

We innovate Materials

scanning electron microscopy

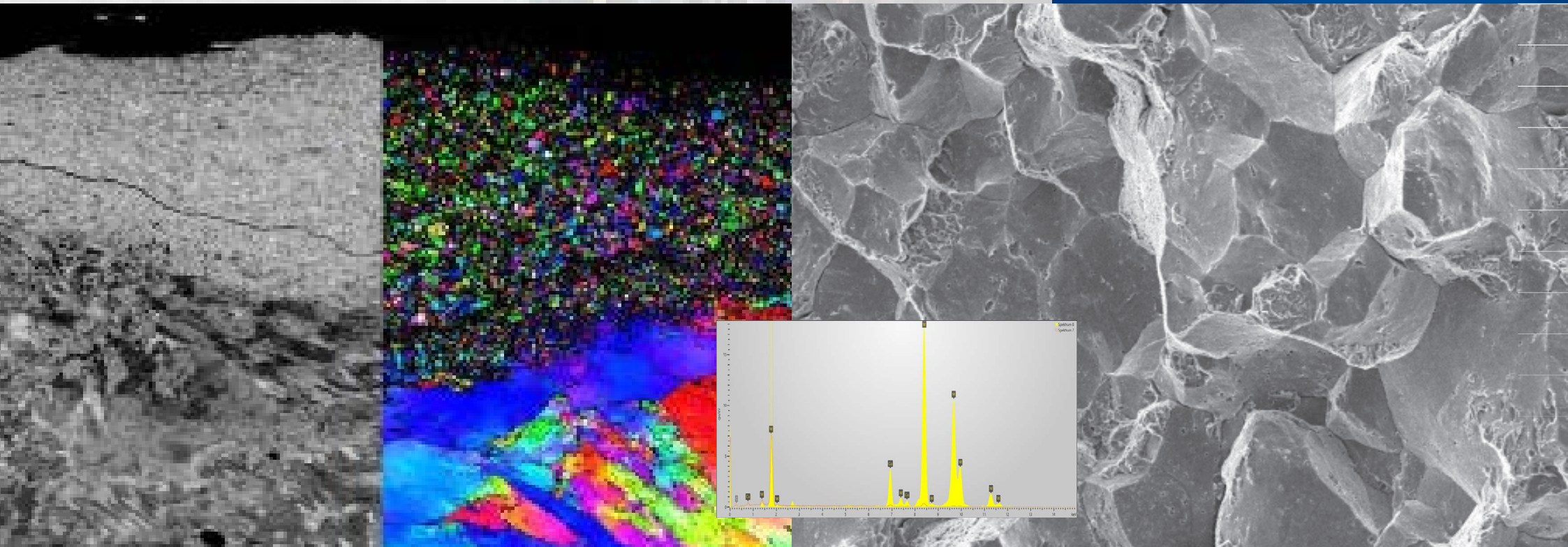


material- and damage investigation
3D microstructure and contour analysis
high resolution scanning electron spectroscopy
precise chemical and structural analysis
Focus Ion Beam micromachining
Insitu - micromechanical investigations
Insitu - temperatur transformation analytics
Ex-/Insitu - AFM-measurements



COMPETENCE & RELIABILITY

material- and damage investigation



high-resolution examination of material sections, surfaces or fracture surfaces incl. local chemical and crystallographic analysis

