

Axia ChemiSEM

Instant fusion of chemistry and imaging

The Axia ChemiSEM is a new generation of SEM. It is an always-ready-to-image platform with unique live quantitative EDS mapping, making it the choice for rapid analysis—even for users new to scanning electron microscopy.

Live quantitative elemental mapping

The Thermo Scientific™ Axia™ ChemiSEM offers a new concept of EDS analysis that introduces a different way of collecting, processing, and presenting the compositional information of a sample. Traditional EDS uses SE/BSE information but does not use image processing, so the data arrives more slowly and the image resolution is relatively coarse. In contrast, with Axia ChemiSEM, the collection of the data is based on a single scan generator approach that perfectly aligns the SEM image and the EDS image, leading to sharper and less noisy results. In addition, new pulse processing with Adaptive Pulse Shaping ensures reliable data acquisition over a range of conditions.

Elemental maps are generated by a quantification algorithm. Therefore, reliable compositional data is shown, and the results do not suffer from peak overlaps that are typical in gross counts maps. Also, the proprietary shadow detection algorithm assists in providing information only from regions where X-rays are detected.

Easy to get started

The Axia ChemiSEM is an always-ready-to-image platform with unique column technology that translates to sample-focused data collection. It includes novel integrated user guidance that provides an interactive approach to implementing new techniques. Its UI-integrated EDS provides all analytical controls within easy reach for maximum efficiency.

Key benefits

Live compositional information: Performs EDS by scanning multiple signals simultaneously, detecting the morphology and elemental makeup of a sample, in real time

Always-ready-to-image platform: Lets you stay focused on data collection

Improved time to data: Offers several imaging and scanning strategies to optimize image acquisition and increase throughput

Flexible stage: Provides large sample capacity with a door that provides access to the entire chamber, as well as a stage with a capacity of 10 kg

Excellent imaging performance: Offers low-vacuum mode and charge-mitigation using beam deceleration mode



Flexible sample loading

The Axia ChemiSEM provides a large sample capacity with a door that provides access to the entire chamber, offering a new level of robustness and flexibility. Thanks to its new design, the Axia ChemiSEM accommodates the highest weight ever—up to 10 kg, allowing you to save time cutting your samples and to avoid extended and useless sample preparation.

Excellent imaging performance

The new Axia ChemiSEM offers remarkable all-round performance to obtain the most information from the characterization of different type of materials. It supports the widest range of samples thanks to the low-vacuum mode and the ability to adjust the pressure up to 150 Pa. Low-vacuum mode will provide several advantages when dealing with non-conductive samples; not only does it enable charge-free imaging, but it also allows an increase in the material contrast and the use of higher beam currents to perform chemical analyses.

Diverse software and detection options for advanced applications

Thermo Scientific SEM Software provides the Axia ChemiSEM with a variety of options for system automation. Additionally, Thermo Scientific AutoScript™ Software allows for customized workflow development. Optional detection technology includes a robust and easy-to-use cathodoluminescence detector.

Easy maintenance

Source exchange in the Axia ChemiSEM is easy and can be completed by users of any experience level. Its straightforward design translates to high uptime and rapid service during those times when attention is needed.

Technical highlights

Electron optics

- High-performance thermal emission SEM column with tetrode source emission geometry
- Stable electronically aligned column with fixed-objective aperture for ease of operation
- Fully automatic filament exchange alignment procedure
- 45° objective lens geometry
- Through-the-lens differential pumping reduces beam skirting for the most accurate analysis and highest resolution at low beam energies in low vacuum

Electron beam resolution

- High-vacuum imaging
 - 3.0 nm @ 30 kV (SE)
 - 8.0 nm @ 3 kV (SE)
- High-vacuum imaging with beam deceleration
 - 7.0 nm @ 3 kV (BD mode* + BSED)
- Low-vacuum imaging
 - 3.0 nm @ 30 kV (SE)
 - 4.0 nm @ 30 kV (BSE)
 - 10 nm @ 3 kV (SE)

