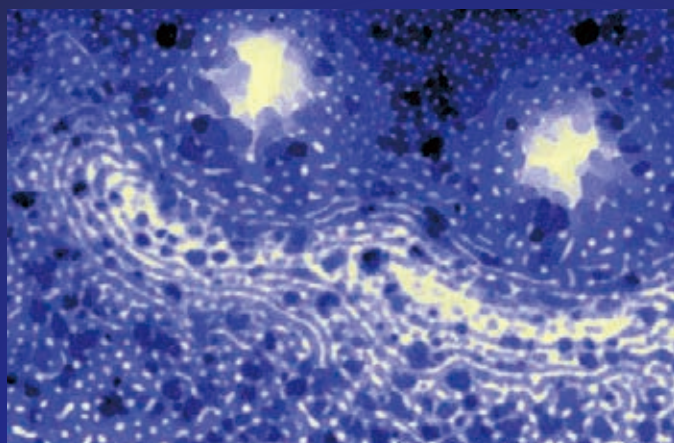


Hitachi Electron Microscope / Scanning Probe Microscopes

HITACHI
Inspire the Next

Product Catalogue



nanoart

Nebula of Water and Oil

The nebula-like structure floating in space was observed using the SE-ADM* method, where dishwashing detergent was examined in a low-pressure atmosphere separated by a membrane coated with heavy metals. This SE-ADM method does not require a high-energy electron beam for signal detection; therefore, damage to the specimen can be suppressed. Additionally, since it does not require direct interaction between the specimen and the electron beam to detect signals, it is possible to obtain images with high star-like brightness even for specimens composed of light elements such as surfactants.

*Scanning Electron - Assisted Dielectric Microscope

From the 79th photo contest
hosted by the Japanese Society of Microscopy in 2023.

Specimen : Dishwashing Detergent
Instrument : SU5000
Accelerating voltage : 3 kV
Magnification : 2,500x



Science for
a better tomorrow

Product Guide - Index

02-03	TEM
04-05	FIB-SEM
06-07	Cold FE-SEM
08-11	Schottky FE-SEM
12-13	SEM
14	Tabletop Microscopes
15	Ion Milling systems
16	Other Tools
17-18	Correlative Microscopy
19-20	AFM
21	Nano-probing systems
22	Peripherals (Software / holders)

That's the line-up current as of August, 2024.
That's changed without contact. Please permit.

HF5000

Hitachi's 200 kV Aberration-Corrected TEM/STEM/SEM : The Perfect Harmony of Multi-Signal Imaging, Resolution, and Analytical Performance

The combination of imaging and chemical analysis at the atomic scale is driving research as well as development in numerous cutting-edge fields. Hitachi's HF5000 guarantees sub-angstrom imaging combined with high-sensitivity elemental analysis by utilizing a redesigned Cold Field Emission Gun (CFEG), Hitachi designed aberration corrector, large solid angle X-Ray detector(s), and novel electron optics. The HF5000 also incorporates unique differential pumping architecture for robust *in-situ* analysis in addition to simultaneous secondary electron (SE), bright-field, and dark-field scanned imaging mode capabilities to provide a truly multifaceted instrument with unsurpassed versatility.

[Features]

- Hitachi in-house fully automated probe-forming spherical aberration corrector
- High-brightness and high-stability cold FE electron gun (CFEG)
- Ultra-stable column and power supplies for enhanced instrument performance
- Simultaneous Cs-corrected SEM and STEM imaging capability with atomic resolution
- Symmetrically opposed dual 100 mm² EDS detectors : "Symmetrical Dual SDD"
- *in situ* observation under heating and gas environment *



<HF5000>

Resolution	0.102 nm (TEM lattice image) 0.078 nm (HAADF-STEM image)
Magnification	100 x ~ 1,500,000 x (TEM) 20 x ~ 8,000,000 x (STEM)
Acceleration voltage	200 kV, 80 kV*, 60 kV*
Maximum tilt angle	$\alpha \pm 25^\circ$, $\beta \pm 35^\circ$ (Double tilt holder*)

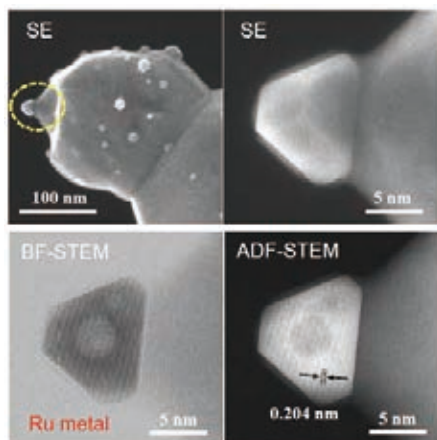
* option

<Options>

Differential pumping *in-situ*, ABF-STEM mode, Remote operation
Specimen holders

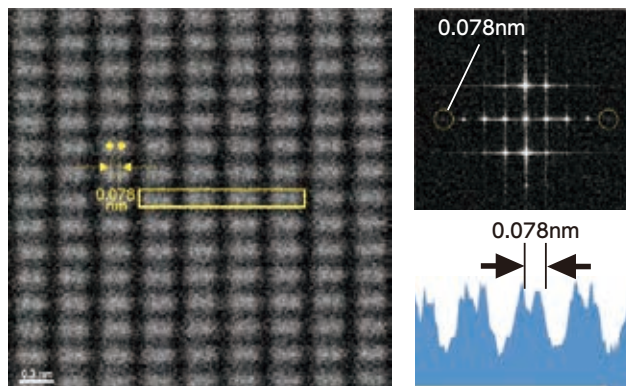
Ask local sales representative for more options

- Atomically resolved STEM images under heating and gas reaction



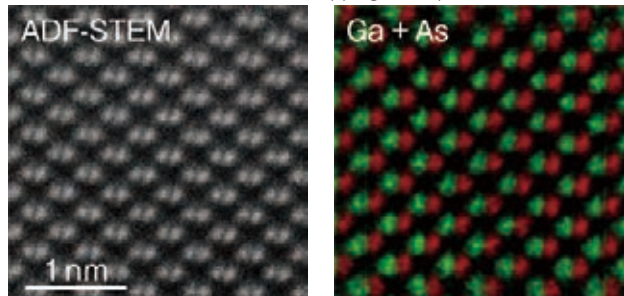
Specimen : Perovskite catalyst including Ru
Acceleration voltage : 200 kV SE, BF and HAADF-STEM
Specimen temperature : 800 degree C

- Atomic resolution STEM image



Specimen : Silicon <112> single crystal
Acceleration voltage : 200 kV

- Atomic column EDS elemental mapping with symmetrical Dual SDD



Specimen : GaAs single crystal (110)
Acceleration voltage : 200 kV

RuliTEM HT7800 series

A Modern Microscope for Modern Solutions

The HT7800 120kV TEM series incorporates best in class resolution with superior contrast in a redesigned intuitive user interface. Featuring the HT7800, HT7820, and HT7830 platforms, versatility as well as performance can be optimized to best suit any facilities' needs. The HT7800 series sets the stage for fields of medical, materials, biological, polymers, semiconductor, and more. Experience unsurpassed ease of use, performance, and power in a single package!

【Features】

- Digital design with high-speed CMOS navigation camera for ergonomic and efficient operation
- High volume TMP and redesigned pumping architecture for ultra-clean, quick vacuum system
- Hitachi dual-mode objective lens for seamless High-Contrast (HC) and High-Resolution (HR) imaging modes
- Tomography, automated montage+stitching, and automated pre-irradiation standard
- Whole view function and advanced image navigation for grid overview/imaging capabilities
- High-stability specimen stage and a wide range of advanced specimen holders
- BF/DF STEM, EDS, CLEM, *in-situ*, hollow cone, and more options available for a broad range of applications

<HT7800>

Resolution	0.20 nm (100 kV, Lattice)
Magnification	50 x ~ 600,000 x
Tilt angle*1	±70°
Accelerating voltage	20 ~ 120 kV

<HT7820>

Resolution	0.14 nm (120 kV, Lattice)
Magnification	50 x ~ 800,000 x
Tilt angle*1	±30°
Accelerating voltage	20 ~ 120 kV

<HT7830 : with high resolution lens>

Resolution	0.14 nm (120 kV, Lattice)
Magnification	100 x ~ 1,000,000 x
Tilt angle*1	±10°
Accelerating voltage	20 ~ 120 kV

<Options *>

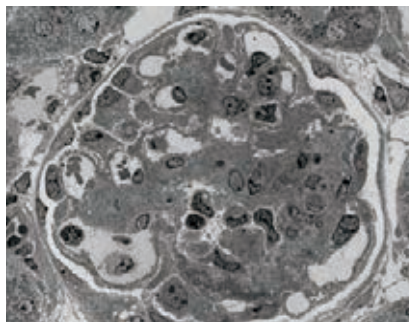
Scanning transmission electron microscopy observation (STEM) unit, Energy dispersive X-ray spectrometer (EDS), Specimen holders, and CMOS camera (16M CMOS RC16 camera etc.)

* Ask sales representative for applicable options



Picture shown with options.