contact



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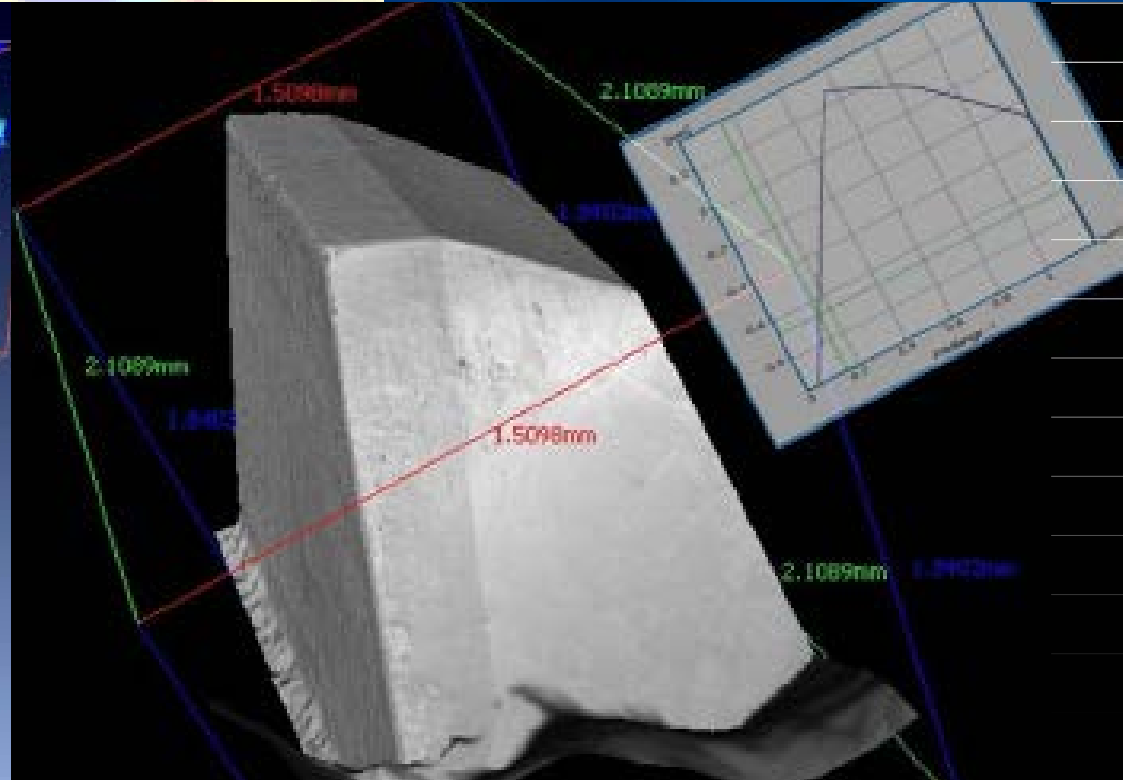
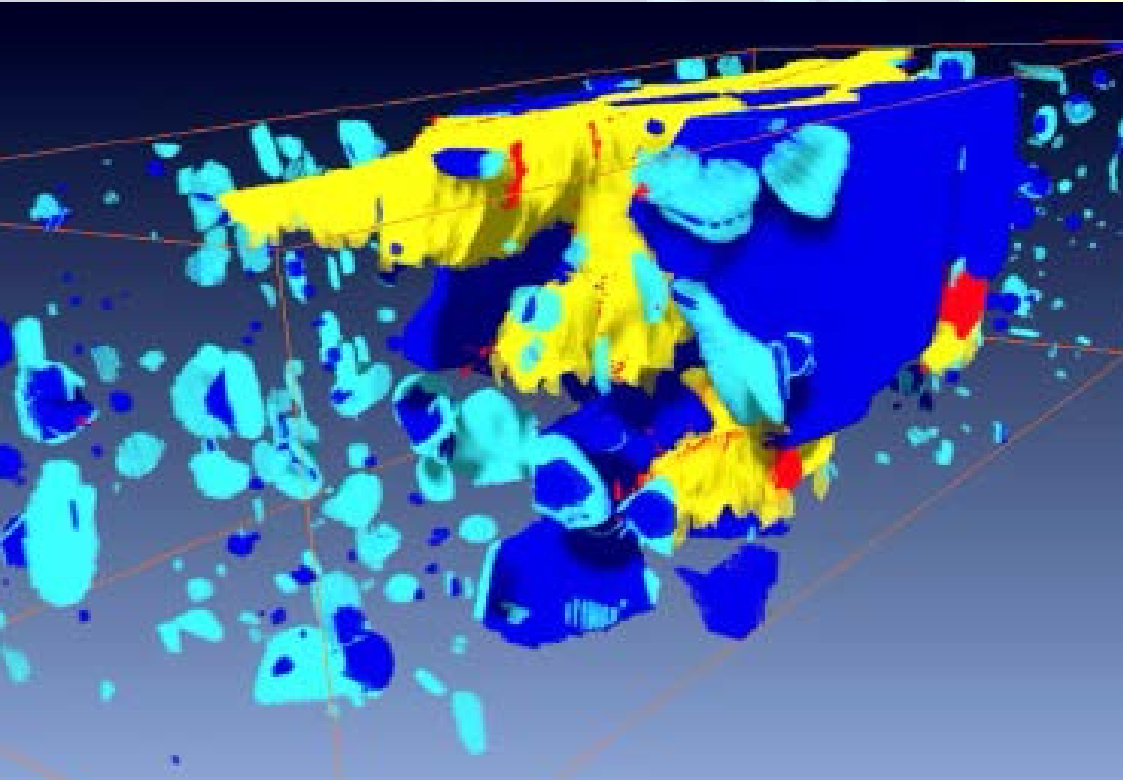
Dr. Angelika Spalek
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our focus / competences

