LYRA3

1.0 nm at 30 keV

BDT 50 eV to 30 keV

FIB Ga

TESCAN

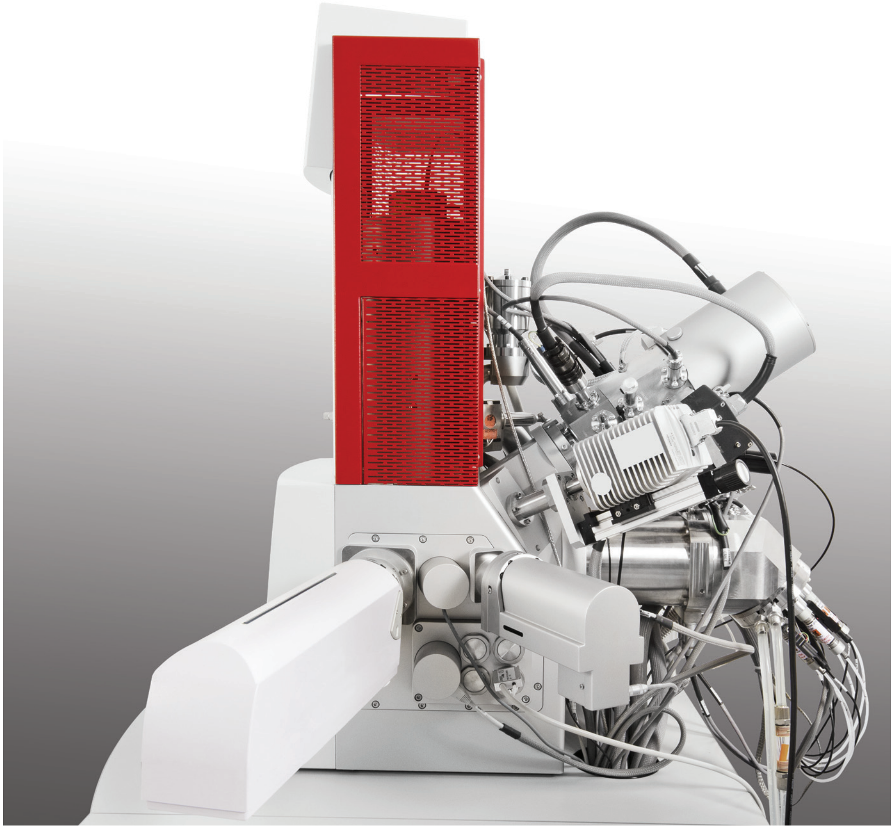
PERFORMANCE IN NANOSPACE

LYRA3 - Focused ion beam scanning electron microscope for high-performance in nanoengineering

LYRA3 is a dual beam system that combines a high-resolution FE-SEM column with a versatile high-performance Ga ion source FIB. LYRA3 is an excellent choice for preparing cross-sections, site-specific high-quality TEM lamellae and, high-resolution FIB-SEM tomography for 3D sample reconstructions. Users can profit from the excellent resolution at high beam currents which has proved to be advantageous for analytical applications such as EDX, WDX and EBSD. LYRA3 satisfies the nowadays needs for sample characterisation and microanalysis in materials science and industry. In addition, beam / ion lithography as well as circuit editing, are tasks at which LYRA3 excels. High-throughput and powerful yet easy-to-use software allows even novice users to effortlessly implement diverse FIB-SEM applications such as 3D reconstructions, serial cross-sectioning as well as correlative microscopy.

Modern Optics

- Unique **Wide Field Optics™** design with a proprietary Intermediate Lens (IML) offering a variety of working and display modes, for instance with enhanced field of view or depth of focus, etc.
- Real time **In-Flight Beam Tracing™** for performance and beam optimization, integrated with the well-established Electron Optical Design software. It also includes direct and continuous control of the beam spot-size and beam current.
- Fully automated electron optics set-up and alignment
- Fast imaging rate
- Unique live stereoscopic imaging using the advanced 3D Beam Technology which opens up the micro and nano-world for an amazing 3D experience and 3D navigation.



High-performance Ion Optics

- Sophisticated high-performance Canion FIB column for fast and precise cross-sectioning and TEM sample preparation
- Optional ultra-high resolution Cobra FIB column comes with the highest level of technology in terms of resolution both for imaging and milling. This is one of the most precise FIB instruments for nano-engineering in the world.

Analytical Potential

- All of the various chamber models provide superior specimen handling using a full 5-axis motorized compucentric stage and ideal geometry for EDX and EBSD.
- Optional extra-large XM and GM chambers with robust stage can accommodate large samples
- 6" and 8" wafer FIB-SEM analysis at any location
- Full 12" wafer SEM inspection
- Numerous interface ports with optimized analytical geometry for EDX, WDX and EBSD as well as for attaching many other detectors
- First-class YAG scintillator-based detectors
- Selection of optional detectors and accessories
- Full operating vacuum can be obtained quickly and easily.
- Investigation of non-conductive samples in variable pressure mode, favorable conditions for the investigation of magnetic samples, undistorted EBSD pattern compared to immersion magnetic lenses
- Integrated active vibration isolation ensures effective reduction of ambient vibration in the laboratory.

User-Friendly Software

- Multi-user environment localized in many languages.
- Image management and report creation
- Built-in self-diagnostics for system readiness checks
- Network operations and remote access/diagnostics

Software Tools

- Modular software architecture enables several extensions to be attached.
- Basic set of software modules, such as highly automated ion beam control; DrawBeam Basic pattern generator; simultaneous FIB/SEM imaging; predefined FIB working profiles available as standard
- Several optional modules and dedicated applications optimized for automatic sample examination procedures, such as Particles Basic/Advanced or 3D surface reconstruction, etc.
- The **DrawBeam** software module turns the FIB-SEM system into a potent instrument not only for electron beam lithography, but also for electron beam induced deposition and electron beam etching as well as for ion beam induced deposition and ion beam milling.
- **3D Tomography** software option provides fully automated procedure for serial SEM imaging of FIB-prepared cross-sections and subsequent 3D reconstruction and visualization.
- **AutoSlicer** enables automation of FIB-SEM operations such as serial cross-sectioning, lamellae preparation or other objects defined at multiple locations. Overnight and unattended operations are possible.
- **Synopsys Avalon™** is a correlative microscopy module for semiconductor applications which includes the Avalon™ software tool for CAD navigation, circuit edit and failure analysis in semiconductors.

