

## **Tabletop Mini-SEM** Scanning Electron Microscope

# About SEC

SEC CO., LTD. designs and manufactures industrial X-ray inspection system and Scanning Electron Microscope.

Established in 1991, SEC pioneered e-beam control technology and served most advanced inspection & analysis system to customers for laboratory research and quality assurance.

SEC prides itself on observing today's ever-changing needs for its customers by providing the most advanced and efficient technology in order to meet customer's production demands. Additionally, our goal is to provide the best service and attention to detail in order to exceed our customer's needs in a constantly evolving, technological environment.

## Imagine a Higher state of Resolution

SEC Mini-SEM series is focused on two essentials: powerful performance and user-friendly operation.

Using the table-top compact configuration, Mini-SEM provides high-resolution, high-magnification SEM images with the ease of use. Auto-focus, Auto-auto brightness and contrast produce an excellent image every time.

No doubt about strong performance and flexible integration. 5-axis full stroke control and 4-hole variable aperture of Mini-SEM 4500M help fine-resolution SEM image. Built-in multi detector (SE+BSE) of Mini-SEM 3200M provides the ideal observation for each different type of specimen. All Mini-SEM series including Mini-SEM 3000MB provide image observation condition within 3 minutes after sample loading.

Optional EDX system and many other tools can be adapted to Mini-SEM for your application.

## Major Applications

### Material Science

- Metal / Ceramic Surface, Fiber Texture
- Particle Distribution and Size Measurement
- Failure Analysis – Corrosion, Stress

### Semiconductor

- Wafer, Bonding Wire, LED, Micro-Pattern
- CNT (Carbon Nano Tube)

