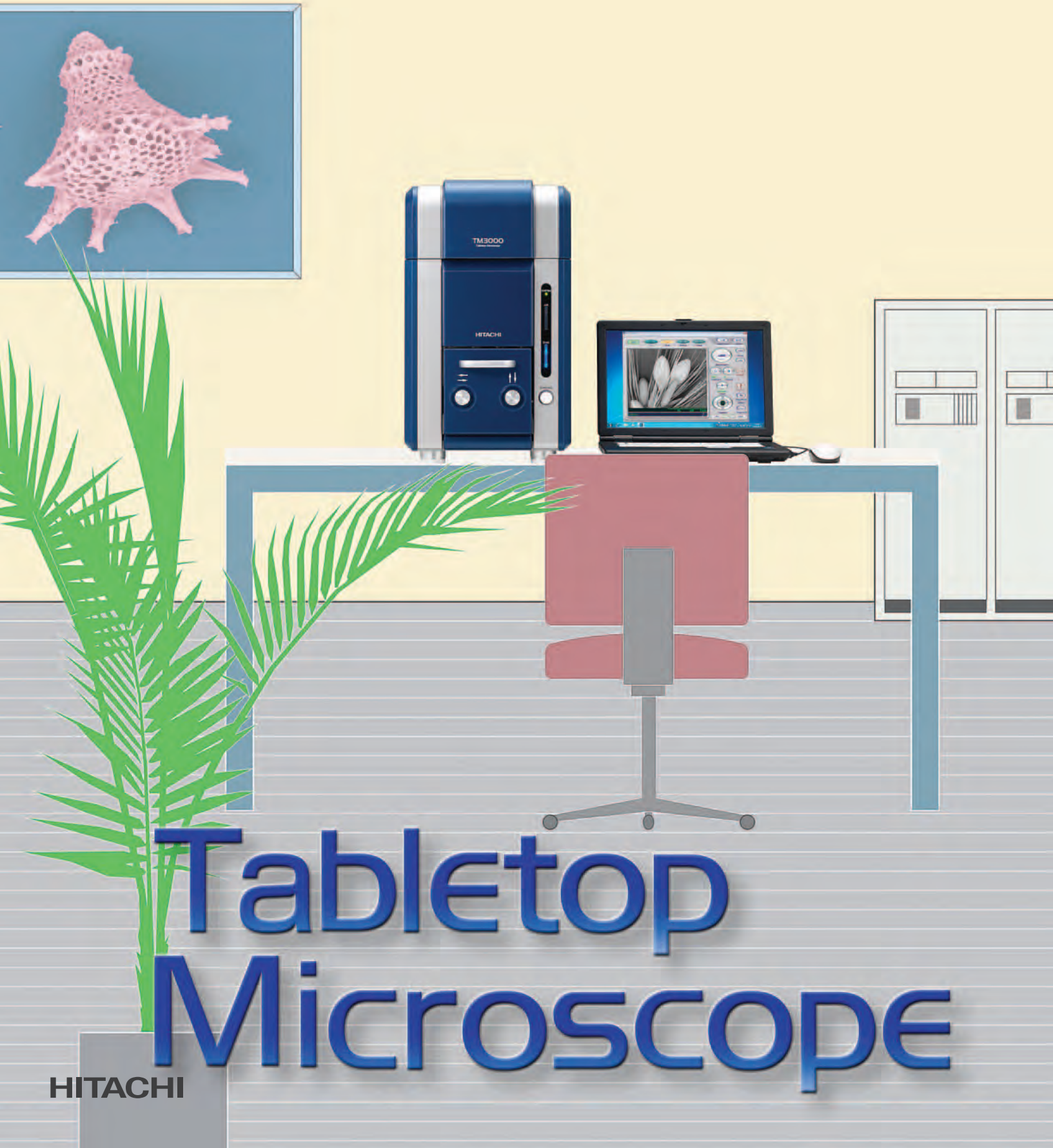
Hitachi High-Tech

Hitachi Tabletop Microscope

TM3000



Tabletop Microscope

HITACHI

The TM3000 is the advanced next-generation tabletop electron microscope from Hitachi.

Perfectly suited to applications in R&D, quality control and education.

The TM3000 builds on the phenomenal global success of its predecessor, with over 1000 instruments installed. Now more advanced microscopy needs are addressed whilst maintaining incredible ease of use - pushing back the boundaries for the tabletop electron microscopy.

[Key Features]

- Compact and portable (24% smaller footprint and 25% lighter)*.
- Simple operation with extensive auto functions.
- Wide magnification range of 15x to 30,000x – ensuring you get maximum benefit from the resolution and depth-of-field advantages of electron microscopy.
- Image insulating materials with ease - no need for specimen coating with the TM3000's charge-up reduction mode.
- Multiple beam conditions and versatile detector control to ensure you get the perfect image.

* Comparison with TM-1000 / Excluding PC and Diaphragm Pump

Specimen: Green foxtail

Compact and portable, with incredibly simple operation

● Tabletop installation

The space saving and lightweight design of TM3000 means it can be conveniently installed on a table*. No cooling water is needed, so installation is quick and easy and requires only a standard 100-240 V AC power supply.

(*) requires a table capable of supporting 100 kg.

● Environmentally-friendly pumping system

The TM3000 features a dry (oil-free) vacuum system, consisting of a diaphragm pump for rough evacuation and a high performance turbo-molecular pump for main pumping.

● Large specimen handling

The large specimen stage allows mounting of a specimen up to 70 mm diameter and 50 mm thick.
X/Y specimen motion: ±17.5 mm

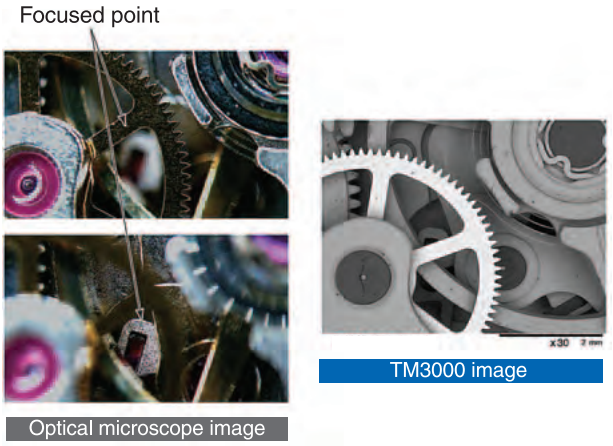
● Fast specimen exchange

The high-performance vacuum system provides fast pump-down, but specimen exchange also requires chamber venting. It takes just 1 minute to vent the TM3000 specimen chamber, twice as fast as the TM-1000.

Comparison of chamber venting time

● Topographic imaging with a large depth of focus

Complex specimen structures are easily observed with a resolution and depth of focus far beyond what is achievable by optical microscopy.



With a width of just 330mm, laptop-PC based operation and no special installation requirements the TM3000 can be installed almost anywhere. Comprehensive auto-functions ensure it can also be used by anyone.

● Comprehensive auto-functions, with one-click "Start".

Imaging with the TM3000 couldn't be simpler. Pressing the "Start" button automatically turns the beam on, adjusts focus, brightness and contrast and displays the image at an easy-to-view starting magnification of 100x.

Specimen: Bandaid

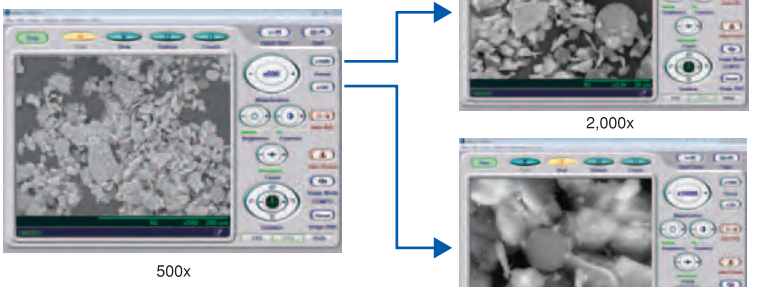
● Smooth magnification adjustment

Since magnification is increased simply by narrowing the scanned area, continuous magnification adjustment from x15 to x30,000 is achieved by simply dragging the mouse - making it quick and easy to find the area of interest.

Specimen: Cloth

● Preset magnification

Frequently used magnifications can be saved in memory (preset). The magnification can be changed to a preset value with a click of the mouse.