Rapid Maintenance

Keeping the microscope in optimal condition is now easy and requires a minimum of microscope downtime. Every detail has been carefully designed to maximize microscope performance and minimize the operator's effort.

Automated Procedures

An automatic set-up of the microscope and many other automated operations are characteristic features of the equipment. There are many other automated procedures which significantly reduce the operator's tune-up time, enable automated manipulator navigation and automated analyses. The SharkSEM remote control interface enables access to most microscope features, including microscope vacuum control, optics control, stage control, image acquisition, etc. The compact Python scripting library offers all these features.

Beam Deceleration Technology

Beam deceleration technology (BDT) is intended for the highest resolution at low electron beam energies. BDT includes a system for negative voltage biasing of the sample stage and an In-beam detector that works either as SE detector in the beam deceleration mode (BDM) or BSE detector in the standard mode.

In the BDM, the energy of the electrons in the beam is decreased before they impact the surface of the specimen by means of a negative bias voltage which is applied to the sample stage. Ultra-low landing energies down to 50 eV (or 0 eV in manual control) are achievable. BDM enhances the performance of the electron column by reducing optical aberrations, thus allowing small spot sizes and high-resolution imaging at low energies. Low electron energies are advantageous for reducing charging effects in non-conductive samples and beam-sensitive specimens. BDM is especially suited for imaging biological specimens in their uncoated state at ultra-low beam energies without damaging the samples.

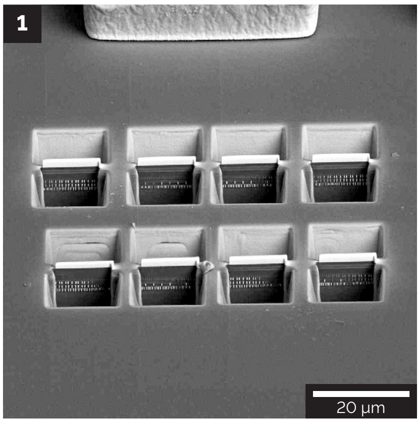


Fig. 1: Serial automatic preparation of site-specific lamellae.

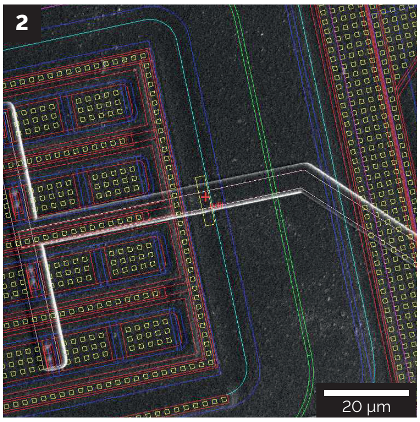


Fig. 2: Synopsys Avalon™ allows live overlay of FIB image with CAD design data for precise navigation on an integrated circuit.

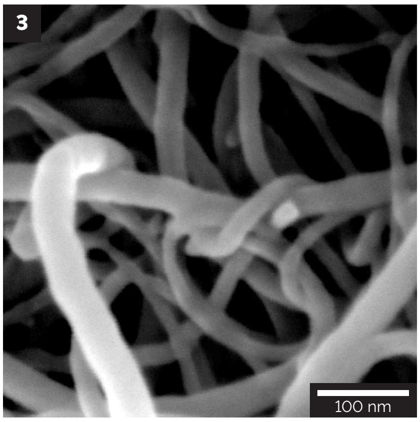


Fig. 3: Carbon nanotubes imaged with the SE(BDM) detector at 2 keV for maximum topographical sensitivity.

Low Energy BSE (LE-BSE) detectors for maximum surface sensitivity at low and ultra-low energies

- Ideal for FIB-SEM tomography
- Retractable LE-BSE with detection limit of 200 eV
- In-Beam LE-BSE with detection limit of 500 eV

Common FIB-SEM Applications

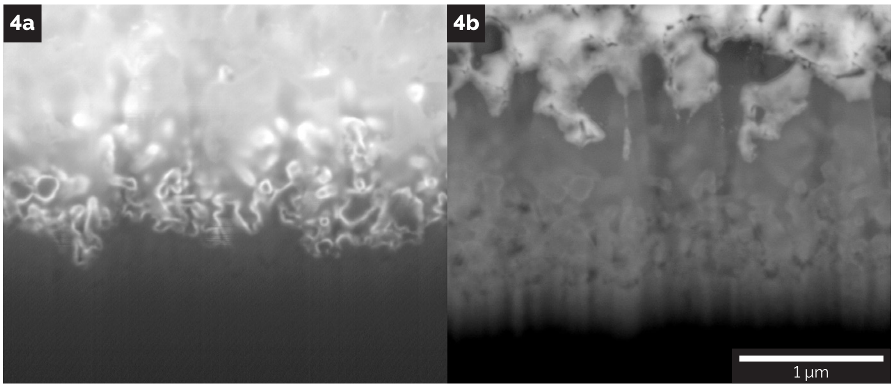


Fig. 4: FIB cross section of nano-structured solar cell. Same image using EBIC detector signal **(a)** and BSE **(b)**.

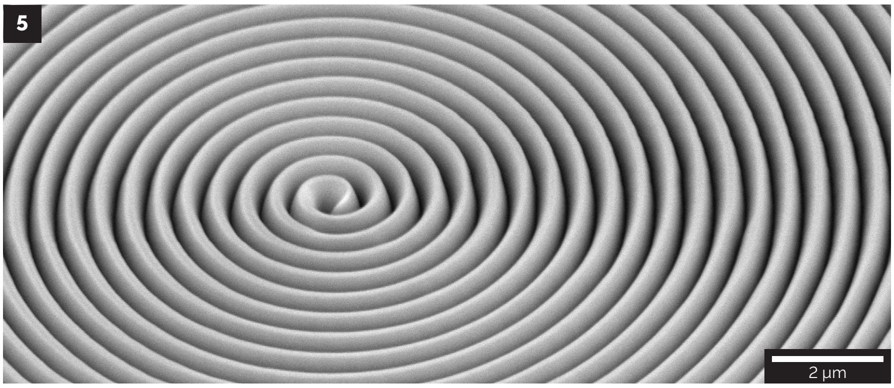


Fig. 5: Milling recipe according to a mathematical spiral function.