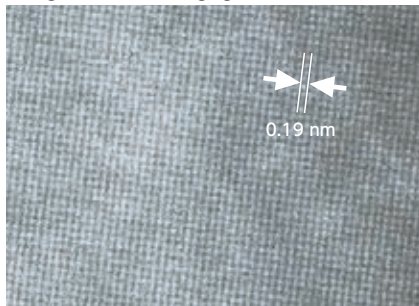
● Low-magnification, wide-area imaging



Sample : Mouse kidney
Instrument : HT7800
Accelerating voltage : 80 kV

10 μm

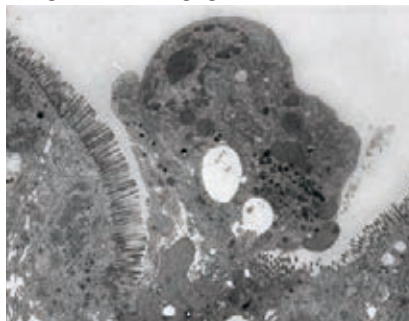
● High-resolution imaging



Sample : Single crystal Silicon
Instrument : HT7830
Accelerating voltage : 120 kV

2 nm

● High-contrast imaging



Sample : Rat Jejunum (unstained)
Instrument : HT7800
Accelerating voltage : 80 kV
Specimen courtesy of Prof. Dr. Akira Sawaguchi,
Faculty of Medicine, University of Miyazaki

2 μm

ETHOS NX5000

High Performance FIB-SEM for Advanced Applications

High Performance SEM Column with Dual Lens Mode

Semi-in-lens Ultra High Resolution mode (HR mode) for nanoscale imaging
Field Free mode (Time Sharing mode) for high accuracy end point detection in real time

High Throughput Material Processing

Ultra-Fast FIB milling with high ion-current density
(Maximum Probe Current 100 nA)
User-programmable recipe function for automated processing

Micro Sampling System

Anti-Curtaining Effects(ACE) technology for making high quality lamella
Fully integrated sample orientation control by Hitachi micro sampling system

Triple Beam System Configuration, Delivering Advanced Quality Preparation

Ultra-low damage capability by material processing with a noble gas beam (argon or xenon) from 500V.
Innovative functions reduce Ga ion related and other FIB milling artifacts

Large Multi-Port Chamber and Stage for Several Applications

Large sample sizes with exceptional stage stability
Full-range enhanced long-distance tracking (150 X 150 mm stage)



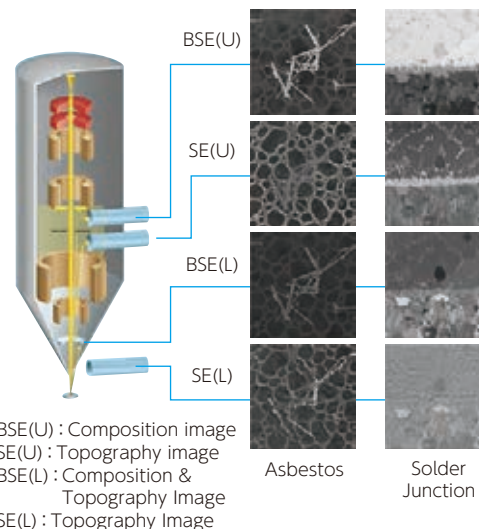
Main Specifications

FIB		
	NX5000	NX5200
	4 nm@30 kV	4 nm@30 kV
SIM resolution (C.P)	60 nm@2 kV	50 nm@2 kV
	Edge Resolution	Edge Resolution
Accelerating voltage	0.5 ~ 30 kV	0.5 ~ 30 kV
Maximum Probe Current	100 nA	100 nA
Ion source	Ga Liquid metal ion source	Ga Liquid metal ion source
SEM		
Resolution	1.5 nm@1 kV	
	0.7 nm@15 kV	
Accelerating voltage	0.1 ~ 30 kV	
Maximum probe current	10 nA	
Electron Gun	Cold cathode field emission type	
Detector		
SEM In-Column	Secondary Electron detector SE (U) Back Scattered Electron detector BSE (U)	
Chamber Port	Back Scattered Electron detector BSE (L)	
	Secondary electron detector SE (L)	
Stage		
Stroke 5 axis motorized	X,Y: 155 mm Z: 16.5 mm R: 360° T: -10° ~ 59°	

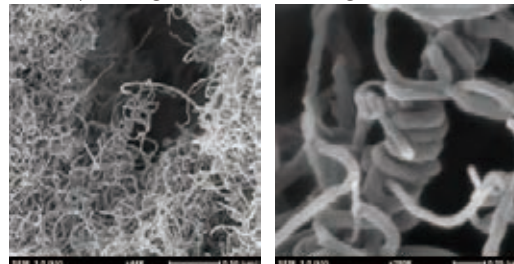
Options (3rd Party Vendor)

EDS	Energy Dispersive Spectrometer
EBS	Electron Backscatter Diffraction
Plasma cleaner	Contamination control for specimen chamber
Image analysis software ImagePro	3D Reconstruction software
STEM Detector	STEM image can be captured

● High performance SEM column



● Example of High resolution SEM image



Multi-wall carbon nanotube (MWCNT) SEM Image

Acc Vol : 1.0 kV
Detector : SE(Upper)
Lens mode : HR mode
WD : 4 mm(C.P.)



NX2000

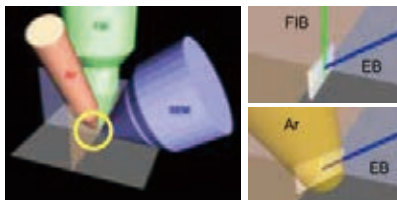
For ultrahigh quality TEM sample preparation

[Features]

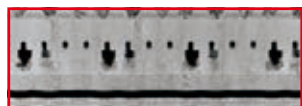
- High-resolution, high-contrast, real-time SEM imaging allows high-precision end point detection for sub 20 nm thick lamella preparation.
- Anti Curtaining Effect (ACE) technologies help mitigate curtaining effect and prepare lamellas of uniform thickness.
- Triple Beam system advances high-throughput, non-skilled operation of FIB-induced damage reduction

[Key technologies]

- Cold field emission electron source for high-resolution, high-contrast SEM
- Real-time SEM monitoring for high-precision end point detection during FIB milling and Ar/Xe ion beam milling.
- ACE technologies such as 4-axis Micro-sampling system with probe rotation and double-tilt system
- Large chamber and 5-axis motorized stage with full coverage of 200 mm wafer
- Various FIB damage reduction methods : low energy FIB and Ar/Xe ion beam
- Multi gas injection system for deposition of various materials and enhanced etching applications
- Automated TEM sample preparation at multiple sites



Without sample orientation control



With sample orientation control

FIB

SIM resolution	4 nm@30 kV 60 nm@2 kV
Accelerating voltage	0.5 ~ 30 kV
Maximum Probe Current	100 nA

SEM

Resolution	2.8 nm@5 kV 3.5 nm@1 kV
Accelerating voltage	0.5 ~ 30 kV
Electron source	Cold field emission

Options

Ar/Xe ion beam system
Micro-sampling system
Automatic micro sampling system
Multi gas injection system
Linkage software with defect inspection instruments
EDS
Double tilt system
Swing function
TEM sample preparation wizard

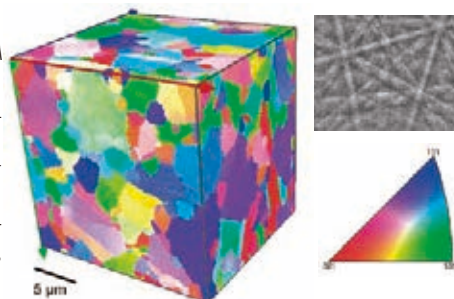
Real-time 3D analytical FIB-SEM

NX9000

FIB-SEM/Triple Beam system for true 3D structural analysis

SEM column and FIB column are orthogonally arranged to realize optimum layout for 3D structural analysis.

- Normal incident SEM imaging at optimized coincidence point maximizes SEM imaging performance.
- Compact sample stage helps reduce drift and enables accurate and stable serial sectioning.
- Multi Cut & See enables automated serial section imaging at multiple sites for high-throughput 3D structural analysis.
- Optimal arrangement of sample and detectors requires no sample moving for various imaging and analyses after FIB processing and hence greatly enhances accuracy and throughput of 3D crystallographic analysis (3D-EBSD).
- Triple Beam system supports high quality sample preparation with less damage using Ar ion beam as well as low energy FIB.



Sample : Ni
SEM accelerating voltage : 20 kV
Cutting interval : 150 nm
Number of cut : 150



SEM

Accelerating voltage	0.1 ~ 30 kV
Resolution	2.1 nm@1 kV 1.6 nm@15 kV

FIB

Accelerating voltage	0.5 ~ 30 kV
SIM resolution	4 nm@30 kV
Maximum Probe Current	100 nA

SU9000II

Bringing the advances of SEM to the forefront

The SU9000II FE-SEM achieves the highest possible system resolution in market*1 (SE Resolution 0.4 nm@ 30 kV) with so-called true in-lens concept combined with the next generation of Hitachi's cold field emission technology. To allow for stable data acquisition at the instrument's highest performance levels in automated manners, the SU9000II offers new optional capabilities that render automated adjustments of the optical system and automated data acquisition. It can also be used to measure EELS.

The SU9000II meets the needs in various research and development fields, including advanced materials such as 2D materials, semiconductor electronics, as well as medical and biological fields.

