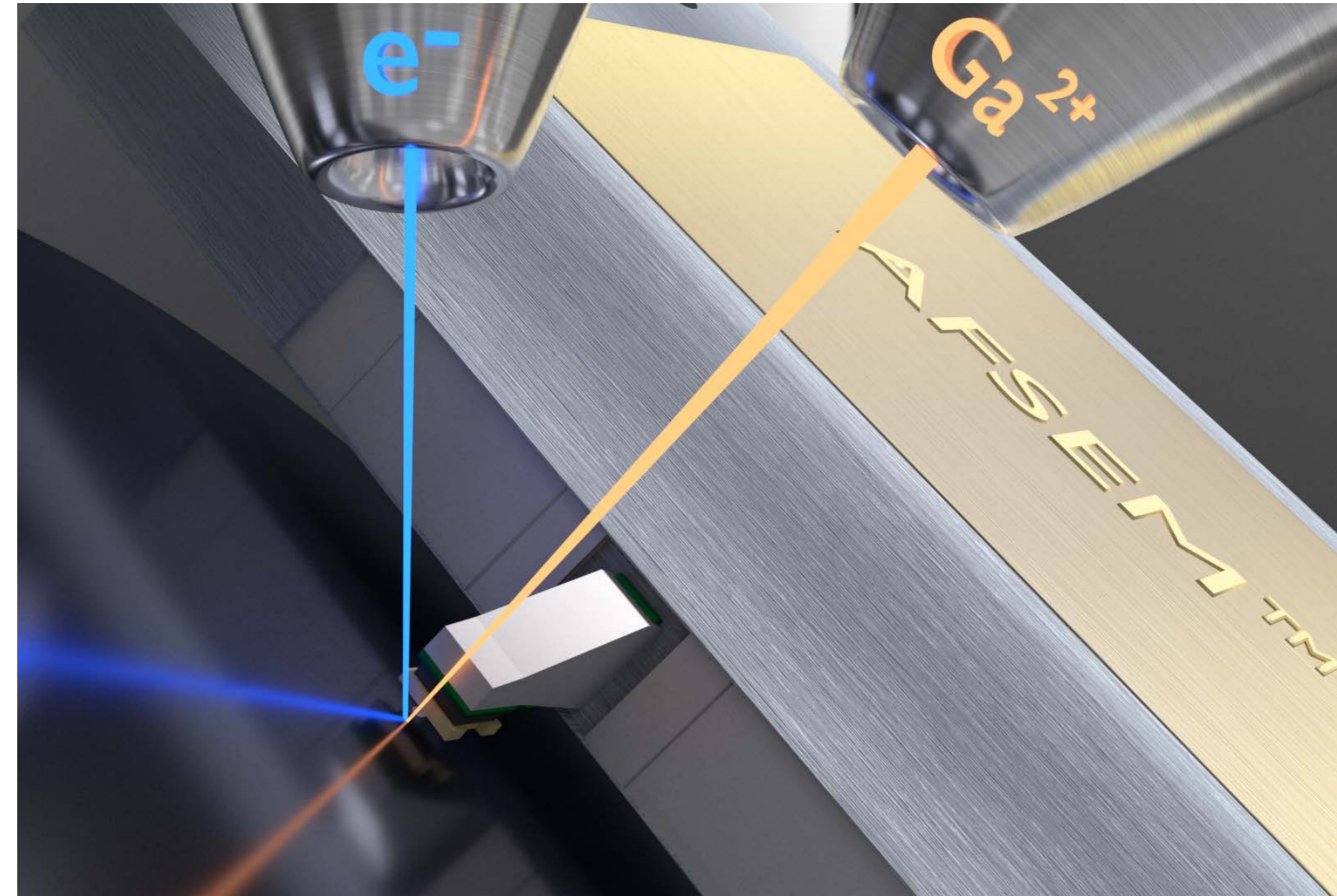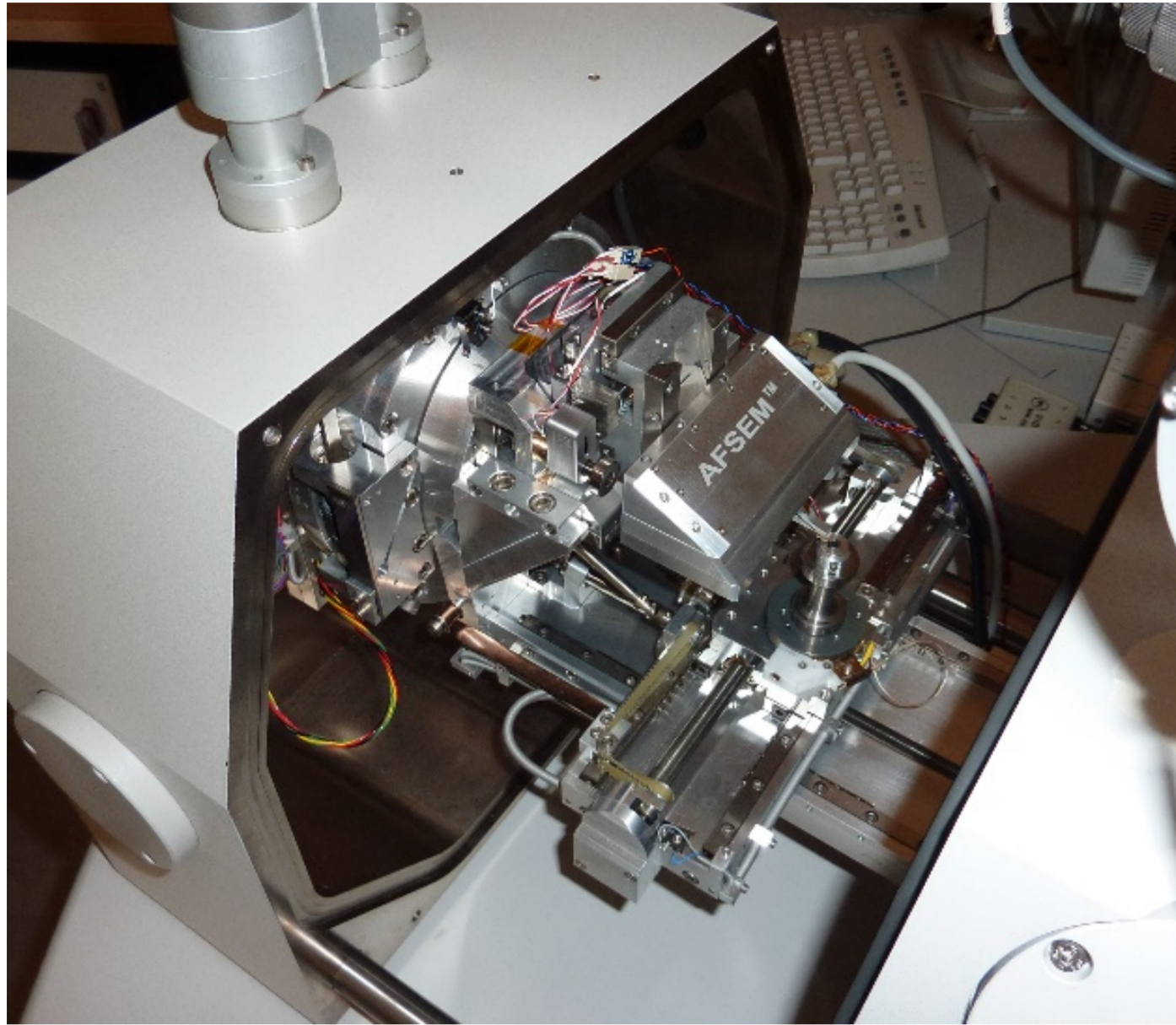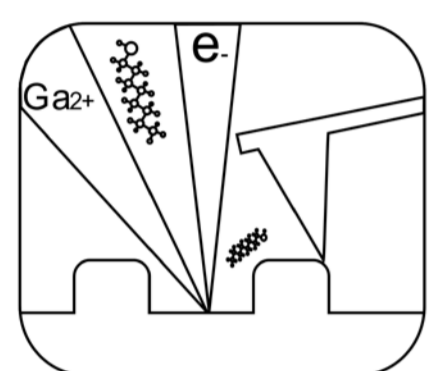
The AFSEM™ concept and user benefits