500x

2,000x

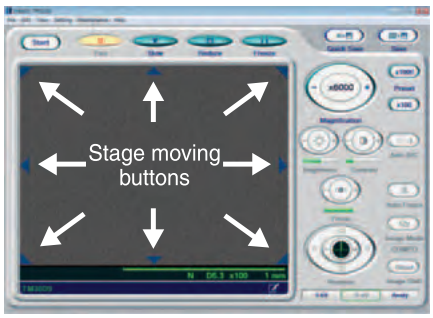
10,000x

Specimen: Foundation

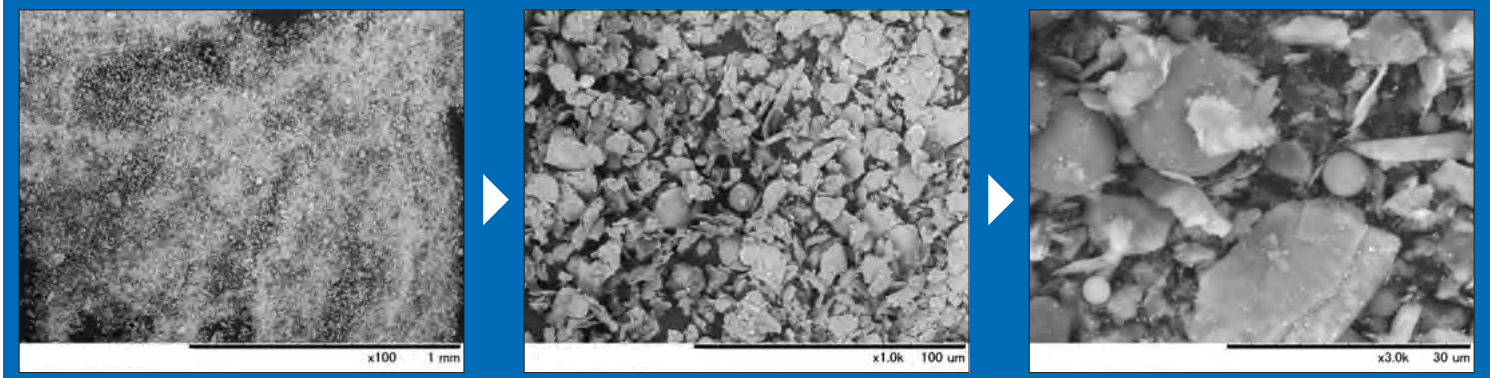
Motorized stage version

With the optional* motorized specimen stage, all functions of the TM3000 can be operated using the mouse alone. Sample navigation can be performed through the user interface - either by double-clicking a desired destination on the image or by clicking the stage move arrows.

* Please specify manual or motor-drive stage when ordering the TM3000



Versatility is assured – with a wide magnification range and multiple operating conditions.



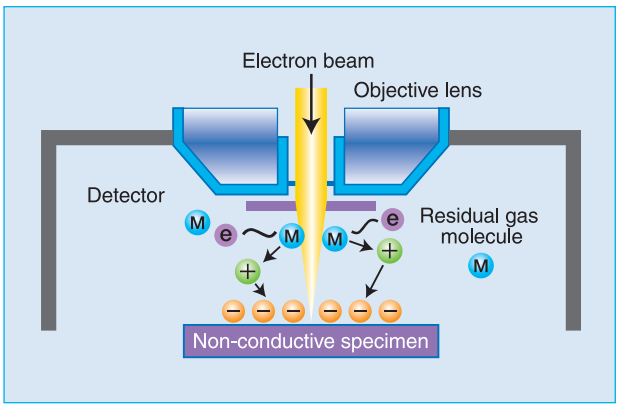
5 kV　　5 kV　　15 kV

● Image non-conducting specimens with ease.

When an electrically non-conducting specimen is observed with a high-vacuum SEM, electrons accumulate on the specimen surface causing a charge-up phenomenon, which prevents normal imaging. Conventionally, to avoid this problem, the sample is usually vacuum coated with a thin layer of metal before observation. This process is not only time consuming, but the metal coating can interfere with imaging and EDX analysis. The TM3000 overcomes this problem with the "charge-up reduction mode" – using low-vacuum operation to eliminate the charge-up effect.

● Low-vacuum microscopy

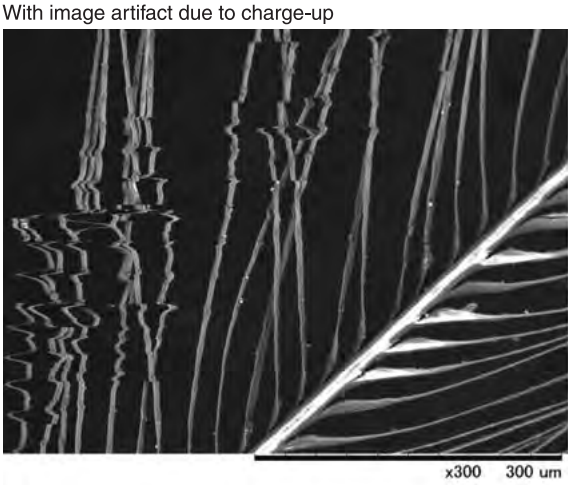
By utilizing a low vacuum level inside the specimen chamber, more gas molecules are present. These gas molecules (M) can collide with the electron beam to generate positive ions (+) and electrons (e). Each positive ion (+) can be neutralized by one of the excess electrons (−) on the specimen surface. In this way the excess electrons on the surface of the sample are removed and the charge-up effect is eliminated or reduced.



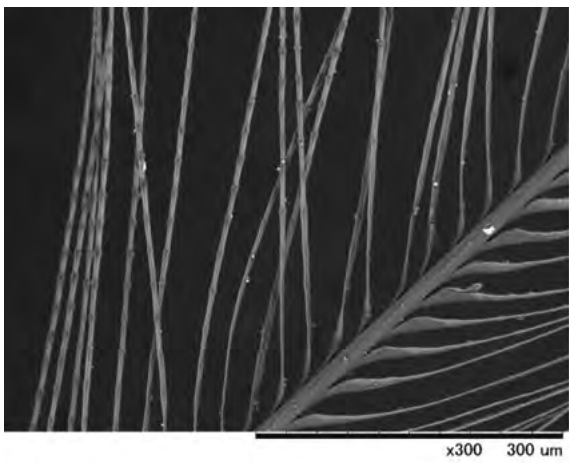
● Change-up reduction mode

The TM3000 can operate either in "standard mode" or "charge-up reduction mode" depending on the extent of the specimen charging.

With image artifact due to charge-up

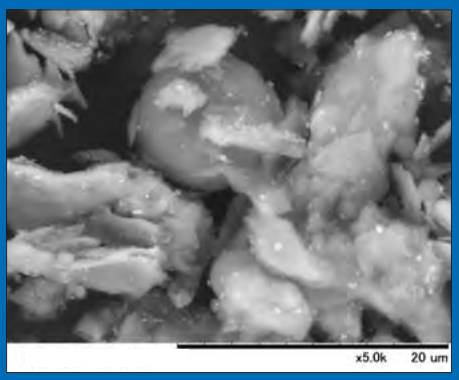


Without image artifact due to charge-up

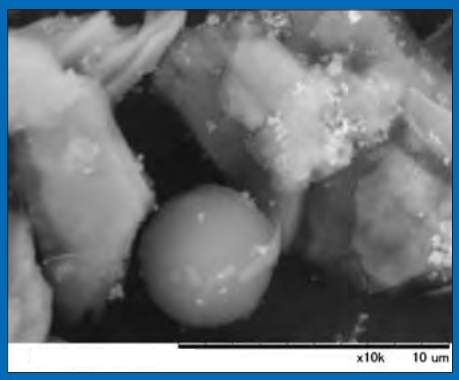


Specimen: Bird's feather

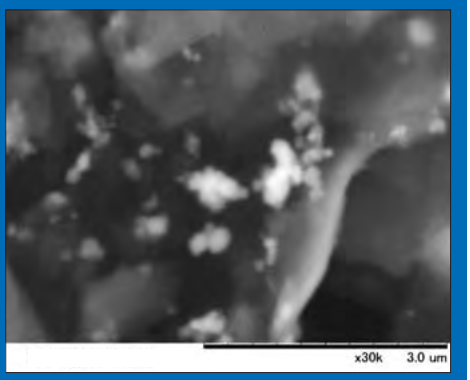
The versatile TM3000 can be used for almost any type of specimen.
Even non-conducting specimens or samples containing moisture can be imaged directly, throughout the whole magnification range of x15 to x30,000, without any special sample preparation.



15 kV



15 kV

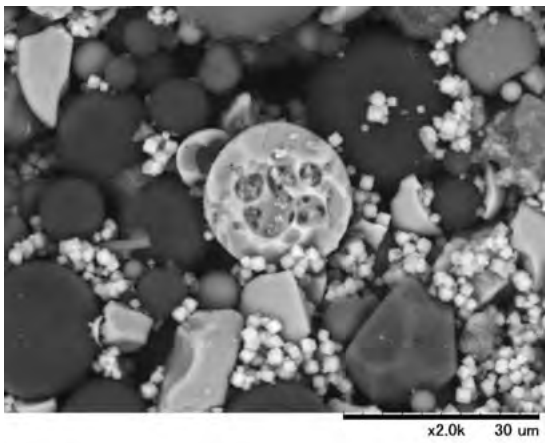


15 kV

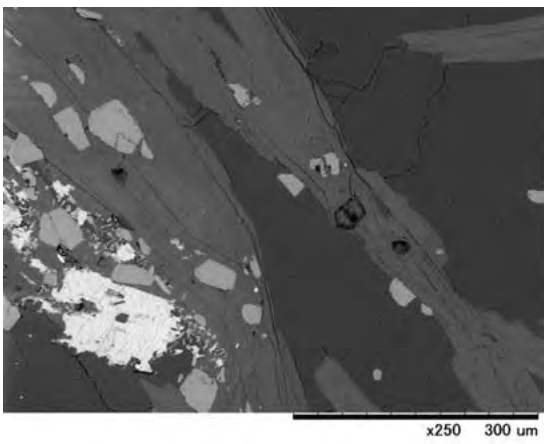
Specimen: Face powder

● Compositional imaging

In addition to traditional topographic imaging, the TM3000 can produce compositional images, where the different brightness levels represent different composition in the sample. In this mode, higher brightness corresponds to higher atomic number.