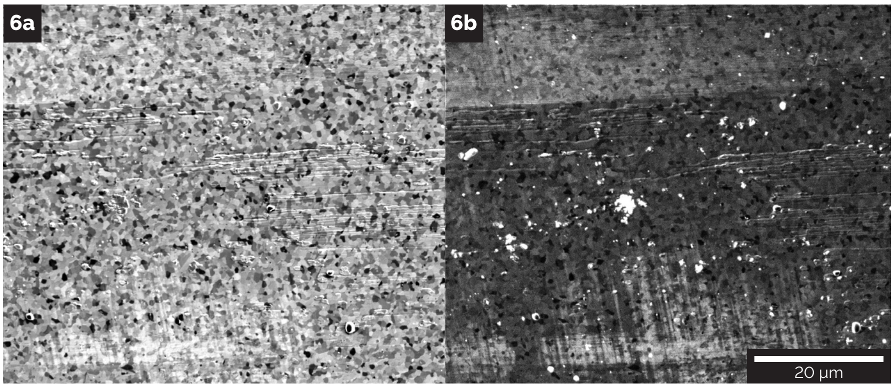


Fig. 6: Visualization of alumina inclusions comparing SE **(a)** to SITD (Secondary Ion TESCAN Detector) **(b)** which is extremely sensitive to ultra-thin surface oxides (seen as bright features).

■ **Forensic Investigations**

Bullet and cartridge investigation, analysis of hairs, fibres, textiles and papers, paints, ink and print characterization, line crossings, examination of counterfeit documents.

■ **Electrotechnical Engineering**

Electron and Ion Beam Lithography, TEM lamellae preparation.

■ **Materials Science**

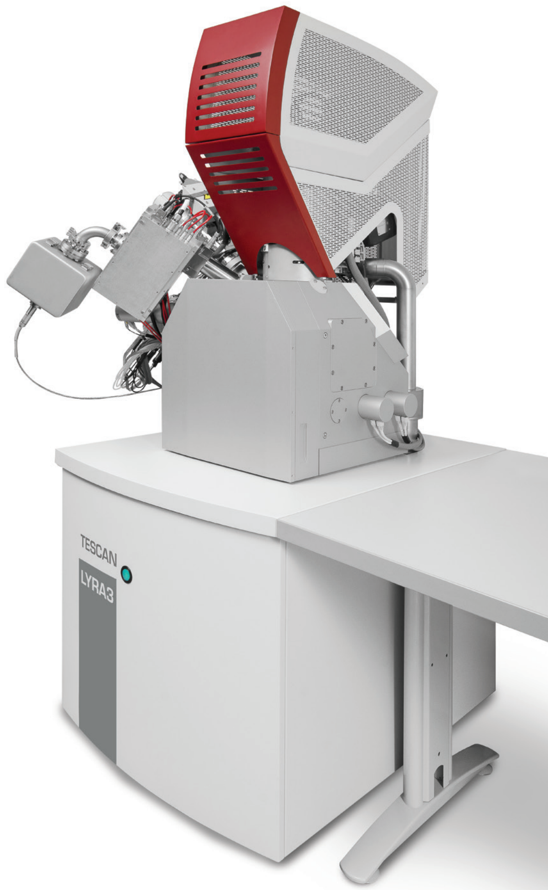
Materials characterization of metals, ceramics, polymers, composites, coatings, metallurgy, metallography, fracture analysis, degradation processes, morphological analysis, steel cleanliness analysis, microanalysis, texture analysis, ferromagnetic materials, etc. using automated 3D EBSD analysis, 3D reconstruction and visualization, TEM lamellas preparation.

■ **Research**

Mineralogy, geology, paleontology, archeology, chemistry, environmental studies, particle analysis, applied physics, nanotechnology, nanoprototyping.

■ **Life Sciences**

Structural examination of biological samples, preparation of biological samples for various analytical microscopy techniques, 3D studies of biological samples.



Applications in forensic sciences

The combination of FIB and SEM makes for one of the most versatile instruments available for the examination and analysis of the micro and nano characteristics of solid objects. The main advantage of this state-of-the-art technique is the capability to analyze defects, microstructure, phases or interfaces in a specific region of interest.

The preparation of samples for other analytical techniques is another important application for the semiconductor or storage media industry as well as in materials research. The preparation of lamella for transmission electron microscopy (TEM) is fast (about 30 minutes) and it can be automated for maximum productivity.

FORENSIC APPLICATIONS

There are many cases in modern forensic science where conventional methods of investigation are not always sufficient. Sometimes, only nano analysis can give us the relevant information to solve a crime.

Forensic Research of Crime Scene Particles

There are several types of particles formed during the rapid cooling of vaporized elements after high-temperature burning. Such particles include e.g., the result of firing a gun, an explosion or drilling into a safe. The quantity, morphological and structural information on the particles from objects at a given crime scene are studied and evaluated, see Fig. 8. The FIB-SEM instrument offers the capability of investigating the morphology and/or inner structure of a particle.

Counterfeit Document Investigation

One such forensic application is determining the authenticity of various commercial documents such as blank bills, agreements, contracts and the like. This is usually done by visual-optical and correlation methods with a stereoscopic microscope and video spectral comparator.