Use your SEM/FIB/AFSEM for truly interactive analysis

- with no restriction on sample size
- without breaking vacuum
- for real 3D topography, C-AFM, MFM, additive & subtractive tomography and mechanical analysis

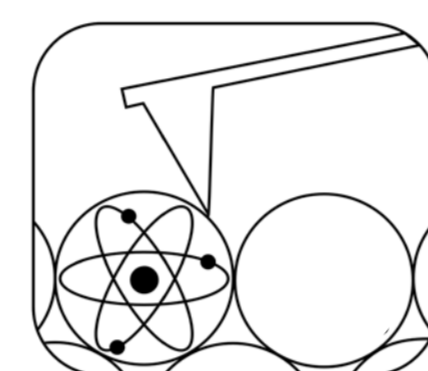**Self-sensing cantilevers** provide high resolution AFM images within a minute

Correlative microscopy
SEM/FIB and AFM at the same region of interest without breaking vacuum and exposing the sample to air
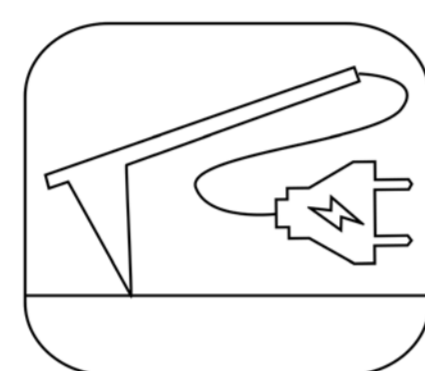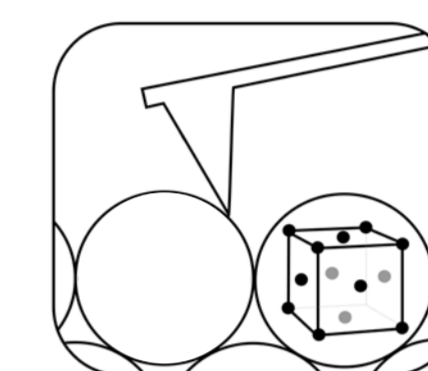
AFM & conductivity measurement
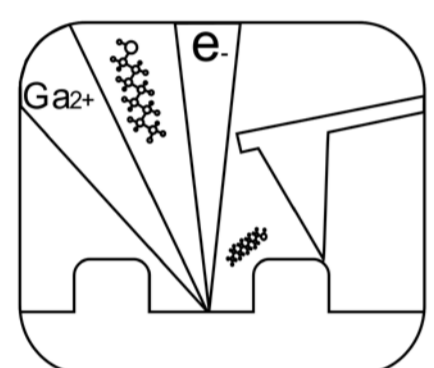Measure conductivity and topography with *pA* and *nm* resolution simultaneously

Topography & elemental analysis
Map chemical composition by EDX and correlate it with AFSEM 3D topography information