*1: as of October 2023

[Features]

- Improved resolution at low accelerating voltage to reduce sample damage
- cold field emission electron source for both small aberration and stable high probe current
- Ultrahigh vacuum sample chamber to mitigate contamination
- High stiffness frame and sound-proof enclosure to ensure high performance in various environments.
- New capabilities to allow sequential data collection, including a function for automated adjustments of the optical system and an optional function that supports automated data acquisition.

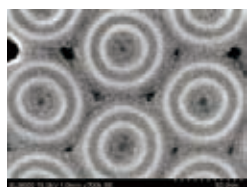


Resolution	0.4 nm (30 kV)
	1.0 nm (1 kV), 0.7 nm (1 kV with deceleration*)
	0.34 nm at 30 kV/BF-STEM*
Magnification	80 x ~ 3,000,000 x (on photo)

(*) option

Electronics

Plan view of DRAM capacitors: Morphology evaluation and compositional analysis

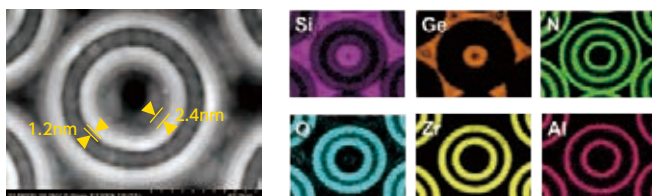


An example of a DRAM capacitor section exposed by ion milling.

In the upper left secondary electron image, concentric multi-layered structures of about 6 nm each can be seen inside the circular capacitor.

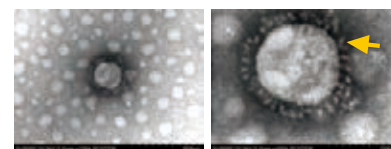
The figure at the lower left, the same sample was thinned and observed by STEM, and a multilayer structure ranging from layers of approximately 1 to several nanometers was clearly observed.

In the EDS elemental map image at the lower right, multiple layer structures with a width of 1 to 6 nm can be seen in the capacitor area, and each layer is composed of SiGe, TiN, ZrO₂ and other materials.



Life science

Novel Coronavirus Image



This is a STEM image of a negatively stained novel coronavirus.

From the image on the left, it is determined that the diameter is around 150 nm.

In the enlarged image on the right, the detailed shapes of the spike proteins (arrow) that are the receptor binding sites are clearly visible.

STEM image magnification: 150 kX (left), 450 kX (right); Acceleration voltage: 30 kV

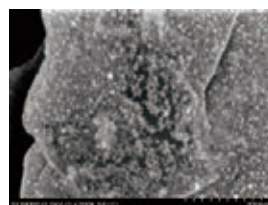
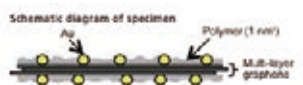
Materials science

Polymer-coated graphene: Evaluation of coating morphology

This example features observations of a graphene surface coated by an extremely thin polymer layer intended to serve as a carrier for gold nanoparticles.

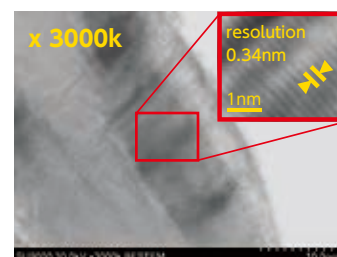
As the polymer layer is an extremely thin film with a thickness of around 1 nm, the observation uses an ultra low landing voltage of 0.1 kV.

The region exposed graphene surface appears dark in the image due to the differing secondary-electron emission yield of the polymer material and the graphene.



Specimen Courtesy of Professor Tsuyohiko Fujigaya, Associate Professor, Applied Chemistry Department, Graduate School of Engineering, Kyushu University

Multi wall carbon nanotube



Magnification : 3,000,000 x
Accelerating voltage : 30 kV

SU8600

Ultrahigh-Resolution and Comprehensive Analysis

SU8600 incorporates multifaceted imaging, automation, increased system stability, efficient workflows for users of all experience levels, and more.

[Features]

- Hitachi's high-brightness cold field emission source provides ultrahigh-resolution images even at low acceleration voltages.
- A smart detection system combined with ExB allows for comprehensive imaging and analysis with ease.
- A multitude of new detectors and options are available to best suit the needs of any user.

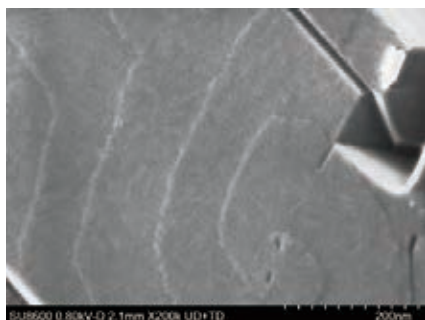
Resolution	0.6 nm (15 kV)
	0.7 nm (1 kV)
Magnification	20 x ~ 2,000,000 x (Photo)



* The instrument picture includes options

More Signals, More Information

Fine Surface Information



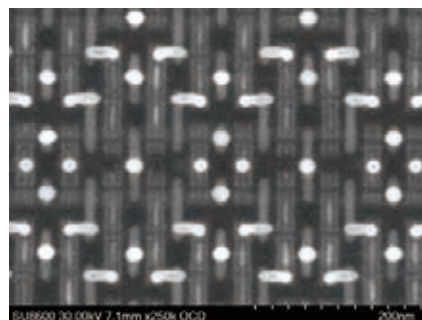
RHO-type Zeolite

Ultra low voltage imaging

In order to reveal fine steps structure on surface, the image was acquired at 0.8 kV of landing voltage. This allows the very fine structure of surface steps to be clearly visible

Specimen courtesy of
Dr. Yoshihiro Kamimura,
National Institute of Advanced Industrial
Science and Technology (AIST), Japan

Rapid Compositional Imaging

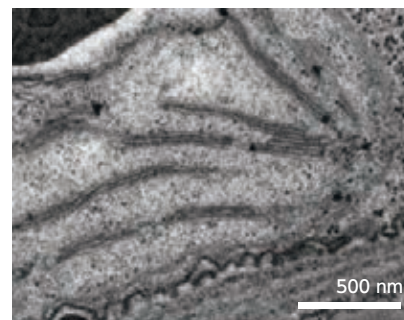


5 nm process SRAM

High speed BSE Detector (OCD)

Lower layer interconnect and Fin FET are visible.
By using new Out-Column Crystal Type BSED (OCD), image acquisition time was less than ONE SECOND, yet structure is clearly visible.

TEM-like Imaging Quality



Ultrathin section of Arabidopsis thaliana

BSE signal at low voltage

Image was acquired at 2 kV of acceleration voltage to demonstrate TEM-like quality. For Energy Filtered BSE detection, ultrastructure such as thylakoid membrane are clearly visible.

Specimen courtesy of Dr. Kiminori
Toyooka, RIKEN CSRS

SU8700

Ultrahigh-Resolution and Analytical Capability

The SU8700 allows for both versatile imaging and demanding analytical capabilities in a single system.

[Features]

- Schottky field emitter provides probe current from a few pA to 200 nA, in order to address a large variety of specimens.
- Novel electron optics enable very low voltage imaging while still maintaining high image quality – even as low as 0.1 kV (down to 0.01 kV as option) without stage bias.
- Optimized detection system and chamber design allow short working distance EDS analysis (WD=6 mm) for both imaging.

Resolution	0.6 nm(15 kV)
	0.8 nm(1 kV)
	0.9 nm(0.3 kV)
Magnification	20 x ~ 2,000,000 x (Photo)
Variable Pressure Range*	5~300 Pa

(*) option

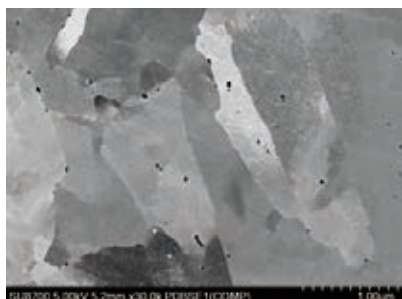
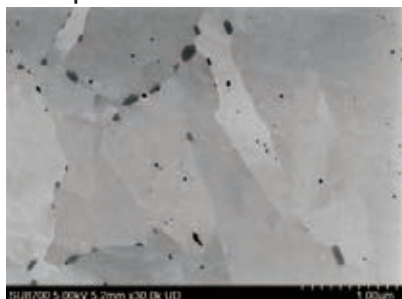


* The instrument picture includes options

Exploring Imaging Capability

Materials

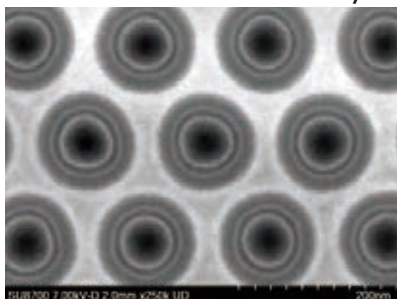
Tempered Martensite in Steel



Specimen courtesy of Dr. Shoichi Nambu,
The University of Tokyo

Electronics

3D NAND Flash Memory



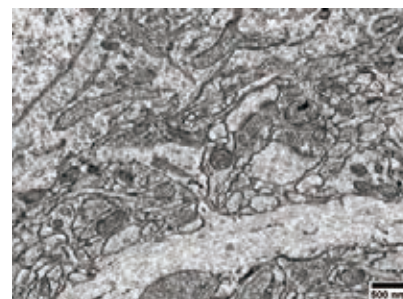
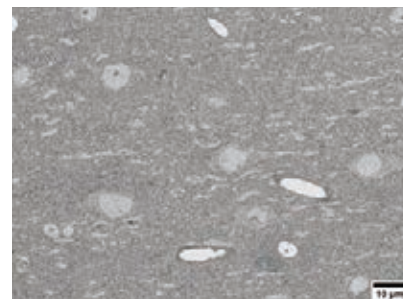
Left : Various Signals Acquisition
The precipitates along grain boundaries are clearly visible when acquiring SE image using the UD (Top image)
Grain size and deformation are easily distinguishable in left-bottom image by acquiring BSE channeling contrast (bottom image).