Specimen: Powder spray



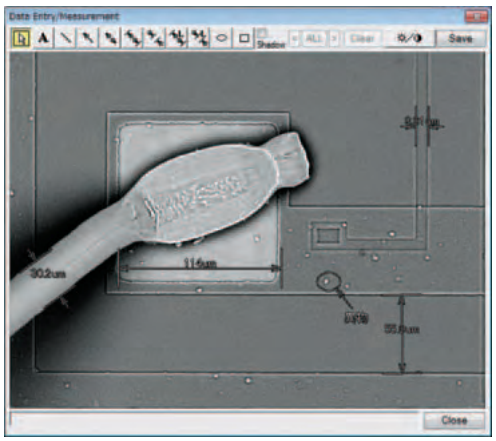
Specimen: Garnet - muscovite - albite schist

Specimen courtesy of: Nagoya University Museum
Designated Prof. Mamoru Adachi

● Tools for measurement and annotation

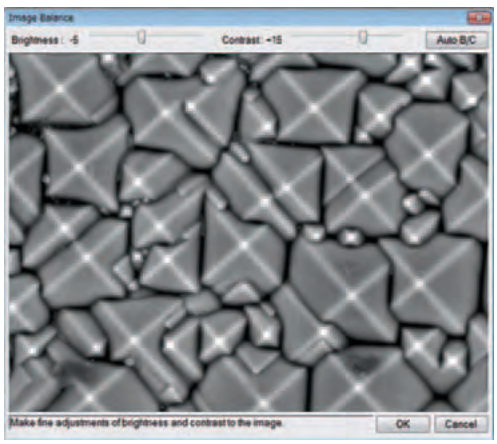
- Distance measurement
  Distance can be quickly and easily measured by dragging the mouse between two points of interest.
- Graphics/comment input
  Simple graphics and comments can be added to the image.

Simple length measurement and graphics/comment input



Specimen: Wire bonding

Brightness/contrast adjustment window



Specimen: Solar battery

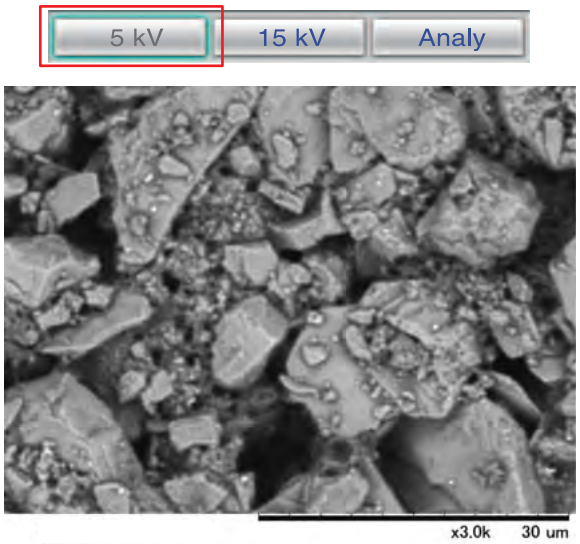
Three independent observation condition modes

The TM3000 features three beam conditions to choose from depending on the information required in the image. The '5 kV', '15 kV' and 'Analysis' modes greatly simplify operating condition setup, and no adjustment is required when switching between modes.

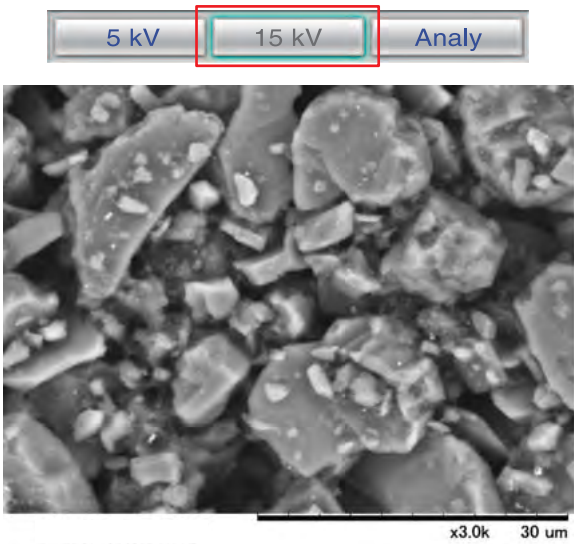
5 kV ..... emphasizes surface detail

15 kV ..... can be used throughout the magnification range and gives the best resolution

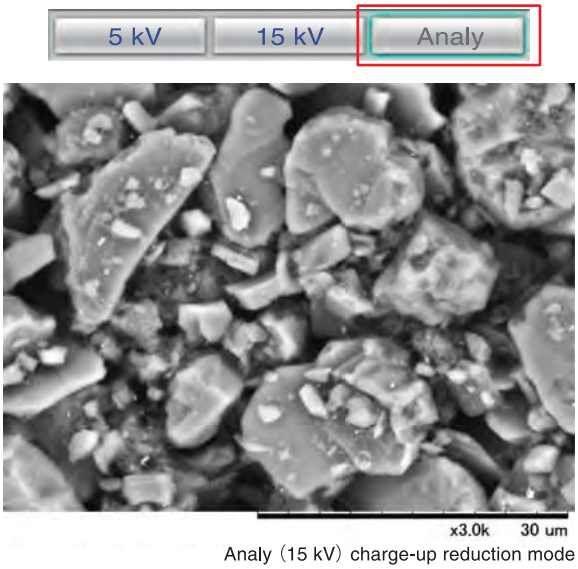
Analysis ..... used for elemental analysis or low contrast specimens



5 kV charge-up reduction mode



15 kV charge-up reduction mode



Analy (15 kV) charge-up reduction mode

Specimen: Tooth paste

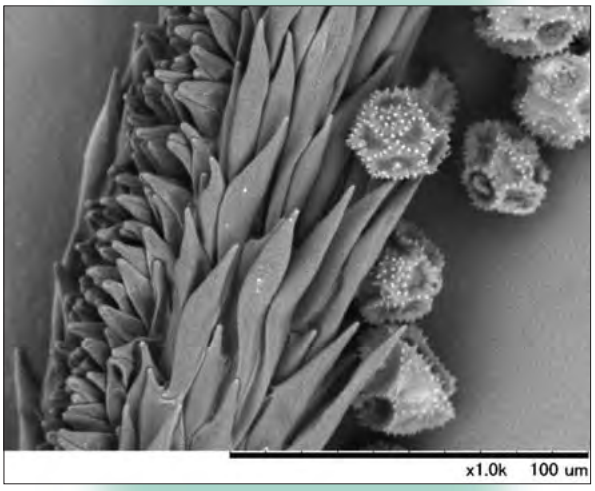
■ Accelerating voltages

By providing different accelerating voltages in '5 kV' and '15 kV' modes, and using the high sensitivity backscattered electron detector, different types of imaging are possible with the TM3000. An accelerating voltage of 15 kV is used for most imaging applications and offers the best resolution. At 5 kV, the electron beam does not penetrate so far into the sample, so the images show more surface detail.

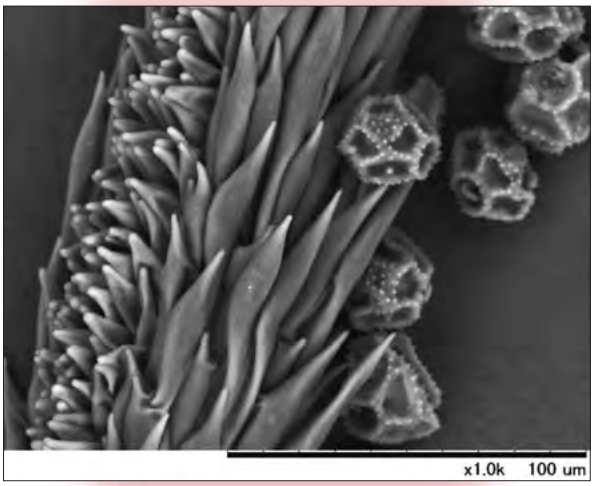
Accelerating voltage	15 kV	5 kV
Resolution	Best ← →	Lower
Image information	Subsurface ← →	Surface
Backscattered electron signal	High ← →	Lower

