

TM4000PlusII / TM4000 II Specifications

Specifications

Item	Description	
Model name	TM4000Plus II	TM4000 II
Model No.	TM4000Plus	TM4000
Magnifications	10x - 100,000x (Photographic magnification*1) 25x - 250,000x (Monitor display magnification*2)	
Accelerating voltage	5 kV, 10 kV, 15 kV, 20 kV*3	
Image signal	Backscattered electron Secondary electron Mix (Backscattered electron + Secondary electron)	Backscattered electron
Vacuum mode	BSE: Conductor/Standard/ Charge-up reduction SE: Standard/ Charge-up reduction Mix: Standard/ Charge-up reduction	BSE: Standard/ Charge-up reduction
Image mode (BSE)	Normal/Shadow 1/Shadow 2/TOPO	
Sample stage traverse	X: 40 mm, Y: 35 mm	
Maximum sample size	80 mm (diameter), 50 mm (thickness)	
Electron gun	Pre-centered cartridge tungsten filament	
Signal detection system	High-Sensitivity 4-segment BSE detector High-Sensitivity Low- Vacuum SE detector (UVD)	High-Sensitivity 4-segment BSE detector
Auto image-adjustment function	Auto start, Auto focus, Auto brightness	
Image data saving	2,560 × 1,920 pixels, 1,280 × 960 pixels, 640 × 480 pixels	
Image format	BMP, TIFF, JPEG	
Data display	Micron marker, micron value, magnification, date and time, image number and comment, WD (Working Distance), accelerating voltage, vacuum mode, image signal, image mode	
Evacuation system (vacuum pump)	Turbo molecular pump: 67 L/s x 1 unit Diaphragm pump: 20 L/min x 1 unit	
Operation help functions	Raster rotation, Magnification presets (3 steps), Image shift (±50 μm @ WD6.0 mm)	
Safety functions	Over-current protection function, built-in ELCB	

Required PC specifications

Item	Description	
Model name	TM4000Plus II	TM4000 II
OS	Windows® 10 (64bit)	
Memory device	HDD, DVD-ROM Drive	

Size/weight

Item	Description	
Model name	TM4000Plus II	TM4000 II
Main unit (motorized stage)	330 (width) × 614 (depth) × 547 (height), 54 kg	
Main unit (manual stage)	330 (width) × 617 (depth) × 547 (height), 54 kg	
Diaphragm pump	144 (width) × 270 (depth) × 216 (height), 5.5 kg	

Optional accessories

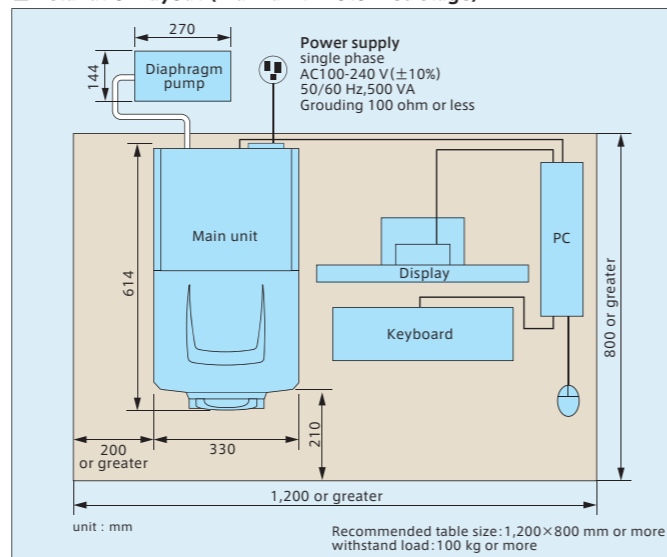
Camera navigation system	Tilt & rotation stage
Energy Dispersive X-ray Spectrometer (EDS)	Multi Zigzag function
Three-dimensional image display/ measurement function Hitachi map 3D	Cooling stage STEM holder

Installation conditions

Item	Description
Room temperature	15-30 °C (Δt: within ±2.5°C/h or less)
Humidity	- 70% RH (no condensation)
Power supply (main unit)	Single phase AC100-240 V (fluctuations in voltage: ±10%)

* Another power source for PC is required.

Installation layout (Main unit: Motorized stage)



- *1 Defined at photo size of 127 mm × 95 mm (4" × 5" picture size)
- *2 Defined at display size of 317 mm × 238 mm
- *3 There is a limit to the focus when using 20 kV
- * Please make room for more than 200 mm to the left side of a main unit and put it the closest to the center position of the table.
- * A table with caster is not suitable to put a main unit of TM4000 Series.
- * Please put a diaphragm pump under the table.
- * Periodical maintenance is required for this apparatus.
- * Powercables, earth terminal and table should be prepared by users.
- * TM4000 Series is not approved as a medical device.
- * Dedicated mentors, teachers who received the operation training of the instrument are required at compulsory schools.
- * It is advisable not to install or relocate the instrument by yourselves.
- * When relocating the system, please contact in advance the sales department that handles your account or a maintenance service company designated by Hitachi.
- * Screen shows simulated image.
- * Windows® is a registered trademark of U.S. Microsoft Corp. in U.S.A. and other countries.
- * Intel® is a registered trademark of Intel Corp. or its affiliated companies in the United States and/or other countries.



Science for a better tomorrow

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Notice: For correct operation, follow the instruction manual when using the instrument.

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HTD-E374 2020.1

Tabletop Microscope TM4000 II / TM4000Plus II

HITACHI
Inspire the Next

Tabletop Microscope TM4000 Series



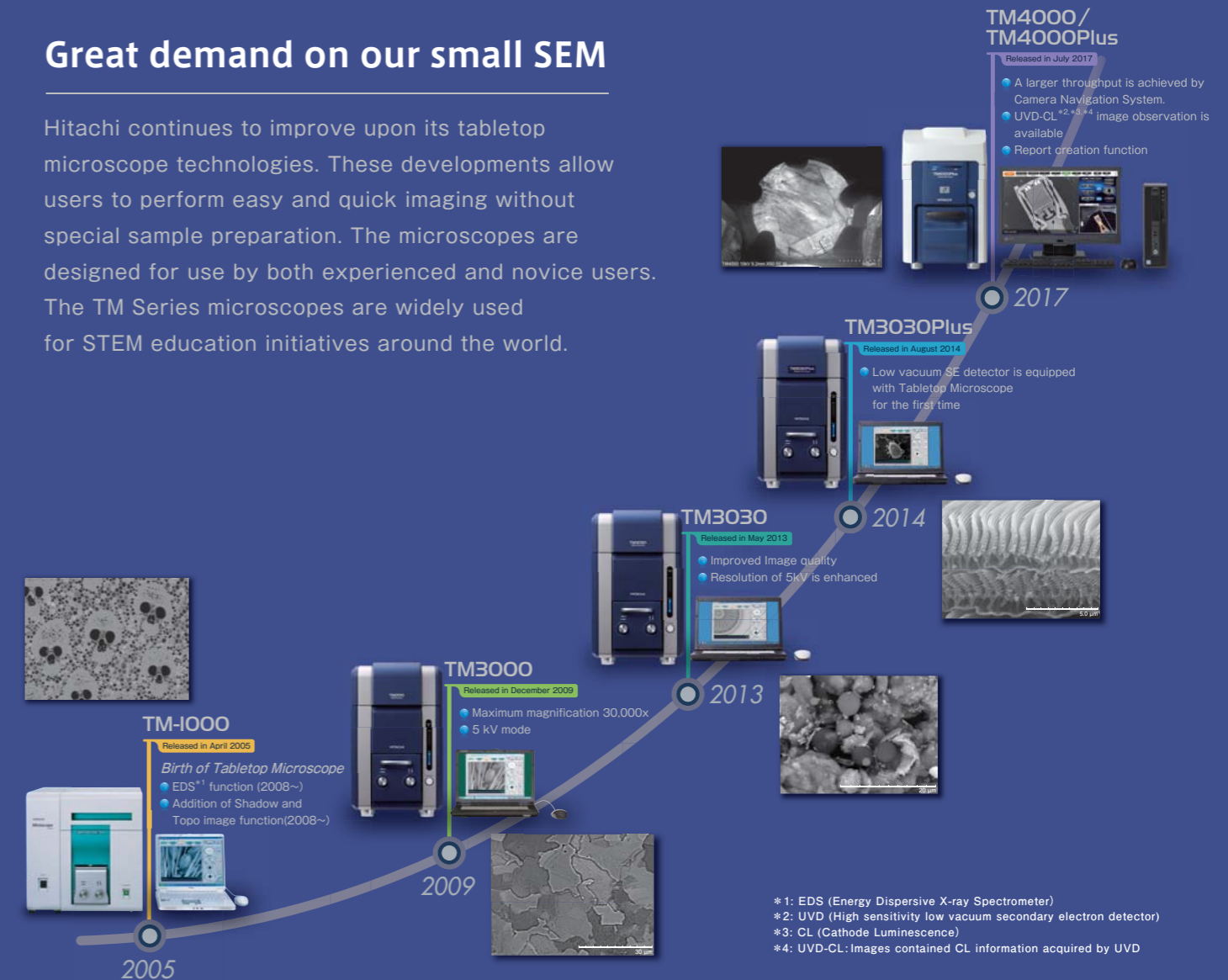
Science for
a better tomorrow

Tabletop Microscope TM4000 Series



Great demand on our small SEM

Hitachi continues to improve upon its tabletop microscope technologies. These developments allow users to perform easy and quick imaging without special sample preparation. The microscopes are designed for use by both experienced and novice users. The TM Series microscopes are widely used for STEM education initiatives around the world.



Easy & intuitive operation

A quality image can be obtained with simple steps.

▶ P3

No sample preparation

Non-conductive sample observation under low vacuum status.

▶ P5

High-sensitivity BSE detector

Various imaging applications using 4-segment BSE detector.

▶ P7

Low vacuum SE detector

Low vacuum SE detector providing surface detail and topography.

TM4000PlusII ▶ P9

Image mixing (BSE + SE)

Simultaneous imaging of various information.

TM4000PlusII ▶ P11

Features *New!*

- 20 kV accelerating voltage for improving both imaging and analytical capabilities.
- Multi Zigzag for large area or multiple areas.

▶ P12

The image on the screen includes options. * Option

Easy & intuitive operation

A quality image can be obtained with simple steps.

1 Sample setting



Sample: Movement of watch

2 Sample observation



1 Start Click the start button.



2 Auto start procedure is activated.



3 Image of magnification x100 will be displayed.

Within several minutes to obtain an image.

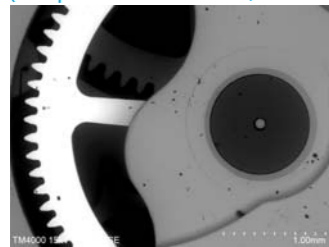
Automation, Observation, and Elemental Analysis

One-click operation



Easy to switch images with one-click.