Top : Material Contrast in SE image
An example of the high detection efficiency of the SU8700. This data clearly shows structure consisting of very thin (<10 nm) nitride, oxide and poly-Si layers in SE image.

Right : Hi-Pixel Resolution
The yellow rectangle field in the top image is shown in bottom image with an increase of digital magnification. The structures of organelle are clearly visible and high-quality is maintained. High pixel resolution image up to 40,960 x 30,720 pixel available.

Life Science

Rat Cerebral Cortex



Specimen courtesy of
Dr. Yoshiyuki Kubota,
Section of Electron Microscopy,
National Institute for Physiological
Sciences

SU7000

High Resolution, High Throughput, Large Chamber with Versatility

Fast and accurate characterization with simultaneous 6-channel signal acquisition and X-ray analysis under one working distance.

[Features]

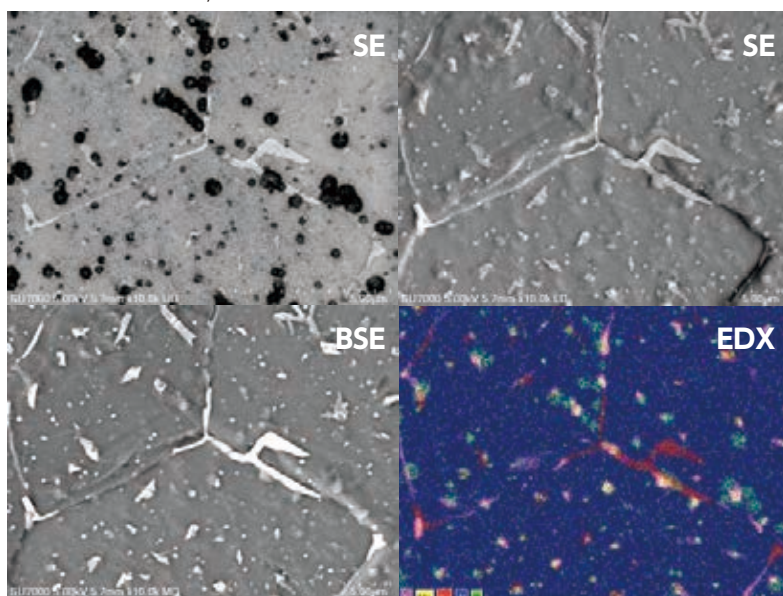
- Ultra high resolution imaging capable to resolve sub nm features
- Simultaneous imaging of SE, BSE and X-ray analysis at one WD
- Large specimen chamber accommodating up to 8 inch wide sample with 18 accessory ports suitable for in-situ and testing/analysis activity.



Resolution	0.8 nm(15 kV)
	0.9 nm(1 kV)
Magnification	20 x ~ 2,000,000 x (Photo)
Variable Pressure mode(*)	5 ~300 Pa

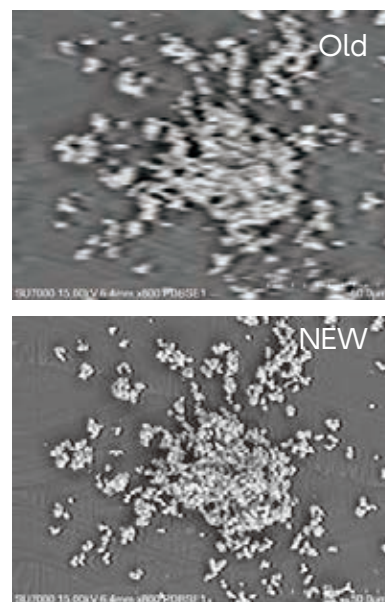
(*) Option

SEM and EDS analysis @ Same WD



Specimen : Aluminum Alloy
Magnification : 10,000 x
Acc. V : 5 kV

Ultrafast BSD(*)



Dramatically improved response.
Specimen : inorganic particles

SU5000

Versatile FE-SEM with great flexibility

[Features]

- EM Wizard with automated calibration to constantly keep electron optical condition
- Enhanced EX deceleration for improved resolution of 1.6 nm@1 kV
- Optimally segmented BSED to individually collect information on topography, composition and crystallographic orientation
- Chamber with open access and anti-contamination conscious electron optics for easy *in-situ* experiment like heating and tensile testing.
- Ultra Variable-pressure Detector* (UVD) for SE detection under low vacuum and CL detection under high vacuum

Resolution	1.2 nm (30 kV)
	3.0 nm (1 kV)
	2.0 nm (1 kV/Deceleration mode*)
Magnification	10 x ~ 600,000 x
Variable pressure mode*	10 ~ 300 Pa

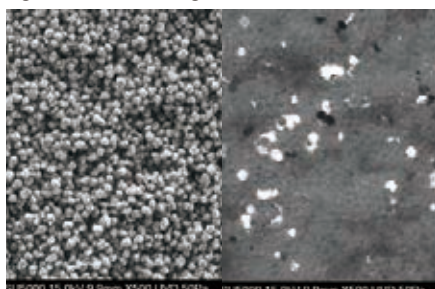


* Option

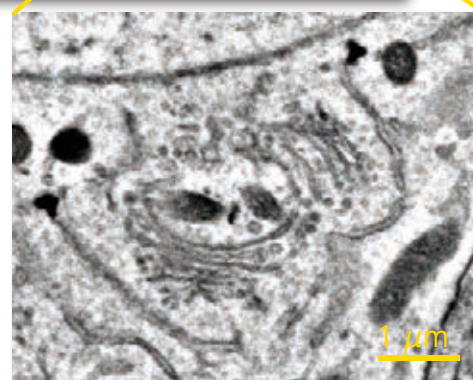
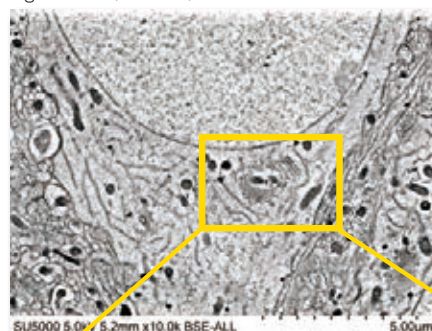
Sample : Carbon nanotube
Accelerating voltage : 0.5 kV
Detector : Top detector
Magnification : 200,000 x



Sample : Phosphor
Accelerating voltage : 5 kV
Detector : UVD
Signal : SE(left) / CL(right)



Sample : Rat forebrain
(resin-embedded section)
Accelerating voltage : 5 kV
Signal : BSE (inverted)



Sample courtesy of Dr. Yoshiyuki Kubota, National Institute for Physiological Sciences

SU3900SE/SU3800SE Series

All-in-one Schottky SEM for a wide variety of analytical requirements

The SU3900SE/SU3800SE Series delivers high-resolution capability for top-surface imaging with the versatility of a large chamber and variable-pressure modes.

The SE Series lineup offers four models to meet the measurement needs of a wide variety of fields, such as Non-conductive specimen observation with variable pressure mode.

Item	SU3900SE/SE Plus	SU3800SE/SE Plus
Resolution	0.9 nm (30 kV) 2.5 nm (1 kV) 1.6 nm (landing voltage 1 kV) *	
Magnification	5x ~ 600,000x (Photographic Magnification)	
Maximum Specimen size (diameter)	Φ300 mm	Φ200 mm
Maximum loadable weight ※1※2	5 kg	2 kg

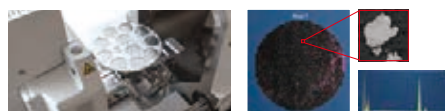
* Optional, with deceleration mode, available only for SE Plus.

※1 Using the heavy weight holder (optional).

※2 The weight and height that can be loaded differ depending on the dimensions of the specimen being loaded.

[Features]

- Advanced models (SE Plus) include deceleration mode which improves performance at low landing voltages.
- High-sensitivity 4+1 segment semiconductor BSE detector is included in standard configuration.
- EM Flow Creator for workflow automation.
- Auto alignment sequence for improved data repeatability.
- SEM MAP covering entire observable region, realizing simple field-of-view search by optical camera images.