Morphology & crystallographic analysis
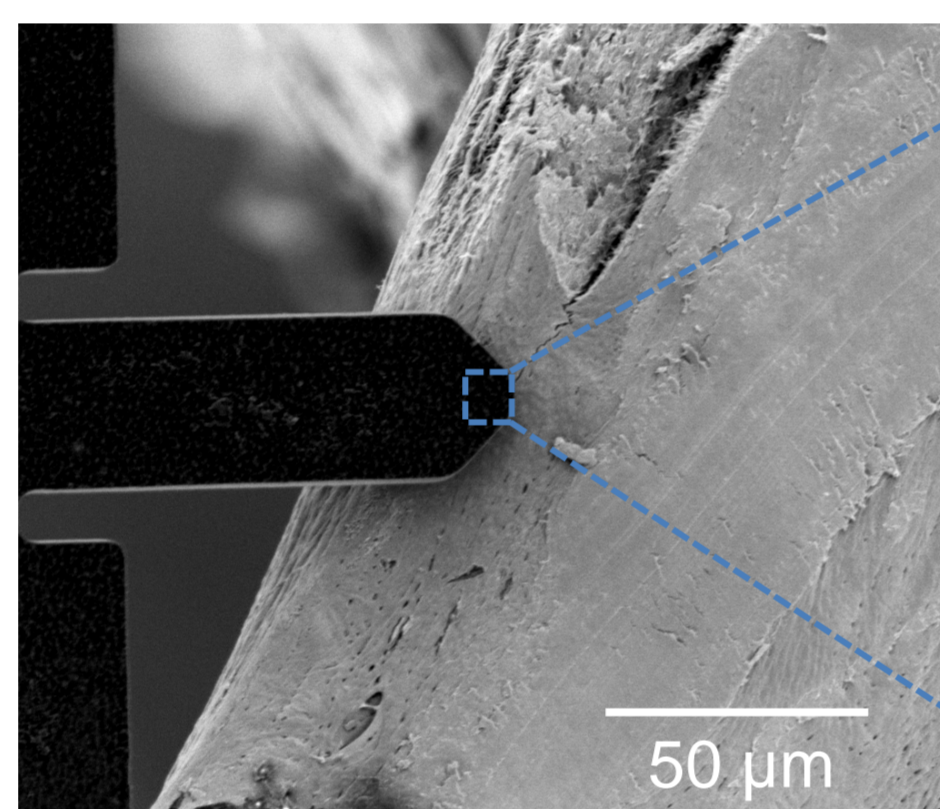Correlate morphology with crystal orientation using EBSD

Interactive correlative analysis of bone collagen on the nanoscale in YOUR SEM/FIB

Process flow of correlative SEM/AFM analysis using AFSEM - From probe positioning to quantitative 3D analysis
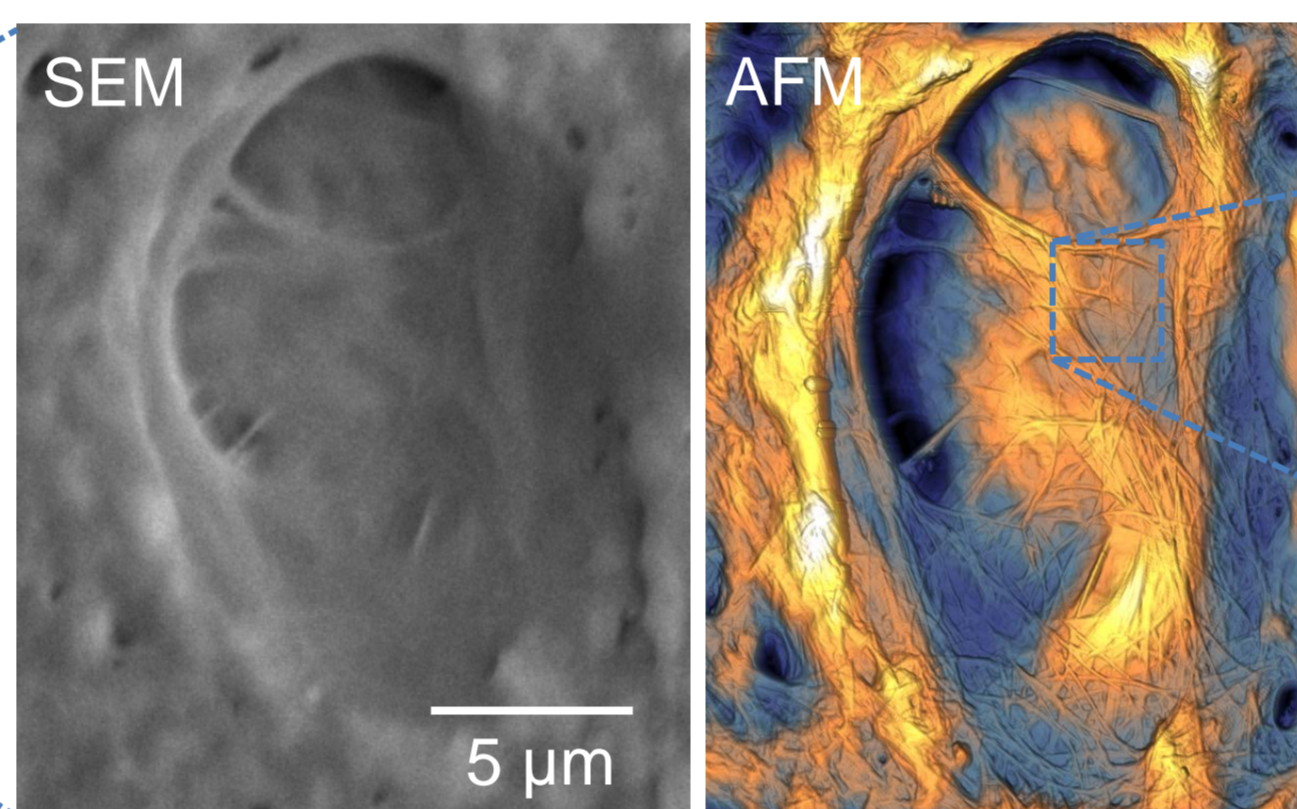
50 µm   5 µm