■ Difference in image appearance using different observation condition modes

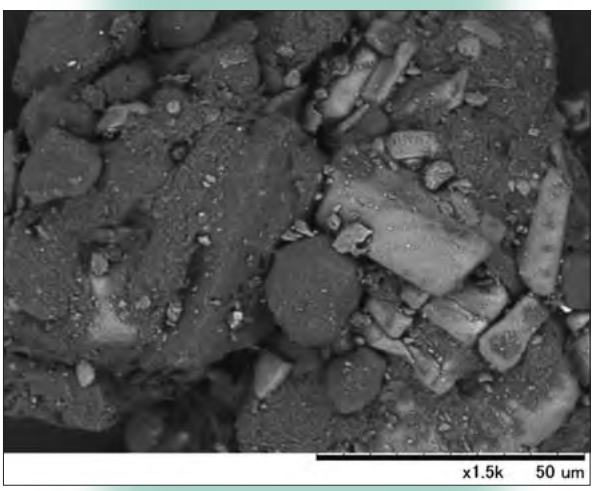
5 kV | 15 kV | Analy

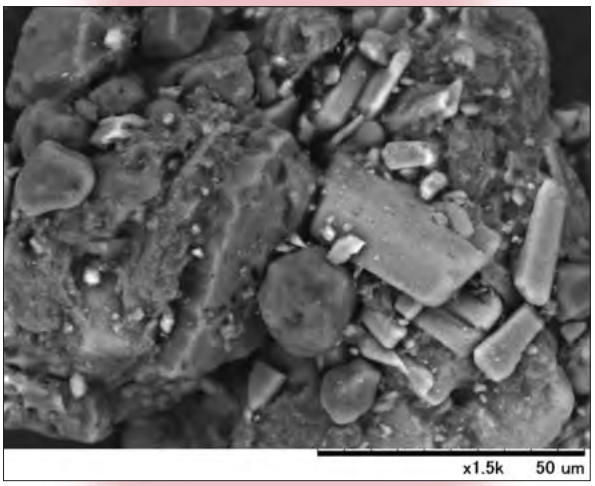


5 kV | 15 kV | Analy

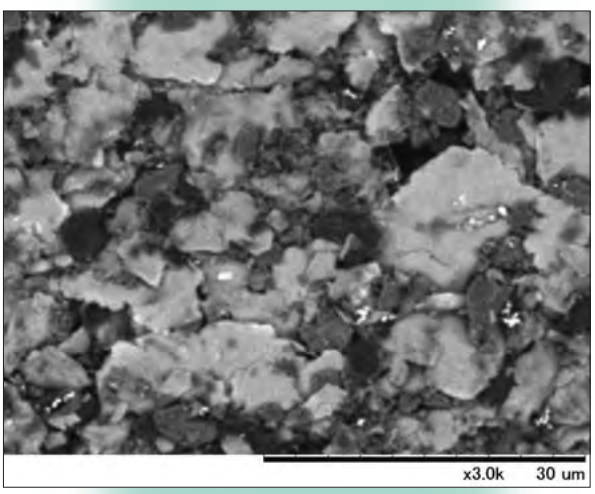


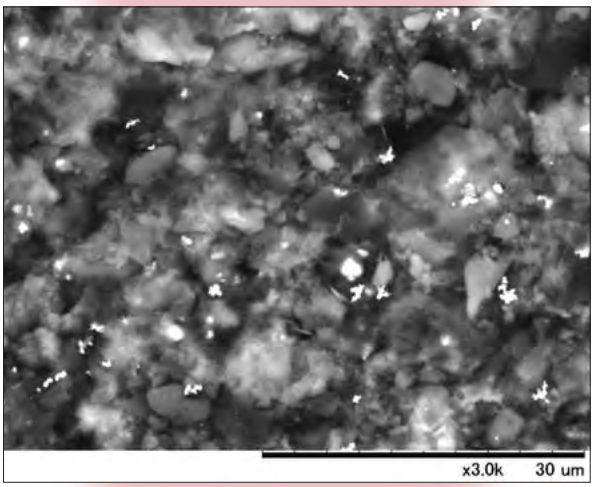
Specimen: Pistil of dandelion





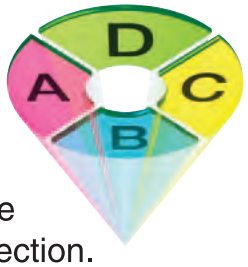
Specimen: Powdered medicine





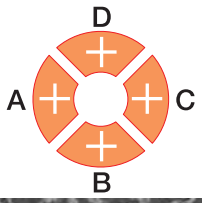
Specimen: Adhesive tape

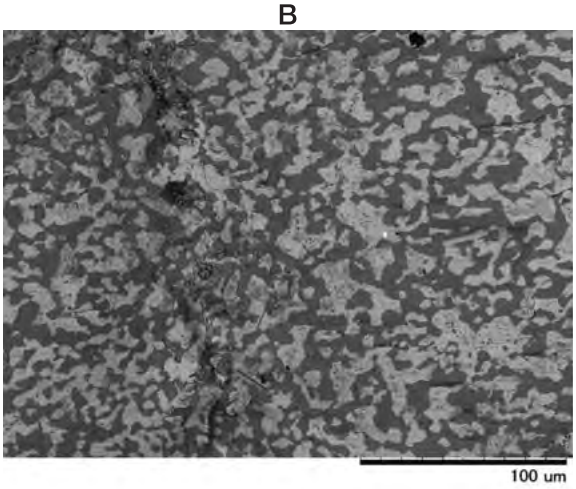
Directional imaging using the 4-segment detector



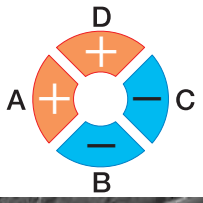
The TM3000 features a backscattered electron detector with 4 independent segments. By adding or subtracting the signals from the segments in different combinations it is possible to emphasize compositional or topographic detail in the image, as well as produce 'shadowed' images which highlight the sample from a particular direction.