- surface analyses, fracture surface analyses, damage analyses
- analysis of large or difficult-to-clean components (up to 3kg), from microsections up to microelectronic components
- SEM analysis of non-conductive components without additional vapor deposition (e.g. ceramic components, metal/plastic composites)
- local chemical and crystallographic analyses

3D microstructure and contour analysis



high-resolution 3-dimensional examination and measurement of contours or structural components

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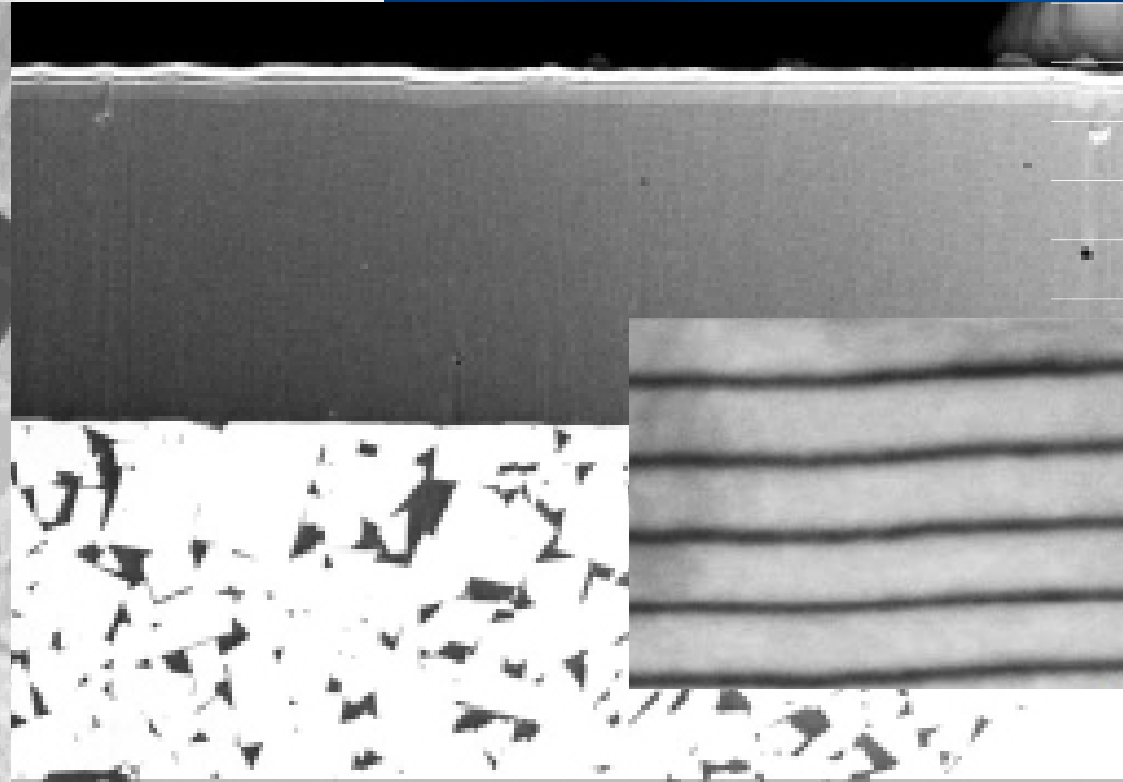
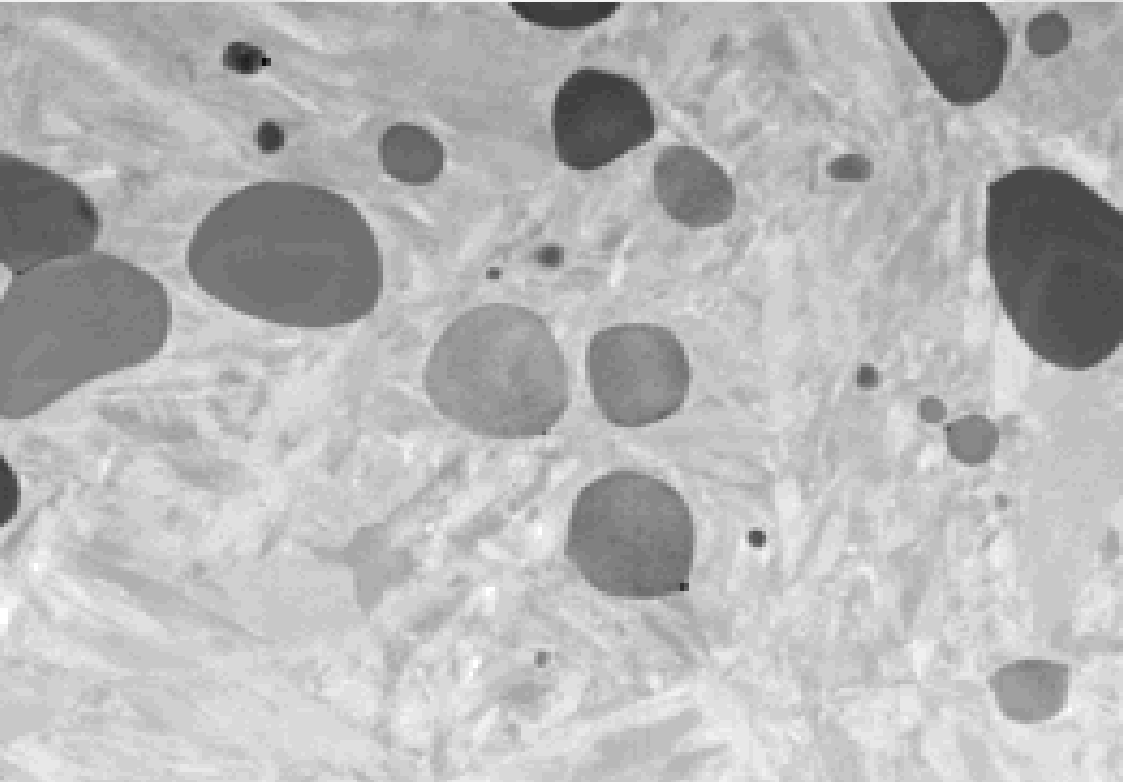


