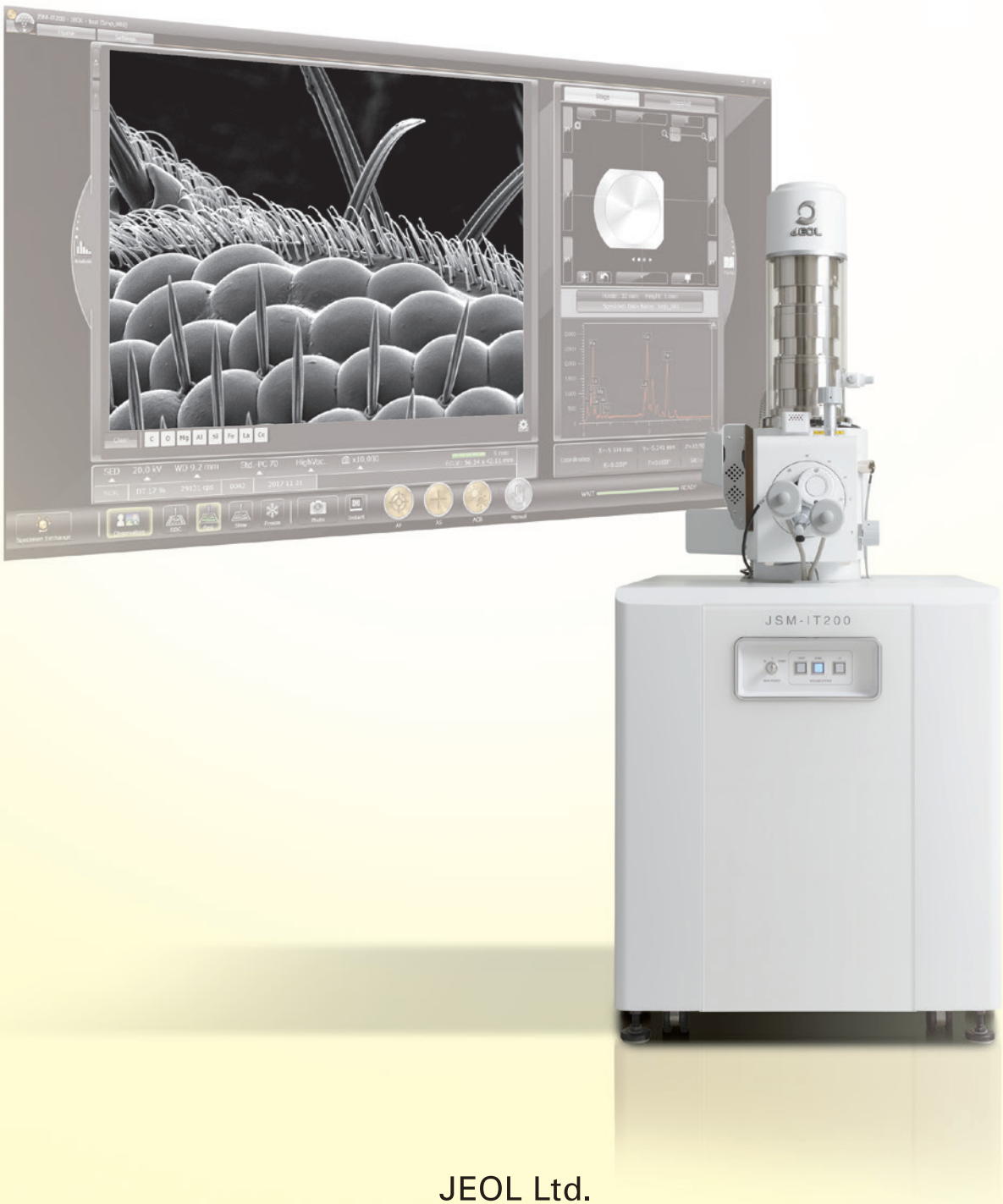
Scientific / Metrology Instruments

Scanning Electron Microscope

Solutions for Innovation

JSM-IT200



JEOL Ltd.

InTouchScope™ series

JSM-IT200 Series

Scanning Electron Microscope

Latest Advancements from JEOL

Fast Observation, Analysis and Report Generation !

High Performance Analytical Tool !

High Performance
With Faster and Easier Analysis

■ Main screen – Zeromag –

You can locate the specimen area or specify analysis positions with Holder Graphics or CCD image[*1] displayed on the Main screen.

■ Element / Spectrum display – Live Analysis[*2] –

The characteristic X-ray spectrum from the measurement area and the main constituent elements are always displayed.

■ Data management button – SMILE VIEW™ Lab: Integrated data management –

A single click of the data management button displays the Data management screen allowing you to generate a report of all images and analysis data, as well as review or re-analyze already-acquired data.

*1 To take a CCD image, SNS (option) is required.
*2 Applicable to (A) Analysis/(LA) Low Vacuum and Analysis versions.

Guided operation from sample introduction to observation

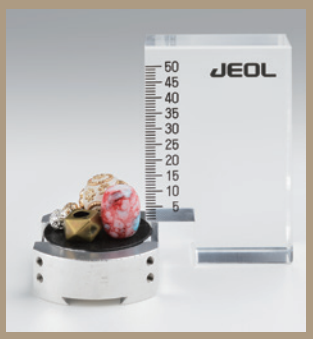
The JSM-IT200 navigation flow guides the user step-by-step from sample introduction to automatic image formation.

■ Specimen Exchange Navi

A step-by-step guide to sample exchange, condition setting and automatic image formation.

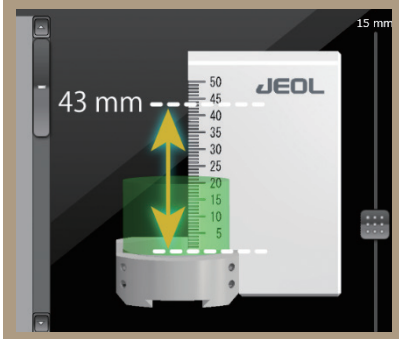
Set sample height

Determine the height offset for tall samples before sample loading.



Entering specimen height

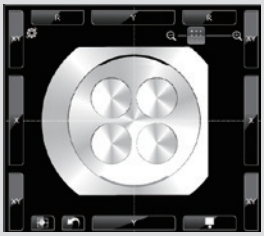
Enter the specimen height within the Specimen Exchange Navi.



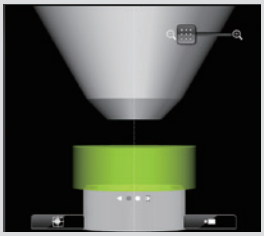
Condition setting using recipes

● Holder Graphics

Holder Graphics allows you to immediately observe the specimen position by showing the current specimen position including specimen tilt and rotation.



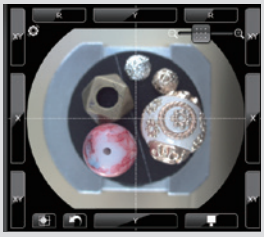
Top view



Side view

● Stage Navigation System (SNS) Option

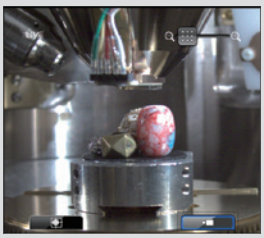
Switch between the Holder Graphics and CCD (color) image. You can specify the observation area by double-clicking the acquired color image. Displaying the color image on the Zeromag screen allows for an easy search of the specimen area.



CCD image area: 6 × 4.5 cm
Number of pixels: 5,000,000
Digital zoom up to × 20

● Chamber Scope (CS) Option

Switch between Holder Graphic and Chamber Scope view.
A camera which displays the relationship of the specimen to the detectors and objective lens pole piece, is available.



Specimen loading

Draw-out method enables smooth exchange of any form or size of specimen.

