Thermo Fisher
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Scios 3C FIB-SEM for materials science
Maximizing productivity through workflow automation

The Thermo Scientific™ Scios™ 3C FIB-SEM's reliable, automated workflows remove operational complexity to help you streamline processes and focus on results. By delivering consistent, high-quality data, it ensures excellent performance in subsurface analysis, 3D characterization, and TEM lamella preparation. Built with flexibility in mind, the Scios 3C FIB-SEM enables complete analysis of a variety of materials, making it an ideal solution for diverse research and industrial environments.

Key features

Fast access to subsurface information using Auto Cross Section Software

Ultra-high-resolution imaging using the NICol electron column with best-in-class performance on a wide range of samples, including magnetic and nonconductive materials

Complete sample information with sharp, refined, and charge-free contrast obtained from a variety of integrated in-column and below-the-lens detectors

Flexible configuration can be optimized to meet specific application requirements

Fast and easy preparation of high-quality, site-specific TEM and atom probe samples using the Sidewinder HT ion column

Access to high-quality, multi-modal subsurface and 3D information with precise targeting of the region of interest using optional Auto Slice & View 5 Software

Ultra-high resolution with complete sample information

Cross sectioning, which makes it possible to image and analyze subsurface features in a material, is the core functionality of a FIB-SEM instrument. Thermo Scientific Auto Cross Section (AXS) Software automates both FIB preparation of cross sections and SEM imaging of the prepared sites. With a focus on ease of use and reliability, this software allows novice users to obtain high-quality results easily and helps experienced users increase throughput and optimize tool use by automating data acquisition.

Three-dimensional characterization is often required to better understand the structure and properties of a sample. The Scios 3C FIB-SEM with optional Thermo Scientific™ Auto Slice & View™ 5 Software allows for high-quality, fully automated acquisition of multi-modal 3D datasets, including, among others, simultaneous multi-detector SEM imaging for maximum materials and topography contrast, energy dispersive spectroscopy (EDS) for compositional information, and electron backscatter diffraction (EBSD) for microstructural and crystallographic information. Combined with Thermo Scientific™ Avizo™ Software, it delivers a unique workflow for high-resolution, advanced 3D characterization and analysis at the nanometer scale.

Thermo Scientific Scios 3C FIB-SEM

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High-quality (S)TEM sample preparation

Scientists and engineers constantly face new challenges that require highly localized characterization of increasingly complex samples with ever smaller features. The latest technological innovations of the Scios 3C FIB-SEM—in combination with easy-to-use, comprehensive Thermo Scientific™ AutoTEM™ 5 Software and our application expertise—allow for fast and reliable preparation of site-specific HR-S/TEM samples for a wide range of materials.

To achieve high-quality results, it is essential to minimize surface damage on the sample. Final polishing with low-energy ions is a critical step in the sample preparation workflow. The Sidewinder HT focused ion beam .(FIB) column delivers great performance for creating high quality (S)TEM lamella.

Productivity for all users

No matter your experience level, the Scios 3C FIB-SEM's streamlined performance can help you obtain high-quality, reproducible results faster and easier. Automated SEM and FIB alignments help ensure that the tool is always ready to acquire data. Plus, the built-in User Guidance makes it easy for novice users to be productive quickly.

Specifications

Electron optics

Ultra-high resolution NICol field emission-SEM column

- High-stability Schottky field emission gun to provide stable, high-resolution analytical currents

- 60° dual objective lens allows for tilting of larger samples

- Automated heated apertures help ensure cleanliness and touch-free aperture exchange

- Continuous beam current control and optimized aperture angle

- Easy gun installation and maintenance—auto bakeout, auto start, no mechanical alignments

- Double stage scanning deflection

- Dual objective lens combining electromagnetic and electrostatic lenses

- User guidance and column presets

- Minimum source lifetime: 24 months

Electron beam resolution

Optimum WD

- 0.7 nm at 30 keV STEM

- 1.4 nm at 1 keV

- 1.2 nm at 1 keV with beam deceleration (optional)

Electron beam parameter space

- Beam current range: 1 pA to 400 nA

- Landing energy range: 20 eV (optional) to 30 keV

- Accelerating voltage range: 200 V to 30 kV

- Maximum horizontal field width: 3.0 mm at 7 mm WD and 7.0 mm at 60 mm WD

- Extra wide field of view (1×) available through standard navigation montage

Ion optics

Sidewinder HT ion column with excellent high-current performance

- Acceleration voltage: 500 V to 30 kV

- Ion beam current range: 1.5 pA to 65 nA

- 15-position aperture strip

- Drift suppression mode as standard for non-conductive samples

- Minimum source lifetime: 1,500 hours

- Ion beam resolution: 3.0 nm at 30 kV using selective edge method

Detectors

- Trinity Detection System (in-lens and in-column)

    – T1 segmented lower in-lens BSE detector

    – T2 upper in-lens SE detector

    – T3 retractable in-column SE detector (optional)

    – Up to four simultaneously detected signals

- Everhart-Thornley SE Detector (ETD)

- High-performance ion conversion and electron (ICE) detector for secondary ions (SI) and electrons (SE) (optional)

- Retractable low-voltage, high-contrast, segmented solid-state backscatter electron detector (DBS) (optional)
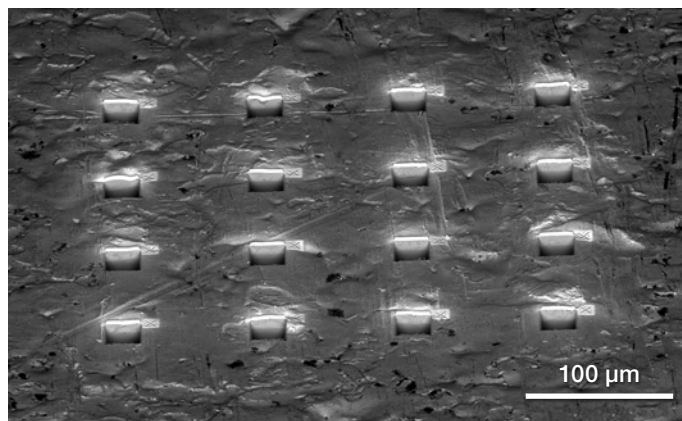
Array of cross sections on Zinc-based automotive coating sample automatically prepared with Auto Cross Section Software.