Backscattered electron image (Compositional information)



Secondary electron image (Surface information)*1



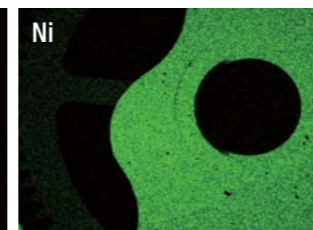
Mixed image (Back scattered electron and Secondary electron images)*1



Compositional analysis



Rapid acquisition of elemental maps*2



Sample: Movement of watch

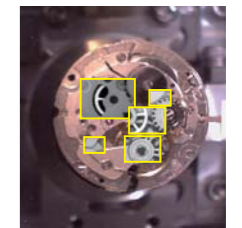
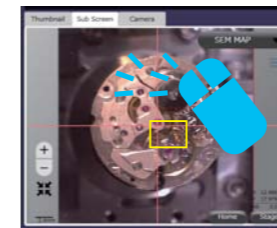
*1 Secondary electron images and MIX images can only be observed in TM4000Plus II
*2 Option

Intuitive operation on Camera Navi*

Easy operation



Use of optical images helps navigate to target observation area easily. Obtained SEM images can be layered on a SEM MAP image.



Sample: Movement of watch
*Option: Camera Navigation System

Report Creator

Build reports quickly



Simply select images and a template to create a customized reports. Created reports can be saved/edited in Microsoft Office® formats.



Sample: Movement of watch
The image on the screen includes options.

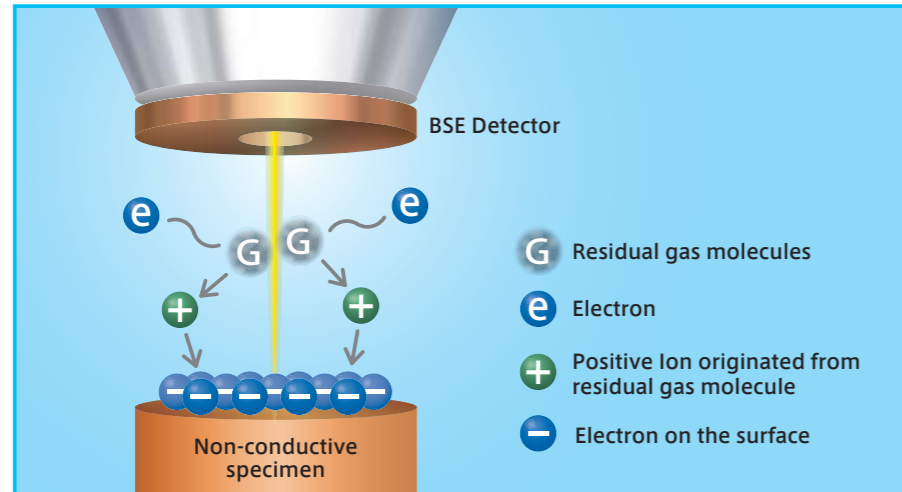


Simple observation on water/oil contained samples

When a non-conductive sample is observed under a high-vacuum state, electrons accumulate on the sample surface causing a charging phenomenon, which prevents imaging. In order to reduce phenomenon, samples are usually coated with a thin layer of conductive material prior to observation. This process is not only time consuming, but also interferes with imaging of surface details as well as EDS analysis. The TM4000 II is equipped "Charge-up reduction mode" for saving your time and removing the interferes.

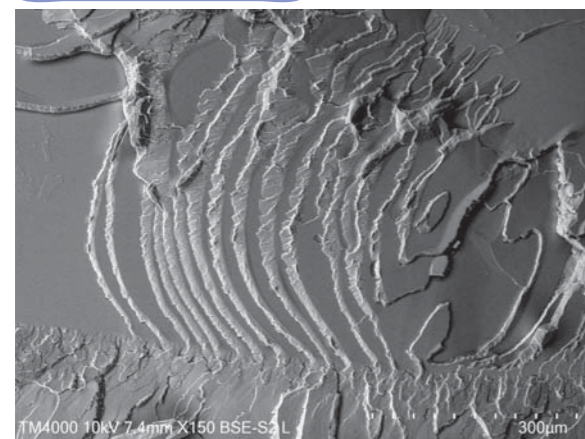
Low-vacuum microscopy

By utilizing a lower vacuum level inside the specimen chamber, more gas molecules are present. These gas molecules **G** collide with the electron beam to generate positive ions **+** and electrons **e**. Each positive ion **+** can be neutralized by one of the excess electrons **-** on the specimen surface. This way, the excess electrons on the surface of the sample are removed and the charging is eliminated or reduced.



Observation without coating

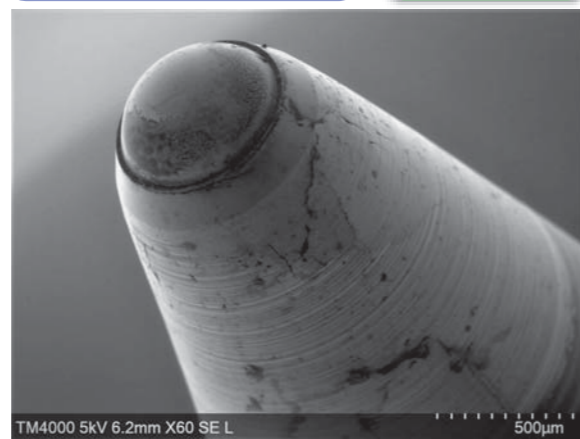
Non-conductive sample



TM4000 10kV 7.4mm X150 BSE-S2 L
Accelerating voltage: 10 kV
Image signal: BSE (Shadow)
Magnification: 150x
Sample: Fracture surface of Resin

Water/Oil contained sample

TM4000PlusII



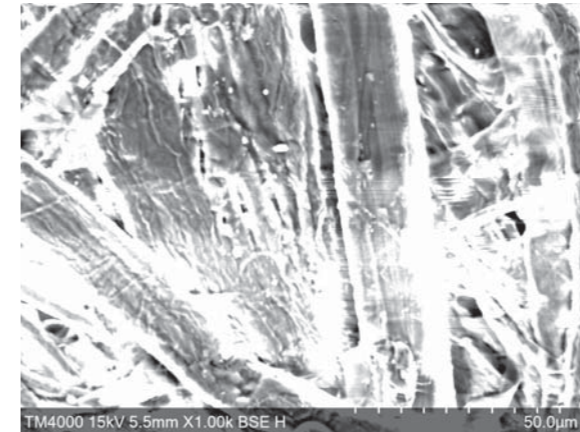
TM4000 5kV 6.2mm X60 SE L
Accelerating voltage: 5 kV
Image signal: SE
Magnification: 60x
Sample: Tip of a ball-point pen



Charge-up reduction mode

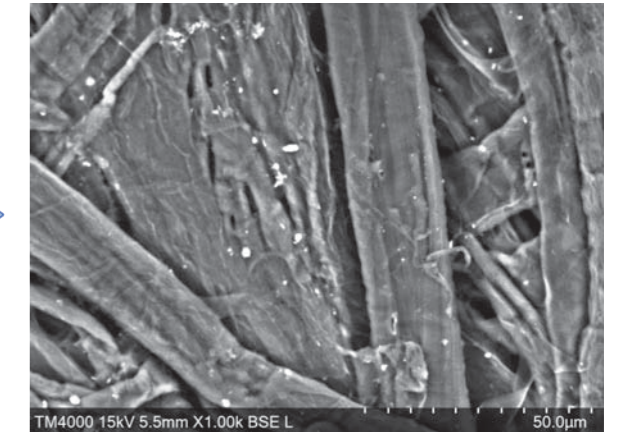
Charge on a sample can be reduced by one-click.

Without charge-up reduction mode



TM4000 15kV 5.5mm X1.00k BSE H
Accelerating voltage: 15 kV
Image signal: BSE
Magnification: 1,000x

With charge-up reduction mode



TM4000 15kV 5.5mm X1.00k BSE L
Accelerating voltage: 15 kV
Image signal: BSE
Magnification: 1,000x
Sample: Recycled paper

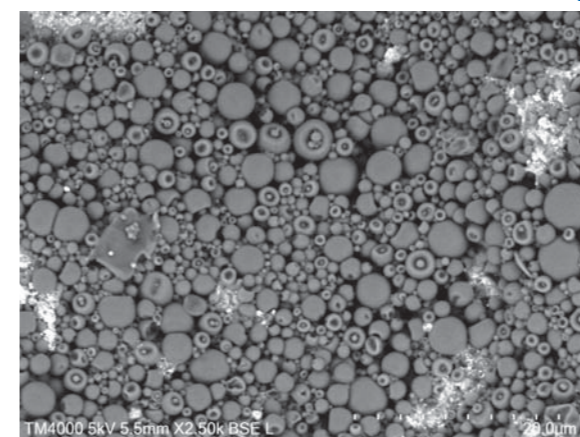


Image a variety of materials under low vacuum condition

The images show observations of non-conductive samples such as ink toner particles and a hydrated leaf surface.

BSE image

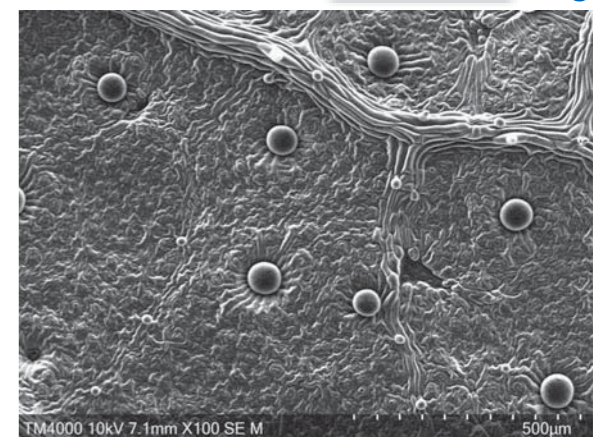
P7



TM4000 5kV 5.5mm X2.50k BSE L
Accelerating voltage: 5 kV
Image signal: BSE
Magnification: 2,500x
Sample: Paint ink

SE image

TM4000PlusII P9

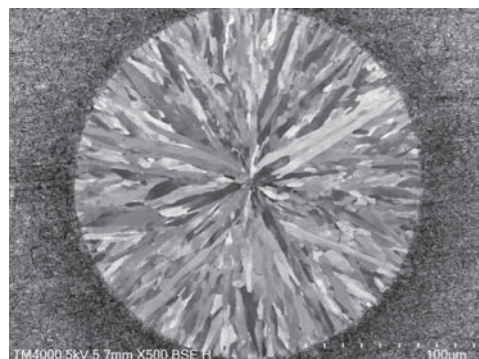


TM4000 10kV 7.1mm X100 SE M
Accelerating voltage: 10 kV
Image signal: SE
Magnification: 100x
Sample: Leaf of plant

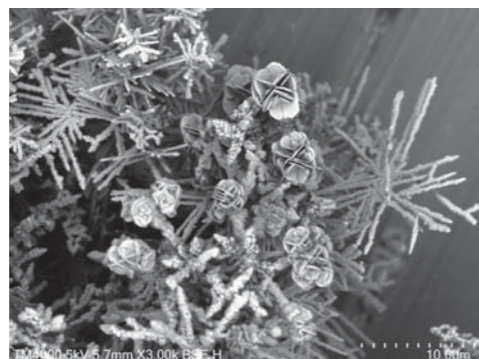
Composition/
Fine structure

Compositional contrast and fine structure observation

The TM4000 Series is equipped with a high-sensitivity four-segments BSE detector which is used to observe the different brightness levels representing composition in the sample or traditional topographic imaging.