### Biological / Pharmaceutical

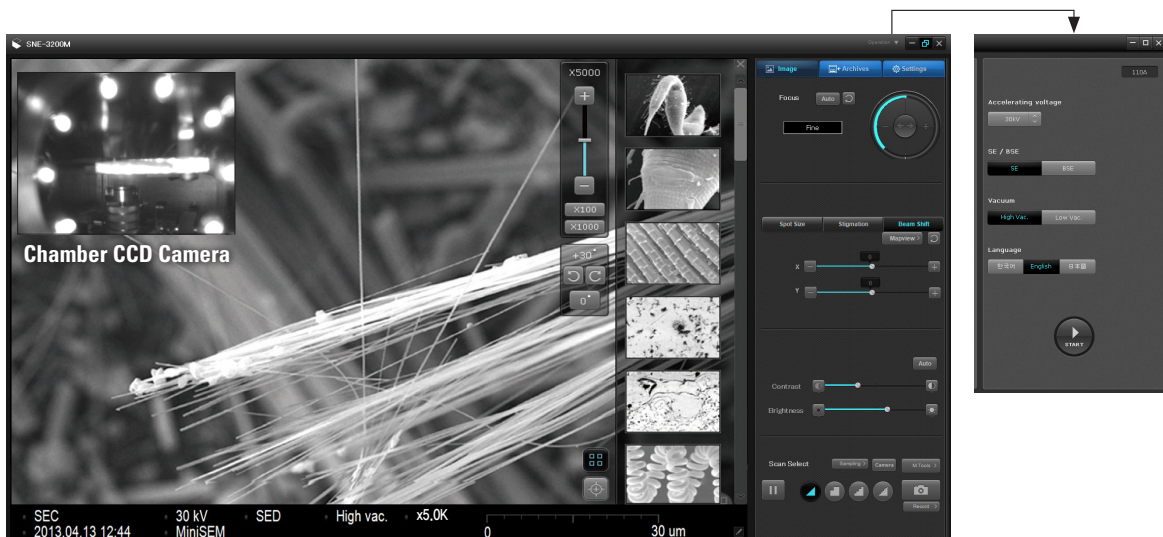
- Food, Bacteria, Medicinal Powder

### Life Science / Energy

- Solar Cell, Battery Electrode, Catalyst

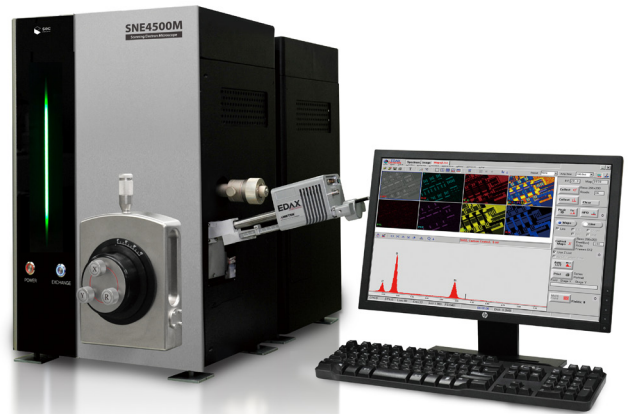
### Education / Healthcare

## Mini-SEM Operating Software - User Interface



## SNE-4500M

- ▶ Max. 100,000x Magnification
- ▶ SE Detector (Option – BSE Detector)
- ▶ 5kV to 30kV Variable Accelerating Voltage
- ▶ Image Observation Ready within 3 min.
- ▶ 5-axis Strokes – X, Y, R, Z, T
- ▶ 4-Hole Variable Aperture (30 / 50 / 100 / 200  $\mu\text{m}$ )
- ▶ Options – EDX System, Cooling Stage, Low Vacuum Control



## SNE-3200M

- ▶ Max. 60,000x Magnification
- ▶ SE Detector & BSE Detector – Multi Mode
- ▶ 5kV to 30kV Variable Accelerating Voltage
- ▶ Multi-Vacuum Mode – Standard / Charge Up Reduction
- ▶ Image Observation Ready within 3 min.
- ▶ 3-axis Strokes – X, Y, R (Option - X, Y, T)
- ▶ Options – EDX System, Cooling Stage



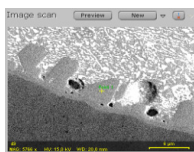
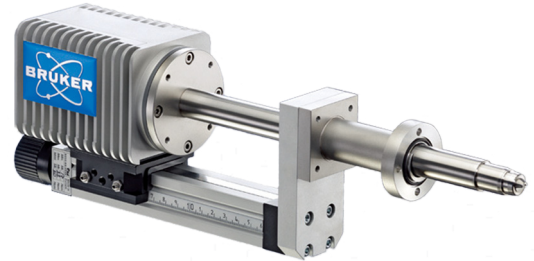
## SNE-3000MB

- ▶ Max. 30,000x Magnification
- ▶ BSE Detector (Solid State Type – 4 Channel)
- ▶ 5kV to 30kV Variable Accelerating Voltage
- ▶ Multi-Vacuum Mode – Standard / Charge Up Reduction
- ▶ Image Observation Ready within 3 min.
- ▶ 3-axis Strokes – X, Y, R (Option - X, Y, T)
- ▶ Options – EDX System, Cooling Stage

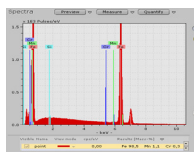


## EDS System

- ▶ SDD Type – Nitrogen Free
- ▶ Elemental Detection from Boron (5) to Americium(95)
- ▶ Spectrum Resolution < 133 eV(MnKa)
- ▶ Multi-point Analysis / Line Scan / Elemental Mapping
- ▶ Window – SUTW(Super Ultra Thin Window)
- ▶ EDS Maker : EDAX, Bruker, Oxford



SEM Image Acquisition



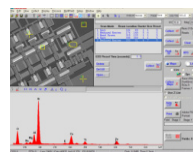
Elemental ID Analysis

Results

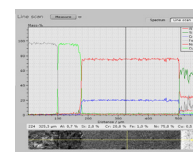
Series	nor. [wt.%]	Atom [%]
Copper K series	40,38	55,85
Tin L series	59,62	44,15
<b>Total</b>	<b>100,00</b>	<b>100,00</b>