- Retractable STEM 3+ detector with BF/DF/HAADF segments (optional)

- IR camera for viewing sample and chamber

- In-chamber Thermo Scientific™ Nav-Cam™ Sample Navigation Camera (optional)

- Integrated beam current measurement

Stage and sample

Flexible 5-axis motorized stage:

- XY range: 110 mm

- Z range: 65 mm

- Rotation: 360° (endless)

- Tilt range: −38° to +90°

- XY repeatability: 3 µm

- Max sample height: Clearance 85 mm to eucentric point

- Max sample weight at 0° tilt: 5 kg (including sample holder)

- Max sample size: 110 mm with full rotation (larger samples possible with limited rotation)

- Compucentric rotation and tilt

Vacuum system

- Complete oil-free vacuum system

- Chamber vacuum: $< 6.3 \times 10^{-6}$ mbar (after 72 hours pumping)

- Evacuation time: < 3.5 minutes

Chamber

- E- and I-beam coincidence point at analytical WD (7 mm SEM)

- Ports: 21

- Inside width: 379 mm

Sample holders

- Standard multi-purpose holder uniquely mounts directly onto the stage, hosts up to 18 standard stubs (Ø12 mm), three pre-tilted stubs, two vertical row-bar holders, and two optional pre-tilted row-bar holders (38° and 90°) and does not require tools to mount a sample

- Each optional row-bar accommodates six STEM grids

- Various wafer and custom holders available by request (optional)

System control

- 64-bit GUI with Windows 11, keyboard, optical mouse

- Up to four live images showing independent beams and/or signals; live color signal mixing

- Local language support: Check with your local Thermo Fisher Scientific sales representatives for available language packs

- 32-inch widescreen monitor 3840 × 2160 pixels (second monitor optional)

- Joystick (optional)

- Multifunctional control panel (optional)

- Remote control and imaging (optional)

Image processor

- Dwell time range from 25 ns to 25 ms/pixel

- Up to 64k × 64k pixels

- File type: TIFF (8, 16, 24-bit), BMP, or JPEG standard

- SmartSCAN System (256 frame average or integration, line integration and averaging, interlaced scanning)

- DCFI (Drift Compensated Frame Integration)

Supporting software

- "Beam per view" graphical user interface concept with up to four simultaneously active quads

- Simultaneous FIB patterning and SEM imaging, intermittent SEM imaging and FIB patterning, integrated real-time monitor, and FIB immersion modes for advanced, real-time SEM and FIB process monitoring and endpointing

- Patterns supported: rectangles, lines, circles, cleaning cross-section, regular cross-section, polygons, bitmap, stream file, exclusion zones, arrays

- Directly imported BMP file or stream file for 3D milling and deposition

- Material file support for "minimum loop time," beam tuning, and independent overlaps

- Image registration enabling sample navigation in an imported image

- Sample navigation on an optical image

- Undo and Redo functionality

- User Guidance for most common FIB-SEM operations and applications

- Drift suppression mode for FIB milling

Accessories (optional)

- GIS (Gas Injection System) Solutions:

  - Single GIS: up to four independent units for enhanced etching or deposition

- GIS – Beam chemistry options (optional)

  - Platinum deposition

  - Tungsten deposition

  - Carbon deposition

  - Insulator deposition II

  - Thermo Scientific™ Enhanced Etch™ Gas Chemistry Solution (iodine, patented)

  - Insulator enhanced etch (XeF2)—Thermo Scientific™ Delineation Etch™ Gas Chemistry Solution (patented)

  - Selective carbon mill (patented)

  - Empty crucibles for Thermo Fisher Scientific-approved user-supplied materials

  - More beam chemistries available upon request

- EasyLift System for precise in situ sample manipulation

- FIB charge neutralizer

- Analysis: EDS, EBSD, WDS, CL

- Thermo Scientific™ QuickLoader™ Vacuum Technology: Load lock for fast sample exchange without breaking system vacuum

- CleanConnect System for safe sample exchange in an inert atmosphere

- Exclusive Thermo Scientific™ CryoMAT™ Kit for cryo applications

- Cryo solutions from external vendors

- Thermo Scientific Acoustic Enclosure

- CryoCleaner Decontamination Device

- Integrated plasma cleaner

Software options

- AutoTEM 5 Software for fast, easy, highly automated STEM sample preparation

- Auto Slice & View 5 Software: automated sequential mill and view to collect a series of slice images, EDS, or EBSD maps for 3D reconstruction

- Auto Cross Section Software: automated milling and imaging of cross sections

- Avizo Software for 3D reconstruction and analysis

- Thermo Scientific Maps Software for automatic acquisition of large images and optional correlative work

- Web-enabled data archive software

- Advanced image analysis software

Warranty and training

- One-year warranty

- Choice of service maintenance contracts

- Choice of operation and application training contracts

Documentation and support

- Online user guidance

- User operation manual

- Prepared for RAPID remote diagnostic support

- Free access to online resources

Learn more at **thermofisher.com/scios3**

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