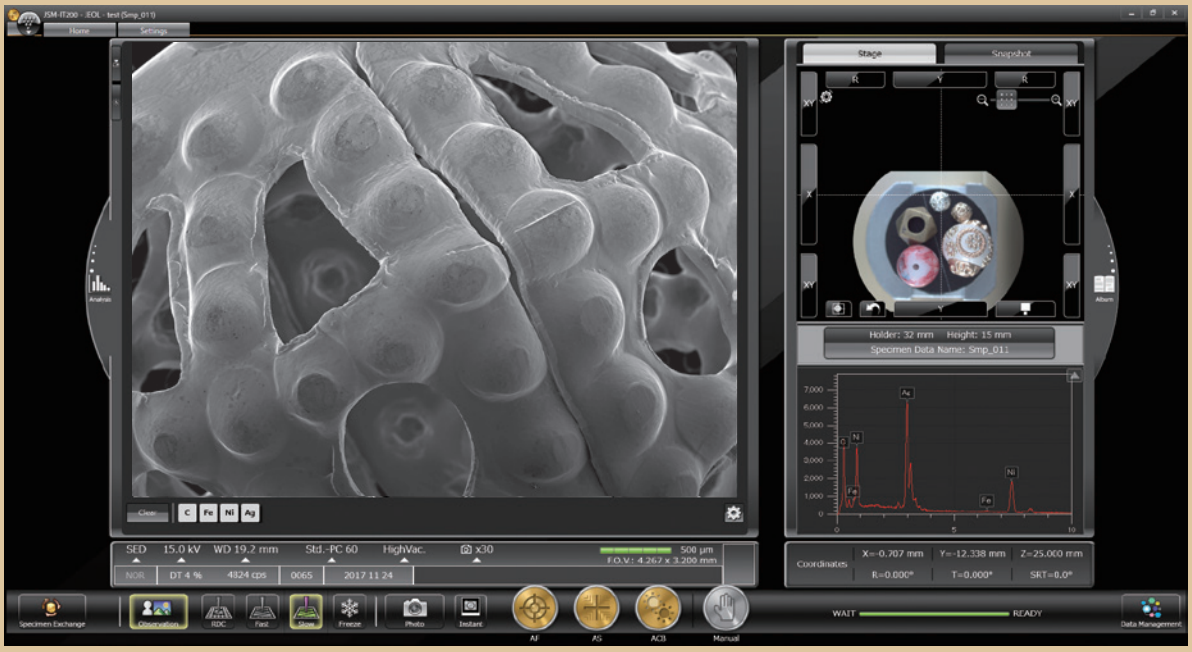
Maximum specimen diameter: 150 mm dia.
Maximum specimen height: 48 mm H

Chamber evacuation starts after acquisition of CCD image

Observation area can be specified on CCD image* during evacuation.

Completion of chamber evacuation

Then, the target observation area is specified, observation conditions are set, image adjustment is completed. You can observe the image at designated magnification.



* To take a CCD image, SNS (option) is required.

True Integration of Optical and SEM imaging

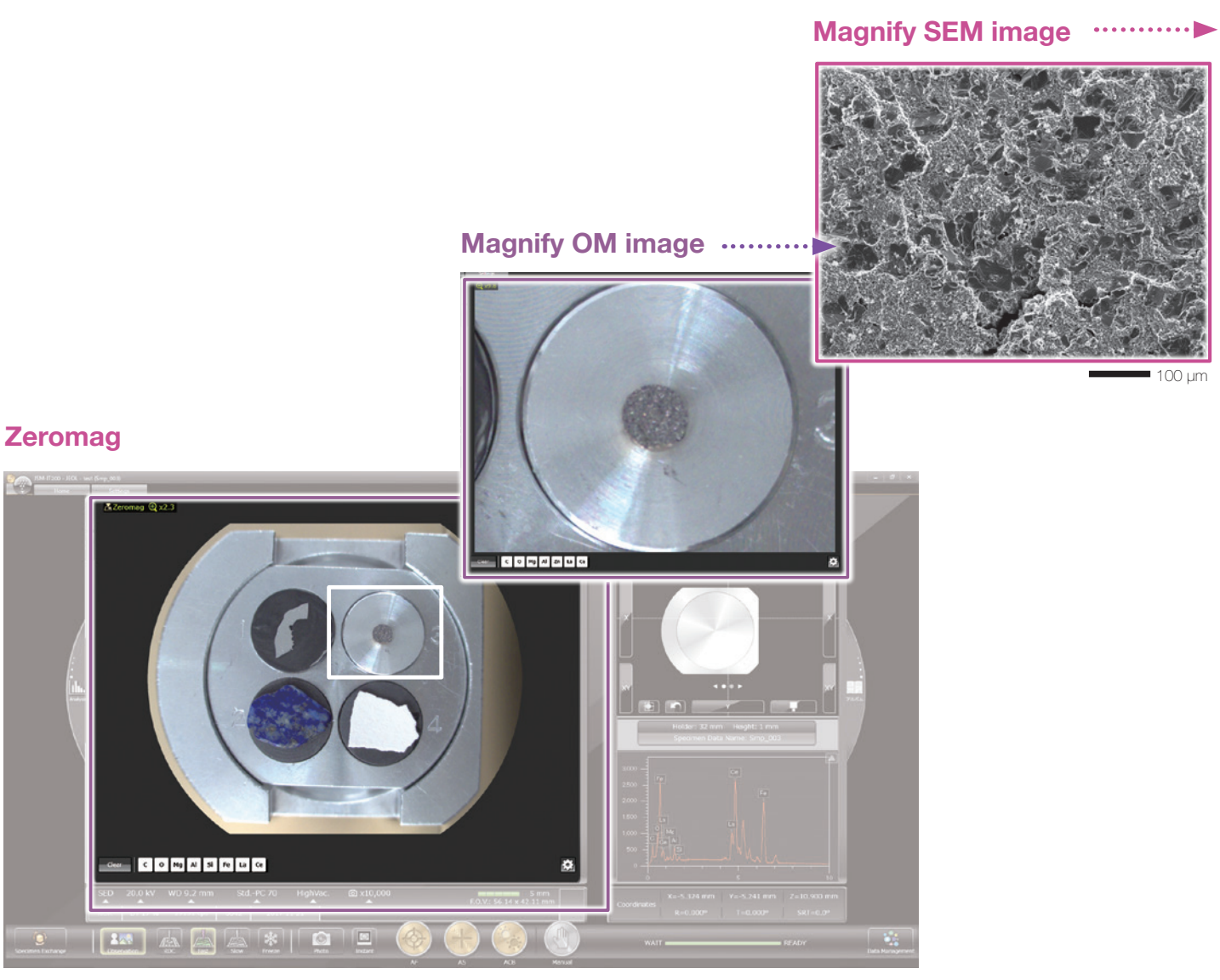
Zeromag

Smooth transition from optical to SEM imaging

Zeromag is a function that links the SEM image with Holder Graphics or CCD image* (optical image) where all are linked to the stage coordinates. This facilitates navigation with seamless transition from the CCD image to a high magnification SEM image.

Features of Zeromag

- Seamless transition from optical to SEM image.
- Can pre-set multiple analysis positions across your specimen set.
- Displays the areas analyzed for easy review or fast return for additional study.