Detection of Foreign Matter During Manufacturing by EDS Particle Analysis



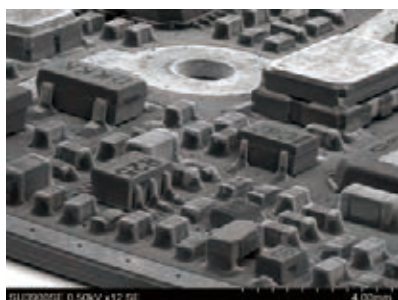
SU3900SE/SE Plus



SU3800SE/SE Plus

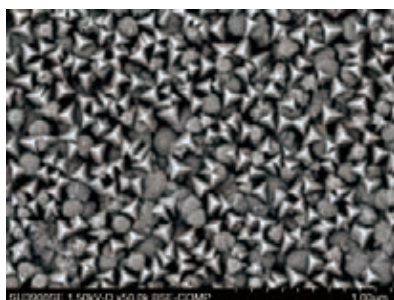
Application

Printed circuit board



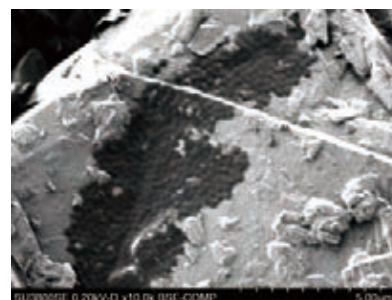
The 3D shapes and positions of mounted components can be seen using low-magnification/high-tilt observation

High-entropy carbide film



Distribution of particles with different compositions/shapes can be seen.

Lithium-ion battery anode material



By applying an ultralow landing voltage at 200 V, lithium-ion battery anode material and binder is clearly distinguished using static voltage contrast.

● Variable Pressure Scanning Electron Microscope

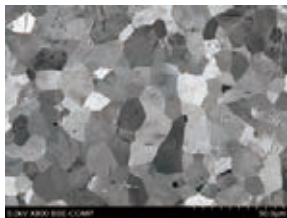
SU3800 / SU3900

The SU3800/SU3900 VP-SEMs combine high image resolution and flexibility with ease of use enabling high quality data acquisition for a wide range of applications.

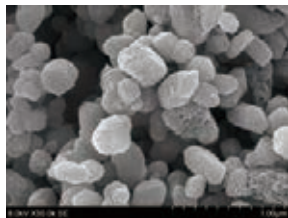
SU3800

[Features]

- SEM MAP for seamless navigation of the entire observable area
- Wide Area Camera Navigation System (optional)
- Automatic optimization of filament performance for extended lifetime
- A multifaceted specimen chamber enabling accessory additions
- SEM/EDS integration system (optional)



Specimen : Pure Titanium
Magnification : 800 x
Accelerating voltage : 5 kV



Specimen : Titania particles
Magnification : 50,000 x
Accelerating voltage : 8 kV



Resolution	3.0 nm@30 kV(High vacuum), 4.0 nm@30 kV(Low vacuum)
Magnification	5x ~ 300,000 x (on photo)
Accelerating voltage	0.3 ~ 30 kV
Maximum sample size	200 mmΦ
Maximum sample thickness ^{※2}	80 mm thick (WD=10 mm)
Maximum mountable weight ^{※1※2}	2 kg (Optional)

※1 Using the heavy weight holder (optional).

※2 The weight and height that can be loaded differ depending on the dimensions of the specimen being loaded.

SU3900

[Features]

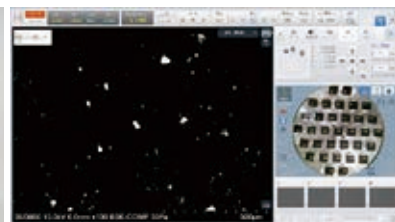
- The same high image resolution and versatile functions as SU3800
- Large chamber that can handle large, heavy, and multiple samples

Resolution	3.0 nm@30 kV(High vacuum), 4.0 nm@30 kV(Low vacuum)
Magnification	5 x ~ 300,000 x (on photo)
Accelerating voltage	0.3 ~ 30 kV
Maximum sample size	300 mmΦ
Maximum sample thickness ^{※2}	130 mm thick (WD=10 mm)
Maximum mountable weight ^{※1※2}	5 kg (optional)

※1 Using the heavy weight holder (optional).

※2 The weight and height that can be loaded differ depending on the dimensions of the specimen being loaded.

- Application : Multiple samples
Φ15 mm stub x 33 with metal particles



- Application : Large sample
Drill (height 130 mm)



Magnification : 50 x
Accelerating voltage : 15 kV

Variable Pressure Scanning Electron Microscope

FlexSEM 1000II

Compact SEM with most advanced features

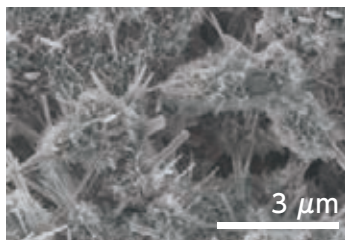
FlexSEM 1000II enables tabletop operation by down sizing and weight saving while achieving resolution comparable to upper model and easy operation without need for experience.

New navigation function, SEM MAP, allows users to quickly find locations for observation from an optical image or an SEM image with intuitive operation.

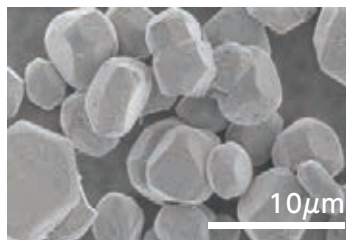
[Features]

- 4 nm resolution yet compact design (45 cm wide main unit)
- New user interface for high resolution and high throughput imaging without need for experience
- New navigation, SEM MAP, to help find locations for observation
- Liquid nitrogen free large area EDS detector for fast elemental analysis (optional)
- Faster autofocus and autobrightness to shorten the process time to one-third*

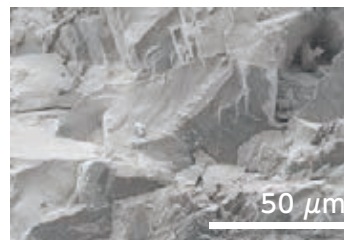
Resolution	4.0 nm@20 kV (High vacuum) 5.0 nm@20 kV (Low vacuum)
Magnification	6 x ~ 300,000 x (on photo) 16 x ~ 800,000 x (on display)
Accelerating voltage	0.3 ~ 20 kV
Maximum sample size	80 mm ϕ
Maximum sample thickness	40 mm



Sample : Cement
(without conductive coating)
Accelerating voltage : 3 kV
Magnification : 15,000 x
Detector : SE



Sample : Phosphor
(without conductive coating)
Accelerating voltage : 1.5 kV
Magnification : 5,000 x
Detector : SE



Sample : Chalcopyrite
(without conductive coating)
Accelerating voltage : 5 kV
Vacuum : 40 Pa
Magnification : 1,500 x
Detector : UVD

* Comparison to Hitachi SU1510 SEM

● Tabletop Microscopes

TM4000 II series

A pioneer in tabletop microscopy, Hitachi has shipped over 5,000 units of this series alone.

Easy and quick imaging without sample preparation for immediate analysis

[Features]

- From sample insertion to observation within 3 minutes.
- Variable pressure function nonconductive samples imaging without any metal coating.
- 20 kV accelerating voltage for improving both imaging and analytical capabilities.
- High-sensitivity BSE detector enables to provide both clear compositional material contrast and high resolution images.
- SE image acquisition capability under variable pressure mode thanks to high-sensitivity Hitachi UVD detector.
- Compact design for tabletop size. Just plug in to a AC100 V three-pronged outlet.
- Environmentally-conscious design with an oil-free vacuum system
- An optical image of the sample and the MAP function make it easy to find a location without getting lost (Camera Navigation optional).
- Report Creator is a standard feature which enables users to generate customized reports easily.



From sample insertion to EDS analysis...in only minutes.



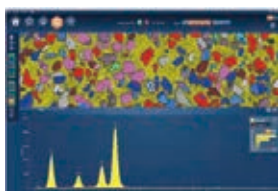
● Energy Dispersive X-ray Spectrometers for Tabletop Microscopes

AZtecLive One/Quantax75/Element

Simple operation and large area EDS detector for high-throughput analysis
Anytime elemental analysis without liquid nitrogen

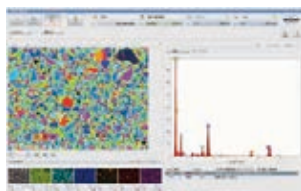
AZtec series

- Live Spectrum Viewer with Automatically labelled peak can be shown. (AZtecLive One)
- High-throughput analysis with high-precision pile-up correction and Tru-Q technologies.
- TruMap generates element maps that peak overlaps removed in real time.



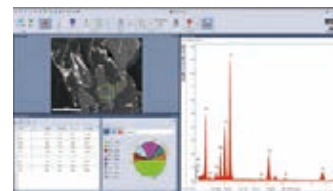
Quantax

- Fast X-ray mapping with simple operation
- Spectrum display for each designated spot position
- HyperMap for simultaneous acquisition of signals for spot analysis /line analysis/mapping



Element

- Excellent resolution
- Designed with a silicon nitride (Si_3N_4) window to optimize low energy X-ray transmission for light element analysis
- Advanced low-noise electronics for outstanding throughput



Model	AZtecLive One	Quantax75	Element
Detector	Silicon Drift Detector		
Detector size	30 mm ² , 65 mm ²	30 mm ² , 60 mm ²	30 mm ²
Energy resolution	equivalent to 129eV with $\text{MnK}\alpha$		
Detectable element	B ₅ ~ Cf ₉₈	B ₅ ~ Cf ₉₈	Be ₄ ~ Am ₉₅



Hybrid Ion Milling systems

IM4000II

Sample polishing system utilizing sputtering phenomena upon argon ion beam irradiation. Both cross-section milling and flat milling are available for various imaging and analysis purposes.