TM4000 5kV 5.7mm X500 BSE H
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 500x
Sample: Metal wiring



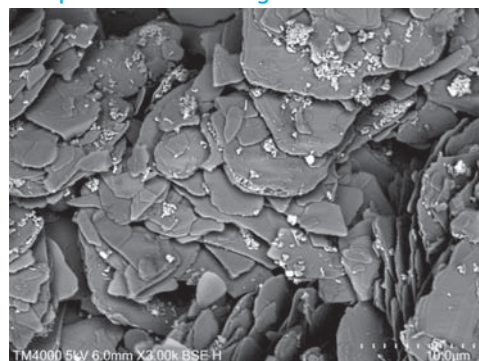
TM4000 5kV 5.7mm X3,000 BSE H
Accelerating voltage: 5 kV
Image signal: BSE Maghification: 3,000x
Sample: Copper crystal

5 kV BSE*

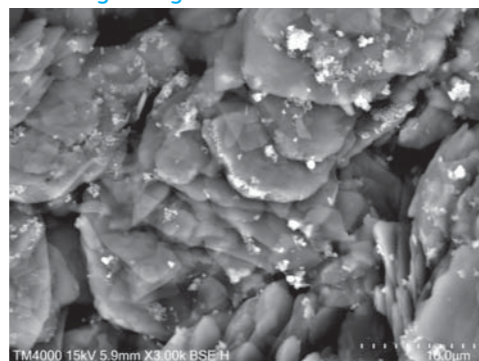
Compositional contrast including surface details using lower accelerating Voltage

Under lower accelerating voltage conditions, the electron signals are generally reduced due to loss of emission and brightness. The TM4000 II Series optimizes the emission across the voltage range to maintain a higher brightness level, even at the lower 5 kV accelerating voltage.

Comparison of BSE images between low and high accelerating voltages



TM4000 5kV 6.0mm X3,000 BSE H
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 3,000x



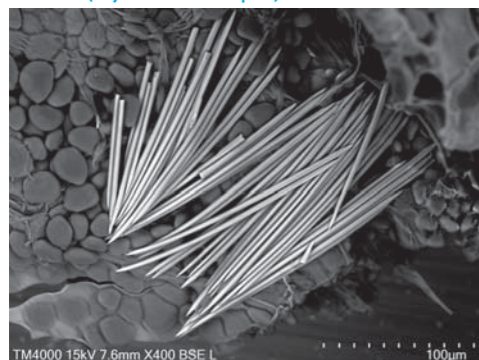
TM4000 15kV 5.9mm X3,000 BSE H
Accelerating voltage: 15 kV
Image signal: BSE Magnification: 3,000x
Sample: Cosmetic foundation

*BSE
(Backscattered Electron)

Application
example

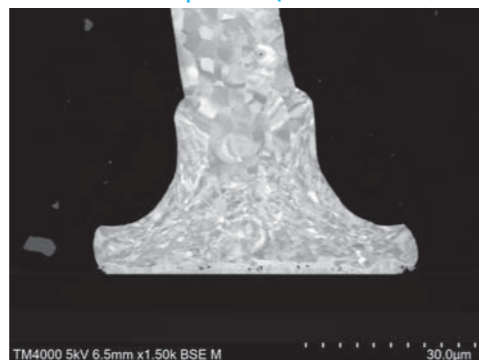
Observation examples using BSE detector

Food (Hydrated sample)



TM4000 15kV 7.6mm X400 BSE L
Accelerating voltage: 15 kV
Image signal: BSE
Magnification: 400x
Sample: Chinese yam

Electronic components (Grain contrast)

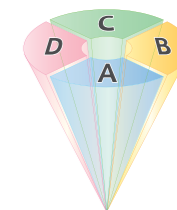


TM4000 5kV 6.5mm x1,500 BSE M
Accelerating voltage: 5 kV
Image signal: BSE
Magnification: 1,500x
Sample: Au Bonding Wire
Sample treated by Hitachi ion milling system

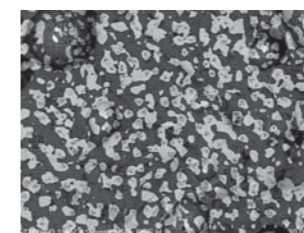
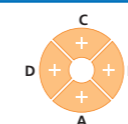


Multiple images observation

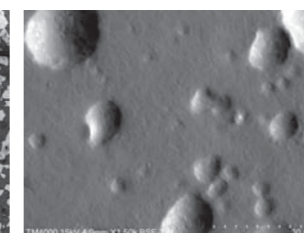
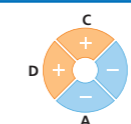
The TM4000 II Series features a backscattered-electron detector with four fully controllable independent segments. By utilizing the segments in different combinations, it is possible to emphasize compositional or topographical detail from the sample, as well as producing 'shadowed' images which highlight the surface from multiple directions.



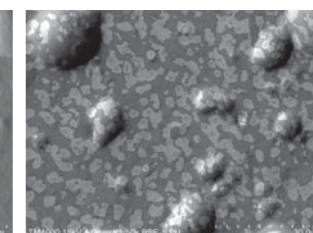
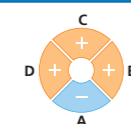
Compo



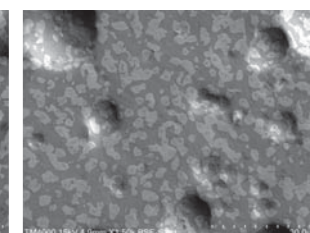
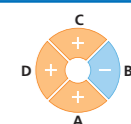
Topo



Shadow 1



Shadow 2



Sample: Solder

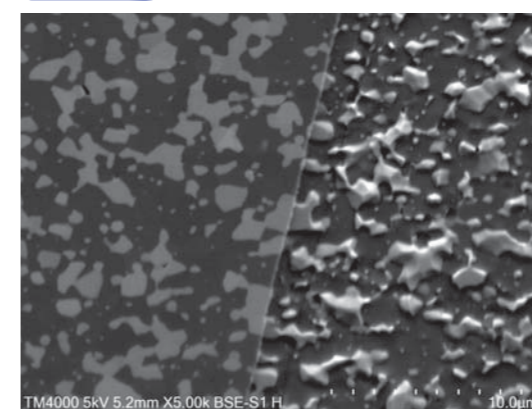


Three-Dimensional image display/ measurement function*

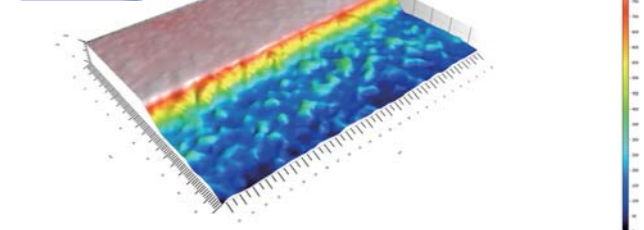
Hitachi map 3D

Three-dimensional images are obtainable without sample tilting or concerns about image shift since this 3D function utilizes the 4-segment BSE detector which can detect images from 4 distinct directions. Surface roughness can be measured easily based on the height measurement between 2 points (line profile), and the entire surface area (3D model).

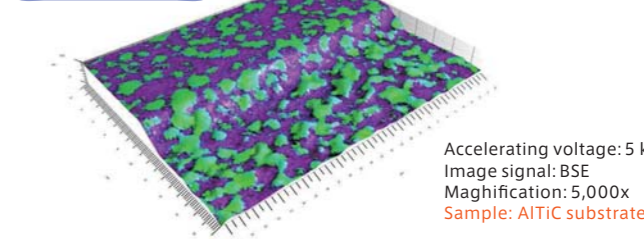
BSE image



3D model



3D model + EDS



Accelerating voltage: 5 kV
Image signal: BSE
Maghification: 5,000x
Sample: AlTiC substrate

* Option

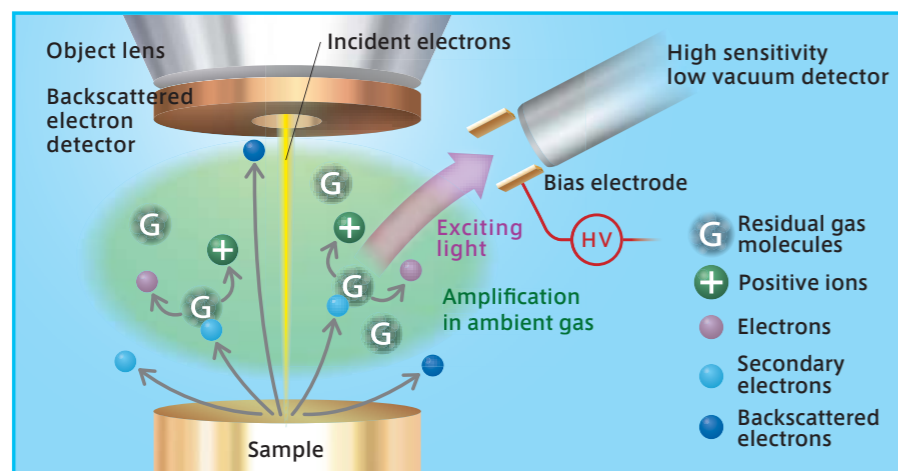
SE imaging under Low vacuum mode

Innovative secondary-electron detector to obtain surface detail with non-conductive samples at lower vacuum conditions

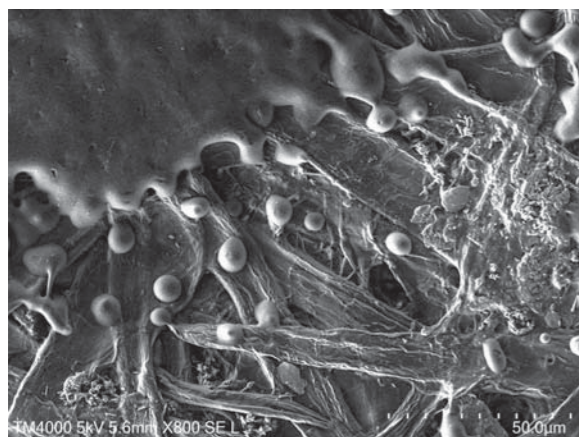
The TM4000Plus II can observe not only conductive samples, but also non-conductive or hydrated samples without sample preparation. Switching between BSE and SE can be performed easily.

High-sensitivity Low vacuum SE Detector (UVD)

Hitachi's UVD generates secondary-electron images by detecting visible light excited by the electron gas interactions.