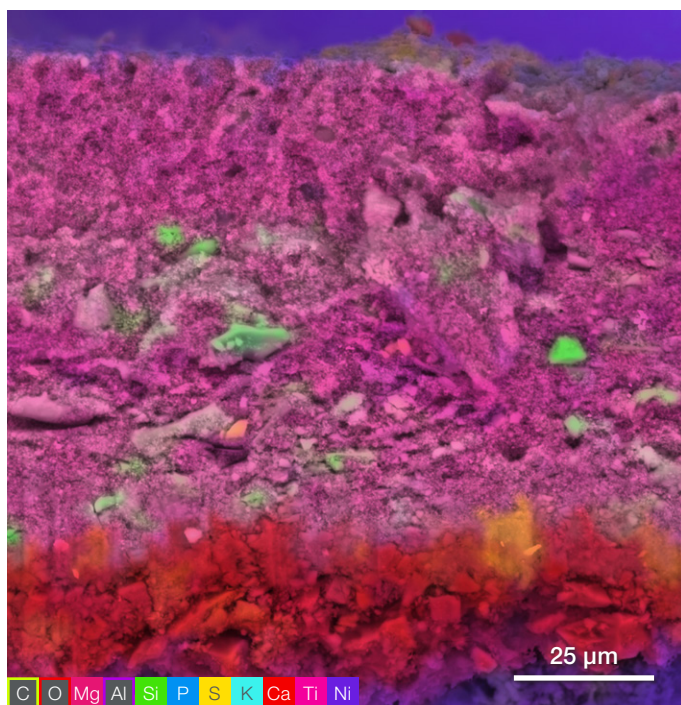


Electron beam parameter space

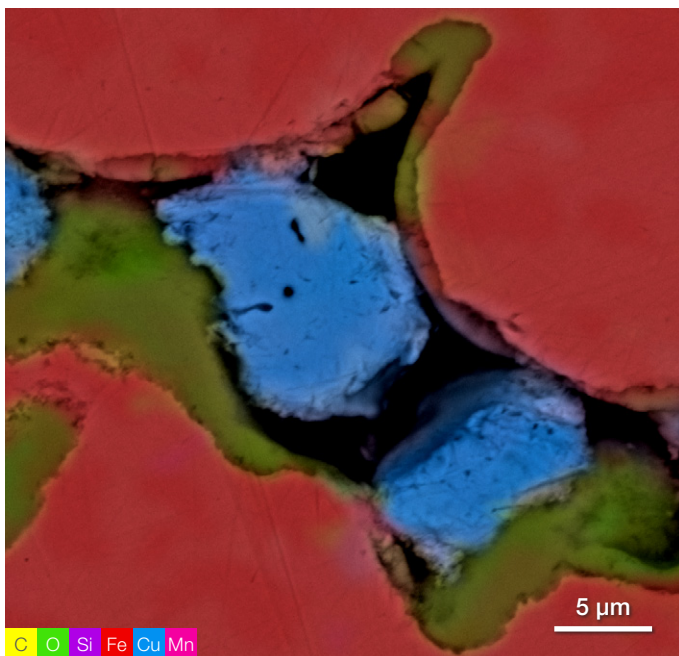
- Beam current range: up to 2 μ A, continuously adjustable
- Accelerating voltage range: 200 V – 30 kV
- Magnification: 15 to 1,000,000 $\times$ (Polaroid)

Chamber

- Inner width: 280 mm
- Analytical working distance: 10 mm
- Ports: an Axia ChemiSEM configured with BSED and EDS offers five available ports
- EDS take-off angle: 35°
- Two opposing EDS detectors possible
- Coplanar EDS/EBSD orthogonal to the tilt axis of the stage



Cross section of a paint made of different layers and showing several type of fillers. Acc voltage 20 keV, beam current 3.6 nA



Copper inclusions in steel. Acc voltage 20 keV, beam current 0.25 nA.