AFSEM setup in SEM
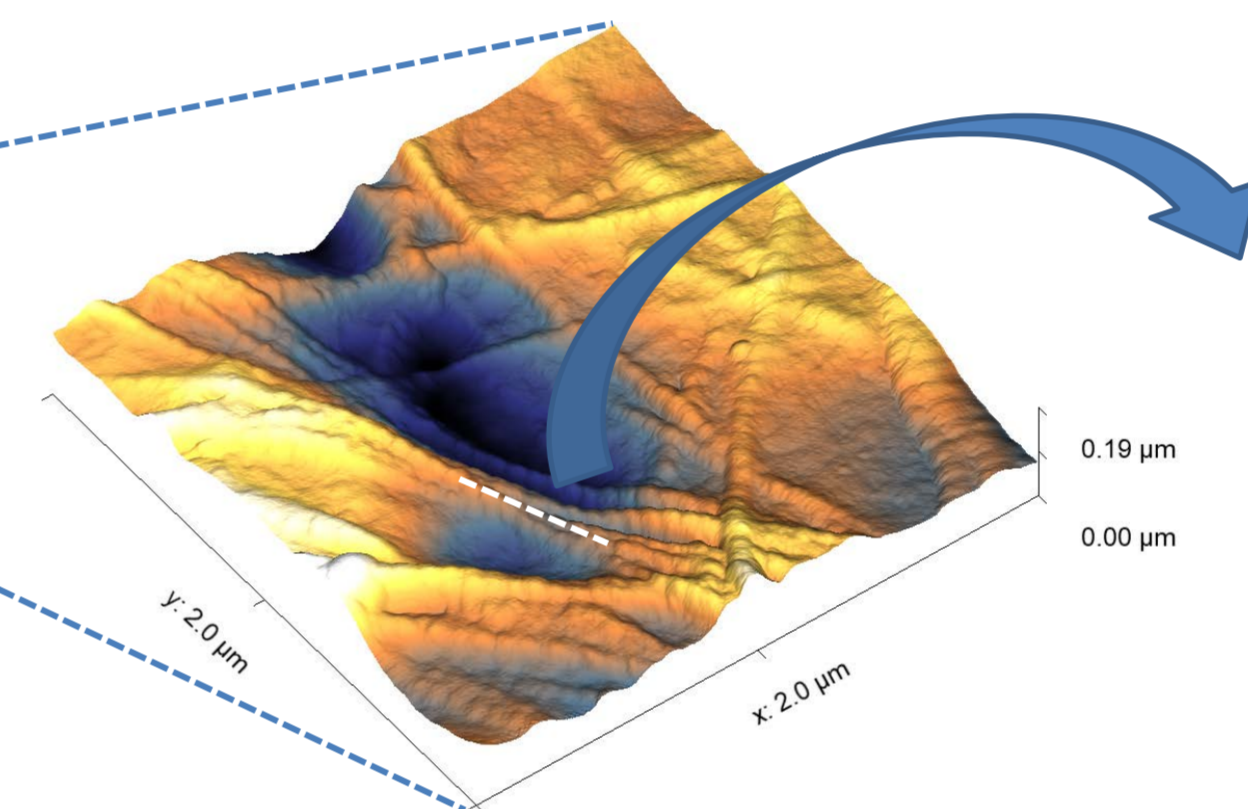AFSEM accepts any sample that fits the SEM/FIB

Region of interest
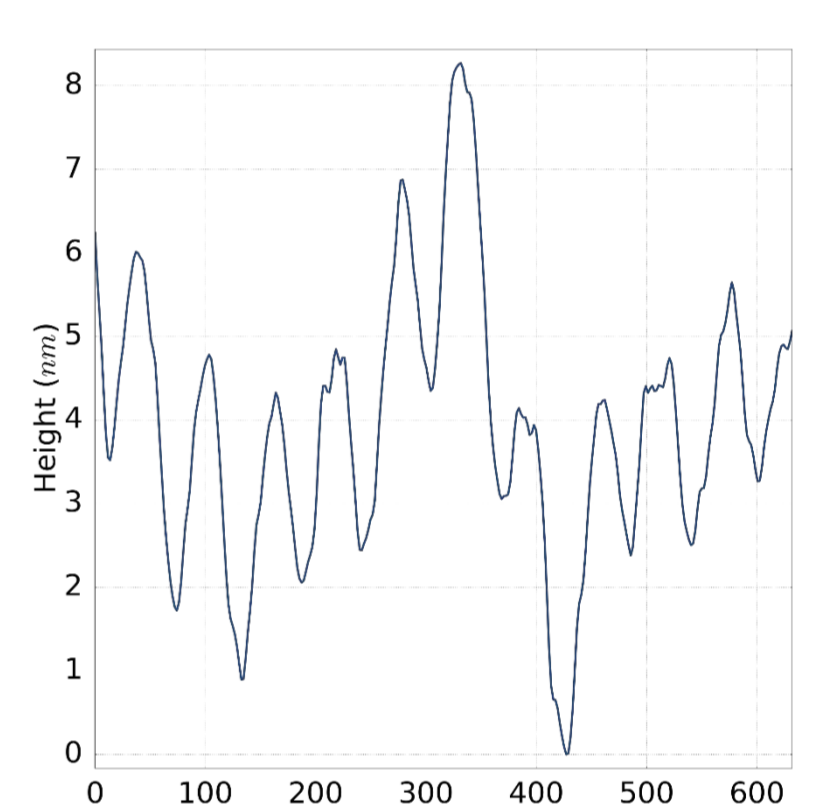SEM-guided easy identification and cantilever positioning on lacunae in bone structure