[Features]

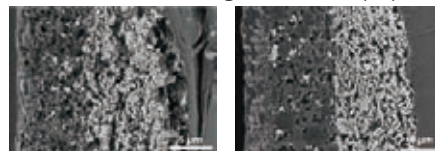
- Compatible milling holder with Hitachi SEM having a chamber with open access for high-throughput analysis (No sample mounting and dismounting between ion milling and SEM observation)
- User-friendly touch panel operation
- Intermittent ion beam irradiation for heat-sensitive samples. Cooling unit (optional) enabling not only thermal damage reduction, but also supercooling prevention
- Air protection unit (optional) allowing subsequent SEM observation without air exposure after ion milling



Common	
Gas	Ar (Argon) gas
Accelerating voltage	0.0 ~ 6.0 kV
Cross-section milling	
Maximum milling rate	500 $\mu\text{m}/\text{h}$ or more for Si*1
Maximum sample size	20(W) x 12(D) x 7(H) mm 35(W) x 17(D) x 8(H) mm*
Flat milling	
Maximum sample size	$\Phi 50$ x 25(H) mm

*1 : Maximum milling depth of Si protruding 100 μm from edge of the mask after one hour

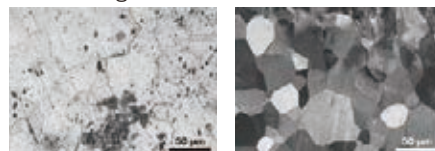
Cross-section milling of thermal paper



Razor cutting

Cross-section milling

Flat milling of steel



After mechanical polishing

After flat milling

Hybrid Ion Milling systems

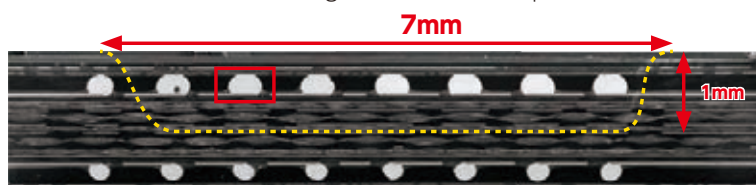
ArBlade 5000

Hard materials like ceramics and metals can be processed in a much shorter time. Wide-area milling allows structural analysis of electric components and metallic parts over a wide region that were previously considered difficult.

[Features]

- New ion source achieving best-in-class cross-section milling rate (Over 1 mm/h)
- Specimen movable range ± 5 mm
- User-friendly touch panel operation
- Cooling unit (Optional) and air protection unit (Optional) are available.

Wide-area cross-section milling of electronic component



Enlargement of red box area



Common	
Gas	Ar (Argon) gas
Accelerating voltage	0.0 ~ 8.0 kV
Cross-section milling	
Maximum milling rate	1 mm/h or more for Si*1
Maximum sample size	20(W) x 12(D) x 7(H) mm 35(W) x 17(D) x 8(H) mm*
Flat milling	
Maximum sample size	$\Phi 50$ x 25(H) mm

*1 : Maximum milling depth of Si protruding 100 μm from edge of the mask after one hour

● Ionic Liquids for Hitachi Electron Microscope

HILEM IL1000

An Innovative Solution for TEM/SEM Sample Preparation

[Features]

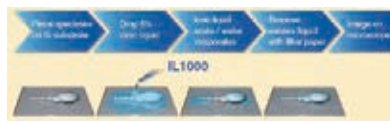
- Hitachi Ionic Liquid is an organic salt that maintains a fluid state at ambient temperature with low vapor pressure to provide a broad range of preparation applications for SEM and TEM
- Provides a conductive matrix for easy observation of non/less-conductive samples
- Prevents shrinkage and morphological deformation of hydrated samples by mitigating desiccation under vacuum
- CLEM as well as *in-situ* TEM compatible for ultimate versatility
- Rapid and easy sample preparation without hazardous chemicals or expensive equipment

SEM sample preparation method for biological specimen

Accelerating voltage : 1.5 kV

Magnification : 47 x

Sample : Micro-crustacean



Untreated



IL1000-treated
Sample : Filter paper

※Please contact Hitachi sales rep

● Ion Sputter

MC1000

Magnetron electrode type ion sputter for high resolution SEM with minimum sample damage and fine particle coating capability

[Features]

- LCD touch panel operation for current/process time setting
- Recipe function to save/load process conditions
- Optional units for thicker or larger samples

Discharging method	Diode discharge magnetron type
Sample size	Maximum diameter : 60 mm Maximum height : 20 mm
Target(Φ63 mm, option)	Pt, Pt-Pd(8 : 2), Au, Au-Pd(6 : 4)
Option	Layer thickness measurement & cooling control unit Large chamber Carbon coating unit



● UV-based Sample Cleaner

ZONESEMI(ZON-2010) & ZONETEMI(ZON-2020)

Compact UV-based sample cleaner with easy-to-use touch screen

ZONEII is a sample cleaner which irradiates samples and stubs with ultraviolet light. Generated ozone and active oxygen remove hydrocarbon attached to the surface to reduce contamination during SEM and TEM observation.

[Features]

- Space-saving desktop design
ZONESEMI : (300(W)x262(D)x326(H) mm)
ZONETEMI : (334(W)x355(D)x250(H) mm)
- Multiple TEM holder ports available for TEM.
- User-friendly touch panel operation
- Simple sample loading and unloading
- Recipe function
- Usable as a vacuum desiccator

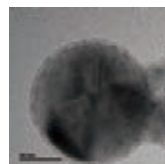


ZONESEMI

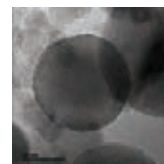


ZONETEMI

Without
ZONETEMI Cleaning



After
ZONETEMI Cleaning

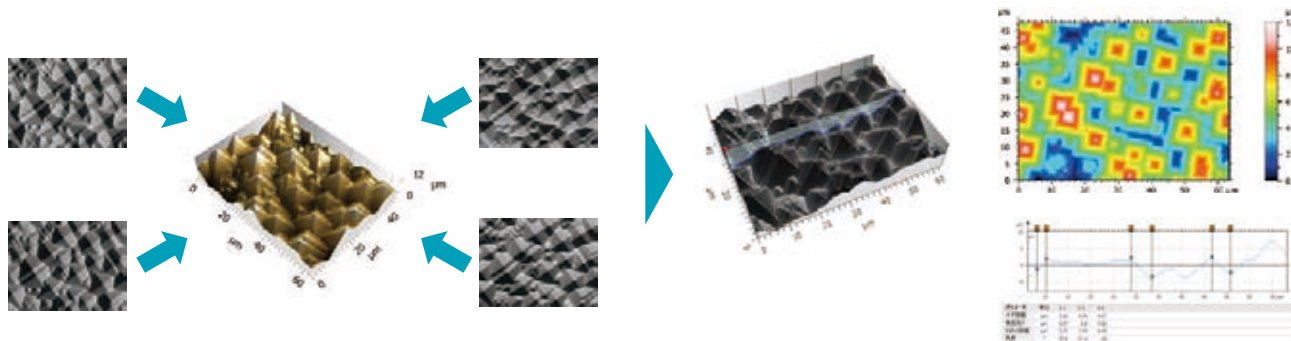


Sample : Nano Particle
(TiO₂, SiO₂, Al₂O₃, CeO, BiO)

3D surface imaging and analysis software

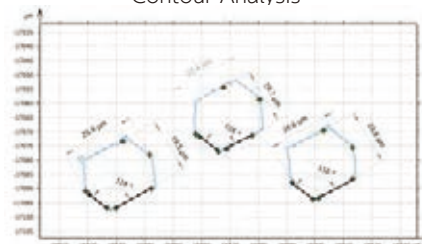
Hitachi map 3D

Hitachi map 3D generates a 3D model without sample tilting or position alignment using signals acquired by a quadrant BSE detector. Supporting various measurements such as height, area and volume as well as ISO-compliant surface and line-profile roughness. Automated and traceable analysis workflow including report creation. 11 languages are supported with extensive help facility. Colorization, Overlay, Stitching are available on demand.



ISO 4287 & 25178 Height Parameters

Contour Analysis



Serial image acquisition software

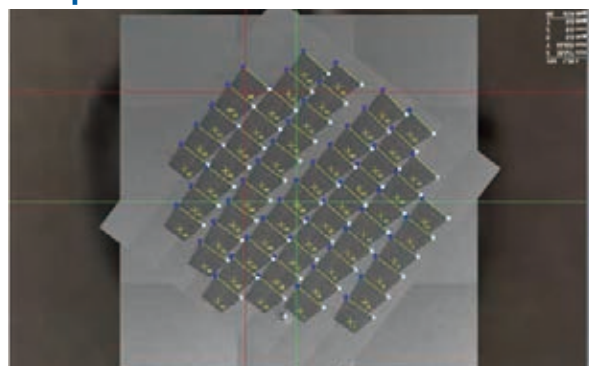
Auto Capture for Array Tomography

ACAT

Automated Image Acquisition System for Serial Section Analysis

ACAT automatically adjusts, aligns, and captures a specific region of interest (ROI) across multiple serial sections. Images are automatically acquired by specifying a ROI from a low-magnification SEM image or specifying the intercept position from an optical image/overlay.