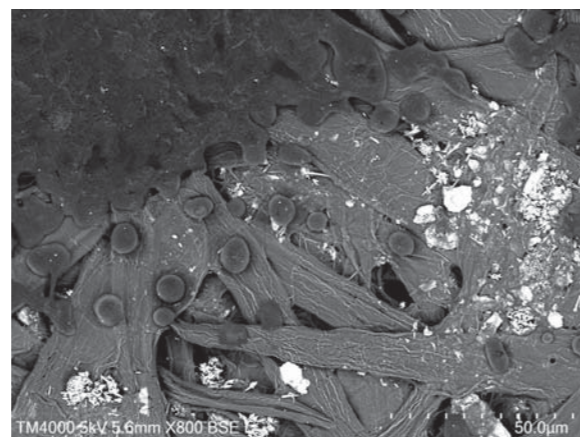


SE image (surface information)



TM4000 5kV 5.6mm X800 SE L
Accelerating voltage: 5 kV
Image signal: SE
Magnification: 800x

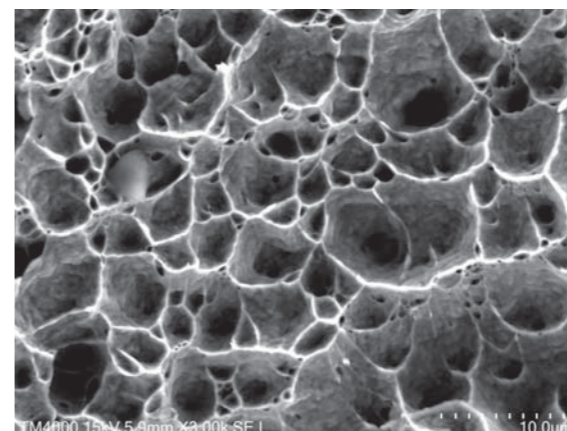
BSE image compotional information



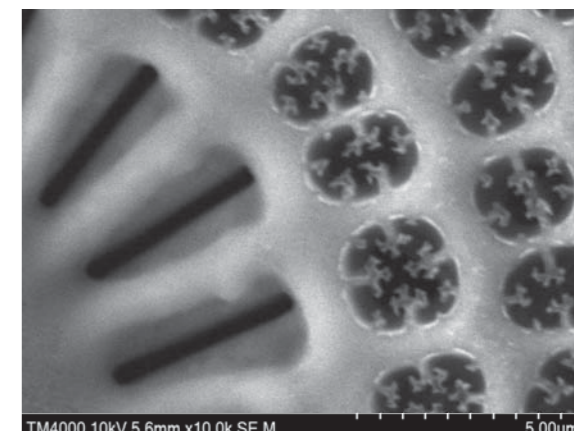
TM4000 5kV 5.6mm X800 BSE L
Accelerating voltage: 5 kV
Image signal: BSE
Magnification: 800x
Sample: Printed paper

Application data

Fine surface structure observation



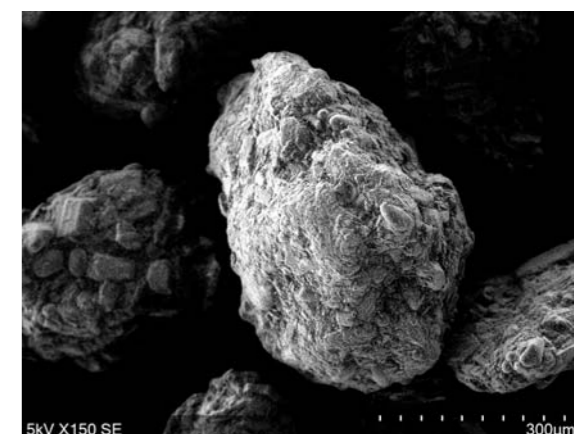
TM4000 15kV 5.9mm X3.00k SE L
Accelerating voltage: 15 kV
Image signal: SE Magnification: 3,000x
Sample: Metal fracture surface



TM4000 10kV 5.6mm x10.0k SE M
Accelerating voltage: 10 kV
Image signal: SE Magnification: 10,000x
Sample: Diatom



TM4000 5kV 8.0mm x1.00k SE L
Accelerating voltage: 5 kV
Image signal: SE Magnification: 1,000x
Sample: Functional Film

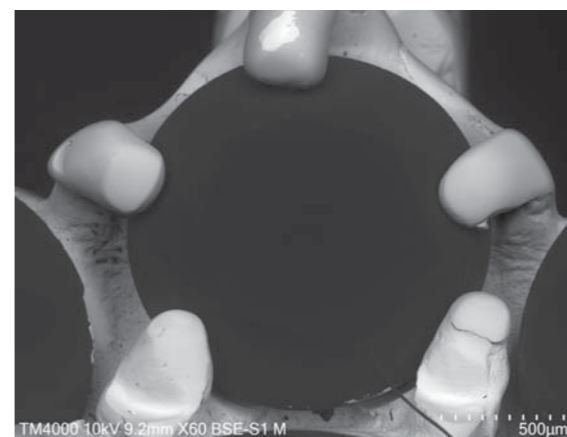


5kV X150 SE
Accelerating voltage: 5 kV
Image signal: SE Magnification: 150x
Sample: Powder Medicine

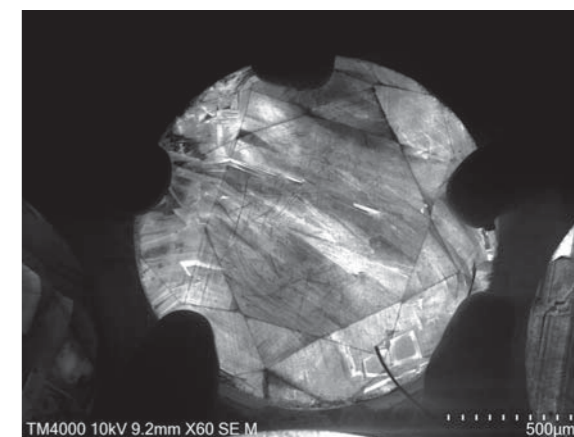
Application data

UVD-CL* image observation

UVD enables to obtain CL information instead of cathode luminescence (CL) detector. In addition, simultaneous imaging of BSE and UVD-CL becomes possible.



TM4000 10kV 9.2mm X60 BSE-S1 M
Accelerating voltage: 10 kV
Image signal: BSE Magnification: 60x



TM4000 10kV 9.2mm X60 SE M
Accelerating voltage: 10 kV
Image signal: UVD-CL Magnification: 60x
Sample: Diamond Ring

*UVD-CL: Image contains CL information captured by UVD

Image mixing
(BSE + SE)

Simultaneous imaging of various information.

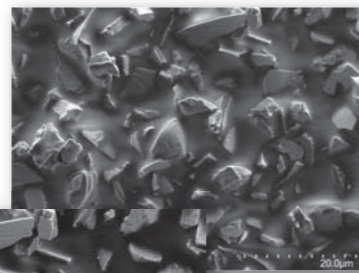
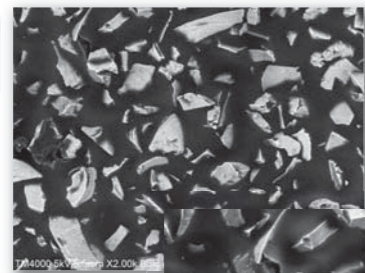
Mix image



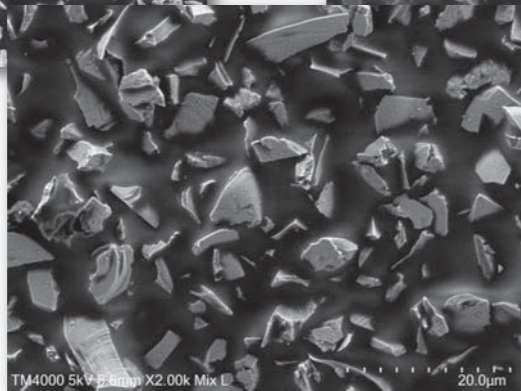
A Single image includes both surface and compositional information

The BSE images shows the composition information and the SE image shows the surface information. By layering the both images in one image as a mixed image, the both composition and surface information of a sample can be observed in one image.

Compositional information (BSE)



Surface detail information (SE)



Mixed image (BSE + SE)

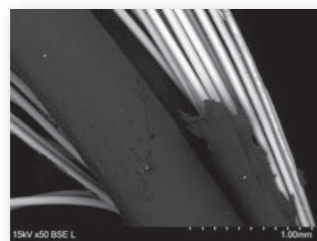
Accelerating voltage: 5 kV
Magnification: 2,000x
Sample: Sandpaper

Application data

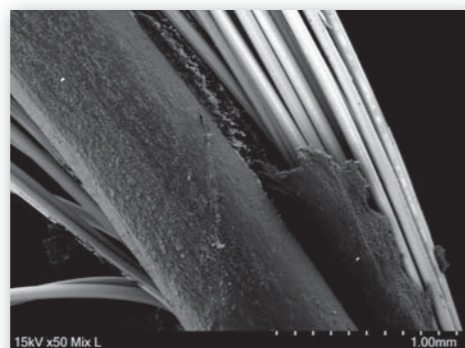
Advantage of mixing images

In addition to imaging of BSE and SE information, TM4000Plus II is capable of layering these images. Therefore, the both characteristic information can be viewed in on image. Furthermore, the BSE, SE and mixed image (BSE+SE) can be switched with one-click.

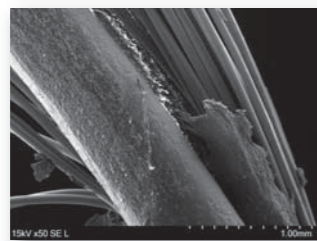
BSE



BSE + SE



SE



Accelerating voltage: 15 kV
Magnification: 50x
Sample: Power cord

Features

New!

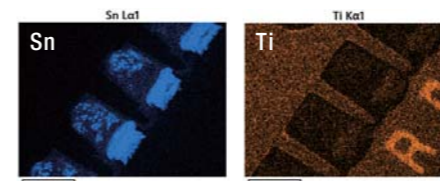
- 20 kV accelerating voltage for improving both imaging and analytical capabilities.
- Multi Zigzag for large area or multiple areas.

Advantages of 20 kV accelerating voltage

High accelerating voltage enables higher-speed EDS analysis.

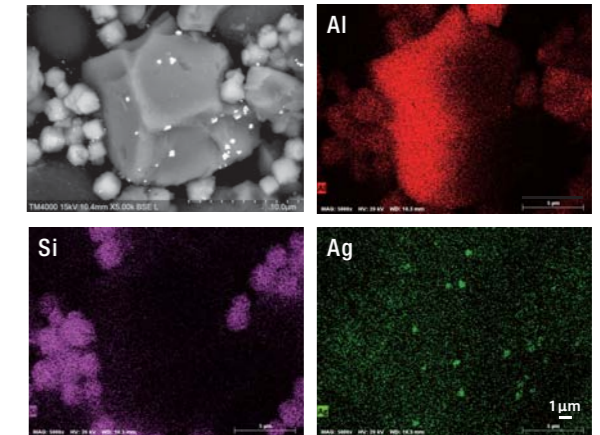
EDS mapping data at 20 kV in 2 min

20 kV accelerating voltage



Sample: Electronic components

EDS mapping data of Ag nano particles

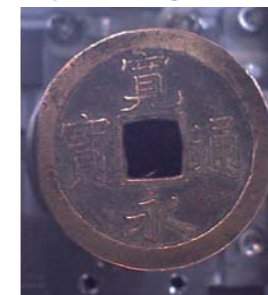


Magnification: 5,000x Sample: Sprayed powder

Multi Zigzag*

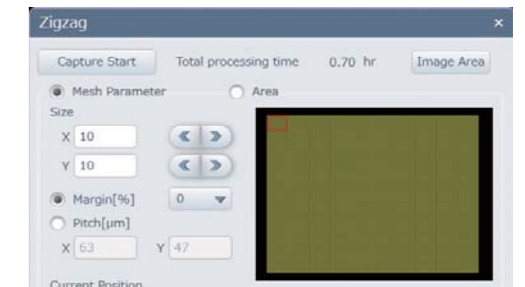
A function that takes multiple high-magnification images and stitches them together to create a single high-resolution image.

<Optical image>



Zigzag conditions

Setting matrix parameters for image array such as field of view, number of images, pitch, and overlay from menu.