Correlative AFM/SEM microscopy
Gain complementary SEM and AFSEM 3D topography information of lacunae and collagen fibers
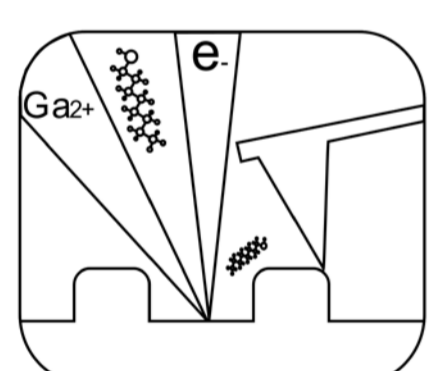
Real 3D representation
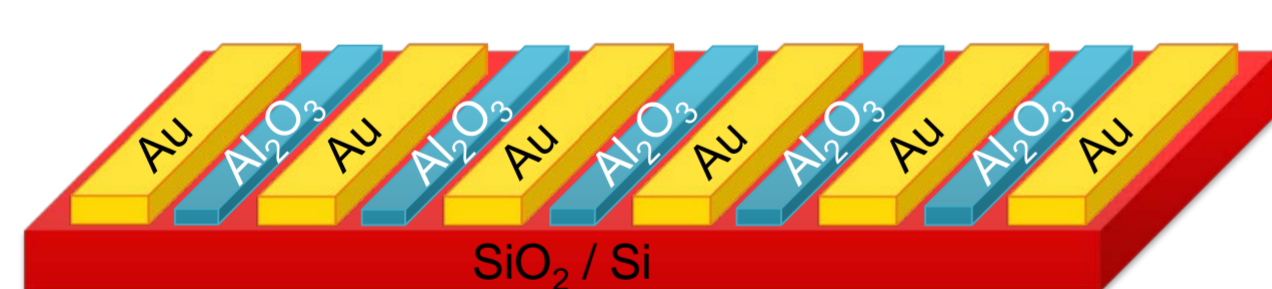3D structure of collagen fibers can be analyzed with high resolution

Quantitative 3D analysis
AFSEM analysis reveals typical 67 nm bending pattern on collagen fibers with sub-nm resolution
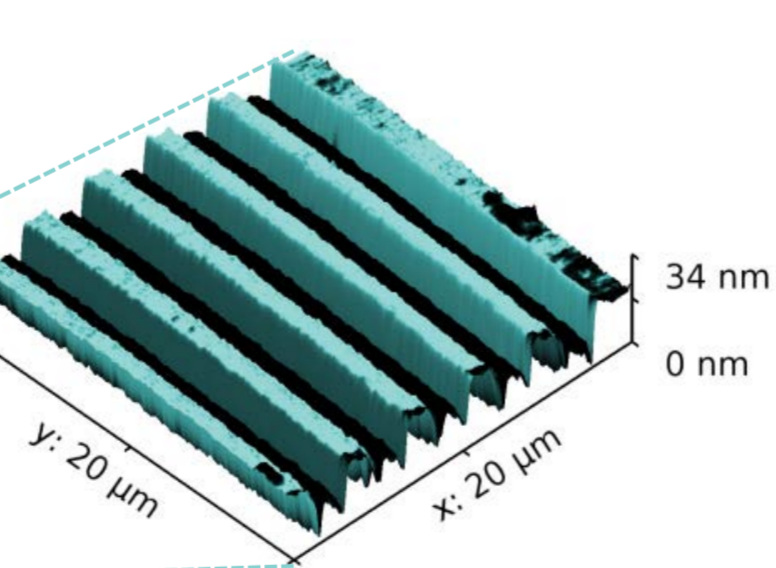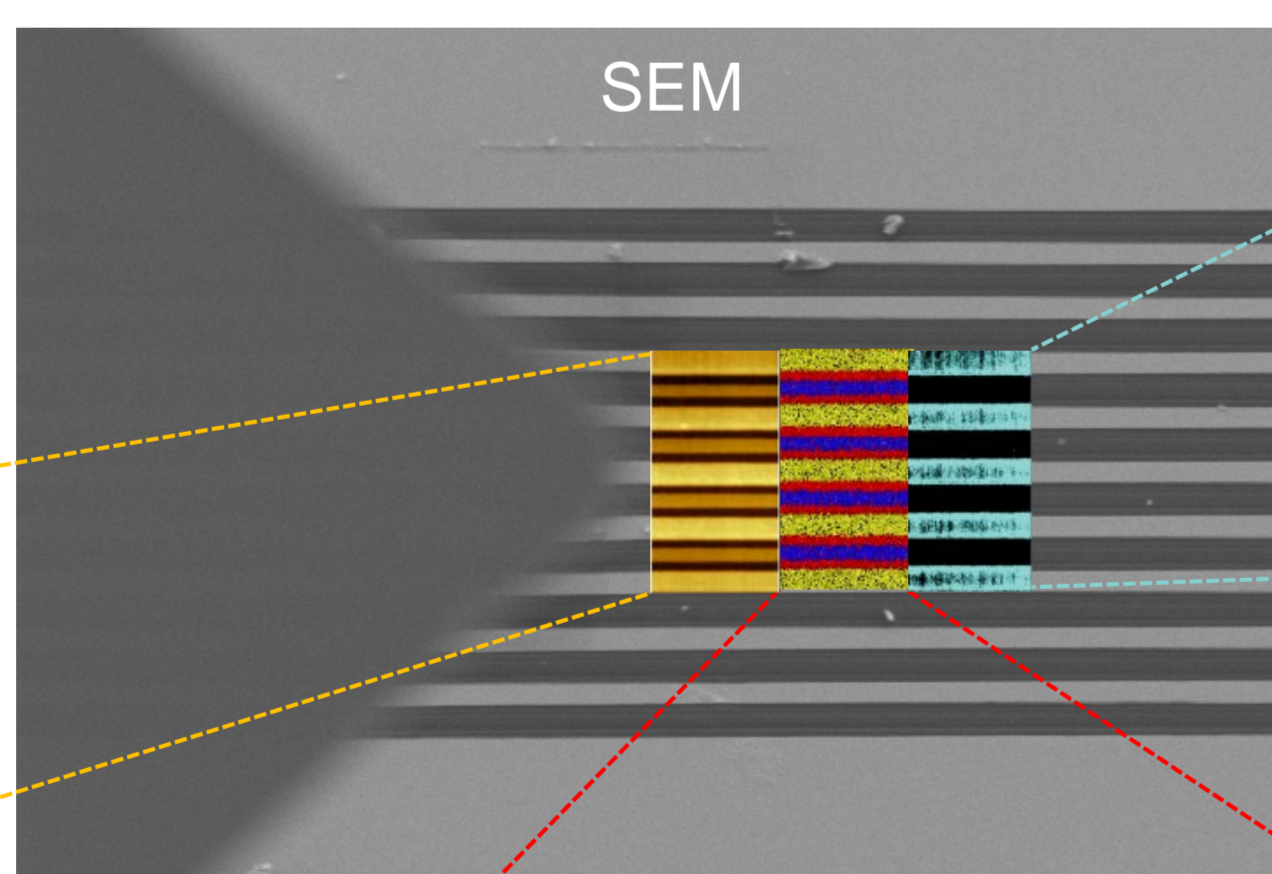
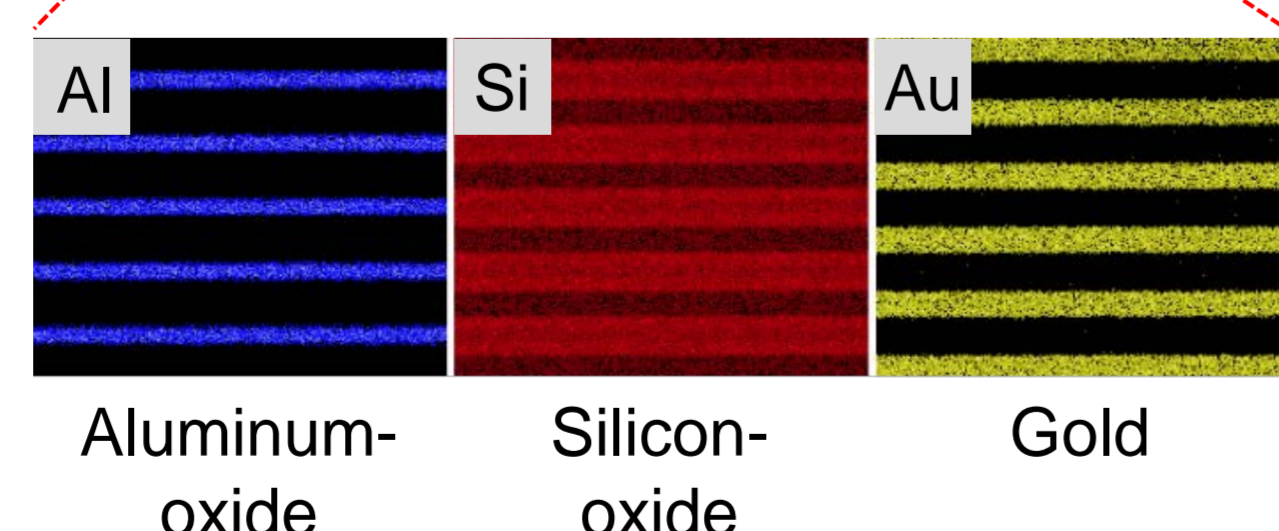## AFM & SEM & EDX analysis