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our focus / competences

- 3D topography of contours, damage, etc. incl. measurement in the mm to sub- μ m range
- 3D tomography of microstructural components by the Slive&View method incl. measurement of local chemistry and structure
- different electron contrasts, EBSD orientation measurement, local chemical composition over the measurable spectrum from lithium to uranium (EDX, WDX, XRF)

high resolution scanning electron spectroscopy



high resolution microstructure characterization

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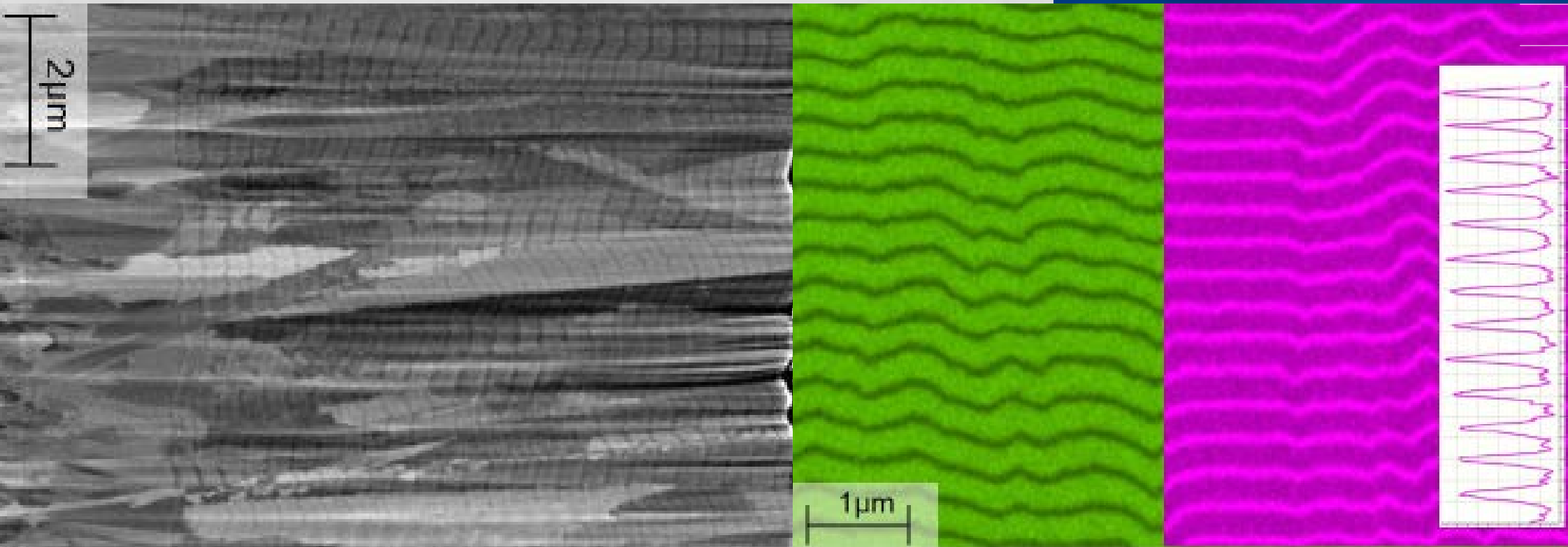
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our focus / competences

- high resolution microstructure characterization with resolutions up to 1,000,000x
- different electron and ion contrasts, EBSD orientation measurement.
- measurement of the crystal structure by EBSD from the cm range down to 20-30nm small structures
- measurement of the local chemical composition over the measurable spectrum from lithium to uranium (EDX, WDX, XRF)

precise chemical and structural analysis



precise chemical and structural analysis of finest structural elements down to a few 10nm in size

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our focus / competences

- precise chemical analysis using EDX, WDX and XRF
- high energy resolution with detection limits of 50-100 ppm
- trace element analyses down to detection limits of 10ppm
- EBSD measurements of grains less than 10nm in size for identification of microstructure or crystal structure