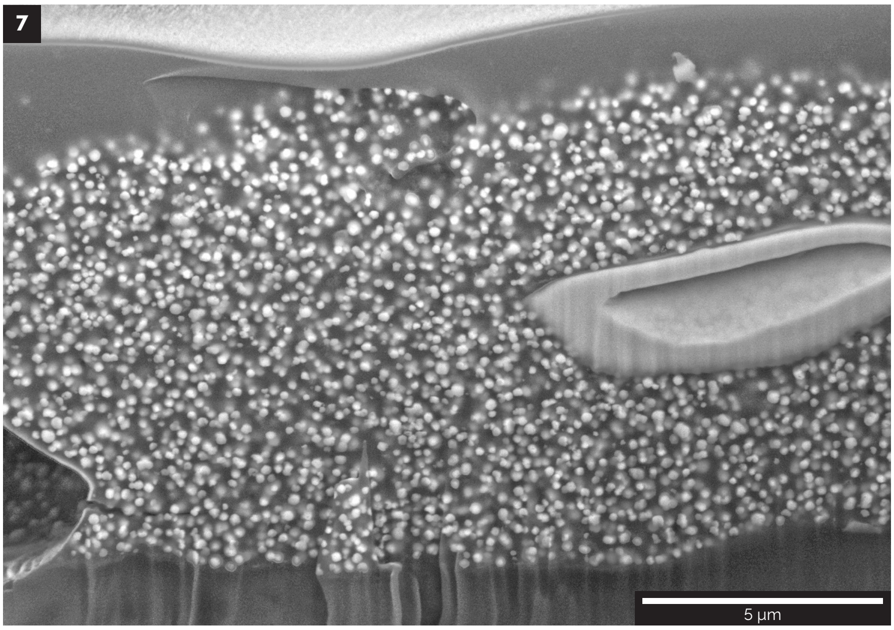


Fig. 7: Cross-section of cross lines showing layer of pen lead on printer ink layer.

Nevertheless, neither of the above-mentioned methods are able to provide definitive proof of a document being counterfeit or authentic. This is where the FIB-SEM plays a vital role. Its capability of creating a micro cross-section of predefined areas allows the user to investigate the positions of each layer. This resolves whether it is pen on ink or ink on pen, as in the case of a counterfeit document, see Fig. 7. FIB-SEM is capable of providing precise conclusions beyond doubt in the shortest possible time.

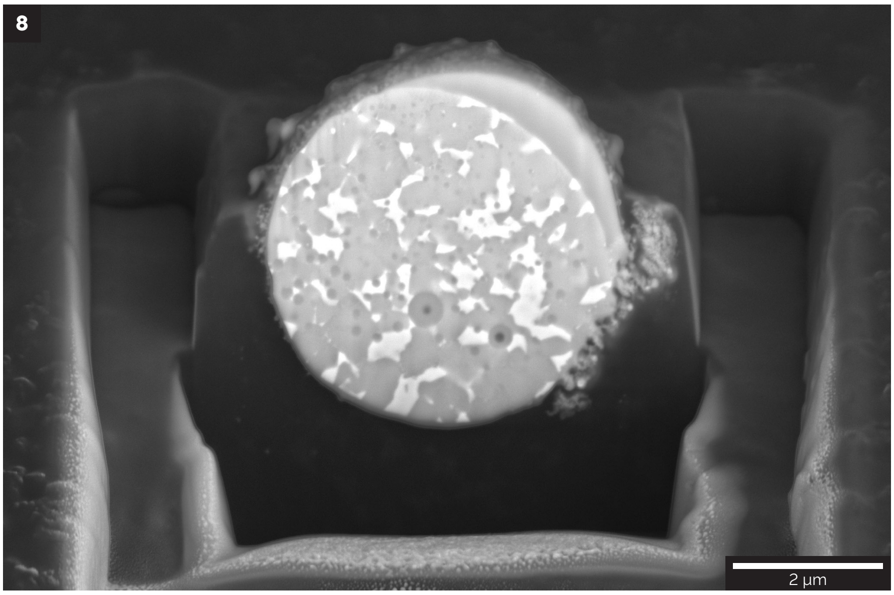


Fig. 8: Cross-section of gunshot residue particle exposing different phases in the structure.

Applications in materials science

The development of new materials requires precise knowledge of their structure and its relationship to mechanical behavior. These FIB-SEM systems enable high-resolution studies of a material's structure, the preparation of FIB cross-sections at selected positions for sub-surface investigations, or the preparation of TEM lamellae.

Oriented TEM Lamella Preparation

The preparation of TEM lamellae by FIB is fast and more accurate than other available techniques. Being able to select the exact position and orientation of the lamella is one of the unique capabilities of the FIB-SEM system, see Fig. 9.

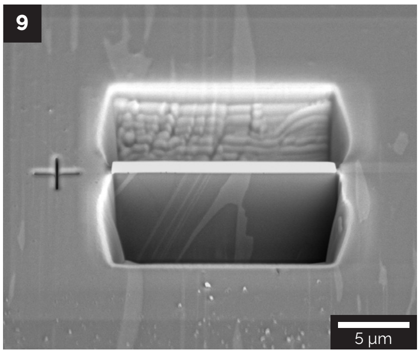


Fig. 9: TEM lamella prepared from TiAl alloy perpendicular to the nanolamellar structure.

Micro-Compression Testing

Recent scientific and engineering research is undoubtedly concentrated in the realm of nanotechnology. A new powerful set of tools was designed for investigating the mechanical properties of materials in the sub-micrometer range. Preparing thin pillars for micro-compression tests is a recent technique for precise studies of the specific micro-mechanical properties of a material. This technique gives easily interpretable data of material properties in relation with crystal orientation, see Fig. 10.

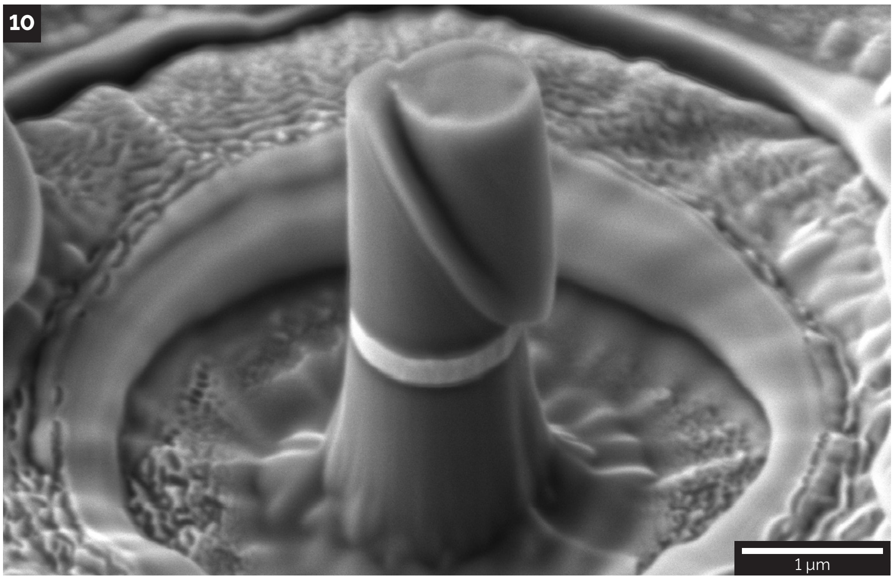


Fig. 10: A micropillar after compression test. Pillar prepared by FIB from a single grain within a thin polycrystalline Al layer.