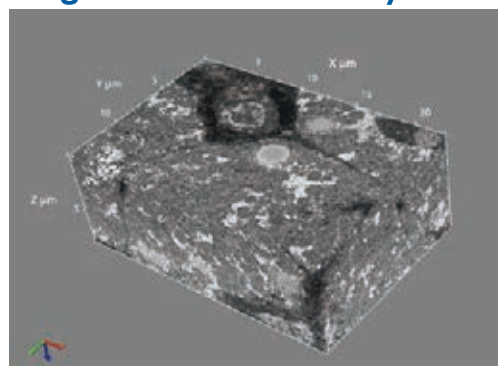
Registering serial section's position and ROI



This group of approximately 60 sections mounted on a glass slide were captured by SEM and superimposed on an optical image. The position of each section and the specified ROI were registered and displayed on the screen, whereafter the high resolution SEM images were automatically captured.

Samples Courtesy of : Dr. Daisuke Koga, Asahikawa Medical University
and
Dr. Satoshi Kusumi, Kagoshima University

3D Reconstruction of Hepatocytes Using ACAT Automated System



Samples Courtesy of : Dr. Daisuke Koga,
Asahikawa Medical University

Ultra-thin Sectioning : ARTOS manufactured
by Leica Microsystems

Correlative Light and Electron Microscopy (CLEM) system

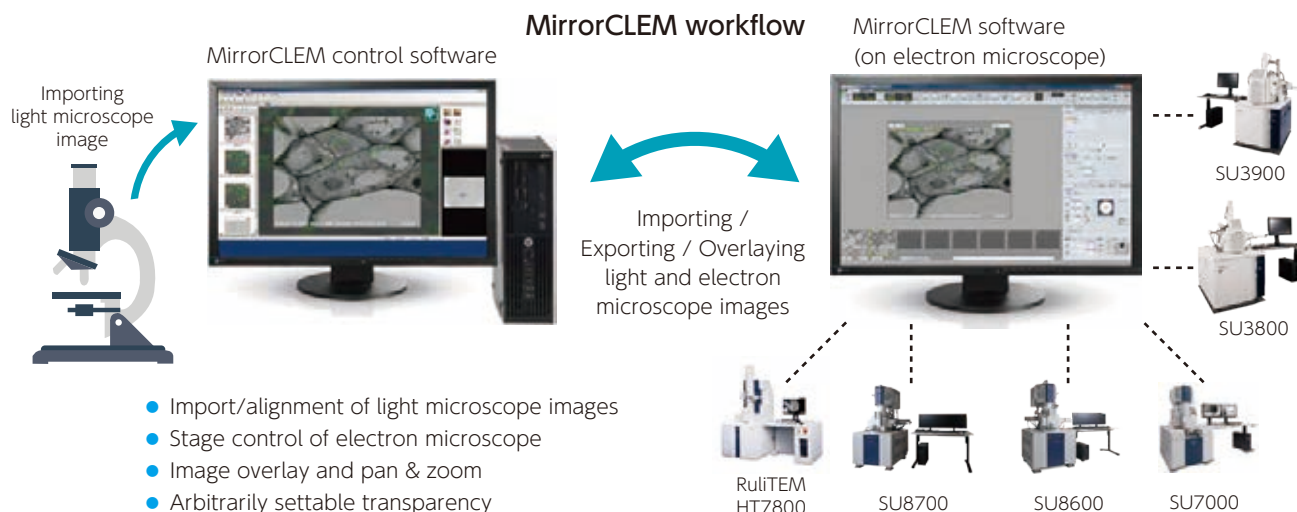
MirrorCLEM

MirrorCLEM

Real-time overlay of light microscope image on electron microscope GUI for easy CLEM imaging

[Features]

- Quick repositioning to ROI of LM image on a SEM
- Available for any light microscope or stage (either manual stage or motorized)
- Supporting electron microscopy workflow for ultrastructural and morphological observation of fluorescently labeled sites



Correlative Microscopy system for SEM and AFM

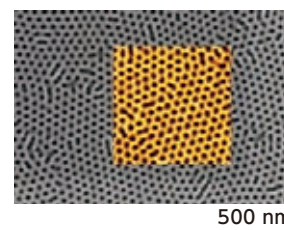
SAEMic

SAEMic. Scanning Atomic and Electron Microscopy

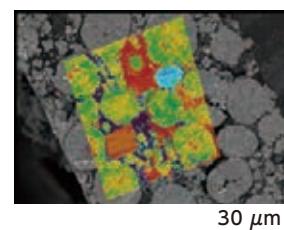
Correlative imaging between SEM and AFM

[Features]

- SEM for quick approaching to ROI from large field of view, in addition, qualitative micro analysis such as EDS and EBSD.
- AFM for various physical property measurement
- Both above at same location on SAEMic system
- Transferable holder for coordinate linkage (SEM and AFM5500MII)
- Air protection compatible holder allowing whole process from ion milling preparation to SEM-AFM correlative imaging without air exposure (SEM and AFM5300E)



On the same field of view with a scan area of 500 nm, the hole size of about 20 nm was measured, which correlates to the values obtained from the SEM image



SEM/AFM(SSRM) of positive-electrode material for lithium ion battery at the same location

● Atomic Force Microscope (SPM/AFM)

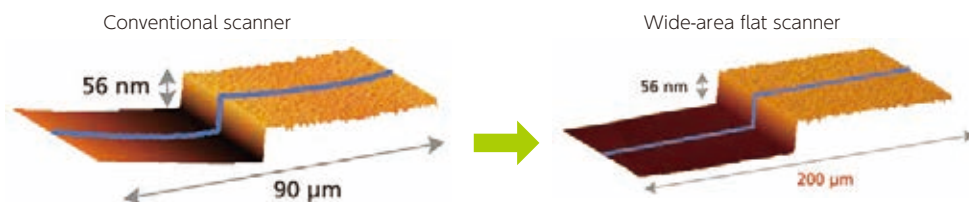
Midsized sample platform AFM5500MII



User-friendly AFM with various automated features and handy correlation capability between AFM and SEM

[Features]

- Correlative imaging of identical location between SEM and AFM
- Automated features for higher productivity (cantilever exchange, laser alignment, parameter tuning, data processing)
- Wide-area flat scanner removing mechanically-generated measurement error



Sample size	Φ100 mm, 20 mm thick
Stage	Automated, fully addressable 100 mm stage
Scan range	200×200×15 μm
Bow	≤2 nm/50 μm
XY orthogonality	± 0.5°
S/EMic.(SEM-AFM Correlation)	Compatible sample holder for sharing coordinate



● Atomic Force Microscope (SPM/AFM)

Environmental control unit AFM5300E

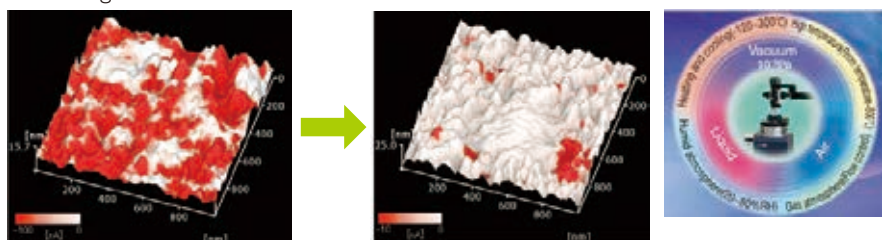


High-resolution, high-sensitivity measurement and reliable property characterization under vacuum

[Features]

- Reliable electrophysical property characterization under vacuum minimizing the impact of surface oxidation or absorbed water
- Various characterization environments such as vacuum, liquid, gas, wide temperature range, and wide humidity range
- Air protection holder allowing sample sharing among ion milling system, SEM and AFM without air exposure

Leakage current characterization of ferroelectric thin film



Sample size	Φ20 mm, 10 mm thick
Scan range	20×20×1.5 μm 100 x 100 x 15 μm*, 150 x 150 x 5 μm*
Vacuum control*	9.9×10 ⁻⁵ Pa
Temperature control*	-120 ~ 300 °C, RT ~ 800 °C
Humidity control*	20% ~ 80%RH
/EMic.(SEM-AFM Correlation)	Air protection sample holder*

* Option



Multifunctional scanning probe microscope AFM100 Series

SAEMiC.
Scanning Atomic and Electron Microscopy

Innovation, Correlation, Reliability, Performance

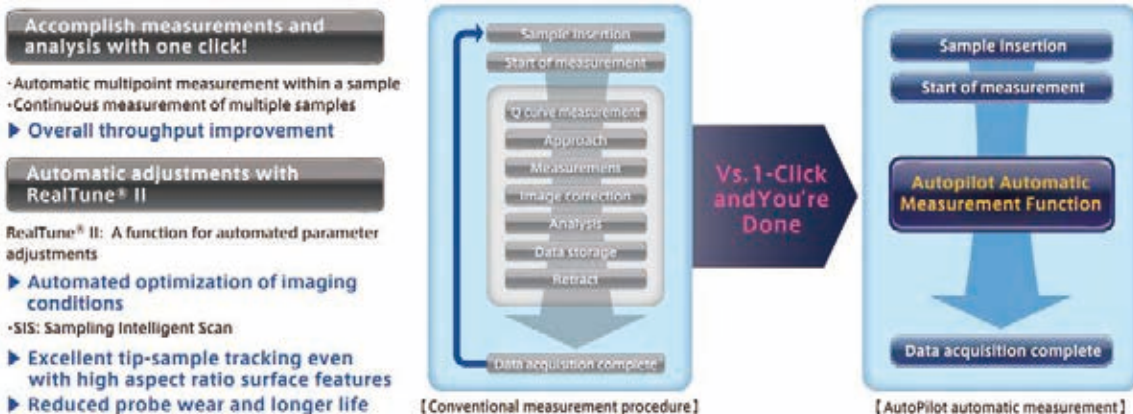
[Features]