Primary energy  
Tilt angle

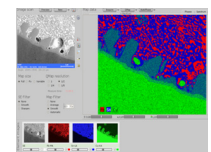
Quantification Analysis



Multi point Analysis



Line Scan



Mapping

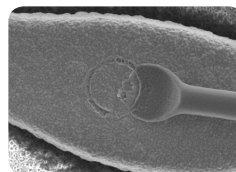
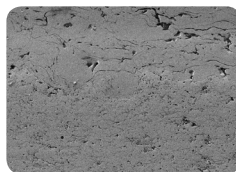
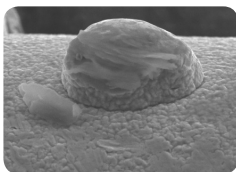
## Ion Sputter Coater MCM-100

- ▶ Quick and Easy Operation
- ▶ Sample Loading Size - Max. 50mm
- ▶ Target Material - Au(Gold) or Pt(Platinum)
- ▶ 180(W) x 310(D) x 310(H)mm / 15kg

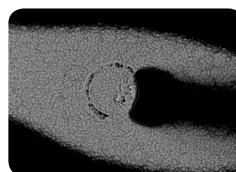
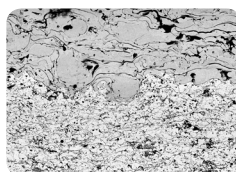
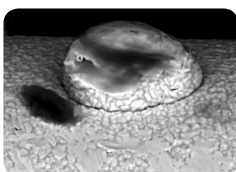


## BSE Detector (Solid state type)

- ▶ SE (Secondary Electron) Image



- ▶ BSE (Backscattered Electron) Image



4-Channel Fixed Type (Solid-State)  
Composition or Topographic Analysis

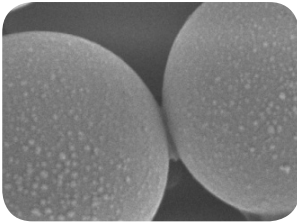


- Tilting Stage / Motorized Stage
- Peltier Cooling stage System

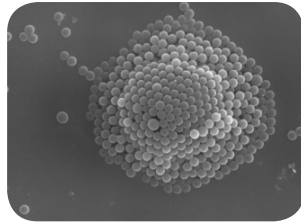
# SEM Application

## Particle Measurement and Characteristic Analysis

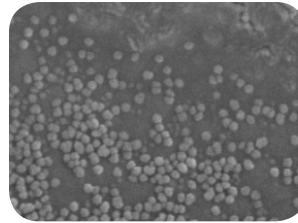
- ▶ Industrial Powder - High Molecule, Nano Powder
- ▶ Battery Electrode / Pharmaceutical and Biological



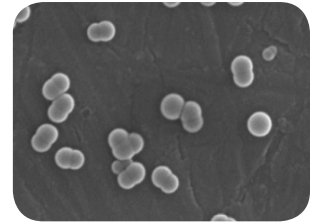
Latex



Silicon Powder



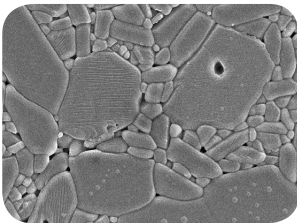
Nano Powder



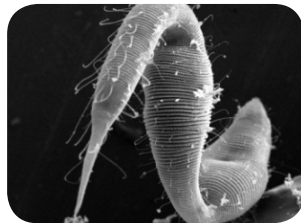
Lactic Acid Bacteria

## Material Science and Failure Analysis

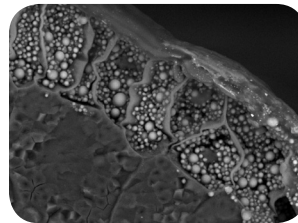
- ▶ Metal / Plastic and Ceramic / Film
- ▶ Bio-science