Focused Ion Beam micromachining



specimen preparation for micromechanical and microstructural investigations

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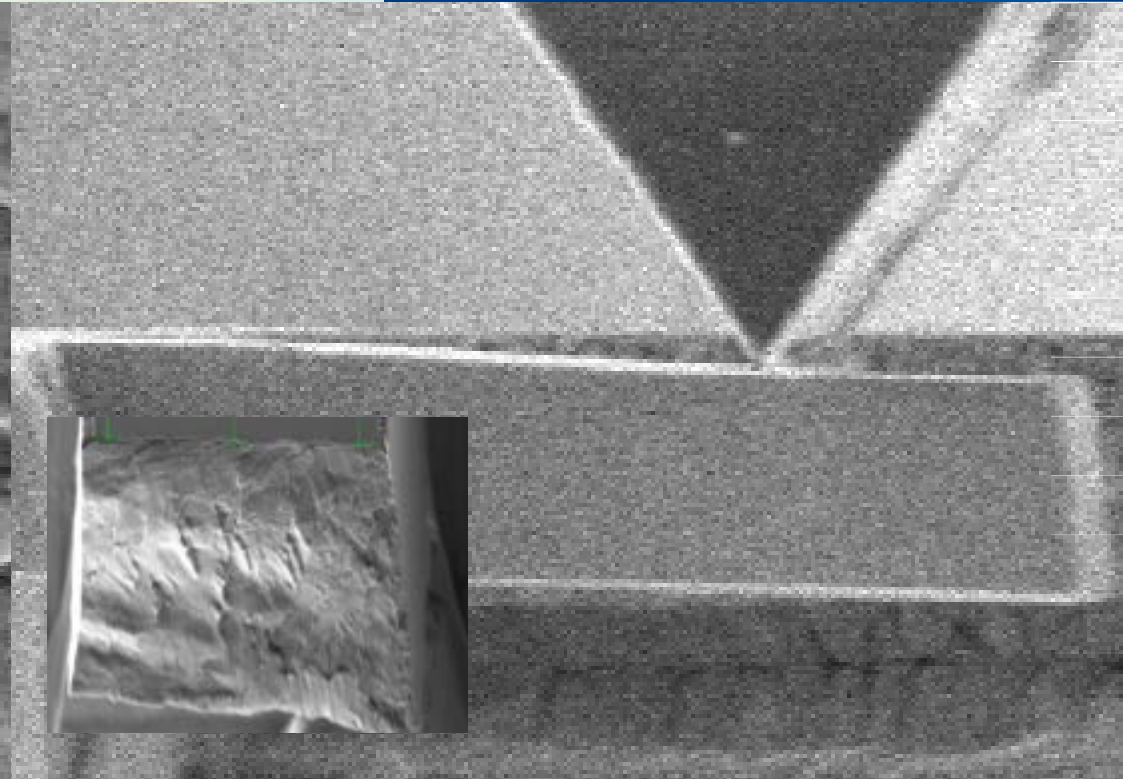
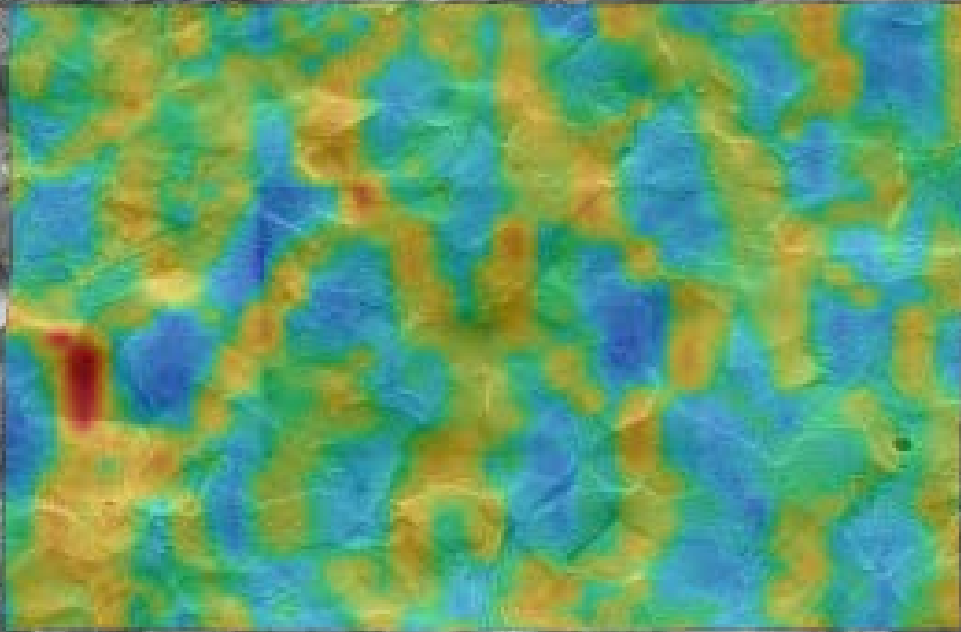
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our focus / competences

- target preparation of thin foils for subsequent electron microscopy and transmission electron microscopy examinations (*)
- target preparation of atom probe tips for subsequent atom probe examinations
- preparation of specimens for micromechanical testing of materials (e.g. thin films or microstructural components)

**advanced TEM, APFIM analyses are performed in cooperation with research partners of the MCL*

Insitu - micromechanical investigations



determination of micromechanical properties of microstructural components or layers