- Pre-mounted cantilevers make replacement EASY
- Automated measurement & analysis with one-click autopilot function
- Correlative SEM-EDS Analysis with our AFM Marking Function

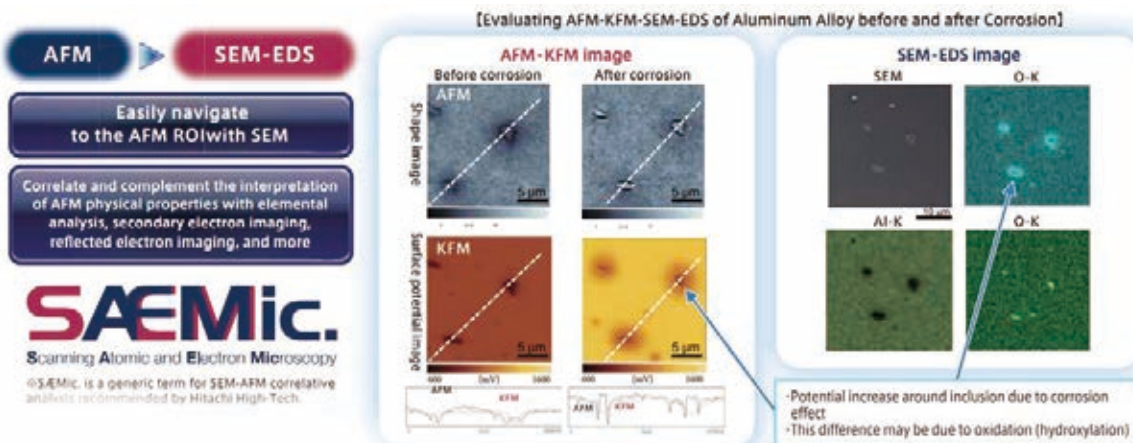
- Pre-mounted cantilevers make replacement EASY



- Automated measurement & analysis with one-click autopilot function



- Correlative SEM-EDS Analysis with our AFM Marking Function



Sample Size	Max. 35 mmΦ, thickness 10 mm, (max. 50 mm sq., thickness 20 mm)*
Sample transfer mechanism	Manual Stage XY : ±2.5 mm
Scan Range	XY : 20 μm/Z : 1.5 μm, XY : 100 μm/Z : 15 μm, XY : 150 μm/Z : 5 μm
Measurement environment	Atmosphere, in liquid*, heated* (room temperature to 250 °C), heated in liquid* (room temperature to 60 °C)

※ The asterisk (*) in the table indicates feature is optional.

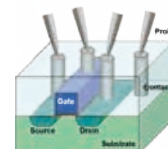
● Nanoscale Device Characteristics Analysis system

NP8000

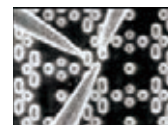
SEM-based dedicated nano-probing system for analysis of 5 nm node semiconductor device and beyond. Improvements in the electron optical system, etc. have made it possible to perform electrical characteristics measurements and EBAC analysis more stably than the previous model. The high-stability measurements makes it possible to narrow down the defect locations down to the order of nanometers.

[Features]

- New Schottky electron gun enables clear image observation by the ultra-low acceleration voltage at less than 100 V
- Improvement of EBAC image quality by high probe current
- Supporting 8 probes
- Temperature control stage for temperature dependent characterization
- OM camera for both top-down and side views to assist coarse probing
- Sub-stage for sample moving independently from probes
- Dedicated exchange chamber for probes
- EBAC (Electron Beam Absorbed Current) imaging function
- Improved voltage-applied EBAC function (Dynamic Induced EBAC "DI-EBAC")
- Pulsed IV measurement for diagnosing resistive gate electrode defects (custom order)



Concept of MOS transistor characterization

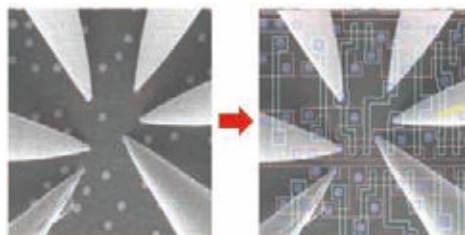


Probing on 5 nm devices

● CAD Navigation System

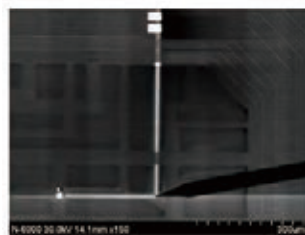
AZSA

AZSA is a system that allows anyone to easily locate identified failure locations by linking CAD data with various stages of analysis equipment. It also has many functions for verification, such as tracing equipotential nodes from CAD data to narrow down the range of defects. The system can also overlay SEM/SIM images and CAD data to visually confirm the underlying wiring.

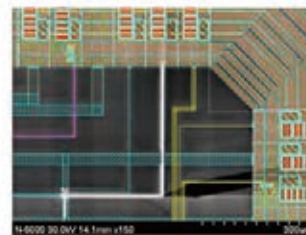


SEM display

Overlay display



EBAC image



EBAC image + CAD Data

● 2D/3D Image Analysis software

Image-Pro 3D



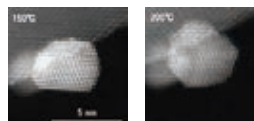
Friendly multidimensional visualization and quantitative analysis with intuitive user interface

- Serial section alignment, segmentation, and measurements on a single platform
- Various automated alignment as well as manual
- Guided segmentation for complex structure
- Straightforward keyframe animation
- Quantitative analysis with a variety of measurements
- Intuitive operation

● HTC MEMS heating TEM specimen holder

MHS-5000/MHS-1000 Blaze

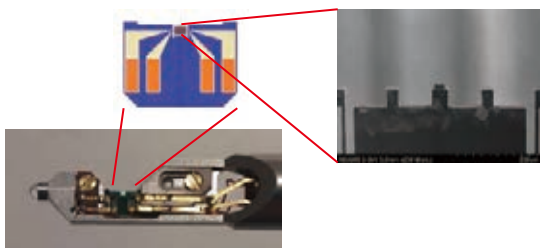
HTC Blaze MEMS holder is a TEM specimen holder using a method of heating extremely local area with MEMS chip. Compared with conventional W-heater method, heater area is extremely small and specimen drift is well-reduced, and lattice imaging can be readily obtained even during specimen heating (Max. temp.: 1,000 °C). Due to its nature of "driftless", stabilizing time for image acquisition is less required, and temperature ascending & descending are prompt, a throughput of sample imaging can be enhanced. Also, heating temperature is controlled by GUI on PC, its operability has been also improved. For Hitachi 200 kV & 120 kV TEMs, holder lineup are prepared respectively, and this holder can be utilized for *in situ* imaging at high magnification also for existing delivered units.



Sample : Pt catalyst

● HTC FIB-compatible MEMS specimen heating holder

FTH-5000 (for HF5000/NB5000)

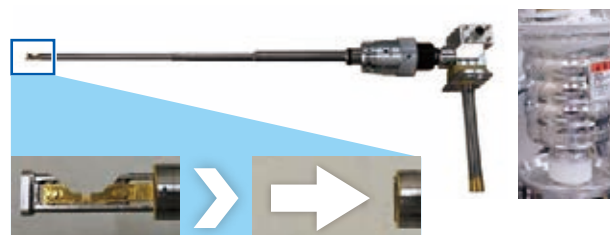


The FIB-compatible MEMS specimen heating holder is a TEM specimen heating holder dedicated to FIB-prepared thin specimen.

Usually, the heater area on the MEMS chip is located in the center of the chip. However, we have newly developed a dedicated MEMS chip in which heater area is located at the chip-edge, and adopted structure of Hitachi's proven FIB-compatible holder for MEMS heating holder. Not only can this holder be inserted into Hitachi's FIB with side-entry stage, and FIB-prepared thin specimen can be mounted on the MEMS chip with them upright, but also the specimen can be carried to Hitachi's TEM using the holder, for subsequent observation.

● HF5000/NX5000 Air-protection cooling holder

Air-protection Cooling ST Grid Holder XF

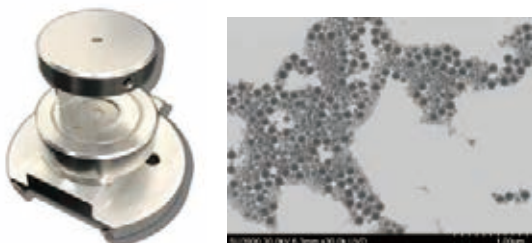


Air-protection cooling ST grid holder XF is a TEM single-tilt LN₂-cooling grid holder, on which specimen can be transferred in vacuum between HF5000 and NX5000 with side entry stage.

This holder can be used to transfer specimen that is NOT preferred to be exposed to the atmosphere, such as battery materials, between FIB and TEM, and then to analyze with TEM while reducing specimen damage.

● STEM holder

STH-1000 UVD-STEM Holder



This unique holder for TEM grid enables to acquire BF-STEM image with using UVD.

- fast scan speed available
- works at both high vacuum and low vacuum
- quick fit of specimen setting

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

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