Fatigue Damage Investigation in Advanced Materials

The trend towards higher economical and ecological efficiency of consumer products through enhanced materials performance has led to significant research activity in advanced materials. Alloys and pure metals with grains of sub-micrometer size are typical examples of such materials, see Fig. 11. Ultrafine-grained (UFG) materials with grain sizes in the hundreds of nanometers offer higher strength than their conventionally grained (CG) counterparts, but the data on their fatigue performance are scarce. Moreover, crack initiation mechanisms are still not fully understood. The combination of FIB and SEM techniques enables the investigation of crack formation thanks to its unique ability to prepare cross-sections in very specific sites of interest and to examine sub-surface regions in nano-scale. The combination of FIB and SEM is therefore an extremely versatile and powerful tool for materials researchers.

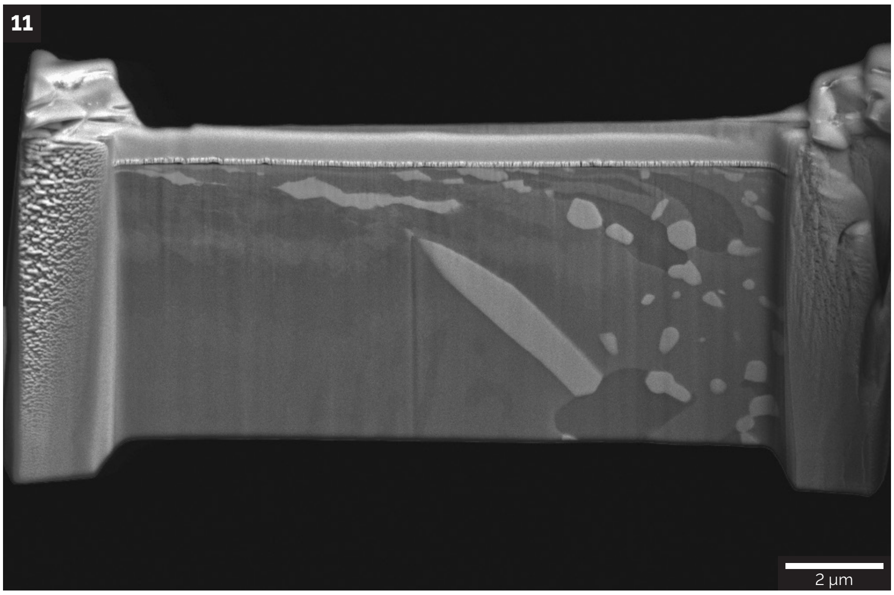


Fig. 11: BSE image of a lamella from a NiAlPt - superalloy interface showing grain structure.

Applications in nanotechnology and semiconductors

Ion Beam Lithography and Prototyping

Spintronic structures are typically prepared by sputter deposition of layered structures, consisting of magnetic and non-magnetic metallic or dielectric thin films, with thicknesses typically in the range of 5–50 nm. They can be patterned by FIB lithography into wires, disks, rectangles or pillars with lateral dimensions varying from under 100 nanometres to several microns. These structures are then used for studies of domain wall motion in magnetic nanowires, spin-transfer-torque studies in nanopillars and nanowires, magnetization dynamics studies of magnetic vortices and in other applications, see Fig. 12.

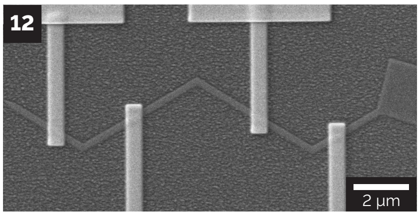


Fig. 12: FIB milled (Permalloy/Cu/Co) nanowire of 200 nm width and 16 µm length with FIB-deposited platinum electric contacts used for the study of domain-wall motion.

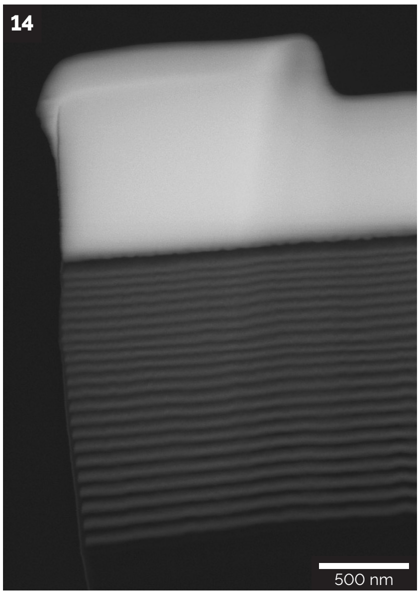


Fig. 14: TEM lamella of optical multi-layer

FIB-SEM systems can successfully combine patterning by FIB with Electron Beam Lithography (EBL). While the FIB is usually used to mill or deposit small specific structures, the benefit of EBL lies in the possibility of creating much wider patterns in reasonable time scales. This opens up a number of applications in a wide range of current research topics such as spinplasmonics.

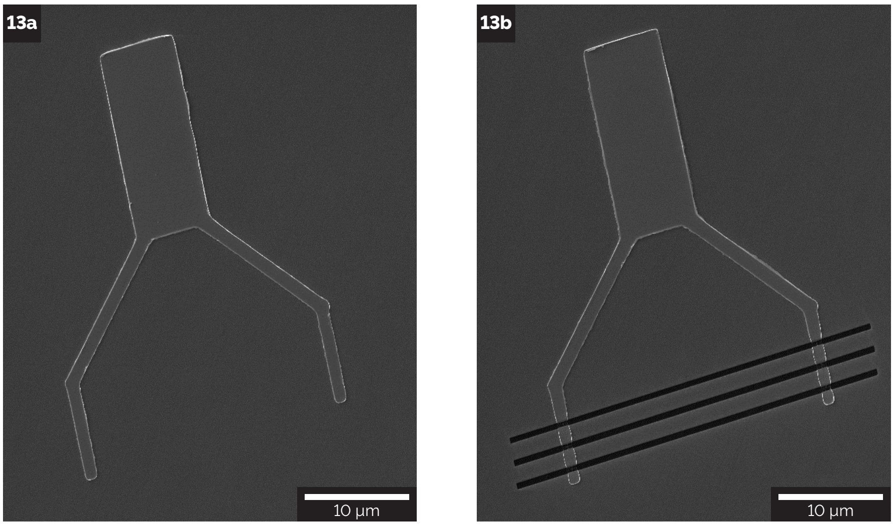


Fig. 13: SEM images of the spinplasmonic Au/Co/Au structure: **a)** result of electron beam lithography, **b)** the structure modified using FIB milling.