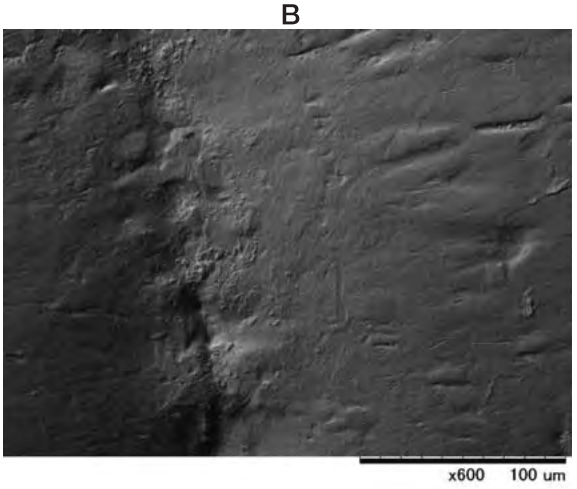
Compo



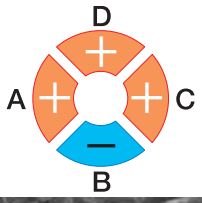


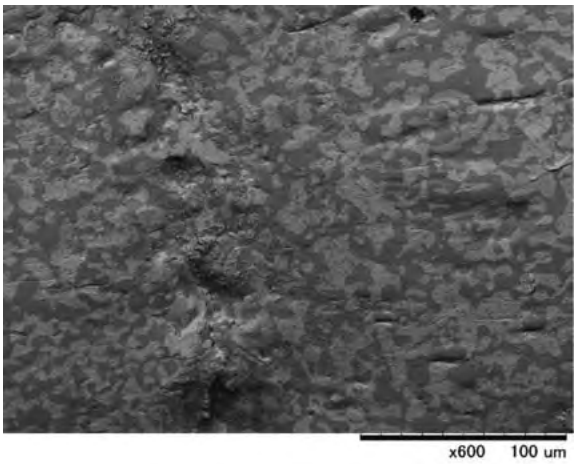
Topo



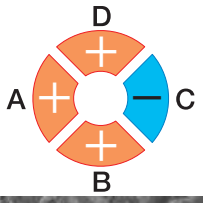


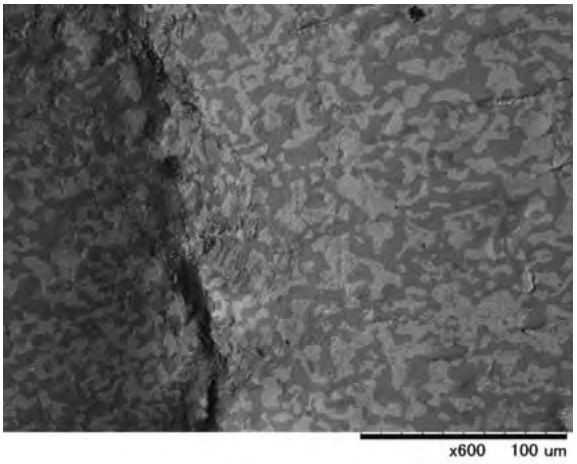
Shadow 1





Shadow 2

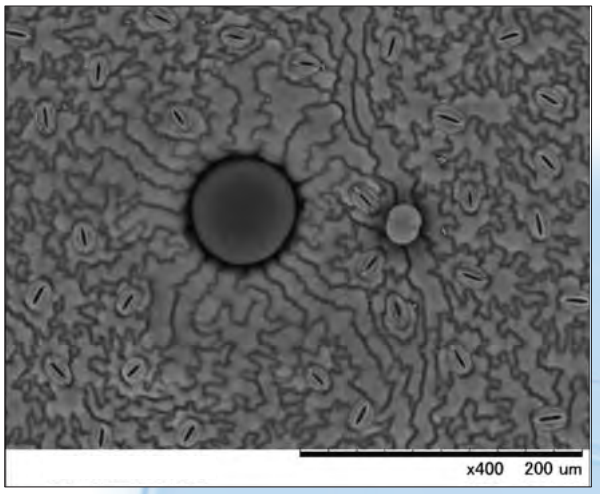




Specimen: Solder

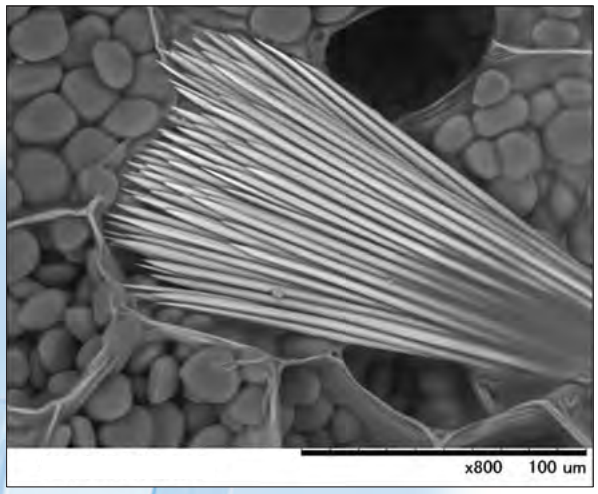
Application Gallery

■ Food and Medicine



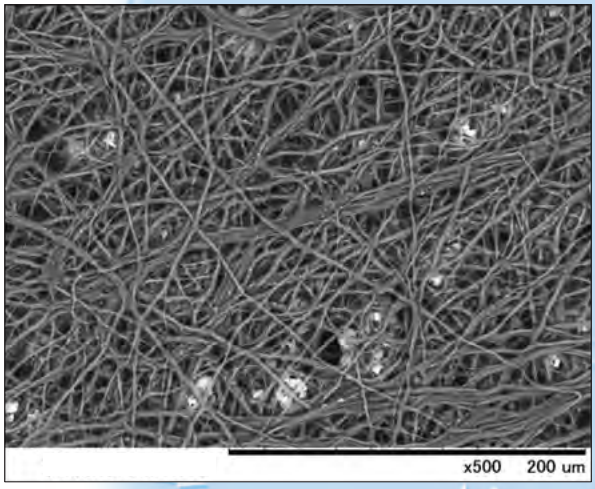
15 kV, charge-up reduction mode

Specimen: Perilla (Japanese Basil) leaf



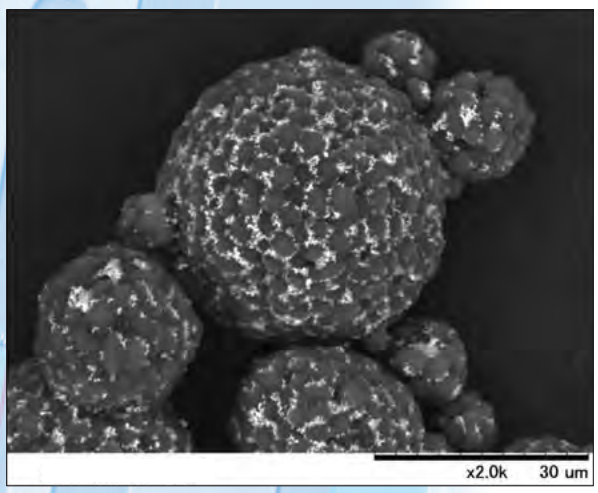
15 kV, charge-up reduction mode

Specimen: Cross section of Chinese yam



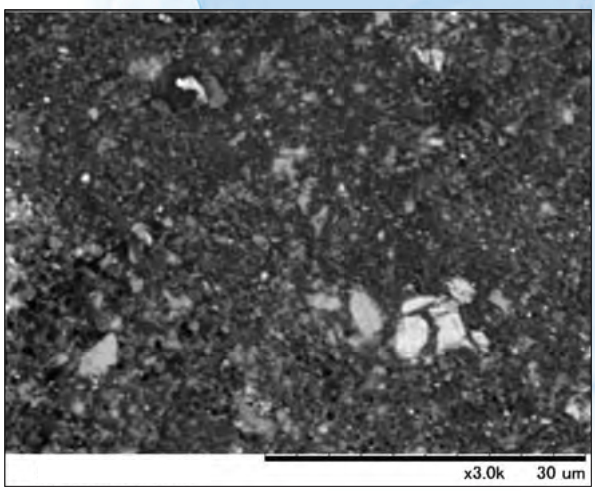
15 kV, charge-up reduction mode

Specimen: Egg shell membrane



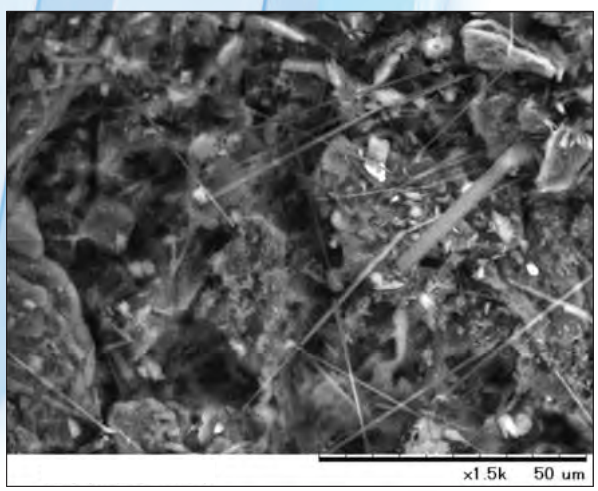
15 kV, charge-up reduction mode

Specimen: Yeast containing zinc



5 kV, charge-up reduction mode

Specimen: Pellet surface

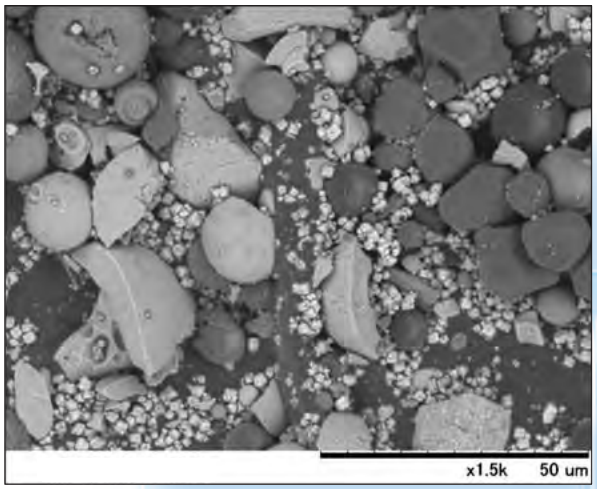


15 kV, charge-up reduction mode

Specimen: Headache remedy tablet

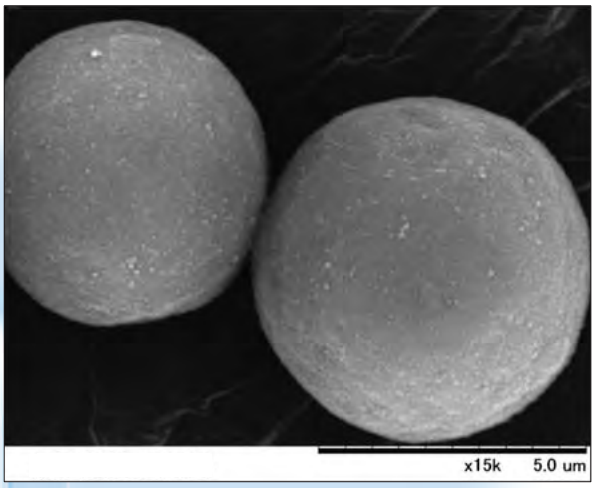
Application Gallery

■ Processed materials



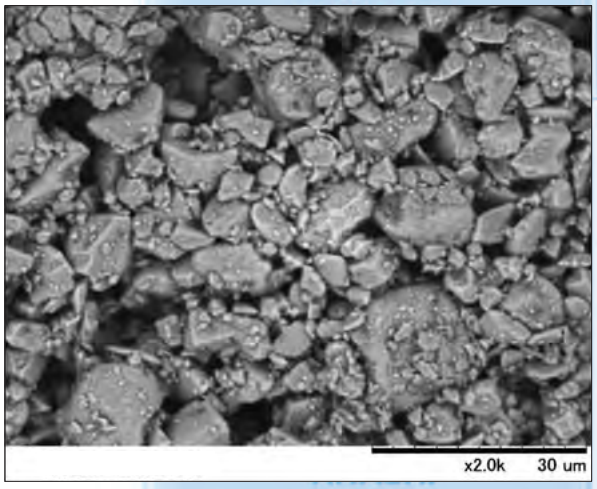
5 kV, charge-up reduction mode

Specimen: Powder spray



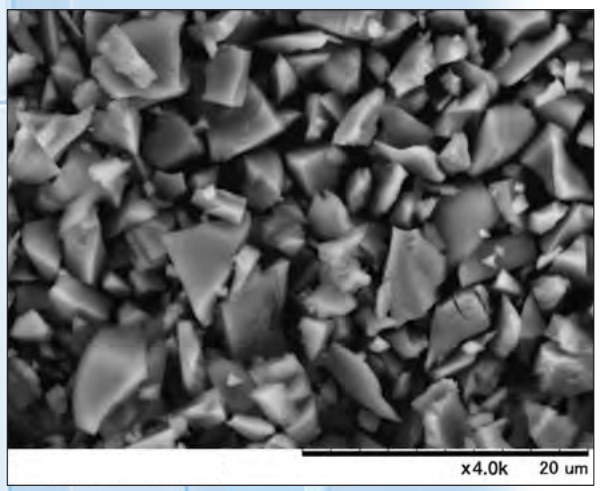
15 kV, standard mode

Specimen: Toner (Pt coated)