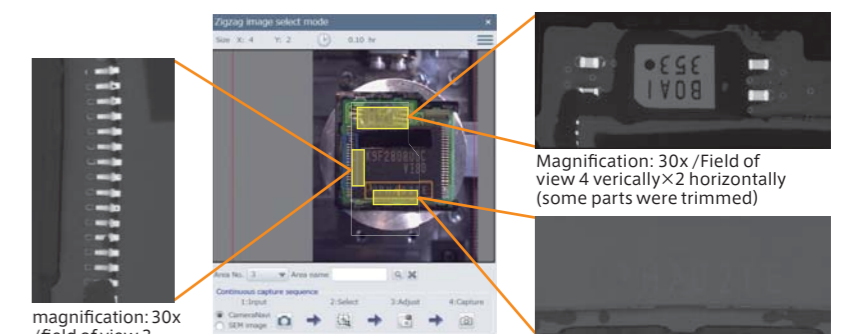
<Stitching>



Acceleration voltage: 15 kV
Image signal: SE
Magnification: 30x
Field of view 10 vertically x 12 horizontally (some parts were trimmed)
Sample: Japanese ancient coin

Zigzag specification

Multiple fields and locations can be specified for each sample.



magnification: 30x / field of view 3 vertically x 7 horizontally (some parts were trimmed)

Magnification: 30x / field of view 4 vertically x 2 horizontally (some parts were trimmed)

Magnification: 30x / field of view 4 vertically x 2 horizontally (some parts were trimmed)

Sample: Electronic components

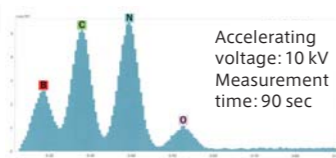
* Option for motor drive stage

Quantax 75

High energy resolution detector and advanced user friendly analysis software.

High-energy resolution detector

The high-energy resolution detector allows light elements such as boron to be analyzed with high accuracy.



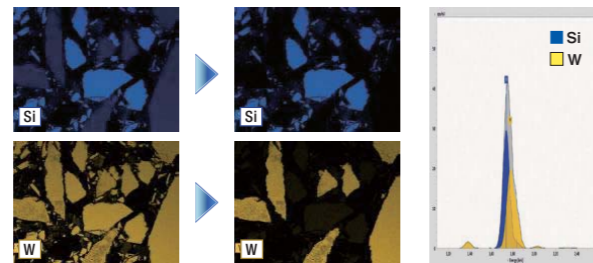
Produced by Bruker nano GmbH



Sample configuration in combination with a TM4000 series instrument

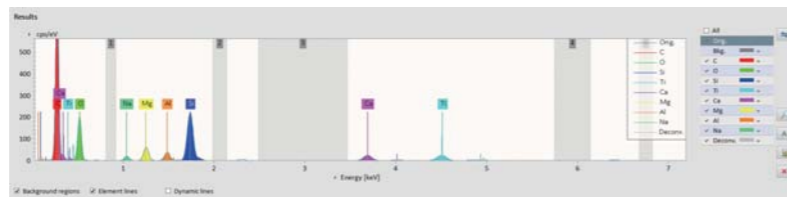
Live deconvolution to separate overlapping elements

Allows spectra with overlapping peaks to be separated and visually mapped in real time.



Peak fitting function

Automatic background subtraction and peak fitting (automatic/arbitrary) provide highly reliable element identification. To be able to estimate the self-measurement conditions, electron beam penetration depth, spread, and density in the actual sample, it is possible to simulate the actual measurement area.



Element

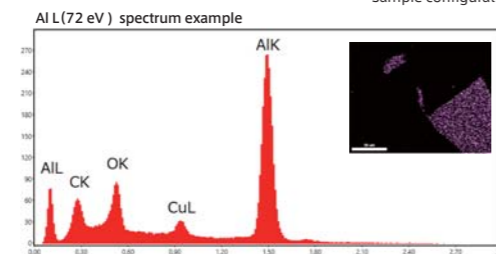
Advanced EDS features for tabletop SEM

Si₃N₄ Window

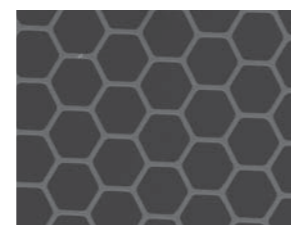
Si₃N₄ Window to optimize low energy X-ray transmission for light element analysis. Compared with conventional detector window, there is improved mapping speed and detection limit.



High X-ray transmittance



Extreme low energy detection



Hexagonal support grid for increased transmission

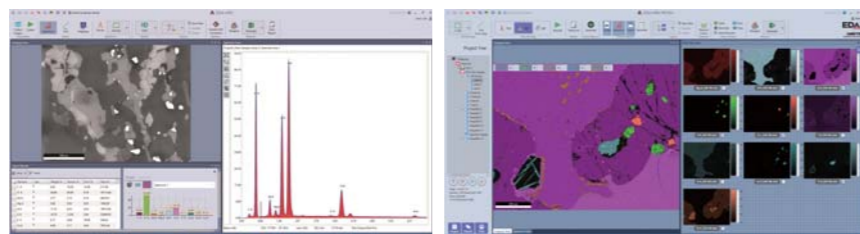
Produced by EDAX Inc.



Sample configuration in combination with a TM4000 series instrument

APEX Software

- Easy to Interpret Data
- Multi user logins
- User configurable windows
- Customizable reporting
- Simplified automation
- Fast mapping
- Collect/Review simultaneously
- Spectrum Match Libraries



Aztec Series

- Live Spectrum Viewer with Automatically labelled peaks can be shown. (AZtecLiveOne)
- High-throughput analysis with high-precision pile-up correction function and TruQ™ Technologies.
- TruMap generates element maps that peak overlaps removed in real time.

Produced by Oxford Instruments NanoAnalysis

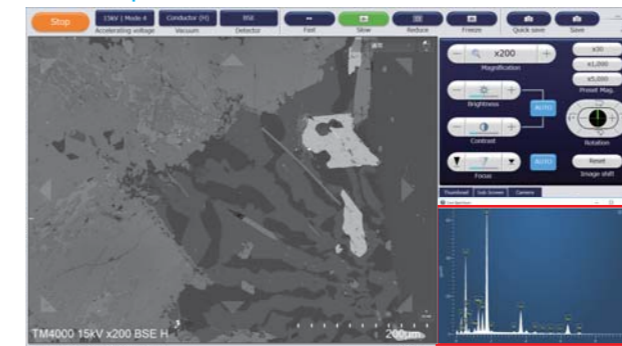


Sample configuration in combination with a TM4000 series instrument

Live EDS function

Live Spectrum View is available on the TM4000 User Interface to see the X-ray spectrum with Automatically labelled peaks. It allows you to confirm elemental information with secondary electron images and/or backscattered electron images, even while moving around your sample.

Live EDS spectrum



Mapping Image



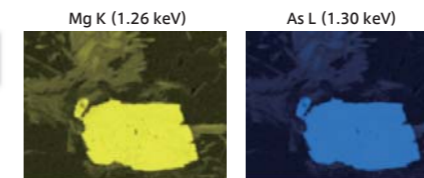
AZtecLiveOne

High precision/ Highly reliable TruMap

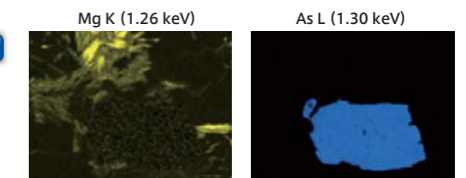
The TruMap feature allows multi-element spectra to be properly separated and background subtracted in real time, resulting in a precise elemental map with no image contamination due to overlapping peaks.

AZtecLiveOne: standard feature
AZtecOne: Option

Typical ROI MAP



TruMap



Sample: Sulfide ore

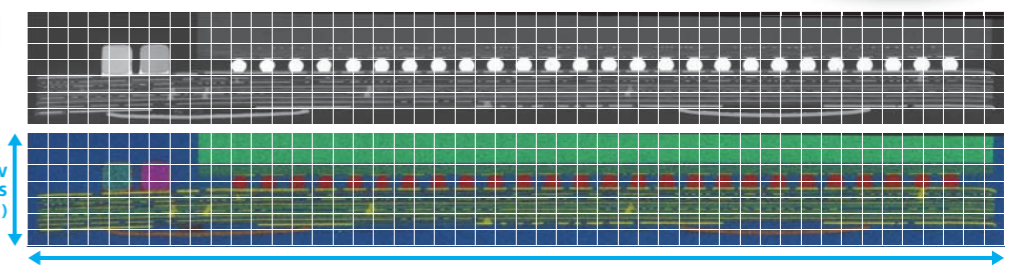
Advanced Analysis Functions

The AZtecEnergy system offers advanced analytical functionality and flexible configurations with an ability to automate analysis via a motorized stage. AZtecEnergy enables large-area mapping and particle analysis.

AZtecEnergy

Large-area mapping

The mapping software automatically acquires data for multiple specified regions to produce a single combined set of mapping information.



48 view segments (17.6 mm)

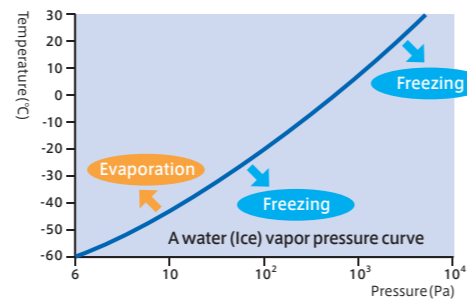
Magnifications: 400x
Sample: Cross section of electronic component



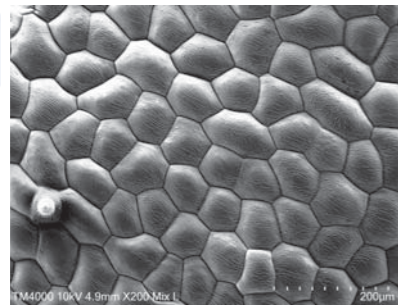
Cooling stage

Produced by Deben UK Ltd.

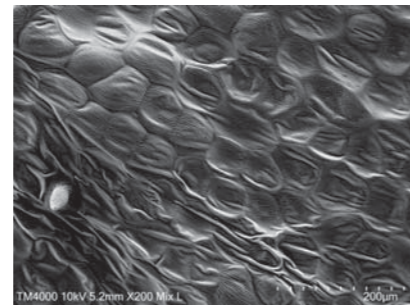
The cooling stage allows samples to be cooled to temperatures as low as -25 °C and kept at the temperature up to a few hours. It is particularly well suited for observation of hydrated samples such as foods and biological tissues, or samples susceptible to thermal damage.



Low temperature Observation



Room temperature observation



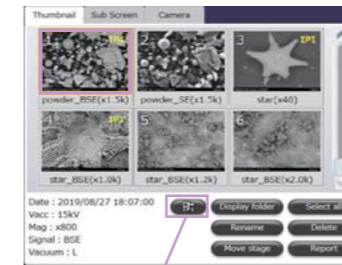
Accelerating voltage: 10 kV
Image signal: Mix
Magnification: 200x
Sample: Petal

Image Processing, Measurement, and Analysis Software: Image Pro® for Hitachi

Produced by Media Cybernetics

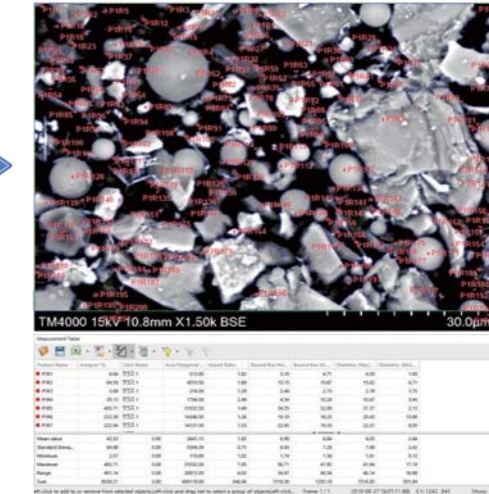
The TM4000 II features integration icon to transfer images into Image Pro® Software with a single click.