Detectors

Detects up to four signals simultaneously from any combination of the available detectors or detector segments:

- ETD: Everhart-Thornley SE detector
- Retractable under-the-lens backscatter detector
- TrueSight X EDS detector. Solid angle 13 mSr, resolution 129 eV. Optional upgrade to TrueSight LX - 38 mSr, 132 eV
- Low-vacuum SE detector (LVD), standard on LoVac model
- IR camera for viewing sample in chamber
- Thermo Scientific Nav-Cam™ Camera: color optical camera for sample navigation
- Photon Cathodoluminescence Detector for UI-integrated real color CL imaging*
- Current measurement*
- Third party detectors possible

Vacuum system

- 1 × 84 liter/s TMP, 1 × PVP
- Patented through-the-lens differential pumping
- Evacuation time: ≤2 minutes to high vacuum and ≤4.5 minutes to low vacuum

Sample holders

- Standard multi-sample SEM holder uniquely mounts directly onto the stage, hosts up to 7 standard stubs (ø 12 mm), and does not require tools to mount a sample
- Single stub holder

Stage

- Type: 5-axes motorized
- XY: 120×120 mm
- Repeatability: <5.0 µm (@ 0° tilt)
- Motorized Z: 55 mm
- Rotation: n×360°
- Tilt: -15° / +90°
- Max. sample height:
 - Clearance 72 mm to analytical working distance (10 mm), no sample holder
 - Clearance 128 mm to analytical working distance (10 mm) with ZTR axes removed
- Max. sample weight:
 - 500 g in any stage position
 - Up to 10 kg with ZTR axes removed
- Max. sample size:
 - 138 mm diameter with full XY moves, rotation, no tilt (larger samples possible with limited stage travel or rotation)

System control

- 64-bit GUI with Windows 10, keyboard, optical mouse
- 24-inch LCD display, WUXGA 1920×1200 (second monitor optional)
- Customizable graphical user interface, with up to four simultaneously active views
- Navigation montage
- Undo / Redo functionality
- User Guidance for basic operations / applications

Image processor

- Dwell time range from 50 ns to 25 ms/pixel
- Up to 6144×4096 pixels
- File type: TIFF (8-, 16-, 24-bit), JPEG or BMP
- Single-frame or 4-view image display
- SmartSCAN (256-frame average or integration, line integration and averaging, interlaced scanning)
- DCFI (Drift Compensated Frame Integration)

Accessories*

- Beam deceleration with stage bias -4,000 V
- Support PC
- Manual user interface
- Joystick
- Analysis: EDS, EBSD, CL, Raman
- Specimen current meter
- Specimen holder kit
- Acoustic enclosure for vacuum pump
- 7- or 52-pin electrical feedthrough
- Oil-free pre-vacuum pumping
- SEM start-up kit
- Software controlled 1,100 °C CleanHeater stage
- Electrical probing / multi-probing stations

Software*

- Thermo Scientific Maps™ Software for automatic large area acquisition using tiling and stitching; correlative work
- Thermo Scientific AutoScript™ 4 Software—a Python-based application programming interface
- TopoMaps for image colorization, image analysis, and 3D surface reconstruction
- Remote control software

Documentation

- Video-guided training
- Online User Guidance
- Operating instructions handbook
- Online help
- Prepared for Thermo Scientific RAPID™ Service (remote diagnostic support)

Warranty and Training

- One-year warranty
- Choice of service maintenance contracts
- Choice of operation / application training contracts

Installation requirements

(Refer to preinstall guide for detailed data)

- Power:
 - Voltage 115–230 V AC
 - Frequency 50 or 60 Hz
 - Consumption: <2.5 kVA for basic microscope
 - Environment:
 - Temperature (20+/- 3)°C
 - Relative humidity below 40%
 - Stray AC magnetic fields <100 nT asynchronous, <300 nT synchronous for line times, 20 ms (50 Hz mains), or 17 ms (60 Hz mains)
 - Minimum door size: 0.775 m wide × 1.61 m high
 - Weight: column console 405 kg
 - Dry nitrogen recommended for venting
 - Acoustics: <68 dBC (site survey required, as acoustics spectrum relevant)
 - Floor vibrations—site survey required, as floor spectrum relevant
 - Active vibration isolation table, UPS*
- ## Consumables (partial list)
- Pre-centered cathodes
 - Tungsten filaments
 - Apertures
 - Rotary pump oil

* Optional

Find out more at thermofisher.com/Axia-ChemiSEM

ThermoFisher
S C I E N T I F I C