contact



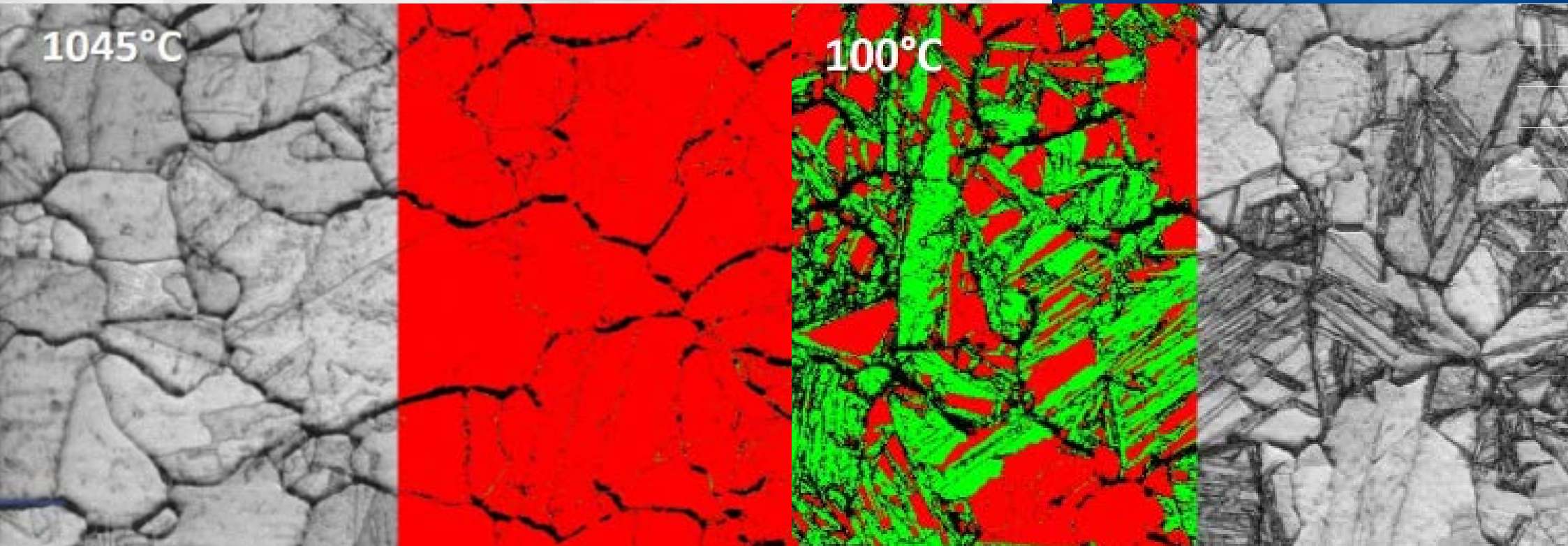
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our focus / competences

- hardness testing of individual microstructural fractions
- Insitu tensile test to observe local strain changes
- Insitu hardness testing using nanoindenter, recording flow curves and determination of Young's modulus
- Insitu static and cyclic material testing using the nanoindenter, determination of fracture and fatigue properties
- testing of shear resistances at interfaces (e.g. interface of a coating)

Insitu - temperatur transformation analytics



High-resolution documentation of the transformation kinetics of individual phase fractions

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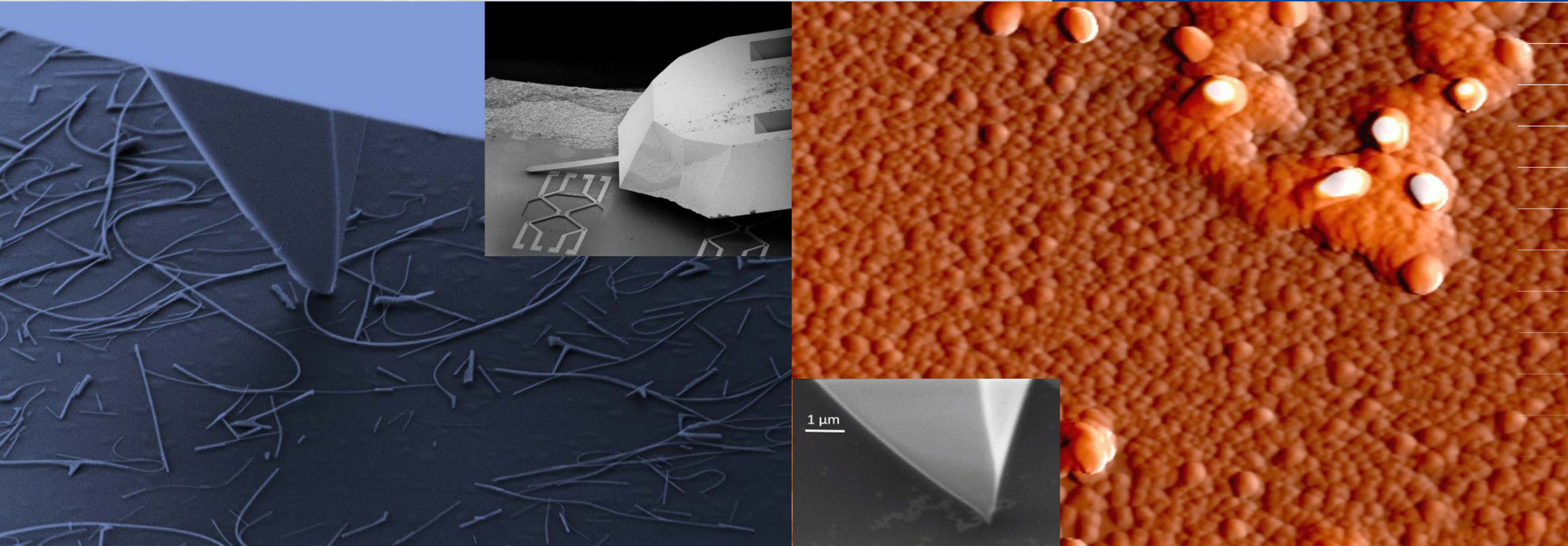