Sample schematic

3D topography & conductance overlay

34 nm / 0 nm

Electric current
0 nA   20 nA

34 nm / 0 nm

AFM 3D topography

EDX mapping

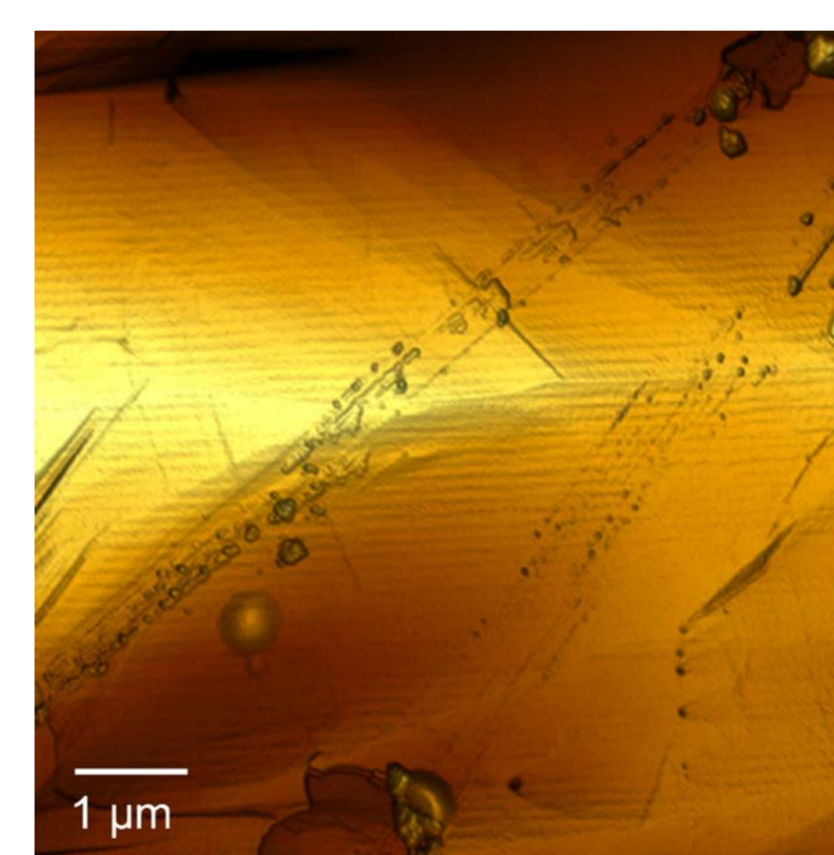Al   Si   Au

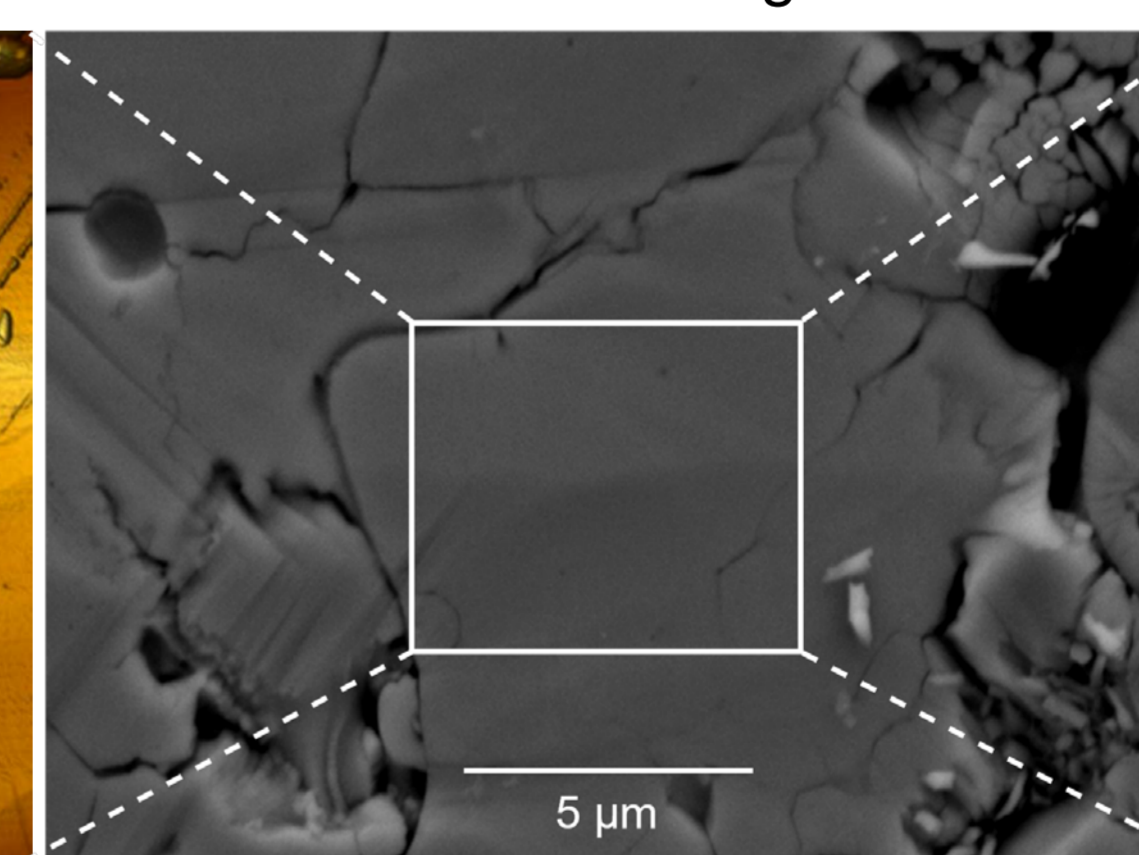Local distribution of   Aluminum-oxide   Silicon-oxide   Gold