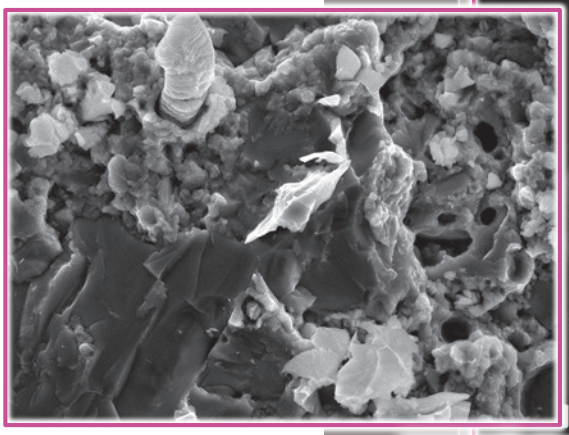


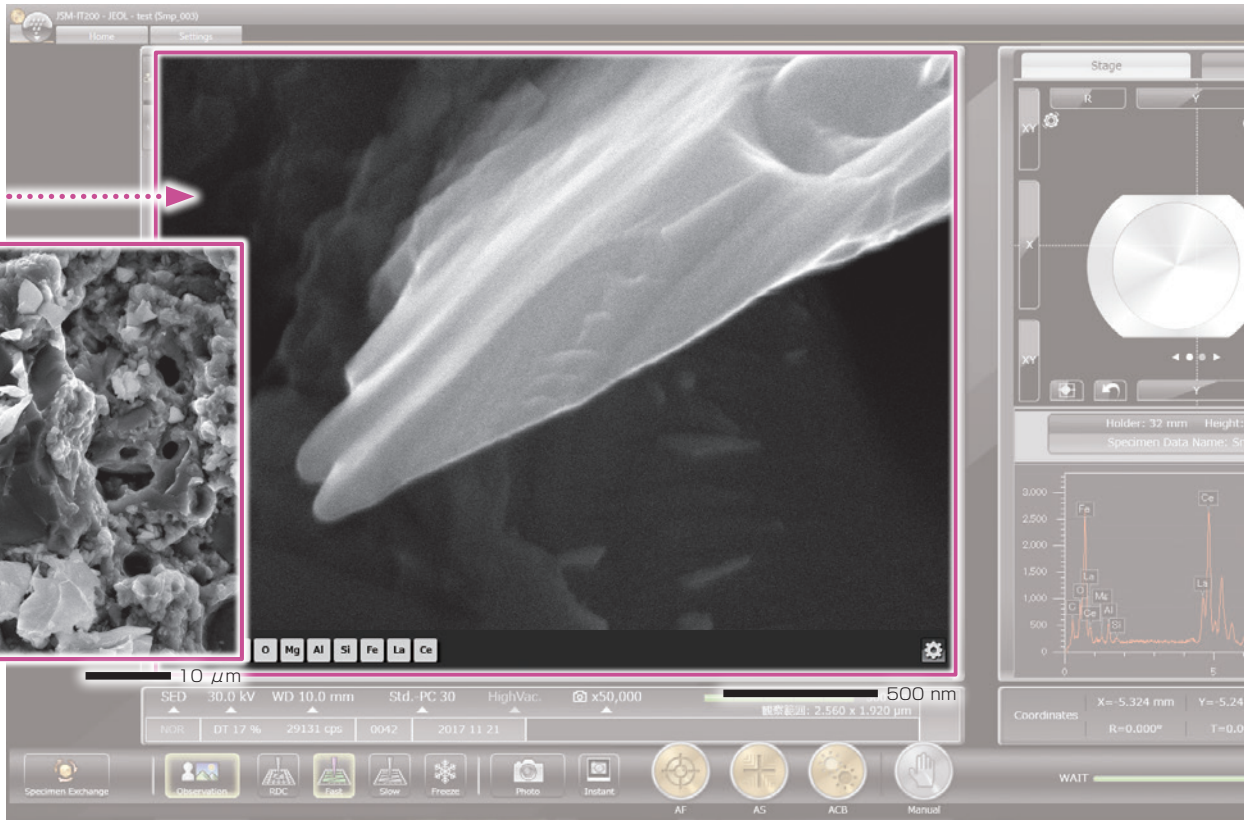
Zeromag image displayed on the Main screen

Secondary electron image

This high magnification image highlights fine surface morphology of the specimen.

Magnify SEM image



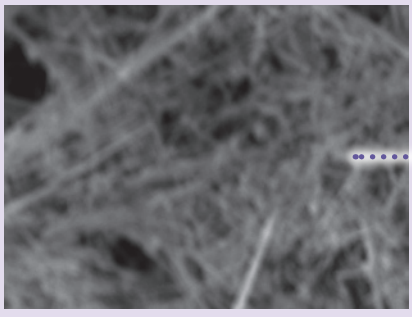


Specimen: Ignition stone
Accelerating voltage: 30 kV
Magnification: ×200, 2,000 and 50,000 (left to right)
High-vacuum mode, Secondary electron image

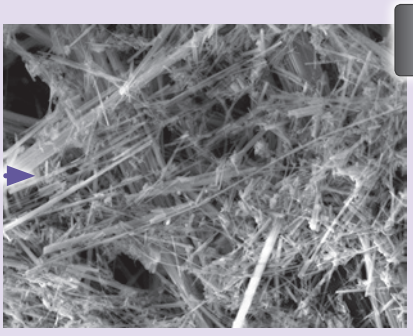
● Auto functions

Our advanced automatic functions simplify operation.
Automatically adjust Focus, Contrast, Brightness and Stigmator with a single click.

Photography



Auto



Specimen : Asbestos
Accelerating voltage: 10 kV
Magnification : ×5,000
High-vacuum mode
Secondary electron image

* To take a CCD image, SNS (option) is required.

Easy Elemental Analysis

■ Live Analysis Standard for (A) / (LA)

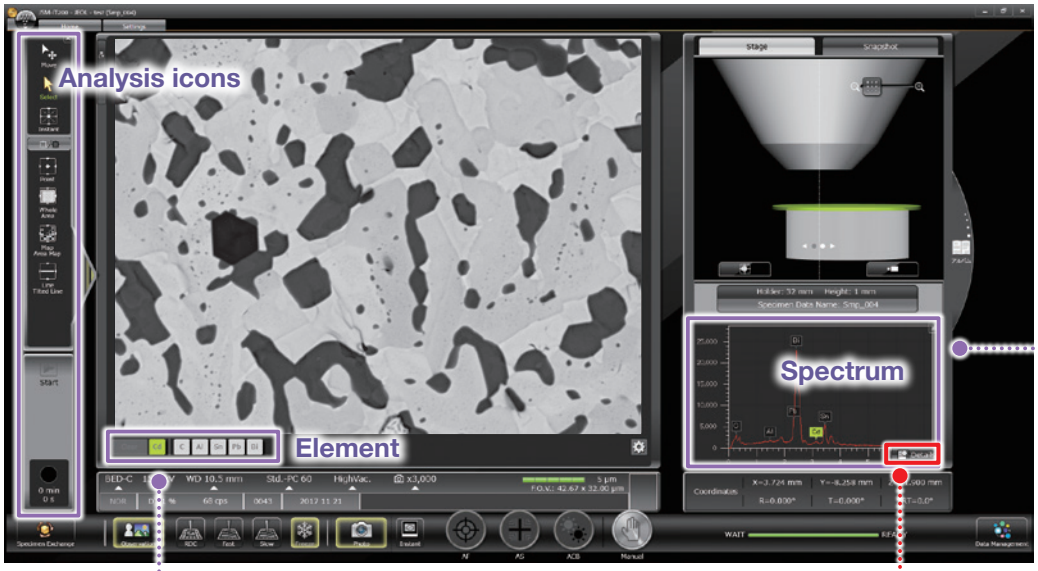
Real time display of elemental analysis results during observation of a high-magnification SEM image.

With our Analytical series, seamless transition is made from high magnification SEM imaging to elemental analysis. The embedded EDS system shows a real time EDS spectrum during image observation, making it easy to find elements of interest or unexpected elements.

Features of Live Analysis

- Always displays the X-ray spectrum.
- Display of the main constituent elements.
- Alert display of elements of interest

SEM observation screen



Specimen: Wood metal, Accelerating voltage: 15 kV, Magnification: ×3,000
High-vacuum mode, Backscattered electron composition image

Spectrum

The X-ray spectrum from the measurement area and automatic qualitative analysis results are always displayed.

Single-click to switch the screen

Single-click enables you to switch between the SEM observation screen and analysis detail display screen.

Toggle to SEM View

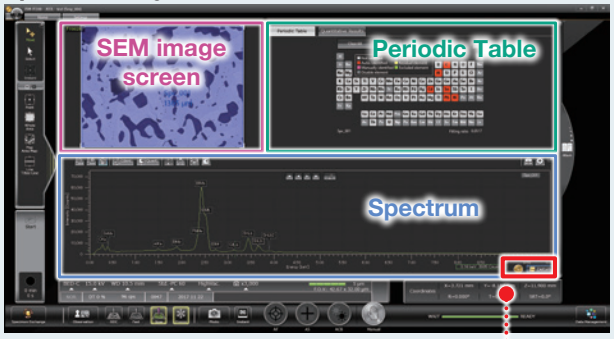
Element

The main constituent elements detected in the measurement area are displayed.
You can display an "Alert" by specifying an element.

■ Analysis Detail display screen

The Spectrum screen, Map screen and other screens are displayed automatically.

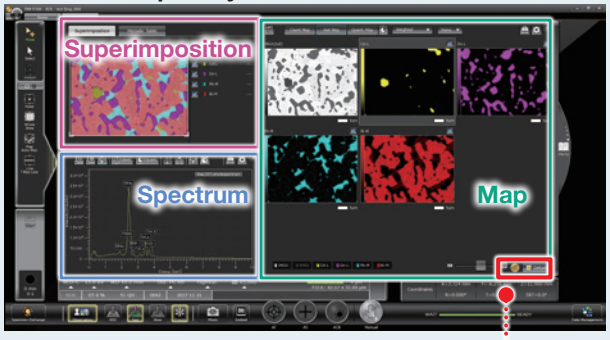
Spectral analysis screen



Specimen: Wood metal

Toggle to SEM View

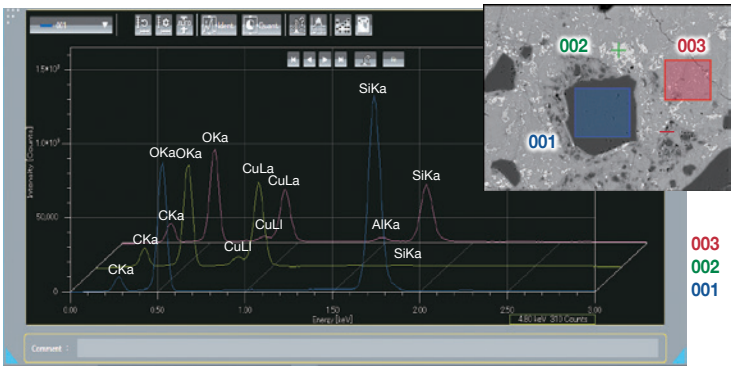
Elemental map analysis screen



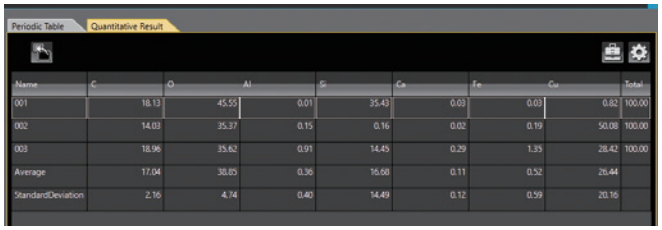
Toggle to SEM View

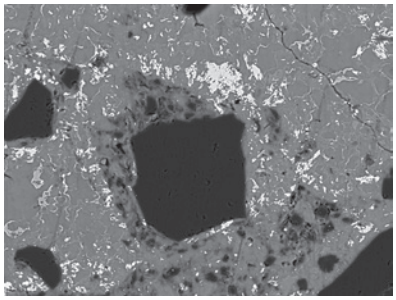
Qualitative & quantitative analysis

Select analysis areas directly in the SEM observation screen. After spectral acquisition, the Quantitative Result tab automatically displays the quantification results.