Spinplasmonics is a branch of science concerned with the study of the interaction of electromagnetic waves with free electrons in ferromagnetic structures. A spinplasmonic device can be prepared from a layered metal structure with dimensions in the micrometre range and is usually created using EBL. FIB is then used for final structure modification, see Fig. 13. The obtained information about the behaviour of the electromagnetic wave, trapped at such specific structures when an external magnetic field is applied, can be used for physical interconnection of electronics and photonics for applications in high-frequency data transmission.

Failure Analysis of Integrated Circuits

Precise quality control is crucial in the semiconductor industry. When a defect in an IC is located, a high resolution investigation needs to be done. An ultra-thin TEM lamella from the defective area can then be prepared and observed either using the TE Detector in the SEM or by conventional TEM.

Thin Layer Measurement

This technique is useful for measuring the thickness of thin layers and determining their composition. When dealing with extremely thin layers (at the nanometer scale), it is often difficult to distinguish particular layers due to a lack of contrast in the image. This contrast deficiency is caused by the interaction volume of electrons, which is large compared to the layers' thickness. The preparation of thin lamellas (with thicknesses of approx. 100 nm or less) is the most widespread technique used to decrease the interaction volume. This leads to much better contrast between each layer in the sample and consequently more accurate determination of layer thickness, see Fig. 14. It also significantly improves EDX mapping resolution.

3D TOMOGRAPHY

The FIB's ability to prepare nano-precise cross sections opens up the possibility of sub-surface analysis. Automated sequential sectioning turns the two-dimensional analysis into a 3D volume characterisation, see Fig. 15. This emerging technique gives a better understanding of the volume distribution, 3D structure and the relationship between three-dimensional objects in the specimen.

Intuitive Software module

TESCAN delivers an advanced and fully integrated 3D Tomography software module intended for data collection automation, reconstruction and visualization. A user-friendly wizard guides the operator to set optimal milling and imaging parameters. Data can be collected with standard FIB-SEM detectors or in combination with other analytical techniques such as EDS or EBSD.

Excellent Visualization Methods

Various methods for visualization are available. Multiple slices can be displayed, either aligned to a major axis or taken at arbitrary angles. In addition, this raw data can be reconstructed into a 3D volumetric dataset. This allows interesting features throughout the entire stack of data to be highlighted using surface or volume rendering techniques, see Fig. 16.

Great Analytical Potential

Combining SEM imaging with the microanalytical possibilities of EDS or EBSD transforms the SEM into a powerful analytical tool. TESCAN FIB-SEM chambers have an optimized analytical design that also allows EDS and EBSD data to be acquired during sectioning, without the need for moving the sample.

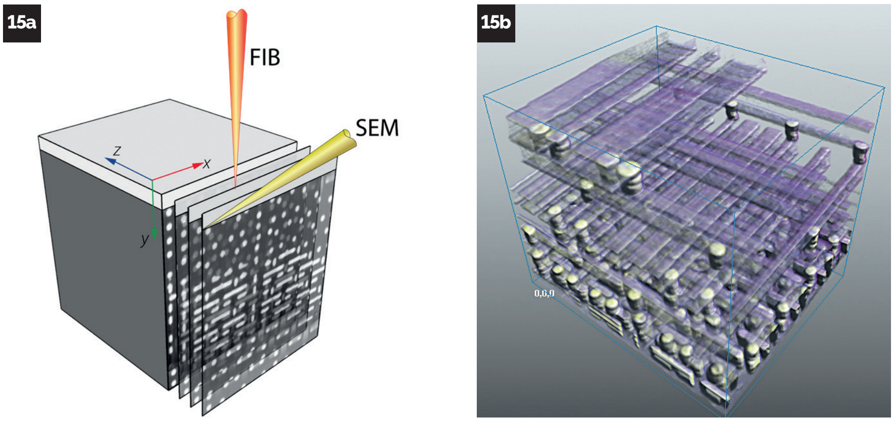


Fig. 15: Direct volume rendering visualization is less sensitive to noise. A semi-transparent colormap can be applied to highlight different objects.

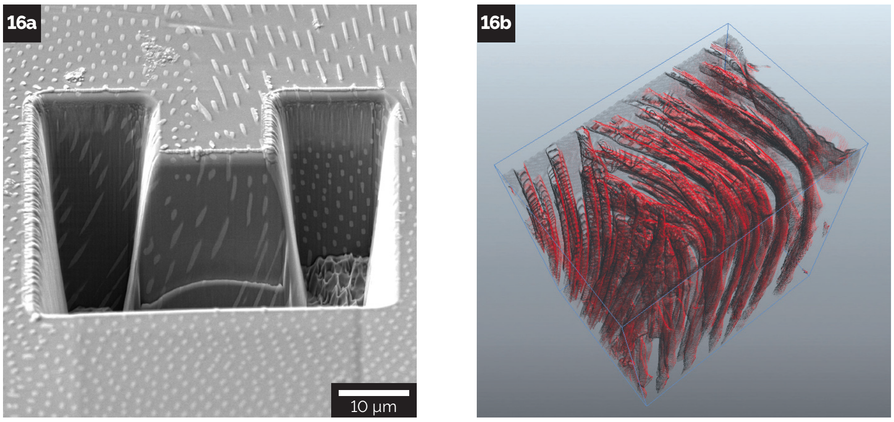


Fig. 16: Reconstruction of the volume distribution of the eutectic phase of NiAlMo alloy after deformation.