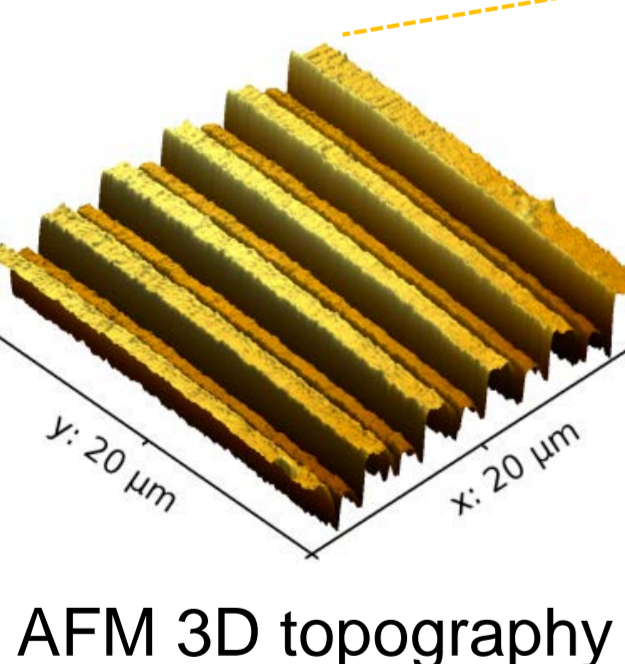
Combine SEM, EDX and AFSEM for *in-situ* correlative chemical, topographical and conductive analysis of nanostructured materials

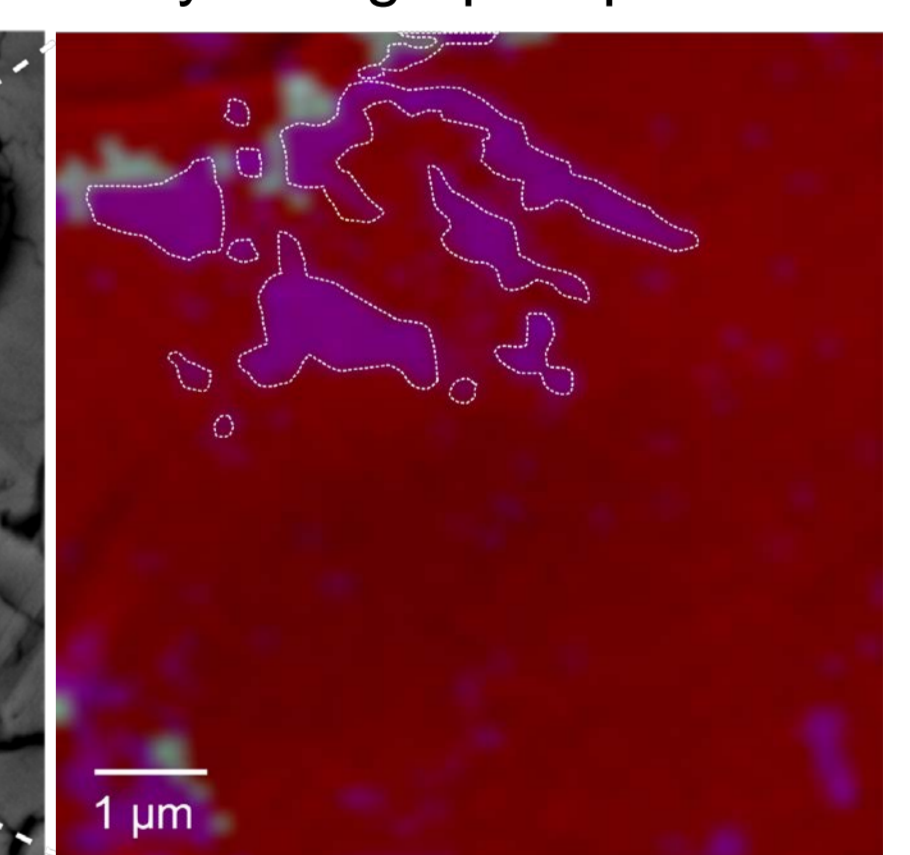## AFM, SEM & EBSD analysis of ZrO$_2$ ceramics