Spectra and qualitative analysis result

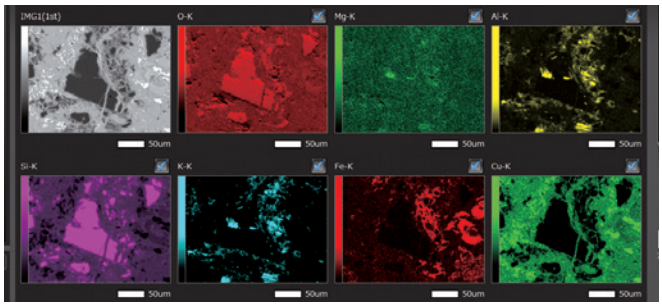




Specimen: Chrysocolla
Accelerating voltage: 15 kV
Magnification: ×500
High-vacuum mode:
C coating, Backscattered electron composition image

Elemental map

Using the Whole/Area icon on SEM observation screen, you can acquire elemental maps from the whole area or a specified area.



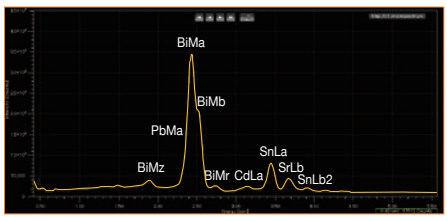
Backscattered electron composition image and elemental maps
Specimen: Chrysocolla

- **Net map / Quantitative map**

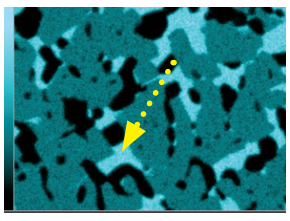
The Net map separates spectral peaks at each pixel and shows an elemental map with a reduced effect of overlapping peaks. Compared to the Count map which unavoidably reflects the peak intensity of other elements close to a specified element, the Net map enables a real-time display of an inherent intensity map even from a specimen containing many elements.
The Quantitative map is also available, which compensates for the Net map and displays the analysis results with the quantification values.

- **Comparison of Count map and Net map**

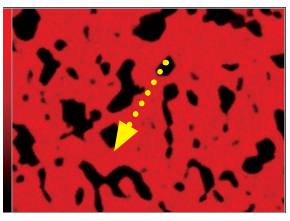
Spectral peaks of Pb-Mα (2.342 keV) are close to Bi-Mα (2.419 keV).
Thus in the Count (intensity) map, it is difficult to separate Pb from Bi. Applying the Net map enables you to confirm the inherent Bi distribution.



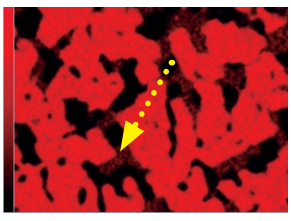
Peaks of Pb and Bi
Specimen: Wood metal



Pb intensity map



Bi intensity map



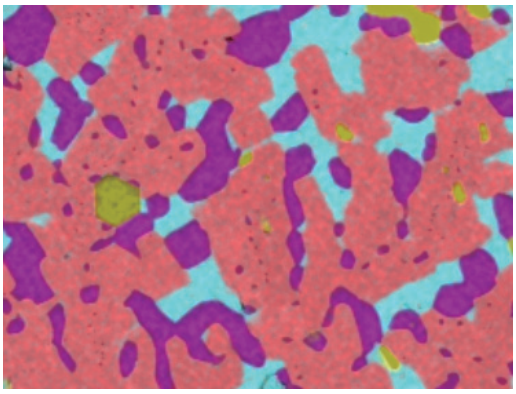
Bi net map

Easy Elemental Analysis

Elemental map

● Color-overlay display of an elemental map

The system allows you to overlay elemental maps on the SEM image in real time. The area is displayed with a composite color.



Specimen: Wood metal

Multi-color overlay display

Line analysis

Line analysis performs elemental analysis along a line set on the SEM image. The X-ray intensity of the specified elements is plotted to show the change in concentrations across the line. You can change elements to show during or after completion of data acquisition.

Line analysis result

■ Functions to improve analysis accuracy

Visual Peak ID (VID)

This function enables you to confirm whether the constituent elements are correctly identified in the qualitative analysis result. A spectrum is reconstructed based on the X-ray intensity of the elements identified.

Probe tracking

With long data acquisitions, the system periodically compares the SEM image at analysis start with the current image, so as to maintain the same analysis area. This capability helps you to monitor any change in a specimen or specimen drift during long acquisitions.

■ SMILE VIEW™ Lab for analysis

Pop-up spectrum

Since the stored map has spectral information, you can extract spectra from anywhere within the map data set.

SMILE VIEW™ Lab

- Re-specifies elements by spectrum, elemental map, line analysis, etc.
- Multi-color overlay display of elemental maps.
- Changes the colors of elemental maps, line analysis results, etc.

■ Other functions

Real-time filter

The system allows for image processing during a map acquisition to signal to noise ratio. This feature provides fast confirmation of the elemental distribution.

Pinpoint Navi

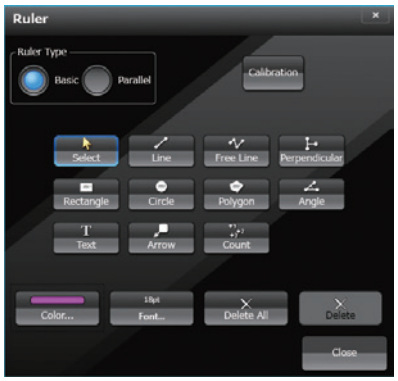
Automatic serial analysis can be made by specifying multiple areas in advance. Pinpoint Navi detects small image shifts by probe tracking, for precise repositioning of the analysis area.

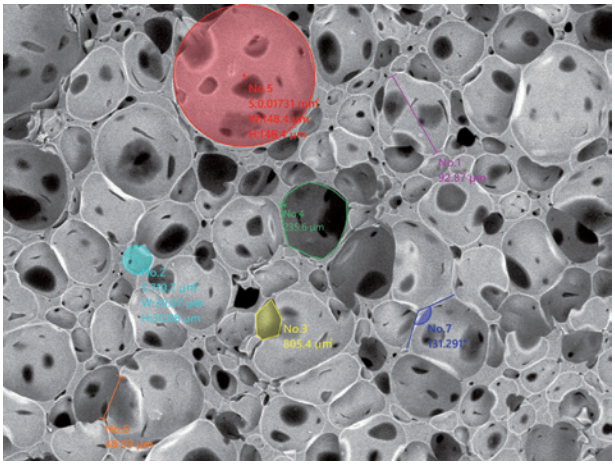
Relocating analysis areas

The stage position and magnification are linked with the analysis data. Return to any analysis area on the SEM image screen for additional study.

Measurement

Measurements are performed on the observation screen, and their results (distance, angle, area, etc.) can be recorded and saved on SEM images.