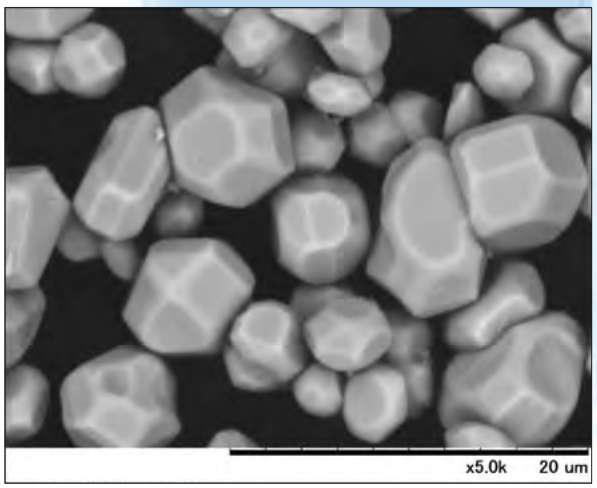
5 kV, charge-up reduction mode

Specimen: Coated paper



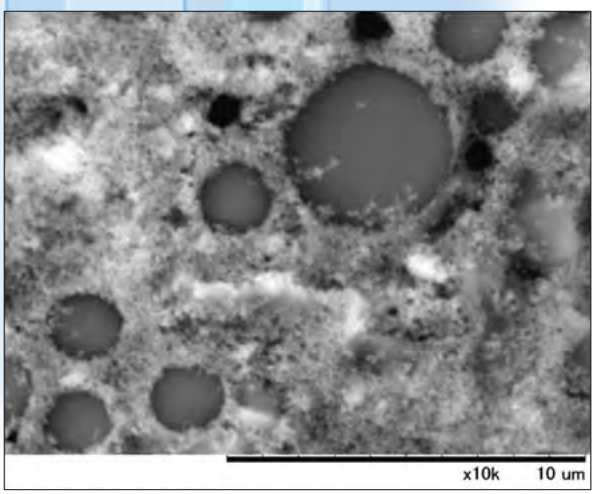
15 kV, standard mode

Specimen: Alumina particle



15 kV, charge-up reduction mode

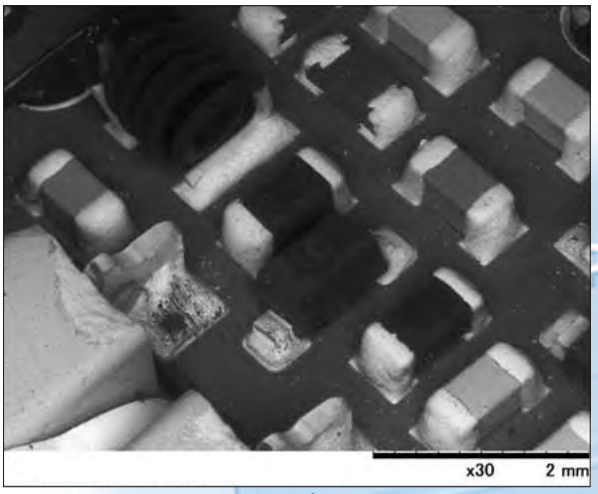
Specimen: Fluorescent material



15 kV, charge-up reduction mode

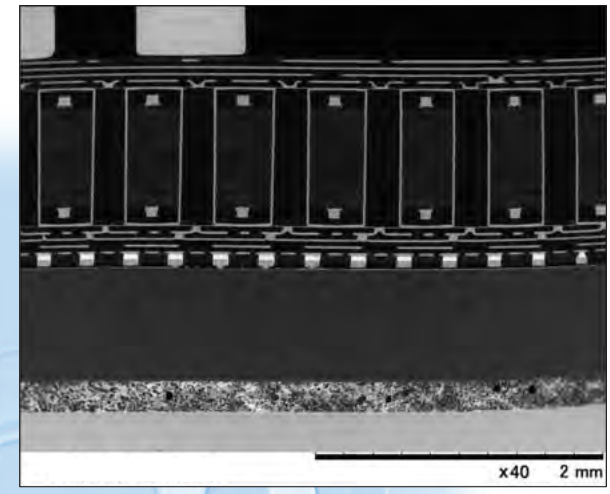
Specimen: Sunscreen lotion

■ Electronic and metallic materials



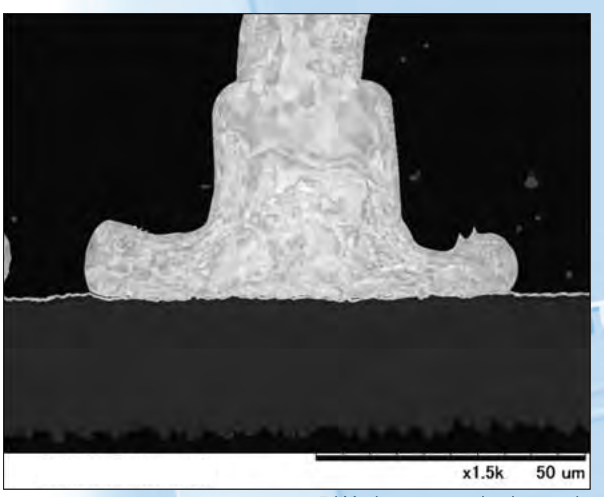
15 kV, charge-up reduction mode

Specimen: PC board



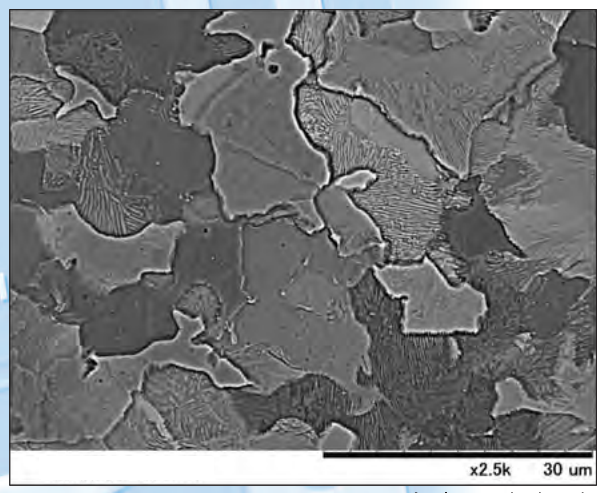
15 kV, charge-up reduction mode

Specimen: Cross section of electronic circuit board



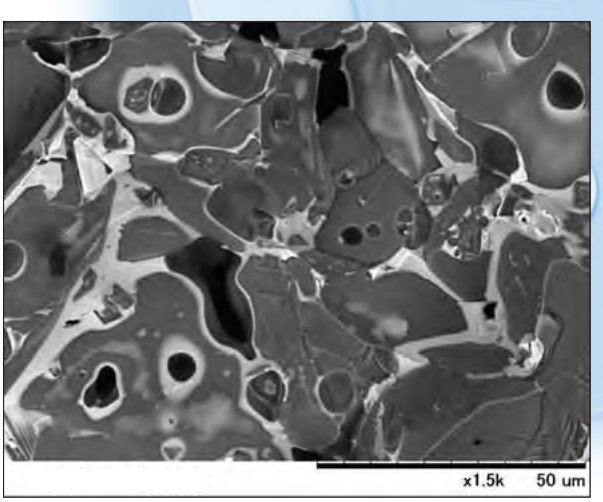
5 kV, charge-up reduction mode

Specimen: Au bonding wire



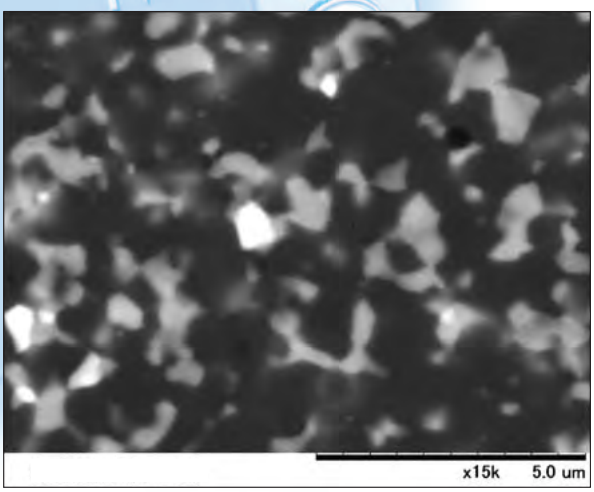
Analy, standard mode

Specimen: Metallographic structure



Analy, charge-up reduction mode

Specimen: Varistor

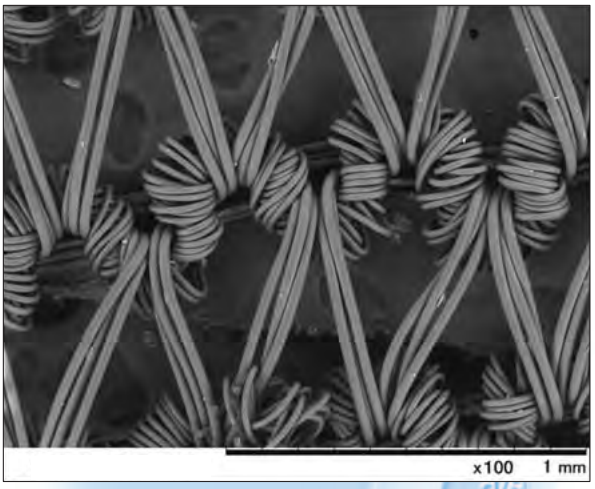


15 kV, charge-up reduction mode