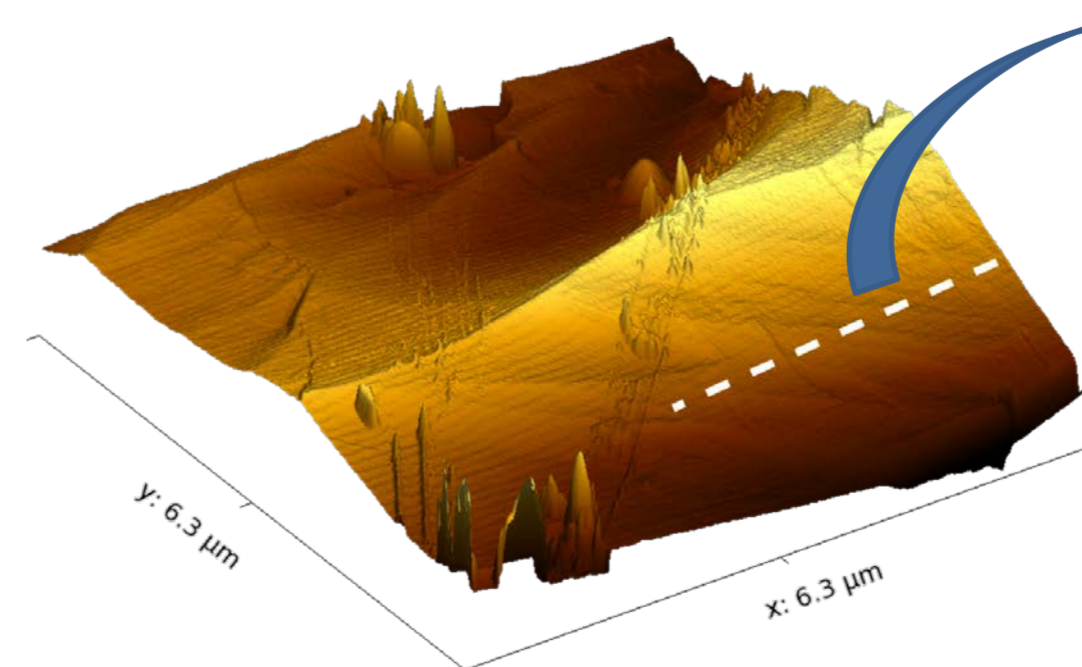AFSEM topography   SEM image of partially phase-transformed region   EBSD mapping of crystallographic phases
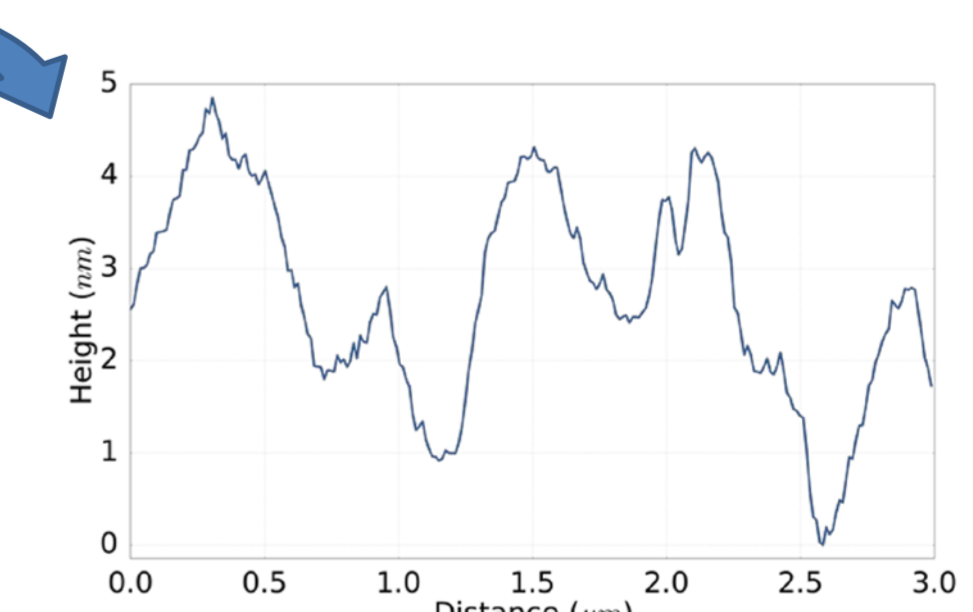
1 µm   5 µm   1 µm

Sample property: Prof. Zeng Yi, Shanghai Institute of Ceramics, Chinese Academy of Sciences

3D representation   Height cross section

Correlate local EBSD crystal phase information with crystal morphology obtained by AFSEM

AFSEM – Combine the strengths of SEM/FIB and AFM interactively