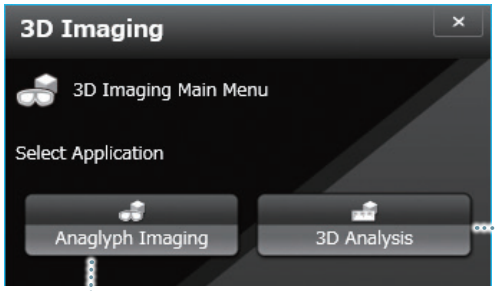




Specimen: Marshmallow

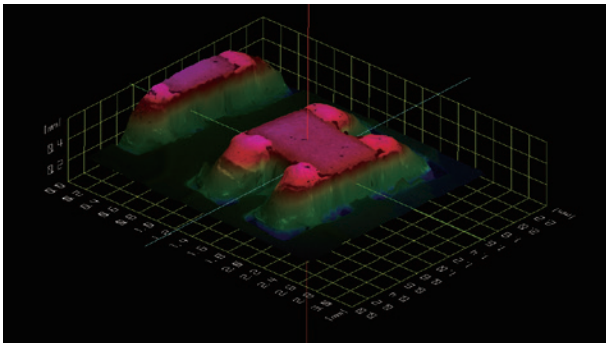
3D imaging

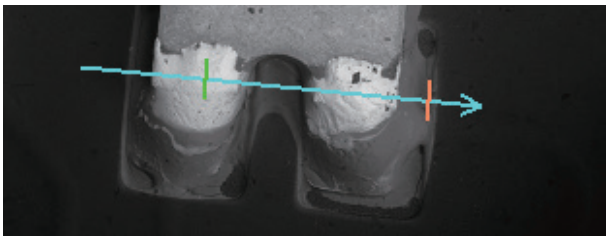
Optional software for creation of 3D image and analysis.

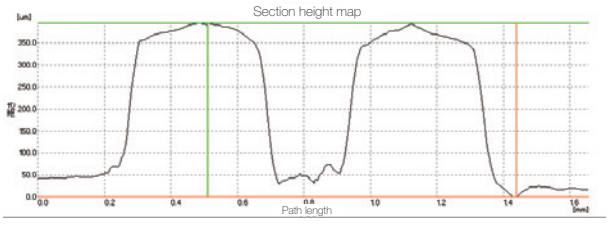


• 3D measurement image Option

Dedicated software for 3D measurement. A 3D image can be created from two SEM images.
The topographic status of the specimen surface can be measured.



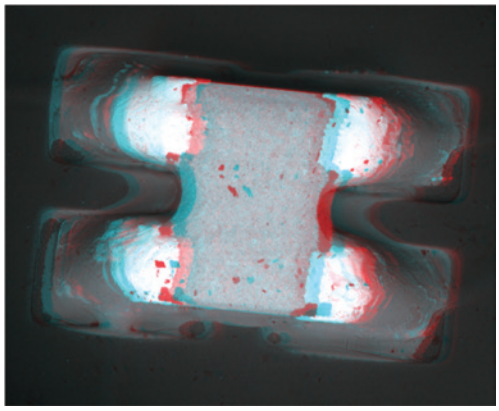




Specimen: Memory device

• Anaglyph

Step-by-step guide to collecting images for creation of an anaglyph image.



Seamless report generation

■ Integrated data management software SMILE VIEW™ Lab

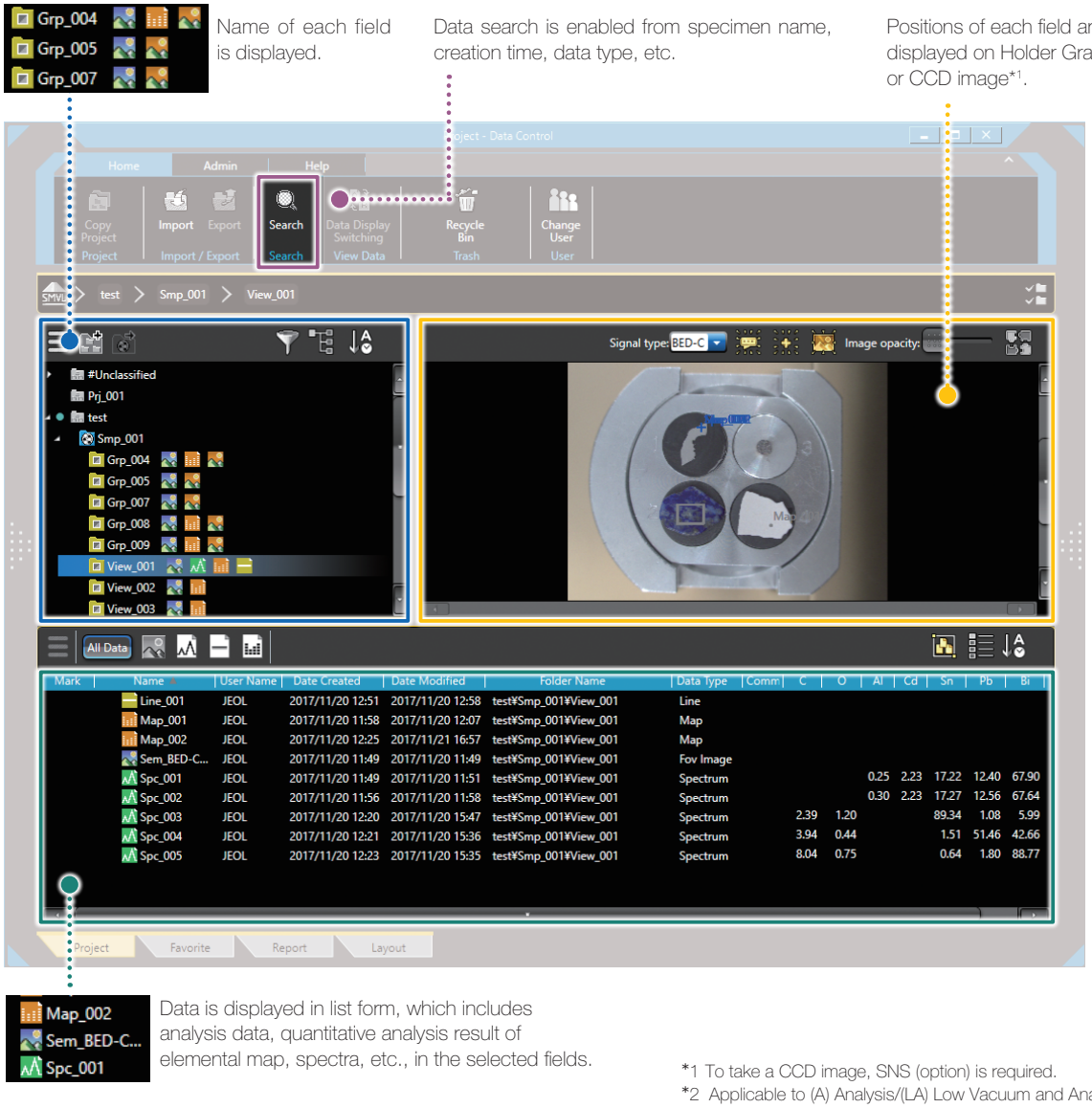
SMILE VIEW™ Lab is a fully integrated data management software which links the CCD image*1, SEM images, EDS analysis results*2, and corresponding stage coordinates for fast report generation or recall of specimen position for further study.

SMILE VIEW™ Lab Data management screen

SMILE VIEW™ Lab Data management screen allows you to easily handle all your data. Our data manager links the observation position, observation & analysis results, and a low magnification image acquired by Holder Graphics or CCD image*1. You can review or reanalyze already-acquired data and export selected data to a report.

Features of SMILE VIEW™ Lab

- Performs integrated management of CCD image*1 data, SEM image data and EDS analysis results*2.
- Allows for immediate understanding of data in each field.
- Enables data searching.
- Screen layout is easy to change.

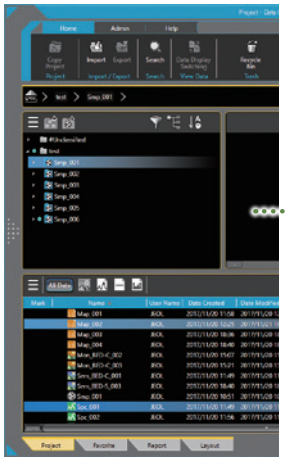


*1 To take a CCD image, SNS (option) is required.
*2 Applicable to (A) Analysis/(LA) Low Vacuum and Analysis versions.

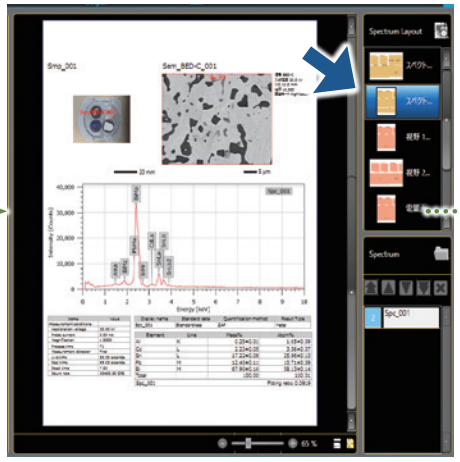
Automatic layout function

Patent applied for

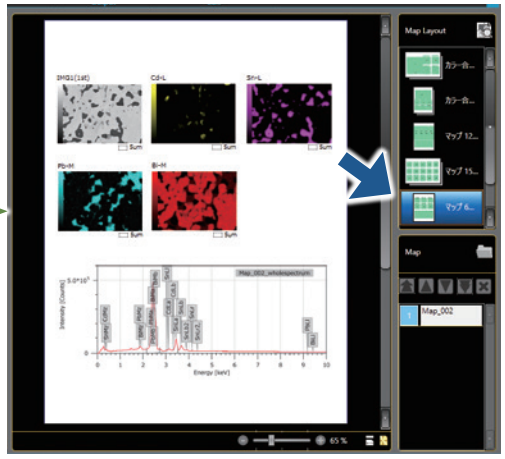
The SEM image data is linked with its EDS data. The report is automatically laid out with all related data included.
If the data set is large, additional pages are allocated automatically. When you change the layout, all related data is updated with a single click.