Capable to transfer images from SEM software

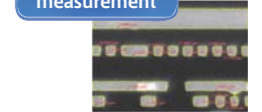


Transfer button

Particle size and distribution analysis example



Binary automatic measurement



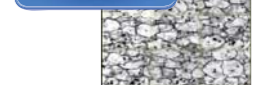
Particle Analysis



Fiber measurement



Stitching Image



Easy maintenance



Oil-free vacuum pump and pre centered cartridge filaments are equipped a standard.



Diaphragm pump



Pre-centered cartridge filament

Maintenance kit available for your daily use.*



*Option



Tilt & Rotation stage

Produced by Deben UK Ltd.

Observation range of 15° to 60° tilting angles and full 360° rotation are available on the tilt and rotation stage.



Tilt: 0°



Tilt: 45°+Rotation

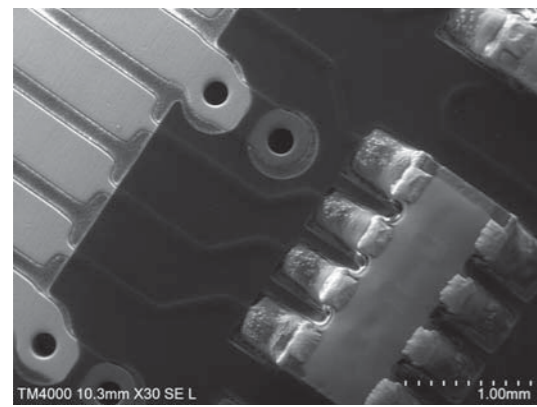


Tilt: 45°+Rotation

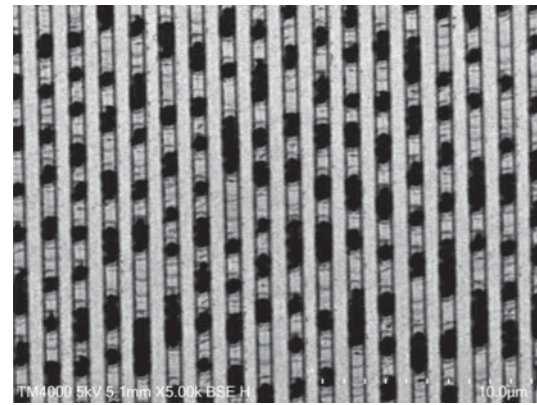


Accelerating voltage: 15 kV
Image signal: BSE, Mix
Magnification: 150x
Sample: Haemaphysalis longicornis
Sample courtesy of professor Tomoyuki Shimano, Hosei University

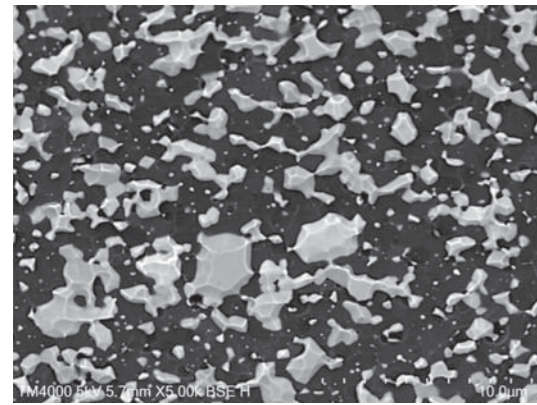
Electronic components



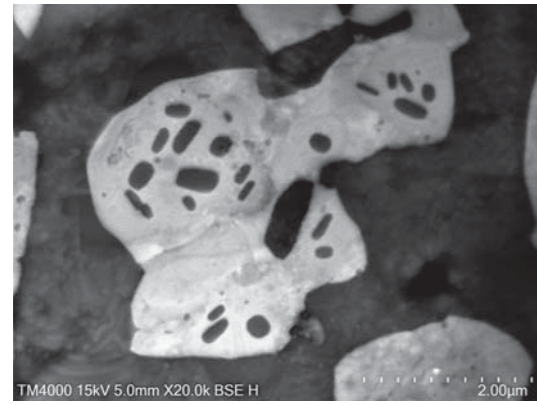
TM4000 10.3mm X30 SE L
Accelerating voltage: 15 kV
Image signal: SE Magnification: 30x
Sample: Electronic substrate



TM4000 5kV 5.1mm X5.00k BSE H
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 5,000x
Sample: CD

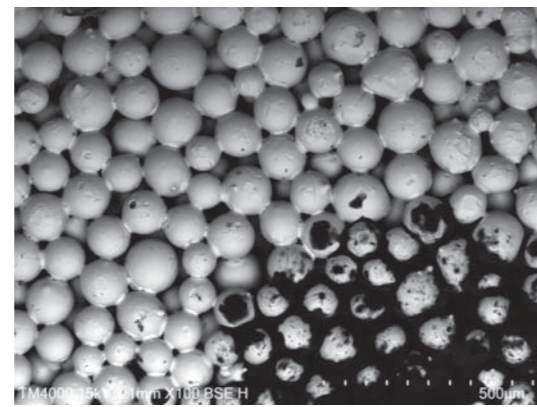


TM4000 5kV 5.7mm X5.00k BSE H
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 5,000x
Sample: AlTiC substrate

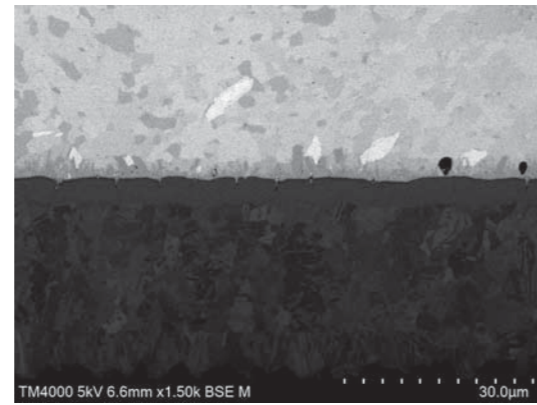


TM4000 15kV 5.0mm X20.0k BSE H
Accelerating voltage: 15 kV
Image signal: BSE Magnification: 20,000x
Sample: Solder

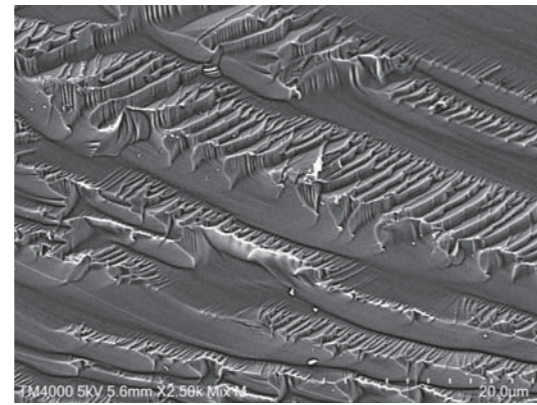
Metal & inorganic materials



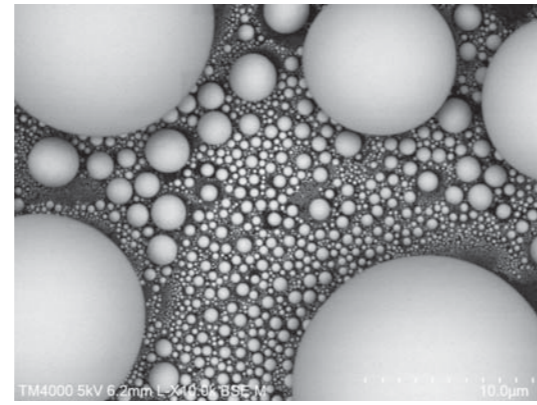
TM4000 15kV 5.0mm X100 BSE H
Accelerating voltage: 15 kV
Image signal: BSE Magnification: 100x
Sample: Oil on metal filter



TM4000 5kV 6.6mm x1.50k BSE M
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 1,500x
Sample: Nickel plating
Ion milling used

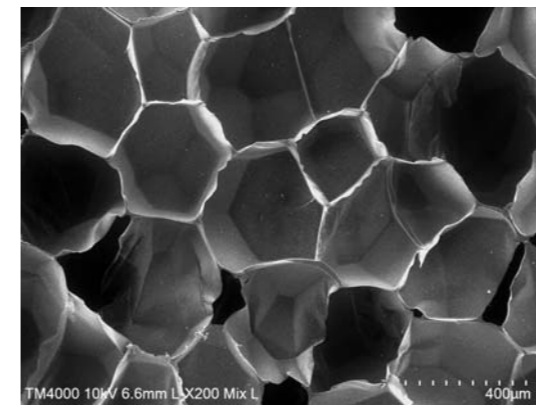


TM4000 5kV 5.6mm X2.50k MIX M
Accelerating voltage: 5 kV
Image signal: Mix Magnification: 2,500x
Sample: Silicon base fracture surface

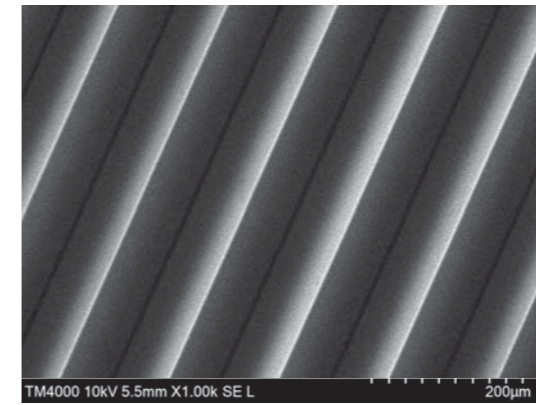


TM4000 5kV 6.2mm X4.0k BSE H
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 10,000x
Sample: Tin particles

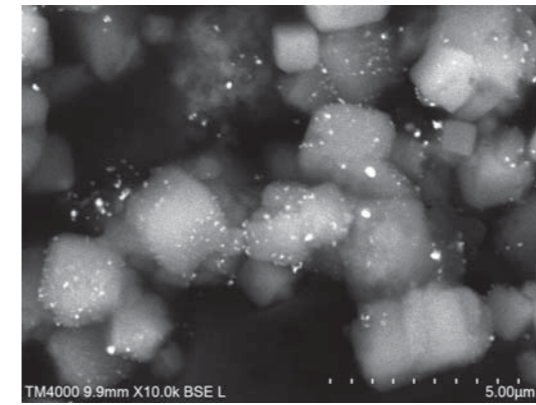
Processed product



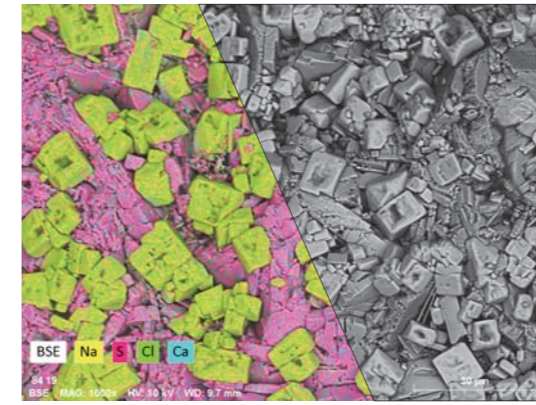
TM4000 10kV 6.6mm LX200 Mix L
Accelerating voltage: 10 kV
Image signal: Mix Magnification: 200x
Sample: Form Resin