Specimen: AlTiC circuit board

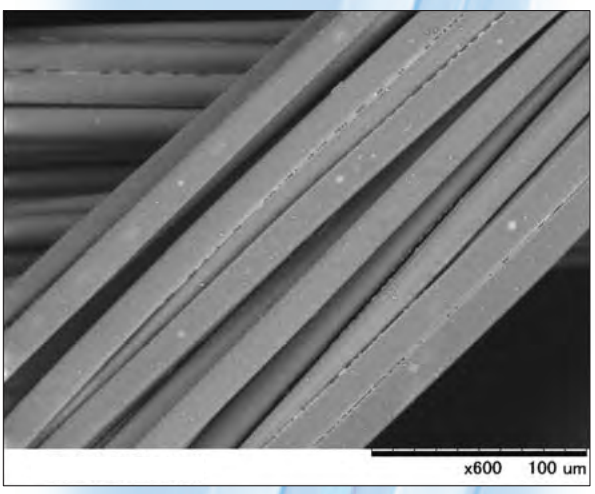
Application Gallery

■ Textiles



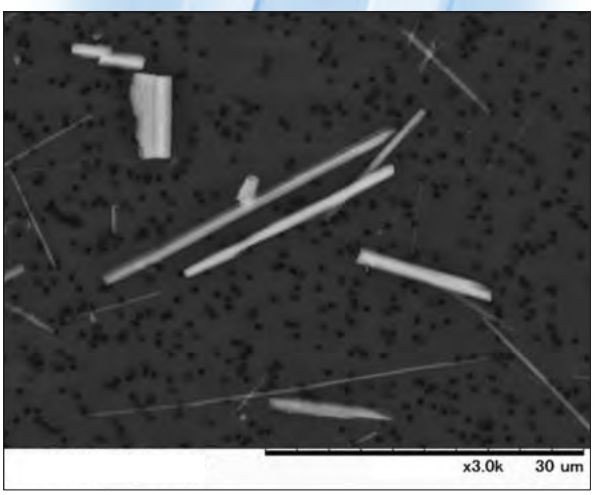
15 kV, charge-up reduction mode

Specimen: Nylon stocking



5 kV, charge-up reduction mode

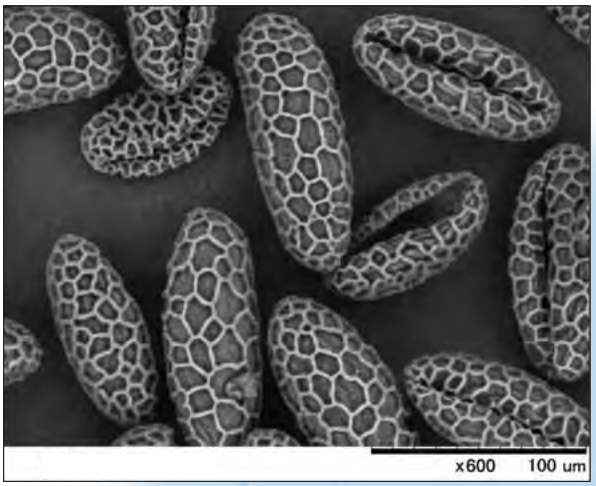
Specimen: Photocatalyst fiber



15 kV, standard mode

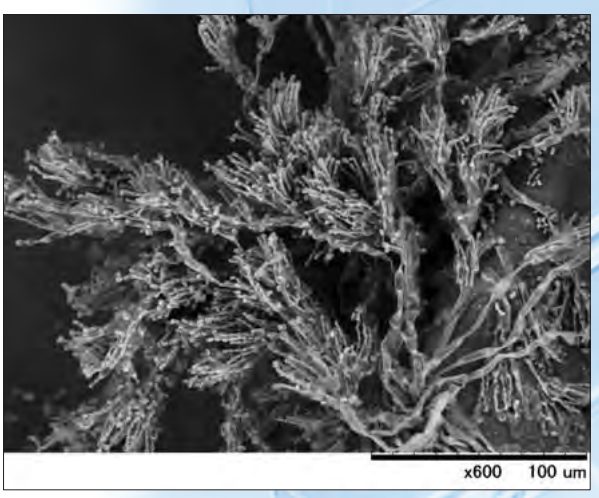
Specimen: Asbestos

■ Biological specimen



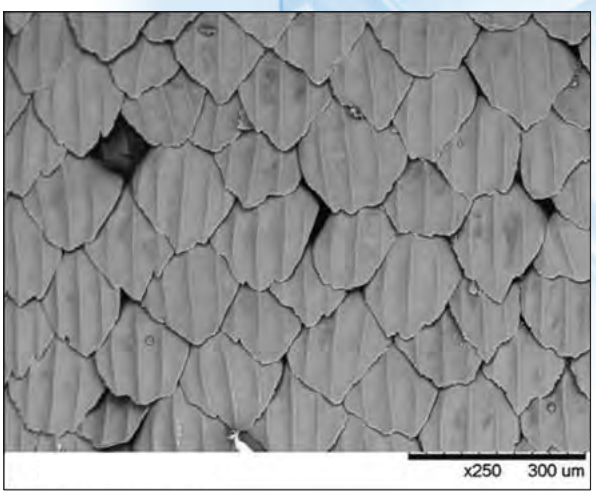
15 kV, charge-up reduction mode

Specimen: Lily pollen



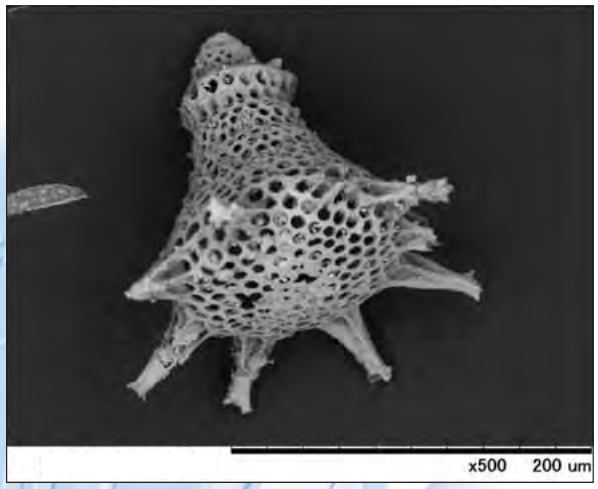
15 kV, charge-up reduction mode

Specimen: Mould spore



15 kV, standard mode

Specimen: Shark skin

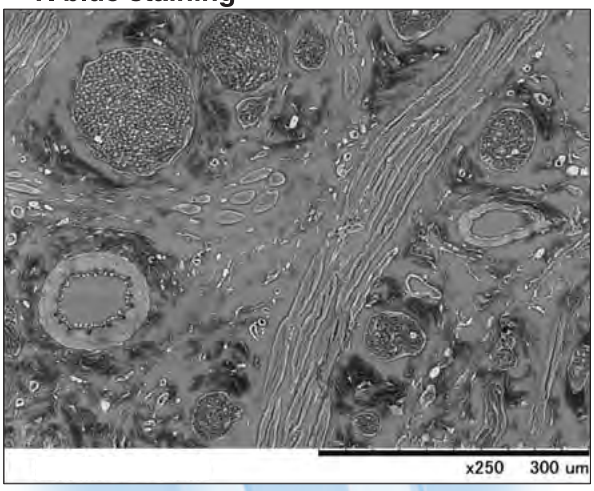


5 kV, charge-up reduction mode

Specimen: Radiolarian fossil (Middle Jurassic radiolarian)*

Specimen courtesy of: Nagoya University Museum
Designated Prof. Mamoru Adachi

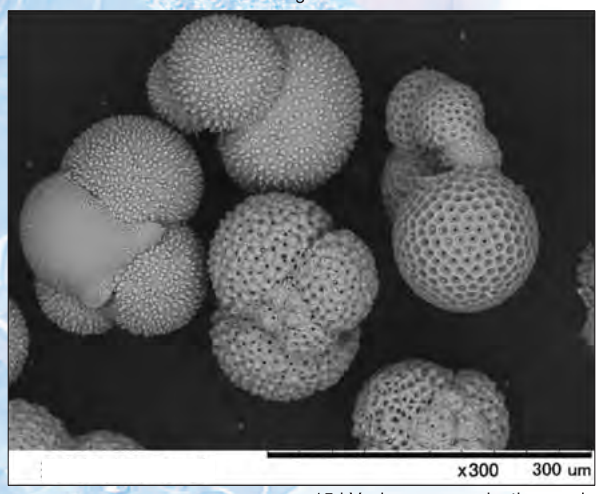
■ Observation of biological specimen by TI blue staining