Select the data for report generation and click “Add to the report”.



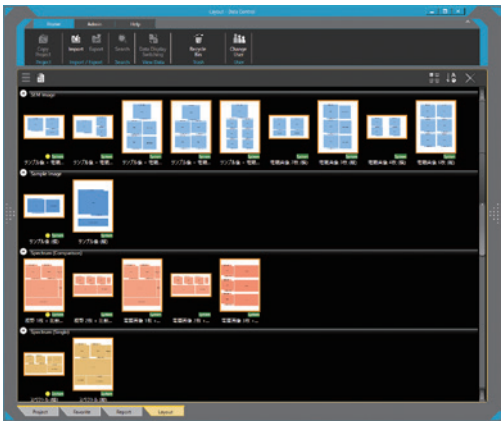
Based on the layout chosen, the linked data is automatically included.



When you select another layout button, only the layout is changed where the data is updated to the new format.

User layout

You can create templates for your reports.



User layout

■ Offline analysis software

Option

Improving productivity

Offline analysis software is available. You can process all your data offline and generate reports.
You can create quantitative maps and extract spectra (Pop-up Spectrum) from your map data sets.

Functions & Applications

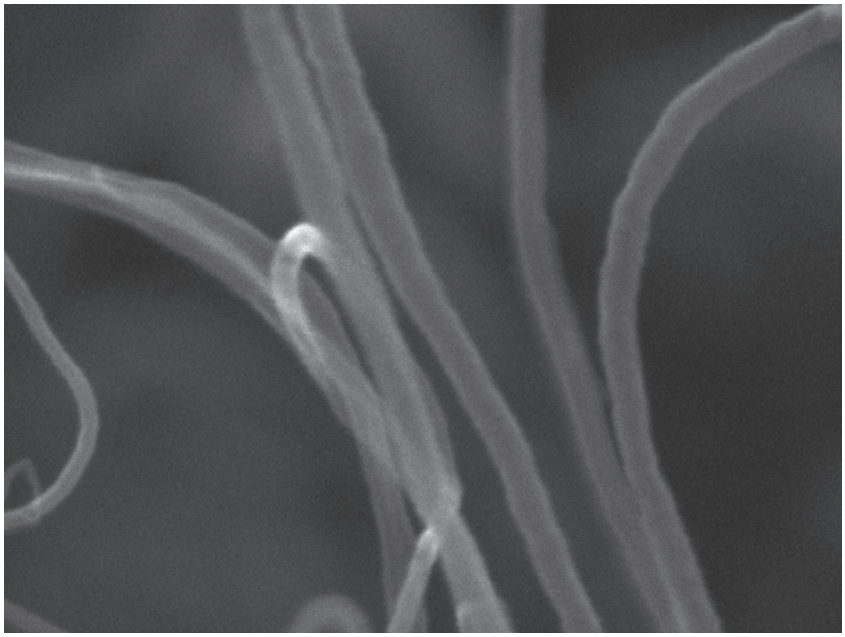
Various functions of the JSM-IT200 and their applications are presented.

Secondary electron image

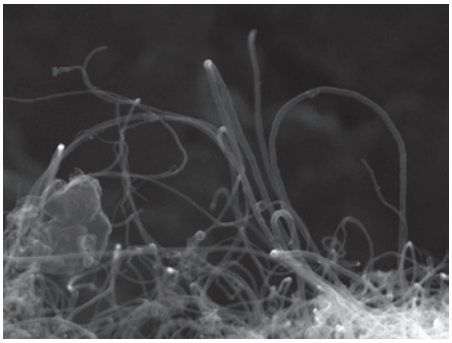
Secondary electron image is used most often to observe the surface morphology of a specimen.

The following secondary electron images show carbon nanotubes at high accelerating voltage. The sharp high magnification image to the left (×100,000) enables length measurement of each tube.

Accelerating voltage 30 kV



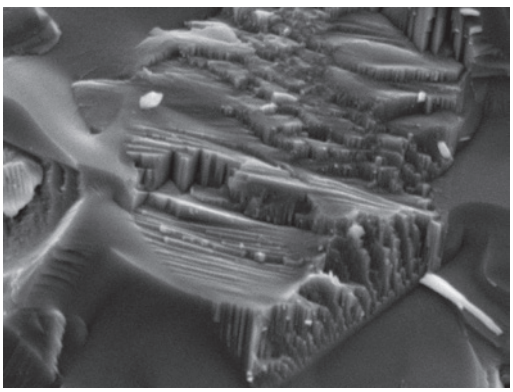
100 nm



0.5 µm

Specimen: Carbon nanotubes
Accelerating voltage: 30 kV
Magnification (left): ×100,000
(right): ×30,000
High-vacuum mode, Secondary electron image

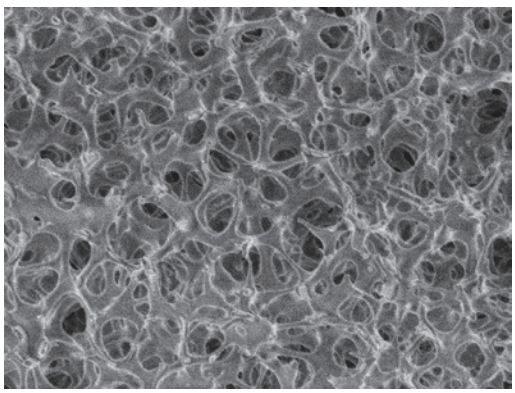
This image shows a cross section of an insulator.



1 µm

Specimen: Insulator
Accelerating voltage: 5 kV
Magnification: ×20,000
High-vacuum mode, Secondary electron image

This hollow fiber specimen has a complicated pore structure. Executing CF scan mode at low voltage allows for clear observation without the need to add a conductive coating.

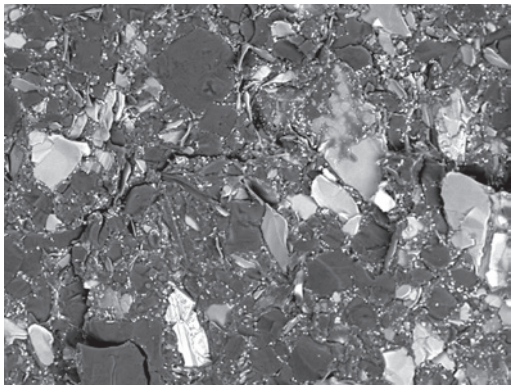


1 µm

Specimen: Hollow fiber
Accelerating voltage: 1.0 kV
Magnification: ×10,000
High-vacuum mode, Secondary electron image

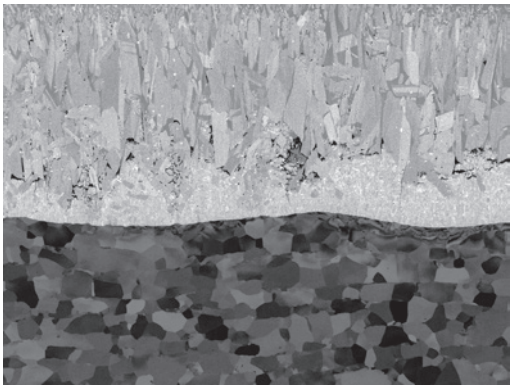
Backscattered electron image

Backscattered electron composition image shows differences in composition (average atomic number) with different intensity. The backscattered electron image enables confirmation of the distribution of lubricants on the surface of a vitamin pill.



Specimen: Vitamin pill (sugar portion)
Accelerating voltage: 5 kV
Magnification: ×2,000
High-vacuum mode, Backscattered electron composition image

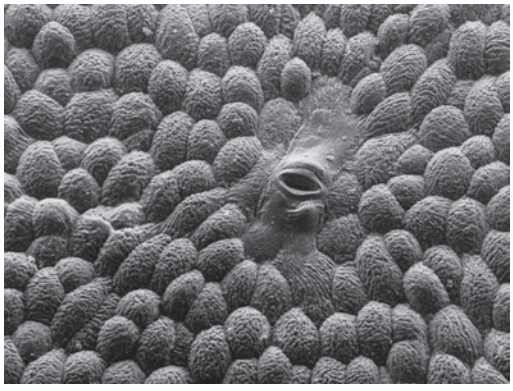
A flat surface prepared with our CROSS SECTION POLISHER™ (CP) was observed by a backscattered electron composition image at low accelerating voltage. The channeling contrast of zinc-plated and iron (substrate) was confirmed.