TM4000 10kV 5.5mm X1.00k SE L
Accelerating voltage: 10 kV
Image signal: SE Magnification: 1,000x
Sample: Film

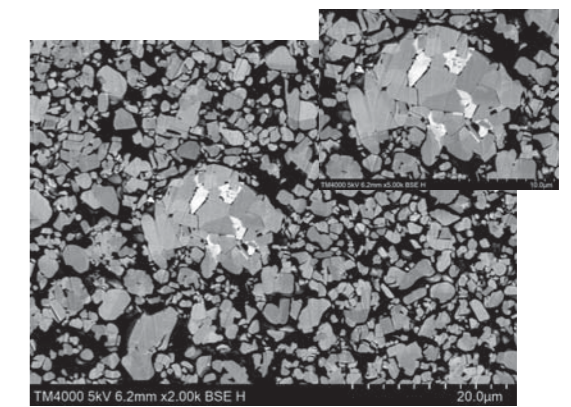


TM4000 9.9mm X10.0k BSE L
Accelerating voltage: 15 kV
Image signal: BSE Magnification: 10,000x
Sample: Ag catalyst in powder spray

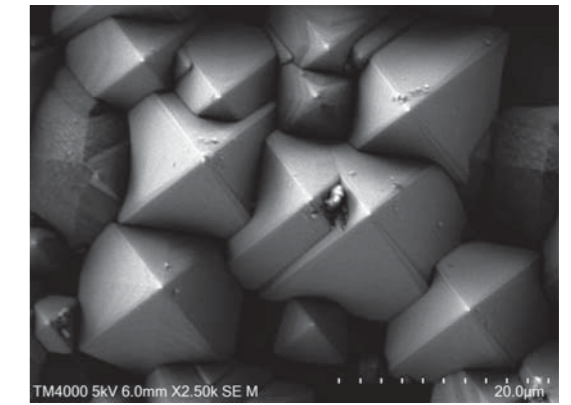


Accelerating voltage: 10 kV
Image signal: Left EDS Mapping Right BSE Magnification: 1,000x
Sample: Bath salts

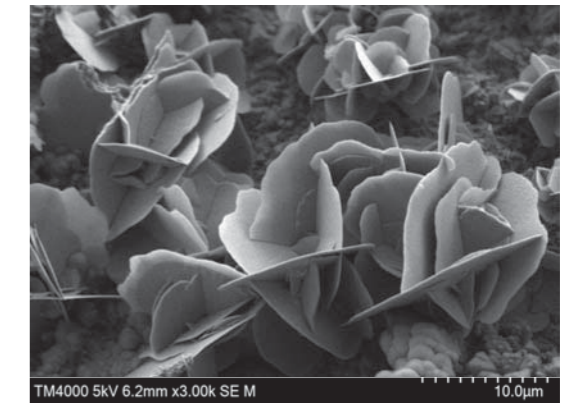
Enviromental & energy material



TM4000 5kV 6.2mm x2.00k BSE H
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 5,000x
Sample: Lithium Ion battery
Ion Milling used



TM4000 5kV 6.0mm X2.50k SE M
Accelerating voltage: 5 kV
Image signal: SE Magnification: 2,500x
Sample: Solar cell



TM4000 5kV 6.2mm x3.00k SE M
Accelerating voltage: 5 kV
Image signal: SE Magnification: 3,000x
Sample: Copper crystal (Copper sulfide)



TM4000 5kV 6.2mm X5.00k BSE H
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 5,000x
Sample: Cement

Secondary electron images and MIX images can only be observed in TM4000Plus II *Option

Minerals

Zircon UVD-CL*¹ observation example

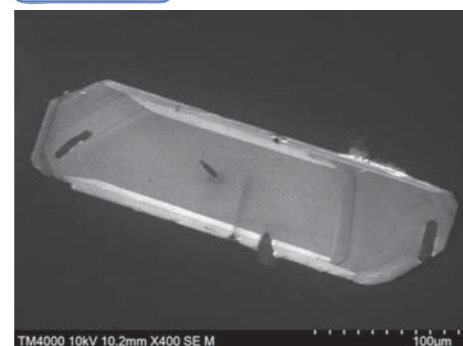
Following are BSE and UVD-CL images of a zircon cross section. Although the compositional difference cannot be confirmed from the BSE image, the UVD-CL image shows the difference via the striped pattern from the emission intensity. This zircon also contains apatite as an inclusion. Zr which is one of the components of "Zircon" and P which is the component of apatite are overlapped in each peak. Normally this combination of elements is difficult to identify with traditional EDS*² mapping, but the distribution of Zr and P can be distinguished by using a peak separation mapping.

BSE Image



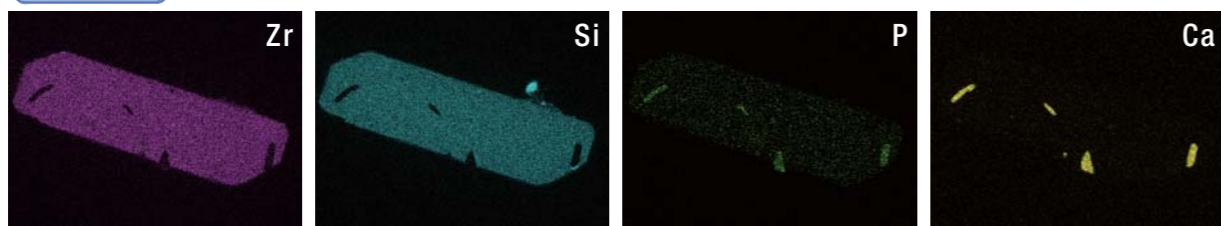
TM4000 10kV 10.2mm X400 BSE L
Accelerating voltage: 10 kV
Magnification: 400x

UVD-CL Image



TM4000 10kV 10.2mm X400 SE M
Accelerating voltage: 10 kV
Magnification: 400x

EDS Mapping



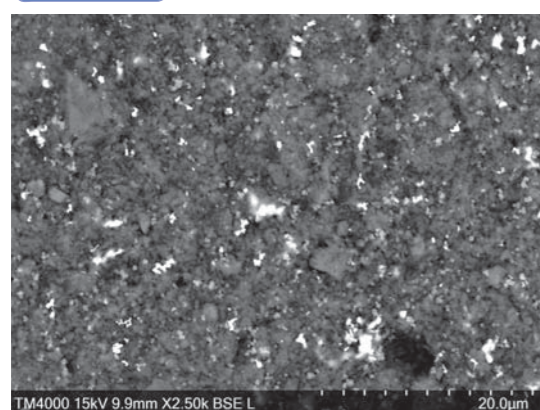
Sample: Zircon

Processed product

UVD-CL*¹ observaiton for fluorecence brightener on paper

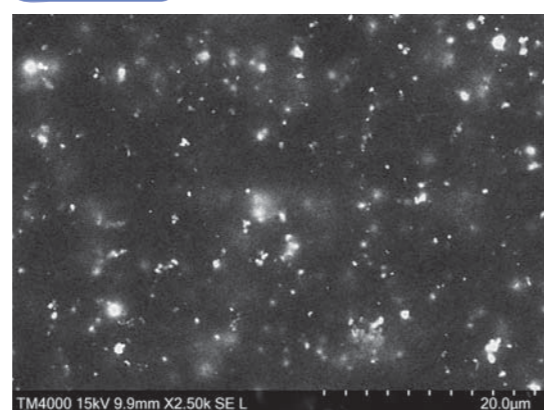
Dispersion of fluorecence brightener which is used for color development on paper is difficult to distinguish between SE and BSE detectors, but UVD-CL allows for these brightener particles to be visible.

BSE Image



TM4000 15kV 9.9mm X2.50k BSE L
Accelerating voltage: 15 kV
Magnification: 2,500x

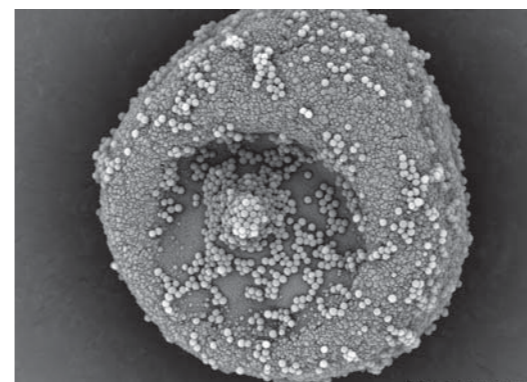
UVD-CL Image



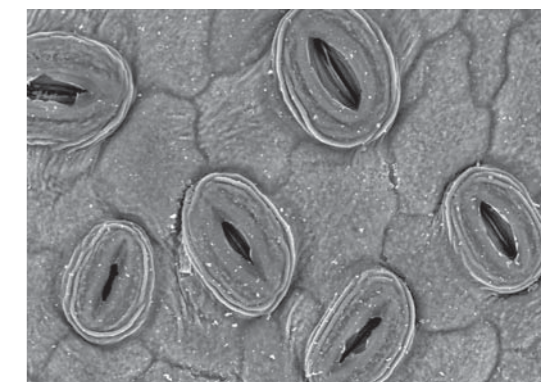
TM4000 15kV 9.9mm X2.50k SE L
Accelerating voltage: 15 kV
Magnification: 2,500x
Sample: fluorecence brightener

*1 UVD-CL: Image contains CL information captured by UVD *2 Option

Biology & foodstuffs & Medicine



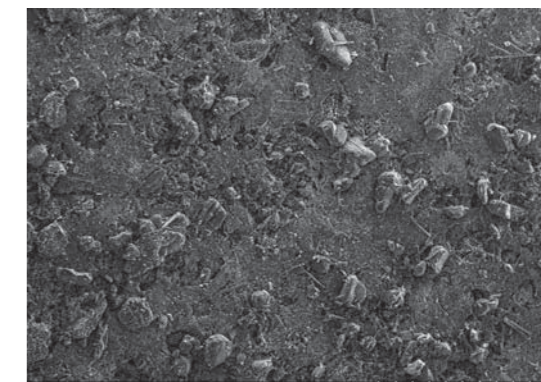
TM4000 10kV 6.1mm X3.00k BSE M
Accelerating voltage: 10 kV
Image signal: BSE Magnification: 3,000x
Sample: Cedar pollen



TM4000 10kV 5.8mm X1.00k BSE H
Accelerating voltage: 10 kV
Image signal: BSE Magnification: 1,000x
Sample: Leaf stomata



TM4000 5kV 5.9mm X300 BSE M
Accelerating voltage: 5 kV
Image signal: BSE Magnification: 500x
Sample: Chocolate
Cooling stage used

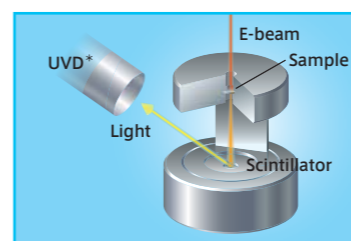


TM4000 5kV 8.5mm x200 SE L
Accelerating voltage: 5 kV
Image signal: SE Magnification: 200x
Sample: tablet

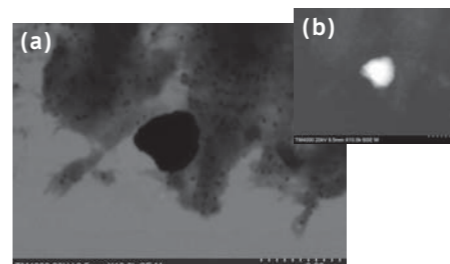
STEM Holder

Easily obtain transmitted images on thin samples

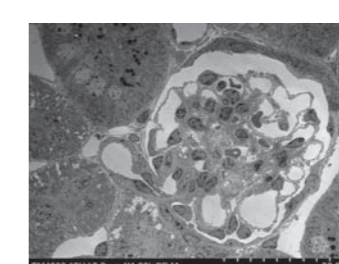
The newly developed STEM holder can be used to perform transmission images with the Hitachi UVD. Images of thin or biological samples can be obtained.