Analy, charge-up reduction mode

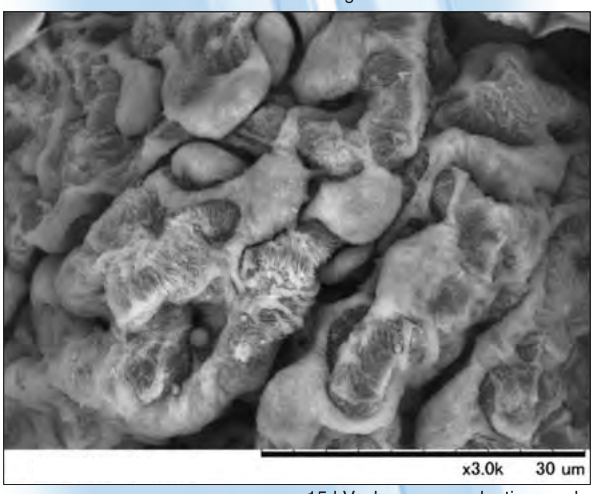
Specimen: Tongue of rat (deparaffinated section)

Specimen courtesy of: Tottori University, Faculty Medicine
Sumire Inaga



15 kV, charge-up reduction mode

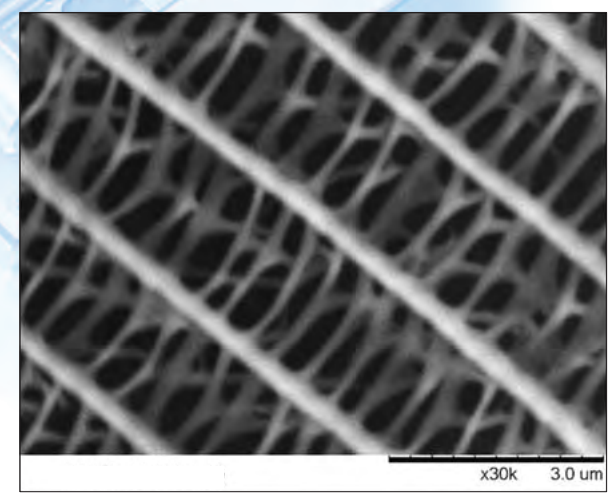
Specimen: Planktonic foraminifer



15 kV, charge-up reduction mode

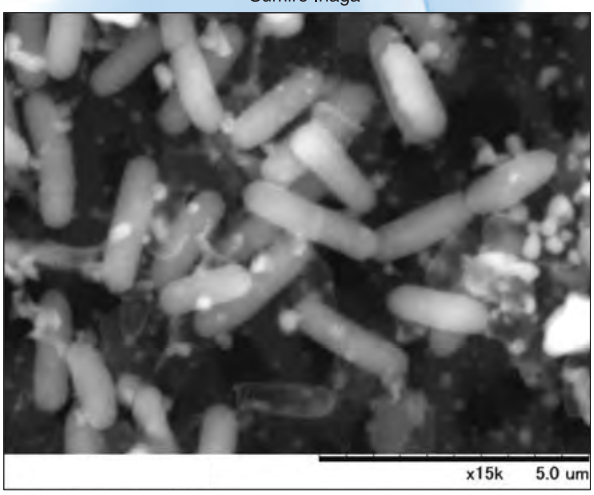
Specimen: Renal glomerulus of rat

Specimen courtesy of: Tottori University, Faculty Medicine
Sumire Inaga



15 kV, charge-up reduction mode

Specimen: Butterfly wing



15 kV, charge-up reduction mode

Specimen: Fermented soybean bacteria

*Specimen: Middle Jurassic radiolarian fossils from the manganese-carbonate nodule collected in Unuma, Kakamigahara City, Gifu Prefecture
Nagoya University Museum (JMP380) (Shinjiro Mizutani, Prof. Emeritus of Nagoya University)

Specifications

Items	Description
Magnification	15 to 30,000× (digital zoom: 2×, 4×)
Observation condition	5kV/15kV/Analysis
Observation mode	Standard mode Charge-up reduction mode
Image mode	COMPO/Shadow 1/Shadow 2/TOPO
Sample stage traverse	X: ±17.5mm, Y: ±17.5mm
Maximum sample size	70mm in diameter
Maximum sample height	50mm
Electron gun	Pre-centered cartridge filament
Signal detection system	High-Sensitivity semiconductor BSE detector
Auto image adjustment function	Auto start, Auto focus, Auto brightness/contrast
Operation help functions	Raster rotation, Magnification preset (two steps) Image shift (±50μm@D*=4.5)
Frame memory	640 × 480 pixels, 1,280 × 960 pixels
Image data memory	HDD of PC and other removal media
Image format	BMP, TIFF, JPEG
Data display	Micron marker, micron value, date and time, image number and comments, Image mode, Observation condition, D* (Distance), Observation mode
Evacuation system (vacuum pump)	Turbomolecular pump: 30ℓ/s × 1 unit, Diaphragm pump: 1m³/h × 1 unit
Safety device	Over-current protection function, built-in ELCB

*D (Distance) is defined as the distance between lower surface of a high-sensitive semiconductor BSE detector and sample surface.

Required PC specifications

Items	Description
OS	Windows® 7
CPU	Intel® Core™ 2 Duo P8700 or compatible CPU
Memory size	2GB or larger
Display monitor	15.4 type, WXGA 1,280 × 800 pixels
Interface connector	USB 2.0

*An associated PC to be procured locally.
*Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.
*Intel is a registered trademark of Intel Corp. or its affiliated companies in the United States and/or other countries.
*Specifications of a PC are subject to change.

Dimensions and weight

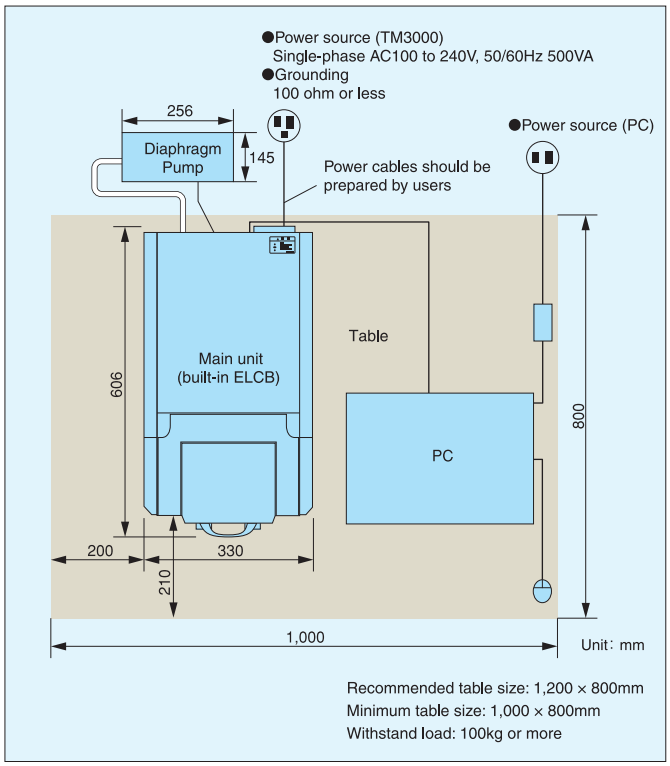
Items	Description (Width × Depth × Height, Weight)
Main unit	330 × 606 × 565mm, 63.0kg (manual stage) 330 × 630 × 565mm, 66.0kg (motor drive stage)
Diaphragm pump	145 × 256 × 217mm, 4.5kg

Installation condition

Items	Description
Room temperature	15 to 30˚C (Δt=±2.5˚C/h or less)
Humidity	70%RH or less
Power source (TM3000)	Single-phase AC100 to 240V (Minimum: 90 [V], Maximum: 250 [V])
Grounding	100 ohm or less

*Another power source for PC is required.

Minimum installation layout



*A table with casters is not suitable to put a main unit of TM3000 on.
*Recommended table size: 1,200 × 800mm, withstand load: 100kg or more.
*Periodical maintenance is required for this apparatus.
*Limited to indoor operation.

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

Specifications in this catalog are subject to change with or without notice, as Hitachi High-Technologies Corporation continues to develop the latest technologies and products for our customers.

Bringing the frontier to the forefront.

For further information, please contact your nearest sales representative.

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