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our focus / competences

- Insitu heating and cooling experiments in the scanning electron microscope
- temperature range -180°C to 1045°C
- heating rates: -180°C to 400°C max. 20°C/min
250°C to 1045°C max. 250°/min
- temperature-dependent residual stress measurement on coatings
- analysis with various detectors (including EBSD)

Ex-/Insitu-AFM measurements



determination of local electrical, thermal and magnetic properties
and surface topographies

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our focus / competences

- topography / roughness
- KPFM for the determination of local electrical properties of grains or microstructural components
- SThM for determination of thermal conductivity of grains or microstructure components
- EBIC for determination of local electrical properties and short circuits/interruptions
- MFM for determination of local magnetic properties (e.g.: retained austenite)
- STM for visualization of atoms or atomic lattice
- C-SPM for measuring electrical properties such as resistance or conductivity

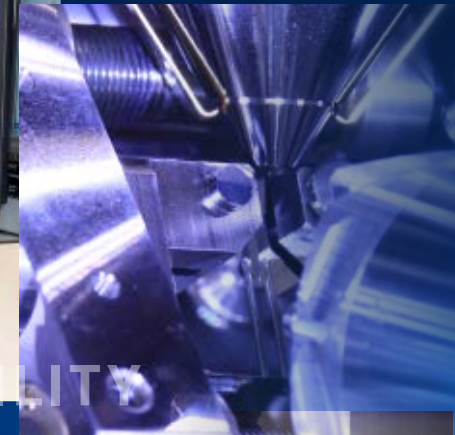
Service offer

- SEM characterization of surfaces, fracture surfaces, damage and microsections incl. local chemical composition
- material investigations up to 3D microstructures, topography and tomography using SEM-FIB technology
- target preparation of TEM thin films, atom probe tips for further high-resolution investigations
- preparation of microsamples for mechanical in-situ experiments with different geometries (e.g. cuboids, cylinders or micro tensile specimens and cantilever)
- investigation of TEM samples in transmission mode (STEM) incl. chemical and crystallographic analysis
- insertion of small crack-like defects (in the sub- μm to μm range) to study the behavior of short cracks
- local and depth-resolved residual stress measurements
- high temperature investigations in combination with EBSD
- determination of physical parameters in combination with modules and analytics
- SPM-SEM in combination of different modules
- one to several days on-site training in preparation & microstructure evaluation

COMPETENCE & RELIABILITY

equipment

- scanning electron microscope with large sample chamber of Zeiss type EVO MA25[®] for the analysis of non-conductive and contaminated samples.
- dual-beam FE-SEM (Zeiss AURIGA[®]-CrossBeam[®]) incl. Focused Ion Beam System (FIB)
- high-resolution FE-SEM (Zeiss Gemini[®]-SEM 450) for imaging structures with a few nm and precise chemical analysis
- modular SEM (Zeiss CrossBeam[®]-SEM 340) with
 - tensile/compression/bending module
 - nanoindenter
 - heating/cryogenic module
 - AFM
- Acquisition techniques and analytics: SE, BSD, STEM, secondary ion, InLens and EBSD detector, EDX, WDX, ED-XRF, WD-XRF, EBSD, STEM, TKD (Transmission EBSD)
- ionslicer for sample preparation (flatmilling, cross sectioning)
- vapor deposition with different substances (graphite, platinum,...) for charge compensation and analysis of non-suffering samples





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