Specimen: Hot dip galvanizing on iron
Accelerating voltage: 5 kV
Magnification: ×500
High-vacuum mode, Backscattered electron composition image

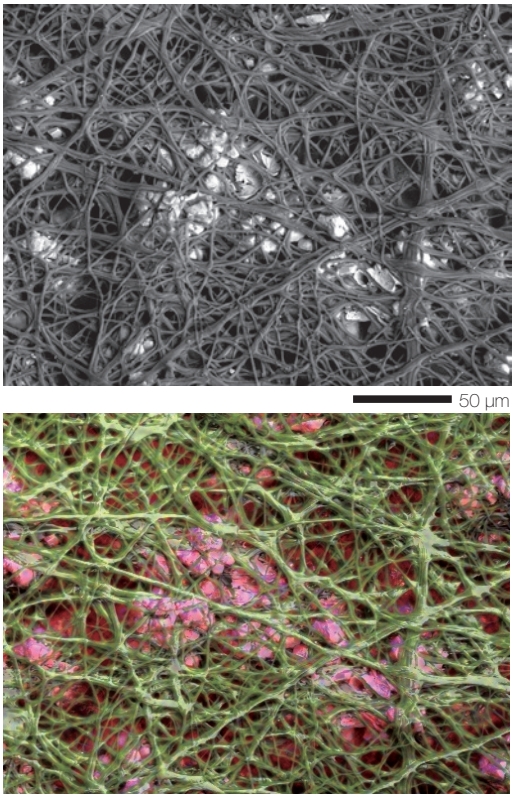
Low-vacuum (LV) mode

The JSM-IT200(LV)/(LA) comes with LV mode. The LV mode neutralizes charging on the specimen surface by introducing the air into the chamber, enabling observation of a non-conductive specimen in its native state.
Another merit of the (LA) version is easy elemental analysis without specimen pre-treatment.



Specimen: Peel of banana
Accelerating voltage: 5 kV
Magnification: ×500
Low-vacuum mode, Low-vacuum secondary electron image*

* To observe a low-vacuum secondary electron image, Low Vacuum Secondary Electron Detector (option) is required.

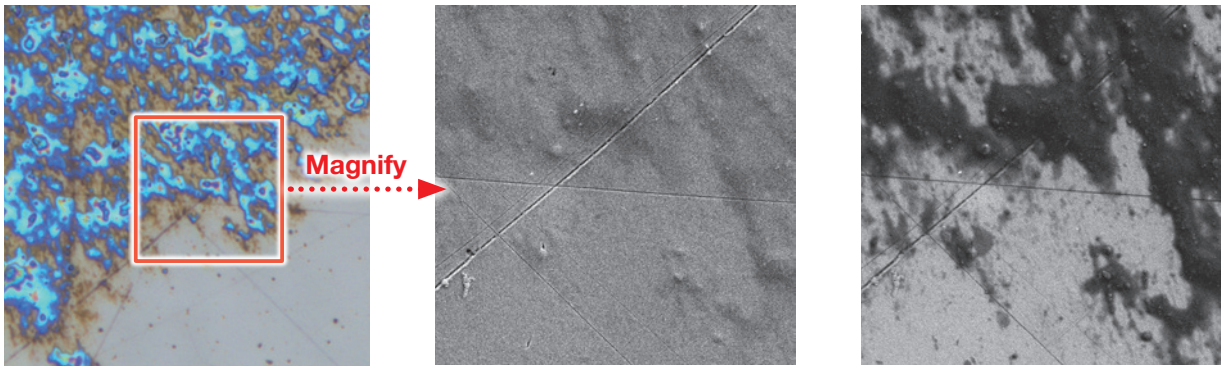


Specimen: Egg-shell membrane
Accelerating voltage: 10 kV, Magnification: ×500
Low-vacuum mode
Top: Backscattered electron stereoscopic image
Bottom: Composite elemental map (Green: C, Blue: O, Red: Ca)

Functions & Applications

Low accelerating voltage

Observation at low accelerating voltage enables finer surface structures to be studied. Contaminants on the surface viewed with an optical microscope are difficult to observe at an accelerating voltage of 15 kV. Lowering the voltage to 2 kV clearly visualizes the contaminants.



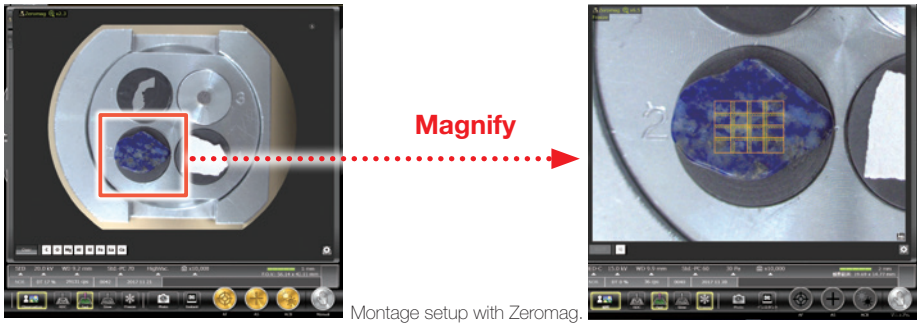
Optical microscope image
Specimen: Micro SD
Magnification: ×3,000
High-vacuum mode, Secondary electron image

Accelerating voltage: 15 kV

Accelerating voltage: 2 kV

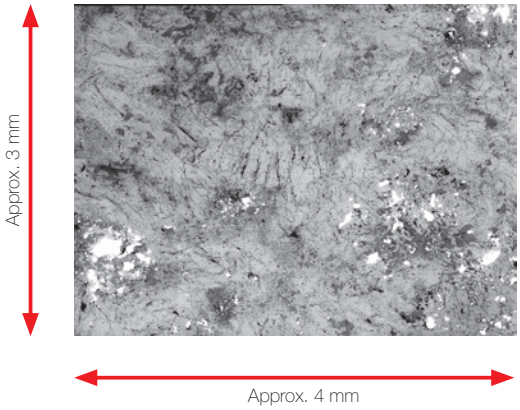
Montage: Automated large-area observation and analysis using Zeromag.

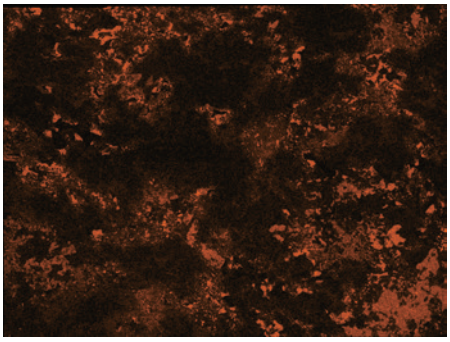
Montage is an effective function for analyzing materials over large areas (for foreign materials, ductile or brittle fracture, etc.).
With Zeromag, it is easy to set up one or more montage areas for imaging and analysis.
"Tilt Correction", "Field Overlap" and "Autofocus Point Setting" functions are built in.



Montage setup with Zeromag.

Montage is an effective function to acquire detailed information across a specimen area.





Montage result: 4 × 4
(Left: Backscattered electron composition image, Right : Na map)
Specimen: Lapis lazuli
Accelerating voltage: 15 kV, Low-vacuum mode

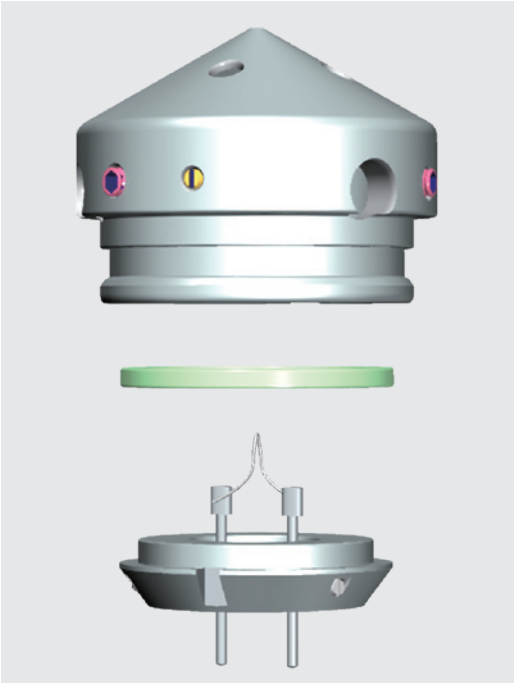
Maintenance

Filament

Filaments for the JSM-IT200 are pre-centered and require no centering by the operator.