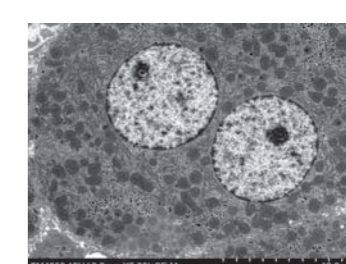
*UVD is a function of TM4000Plus II.



Accelerating voltage: 20 kV
Image signal: (a) STEM, (b) BSE
Magnification: 10,000 x
Sample: Abrasive



Accelerating voltage: 15 kV
Image signal: STEM
Magnification: 1,000 x
Sample: Rat kidney



Accelerating voltage: 15 kV
Image signal: STEM
Magnification: 5,000 x
Sample: Rat liver

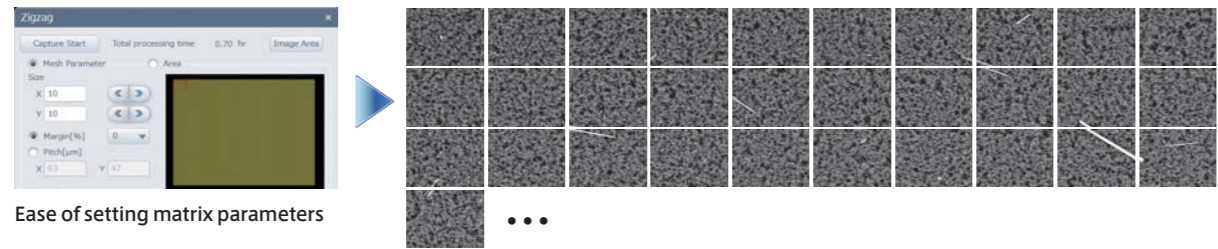
UVD is function of TM4000Plus II *Option

Workflow approach to asbestos analysis

The TM4000 II Series can count and analyze asbestos fibers by using EDS* along with Multi Zigzag.

Step 1 ▶ Locating fiber on filter

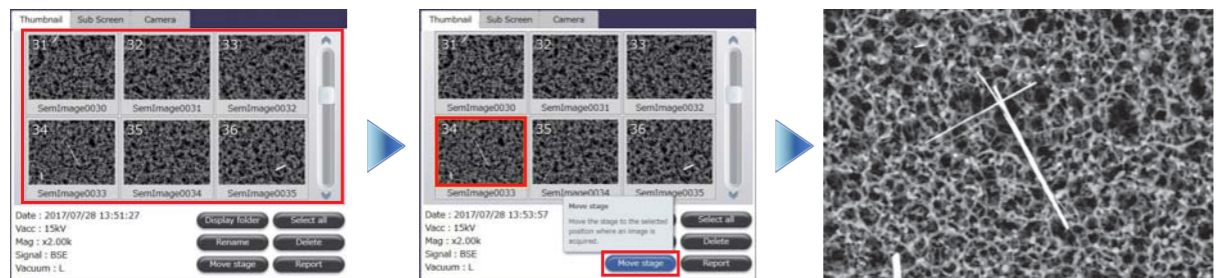
Multiple fields of view can automatically be captured.



Ease of setting matrix parameters

Image signal: BSE
Magnification: 2,000x
Sample: Tremolite (asbestos standard sample)

Step 2 ▶ confirmation of fiber locations within matrix

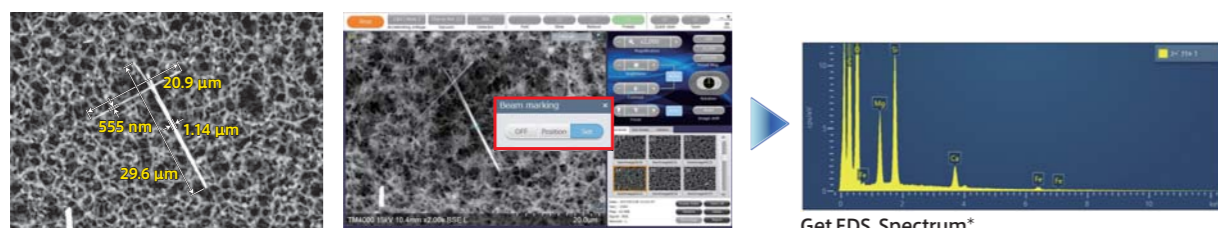


Choose thumbnails with fibers

One click takes you to fiber of interest

Fine tuning for best image quality

Step 3 ▶ Measuring the fiber diameter and elemental confirmation



Confirm aspect ratio and fiber length

Spot analysis for elemental confirmation

Get EDS Spectrum*

* Option

EDS specification (option)

Quantax75 specification

Made by Bruker nano GmbH

■ Detector	
Item	Description
Detector type	Silicon drift detector (SDD)
Detector area	30 mm ²
Energy resolution	148 eV(Cu-Kα) (Mn-Kα: equivalent of 129 eV or less)
Detection element	Bs~Cfas
Cooling method	2-stage thermoelectric (peltier) cooling (without fan and LN ₂ free)
Energy channel	4,096 channel (2.5 eV/ch at minimum)
■ Software	
Item	Description
Qualitative analysis	Auto/manual
Quantitative analysis	Standardless quantitative analysis, normalized to 100%
Analysis mode	Object mode (including point, rectangle, ellipse and polygon) Line scan Hypermap (mapping, spot analysis, line analysis)
Element mapping	Maximum map image resolution 1,600x1,200 Rainbow map Online deconvolution
Report preparation features	Templates for printing may be prepared PDF, Microsoft® Word, Excel
■ Size / weight	
Item	Description
Detector	100 (width) × 45 (depth) × 120 (height) mm, 1.45 kg
Scanning control unit	225 (width) × 230 (depth) × 150 (height) mm, 3.65 kg
■ Installation conditions	
Item	Description
Power supply	Single-phase AC, 100/240 V 50/60 Hz

Element specification

Made by EDAX Inc.

■ Detector	
Item	Description
Window type	Silicon Nitride Windows
Type of Sensor	Silicon drift detector (SDD)
Sensor size	30 mm ²
Energy resolution	129 eV (Mn-Kα)
Detection range	Be _s ~Am _{as}
Cooling system	Thermoelectric Peltier cooling (fan and LN free) No cooling required when not in use
■ Software	
Item	Description
Qualitative analysis	Auto/Manual, HPD
Quantitative analysis	Standardless Method, Graph view/Statistics display
Analysis mode	Spectrum (Point, Area, Free Draw, Grid) Linescan (Spectral Linescan, Review and Rebuild) X-ray Map (Spectral Map, Review and Rebuild)
X-ray Map	1,024×800 (Max.) Spectral Map (Review Spectrum, Line from Map, Rebuild Map) Comp Map (Real-time Peak deconvolution map) Quant Map (Concentration map) Drift Collection
Reporting	Report Template for Printing PDF, Microsoft® Word, Excel, PowerPoint
■ Size / weight	
Item	Description
PC Workstation	169 (width) × 435 (depth) × 356 (height) mm, 12 kg
Detector	100 (width) × 45 (depth) × 120 (height) mm, 0.5 kg
DPP Box	73 (width) × 171 (depth) × 121 (height) mm, 1.6 kg
■ Installation conditions	
Item	Description
Power supply	Single-phase AC100/240 V 50/60 Hz

Aztec series specification for TM4000 series

Made by Oxford Instruments NanoAnalysis

■ Detector		AZtecOne	AZtecLiveOne	AZtecEnergy
Item	Description			
Detector Type	Silicon drift detector (SDD)			
Detector Area	30 mm ²			
Energy resolution	158 eV (Cu Ka) (Mn Ka: equivalent of 137 eV)			
Detection Element	Bs~Us _z			
Thermal Cycle	Detector cool down on demand			
Cooling Method	2 stage thermoelectric cooling (without fan/LN ₂ free)			
■ Software		AZtecOne	AZtecLiveOne	AZtecEnergy
Live spectrum		—	Live Spectrum Monitor on Viewer window with automatically labelled peak	Live Spectrum Monitor on Mini View with automatically labelled peak
Spectrum display	Scaling display in horizontal and vertical directions, KLM markers and/or peak profile displayed			
Qualitative analysis	Auto / Manual by TruQ™ technology, Pulse Pile			
Quantitative analysis	Standard less analysis by XPP correction, 100% normalized			
Image acquisition	2,048×1,536, 1,024×768, 512×384			64 - 8,192 pixels
Element mapping	1,024×768, 512×384, 256×192, 128×96, Tiled or Layered view layered Image: No limit on the number of X-ray maps that can be overlaid on SEM image Reconstruct Spectrum from mapping during/after acquisition			64 - 4,096 pixels layered Image: No limit on the number of X-ray maps that can be overlaid on SEM image Reconstruct Spectrum from mapping during/after acquisition
Line Scan	Arbitrary line position and direction may be specified; The colour and thickness of the Linescans for each element may be changed. Linescans can be viewed in a Vertical tiled, Stacked or table of values Spectra can be reconstructed from any point on the linescan			
Point & ID	Acquire from point, rectangle, ellipse or freehand Overlap a spectrum from any project in the Data Tree over the current spectrum			
TruMap	optional	Overlap and background corrected mapping and LineScanning during/after acquisition		optional
Assistance	Operation guide functionality			
Data management	Data saved in individual projects			
Report preparation	Quick and easy reporting functionality · Content selectable via radial buttons · Exports in Microsoft® Word format (reports can be viewed in free Microsoft viewer)			Comprehensive list of Report templates that can be exported in Word and Excel format Image, Maps and Spectra can be saved as selectable image files with user control over resolution and format
Option		—	—	TruMap (TruLine), AZtec Large Area Mapping, AZtec Feature, etc.
■ Size / weight		AZtecOne	AZtecLiveOne	AZtecEnergy
Detector		145 (width) × 150 (depth) × 200 (height) mm, 2.7 kg		
Analyzer unit		290 (width) × 260 (depth) × 330 (height) mm, 10 kg		Mics F+ ; 180 (width) × 260 (depth) × 330 (height) mm, 2.6 kg X-stream2: 180 (width) × 260 (depth) × 330 (height) mm, 2.6 kg
■ Installation conditions		AZtecOne	AZtecLiveOne	AZtecEnergy
Power supply		Single Phase AC, 100-240 V, 50/60 Hz, 400 VA		Single-phase AC, 100-240 V, 50/60 Hz, 1,500 VA