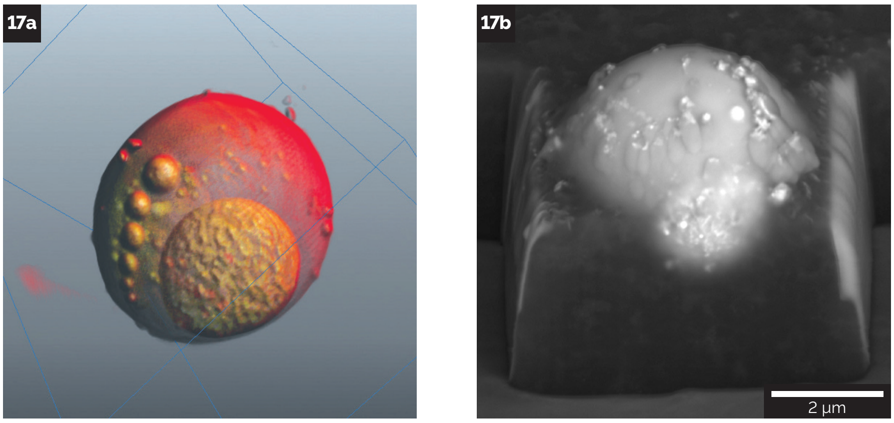


Fig. 17: Reconstruction of the volume distribution of a gunshot residue (GSR) particle.

Micro-tomography Reconstruction of Volume

3D Tomography software is a useful tool for the acquisition and visualization of FIB-SEM based tomography. This emerging technique gives a better understanding of the volume distribution, 3D microstructure and the relationship between three-dimensional objects in the specimen. A fully automated software tool for data acquisition using various detectors can be used for FIB-SEM tomography applications.

LYRA3 FIB-SEM configurations

LYRA3 can be equipped with a gas injection system (GIS) which is an essential component for most of all FIB applications as it delivers the gas chemistry needed for depositing Pt protective layers for cross-sectioning and lamellae preparation, Pt, W and SiO_2 depositions for circuit edit, XeF_2 for enhanced milling rates in Si, and, it also makes it possible gas-assisted delayering. LYRA3 can also be equipped with nanomanipulators, and a wide variety of detectors to comply with the most diverse range of applications in all fields of research in both science and industry. In addition, LYRA3 can be configured in different chamber sizes for accommodating small, large or extra-large specimens so to best fit particular needs for sample analysis.

XM/GM chambers

The XM/GM chambers are equipped with a compucentric fully motorised specimen stage, and, their optimised geometry allow multiple detectors to be installed. The chambers can be configured to operate either high vacuum (XMH/GMH), or, in the variable pressure (XMU/GMU) - a feature that extends their operations to low vacuum. The XMH/ GMH chambers allow imaging of conductive specimens under high-vacuum conditions while the XMU/GMU chambers enable imaging of uncoated non-conductive samples under low-vacuum conditions.

Extended XM and GM chambers

The volume capabilities of the standard XM and GM chambers can be further extended by means of special front-mounted chamber frames. Larger analytical chambers mean a wider range of applications in science and technology. For instance, such extended chambers is a specific solution for the semiconductor industry and fabs enabling the inspection of large wafers. The extended XM chamber with a modified Y-axis and an extension frame allows the LYRA3 system to perform SEM inspection as well as FIB micromachining at any location of 6" and 8" wafers. In addition to that, the extended GM chamber also allows the SEM inspection of 12" wafers at any location.

Chamber	XM	GM
Internal size	290 mm (W) × 340 mm (D)	340 mm (W) × 315 mm (D)
Door	290 mm (W) × 322 mm (H)	340 mm (W) × 320 mm (H)
Maximum Specimen Height	100 mm (with rotation stage) 141 mm (without rotation stage)	100 mm (with rotation stage) 141 mm (without rotation stage)
Number of ports	12+	20+
Chamber suspension	Integrated active vibration isolation system	

Specimen Stage	XM	GM
Type	Compucentric fully motorised	Compucentric fully motorised
Movements	X = 130 mm (-50 to +80) Y = 130 mm (-65 to +65) Z = 100 mm	X = 130 mm (-65 to +65) Y = 130 mm (-65 to +65) Z = 100 mm
Rotation	360° continuous	360° continuous
Tilt	-30° to +90°	-60° to +90°

Vacuum System	
Chamber vacuum	High vacuum mode: < 9×10^{-3} Pa* Low vacuum mode: 7 – 500 Pa**
SEM gun vacuum	< 3×10^{-7} Pa
FIB gun vacuum	< 5×10^{-6} Pa

*pressure < 5×10^{-4} Pa can be displayed with an optional WRG vacuum gauge (on request)
** with a low vacuum aperture inserted

Software Tools	
Image Processing	☑
Object Area	☑
Hardness	☑
Tolerance	☑
Multi Image Calibrator	☑
Switch-Off Timer	☑
3D Scanning	☑
X-Positioner	☑
Live Video	☑
Histogram	☑
DrawBeam Basic	☑
Analysis & Measurement	☑
EasySEM™	☑
Particles Basic	☐
Particles Advanced	☐
Image Snapper	☐
DrawBeam Advanced	☐
3D Tomography	☐
3D Tomography Advanced	☐
Sample Observer	☐
3D Metrology (MeX)	☐
Cell Counter	☐
TESCAN TRACE GSR	☐
System Examiner	☐
AutoSlicer	☐
Coral	☐
SYNOPSYS Avalon™	☐

☑ standard, ☐ option

LYRA3 - Technical specifications

Electron Optics

Electron Gun	High Brightness Schottky Emitter
Resolution in high-vacuum mode	
SE	1.2 nm at 30 keV 2.5 nm at 3 keV
In-Beam SE (option)	1.0 nm at 30 keV
In-Beam BSE (option)	2.0 nm at 15 keV
Beam Deceleration (option)	1.8 nm at 3 keV 3.5 nm at 200 eV
STEM (option)	0.9 nm at 30 keV
Resolution in low-vacuum mode	
SE	2.0 nm at 30 keV
LVSTD (option)	1.5 nm at 30 keV
Electron optics working modes	
High-vacuum mode	Resolution, Depth, Field, Wide Field, Channelling
Low-vacuum mode	Resolution, Depth
Magnification	Continuous from 1 x to 1,000,000 x
Field of view	6.0 mm at $WD_{analytical}$ 9 mm 17 mm at WD 30 mm
Electron Beam Energy:	200 eV to 30 keV / down to 50 eV with BDT option
Probe current	2 pA to 200 nA