Gun alignment

Fully automated alignment function is built in.

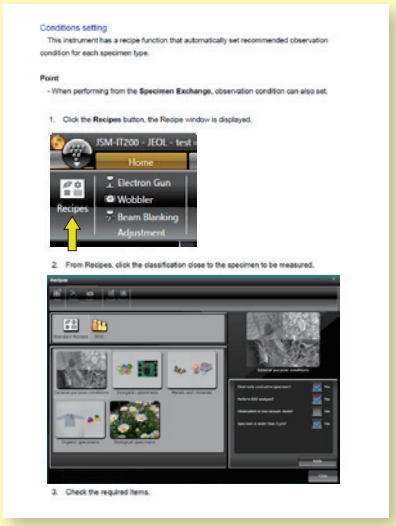


By simply inserting the filament into the Wehnelt and fixing it, the filament is automatically aligned to the center axis.

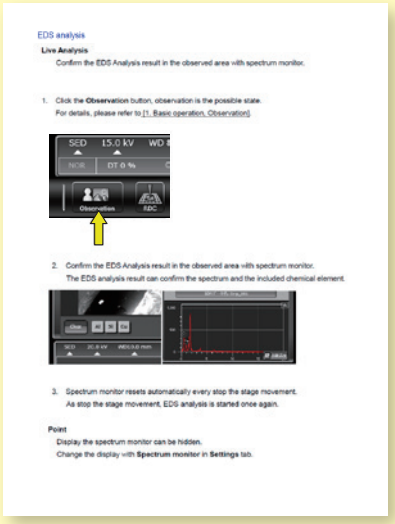
Help Guide for any operation

The help guide, makes it easy to understand operation methods of SEM and EDS, as well as maintenance procedures. With this guide, novice users can quickly achieve results.

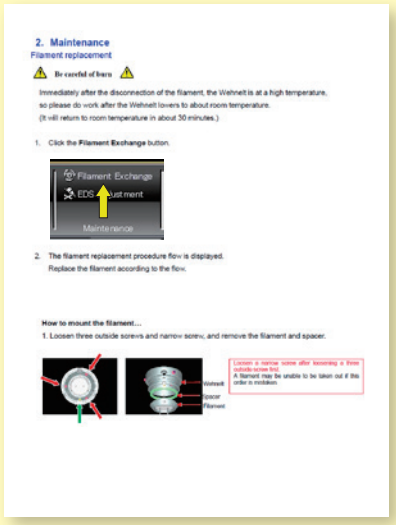
Help guide



Condition setting



Analysis



Maintenance

Technical DATA

JSM-IT200 Series Can be equipped in the following 4 configurations: (BU) Base Unit / (A) Analysis / (LV) Low Vacuum / (LA) Low Vacuum & Analysis.

Main Specifications

Resolution High vacuum mode	3.0 nm (30 kV), 8.0 nm (3 kV) 15.0 nm (1.0 kV)
Low vacuum mode *1	4.0 nm (30 kV, BED)
Direct magnification	×5 to 300,000 (Print size of 128 mm × 96 mm)
Display magnification	×14 to 839,724 (Display size of 358 mm × 269 mm)
Electron gun	W filament, Fully automatic gun alignment
Accelerating voltage	0.5 to 30 kV
Probe current	1 pA to 0.3 μA*5
LV pressure adjustment*1	10 to 100 Pa
Objective lens aperture	1-stage, with XY fine adjustment function
Automatic functions	Filament adjustment, Gun alignment, Focus /Stigmator /Brightness /Contrast
Maximum specimen size	150 mm dia. × 48 mm (H)
Specimen stage	XY-2 axes motor-drive eucentric stage X: 80 mm, Y: 40 mm, Z: 5 to 48 mm Tilt: –10 to 90°, Rotation: 360°
Montage function	Built-in
Holder Graphic display range	127 mm dia.
Standard recipes	Built-in (includes EDS condition*2)
Image mode	Secondary electron image, REF image, Composition image*1, Topographic image*1, Stereoscopic image*1
Pixels for image acquisition	320 × 240 640 × 480 1,280 × 960 2,560 × 1,920 5,120 × 3,840
OS	Microsoft®Windows®10 64bit
Observation monitor	24-inch touch panel
EDS functions*2 Measurement functions	Refer to EDS specifications. Built-in (distance between 2 points, between parallel lines, angle, diameter,)
Data management	SMILE VIEW™ Lab
Report generation	Output to Microsoft®Word*3 Output to Microsoft®PowerPoint®*3
Language switch	Operable on UI (Japanese/English)
Vacuum system	Fully automatic, TMP: 1 RP: 1

*1 Standard in JSM-IT200 (LV) / (LA).
*2 Standard in JSM-IT200 (A) / (LA).
*3 Microsoft® Office must be installed.
*4 The optional probe current compensation unit is required. Automatic monitoring of the probe current is possible only when EDS is connected to the microscope PC.
*5 When MP-30060 is used, probe current ranges from 1 pA to 1 μA.

Main Options

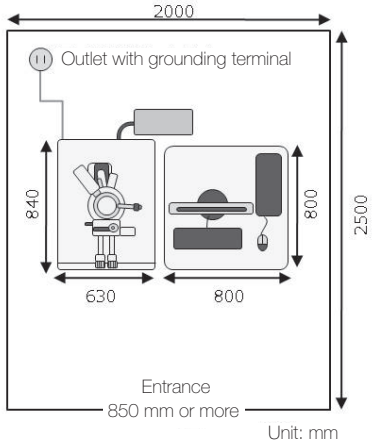
Backscattered Electron Detector (BED) *1
Low Vacuum Secondary Electron Detector (LSED)
Energy Dispersive X-Ray Spectrometer (EDS) *2
Motor Drive Stage (XYZ-3 axes, XYR-3 axes, 5-axes drive)
Stage Navigation System (SNS)
Chamber Scope (CS)
Operation Panel
3D Measurement Software
Table

Installation Requirements

Power	Single-phase 100 V AC, 50/60 Hz, 1.5 kVA (supplied by 3-pin outlet with grounding terminal)
Voltage regulation:	Within ± 10%
Grounding terminal:	100 Ω or less
Installation room:	Room temperature: 15 to 27°C Humidity: 60% or less
Room dimensions:	2,500 mm × 2,000 mm × 1,800 mm or more Door width: 850 mm or more

	W(mm)	D(mm)	H(mm)	Weight(kg)
EOS column unit	630	840	1480	Approx. 260
Rotary pump (RP): 1	530	230	320	Approx. 23
EDS unit*2				Approx. 5

Installation Room Example



EDS Applicable to two configurations: (A) Analysis and (LA) Low Vacuum & Analysis.

Main Specifications

● : Standard ○ : Option

		Basic	Standard
SEM integration	Built into the SEM control software	●	●
	Integrated management of observation & analysis data		
	Specifying analysis positions on the SEM operation screen (direct analysis on UI for SEM)		
	Graphical display of analysis positions		
Detector	SDD type	Refer to "Details of DrySD™ detectors"	
Spectral analysis	Qualitative analysis (peak identification, automatic qualitative analysis)	●	●
	Visual Peak ID		
	Standard-less quantitative analysis (ZAF method)		
	Standard quantitative analysis (ZAF method) *4		●
	PHI-RHO-Z (PRZ) method: quantitative correction method		
Line analysis	Line analysis (parallel & arbitrary direction)	●	●
Real-time net count map	Elemental map (map with multiple colors, monochrome, multiple-color superimposition)	●	●
	Maximum pixel resolution: 4,096 × 3,072		
	Real-time pop-up spectrum		
	Deconvolution map (net count map, quantitative map)		
	Real-time net count map		
	Real-time filter		
	Line profile display		
	Probe tracking		
Serial analysis	Spectral analysis, line analysis, elemental map	●	●
	Comprehensive analysis of already-analyzed data (qualitative & quantitative analysis)		
Montage	Automatic montage (SEM image, elemental map)	●	●
	Serial elemental mapping for multiple areas		
Particle Analysis Software	Particle analysis (auto / manual) & EDS analysis	○	○
	Classification of particle analysis data		
	Graph display of statistical processed particle analysis data		
	Large-area serial particle analysis & EDS analysis		
	Specifying the measurement area on Stage Navigation System		
Data management function Report generation	SMILE VIEW™ Lab	●	●
Help function	Help guide	●	●
Offline function	Offline software for data analysis	○	○

Details of DrySD™ detectors

Detection area	Energy resolution	Detectable elements
25 mm^2	130 eV or less	Be to U

Specifications subject to change without notice.

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