Ion Optics

Ion column	Canion / Cobra
Ion Gun	Ga Liquid Metal Ion Source
Accelerating Voltage	0.5 kV to 30 kV
Probe Current	1 pA to 40 nA / 1 pA to 50 nA
Resolution	< 5 nm at 30 keV / < 2.5 nm at 30 keV (at SEM-FIB coincidence point)
Magnification	Minimum 150 × at coincidence point and 10 keV (corresponding to 1 mm view field), maximum 1,000,000 ×
SEM-FIB Coincidence at	WD 9 mm for SEM – WD 12 mm for FIB
SEM-FIB angle	55°

System Control

Microscope control	All microscope functions are PC-controlled using trackball, mouse and keyboard via the program LyraTC using the Windows™ platform.
Scanning speed	From 20 ns to 10 ms per pixel adjustable in steps or continuously
Scanning features	Focus Window, Dynamic focus, Point & Line scan, Image rotation, Image shift, Tilt compensation, 3D Beam, Live Stereoscopic Imaging (SEM), Other scanning shapes available through DrawBeam Software
Image size	16,384 x 16,384 pixels, adjustable separately for live image (in 3 steps) and for stored images (11 steps), selectable square or 4:3 or 2:1 rectangle. Unlimited large panorama image size (up to storage capacity).
Automatic procedures	In-Flight Beam Tracing™ beam optimization, Spot Size and Beam Current Continual, WD (focus) & Stigmator, Contrast & Brightness, Scanning Speed (according to Signal-Noise Ratio), Gun Centering, Column Centering, Vacuum Control, Compensation for kV, Look Up Table, Auto-diagnostics, Gun Heating, Setup of FIB-SEM intersection point, Automated FIB/SEM emission start
Remote control	Via TCP/ IP, open protocol

Requirements

Installation requirements	Power: 230 V ± 10 % / 50 Hz (or 120 V / 60 Hz - optional), 2300 VA No water cooling Compressed dry nitrogen for venting: 150 – 500 kPa Compressed air: 600 – 800 kPa

Environmental requirements	Environment Temperature:	17 - 24 °C with stability better than 2 °C with the rate of change 1°C/hour (0.017°C/min)
	Relative humidity:	< 65 %
	Acoustic noise:	< 60 dBC
	Active vibration isolation:	< 10 µm/s below 30 Hz < 20 µm/s above 30 Hz
	Background magnetic field[‡]:	synchronous < 300 nT asynchronous < 100 nT
	Room for installation:	4 m x 3.5 m minimum minimum door width 1.0 m
Altitude:	max. 3000 m above sea level	

[‡]Accepted values corresponding to a beam energy in the range of 20 keV – 30 keV. For lower beam energies, the specification changes.

Accessories*

	XMH GMH	XMU GMU
pA Meter	☑	☑
Touch alarm	☑	☑
IR TV Camera	☑	☑
Peltier Cooling Stage	☐	☐
Beam Blanker for SEM column	☐	☐
Load Lock**	☐	☐
Control Panel	☐	☐
Optical Stage Navigation***	☐	☐
Nanomanipulators	☐	☐
Gas Injection System (5 precursors)	☐	☐
MonoGIS	☐	☐
Decontaminator/plasma cleaner	☐	☐
Flood gun	☐	☐
Rocking Stage*****	⊘ / ☐	⊘ / ☐
Active vibration isolation	☐	☐

*Possible combinations of optional detectors and other accessories must be discussed with TESCAN, **Manual and motorised options available,***Not available for the extended chambers, **** Automated sample loading possible with Load Lock (motorized) only

Detectors

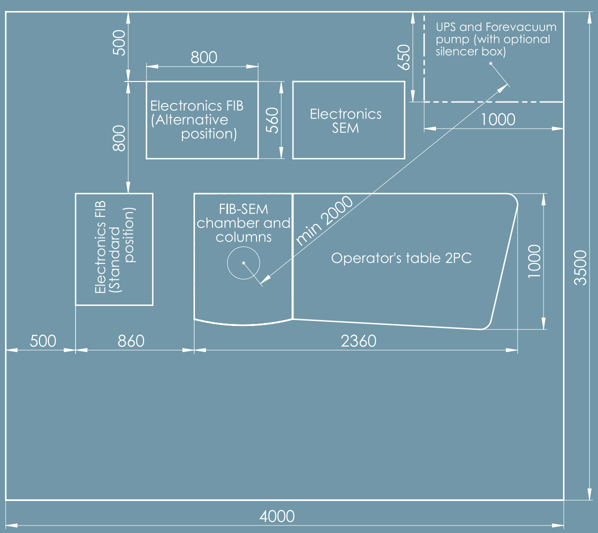
	XMH GMH	XMU GMU
SE Detector	☑	☑
Retractable BSE Detector (mot.)	☑	☑
In-Beam SE Detector	☐	☐
In-Beam BSE Detector	☐	☐
In-Beam LE-BSE Detector	☐	☐
LE-BSE Detector (mot.)[1]	☐	☐
Beam Deceleration Technology[2]	☐	☐
Low Vacuum Secondary Electron TESCAN Detector (LVSTD)	⊘	☐
Secondary Ion TESCAN detector (SITD)	☐	☐
STEM Detector	☐	☐
HADF R-STEM (mot.)	☐	☐
CL Detector (mot.)[3]	☐	☐
Rainbow CL Detector (mot.)[3]	☐	☐
EBIC	☐	☐
EDX[4]	☐	☐
WDX[4]	☐	☐
EBSD[4]	☐	☐
TOF-SIMS[4]	⊘ / ☐	⊘ / ☐
WiTec Raman (RISE)	⊘ / ☐	⊘ / ☐

[1]Integrated shutter is mandatory for FIB-SEM tomography [2]A BDT package including decontaminator is also available [3]Compact version with manual retraction available (motorised retraction upon request) [4]Fully integrated third party products

☑ standard, ☐ option, ⊘ not available

If a fore-vacuum pump is to be placed in the same room as the LYRA3 microscope, it is highly recommended to purchase the TESCAN silencer box with the microscope.

Footprint of LYRA3 XM/GM (all dimensions in mm)



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