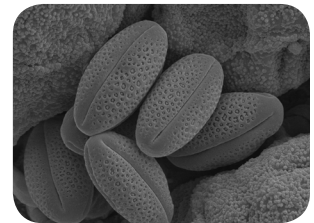
Ceramic



Sea Animal



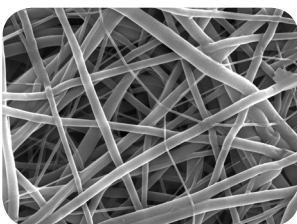
Rice



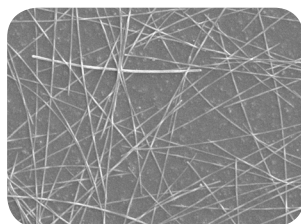
Flower's Stamen

## Fiber Observation

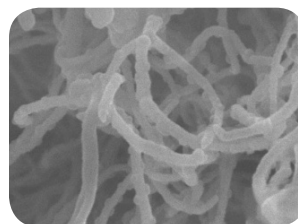
- ▶ Carbon Fiber / Glass Fiber
- ▶ CNT (Carbon Nano Tube)



Fiber



Nano wire



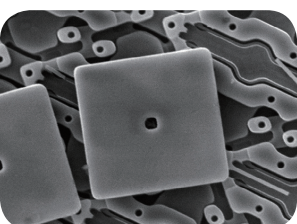
CNT (Carbon Nano Tube)



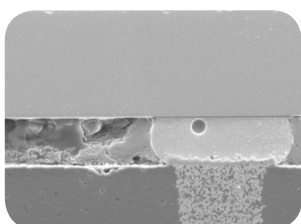
Fiber

## Electronic Component Observation and Failure Analysis

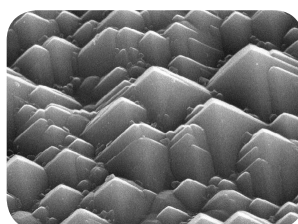
- ▶ BGA / PCB / LED / Wafer
- ▶ Bonding Wire / Micro-Electronics



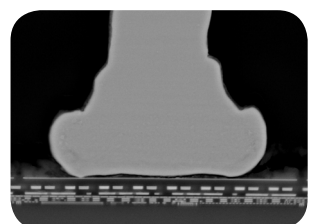
Pattern



BGA Chip



Solarcell

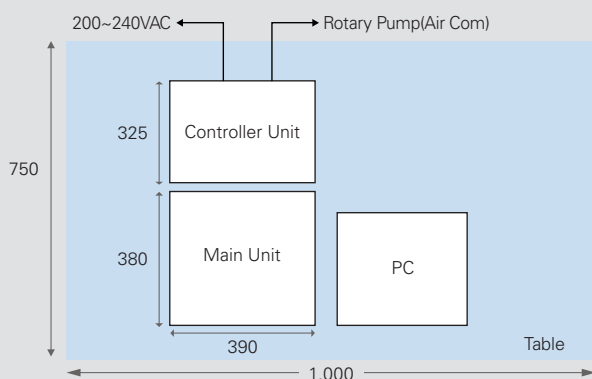


Wire Bonding

# Mini - SEM Specifications

	SNE-3000MB	SNE-3200M	SNE-4500M
<b>Electron system</b>			
Resolution	20nm (30kV, BSE Image)	15nm (30kV, SE Image) 20nm (30kV, BSE Image)	5nm (30kV, SE Image)
Magnification	30x ~ 30,000x	30x ~ 60,000x	30x ~ 100,000x
Accelerating Voltage	5~30kV (5 / 10 / 15 / 20 / 30 – 5 Steps)		
Detector	Backscattered Electron (BSE)	Secondary Electron (SE) Backscattered Electron (BSE) *Multi Mode	Secondary Electron (SE) Backscattered Electron (BSE) *option
Observation mode	Standard mode Charge-up reduction mode	Standard mode Charge-up reduction mode	Standard mode
Electron Gun	Pre-centered Tungsten Filament Cartridge		
Lens System	Two-stage Electromagnetic Condenser Lens One-stage Electromagnetic Objective Lens		
<b>Stage system</b>			
Stage Traverse	3-axis System - X, Y-axis : 35mm / R-axis : 360° · Image Shift : ±150 $\mu$ m · Chamber CCD Camera · T-axis : 0 to 45°(Option)		5-axis System · X, Y-axis : 40mm / R-axis : 360° T-axis : 0 to 45°, Z-axis : 0 to 35mm · Image Shift : ±150 $\mu$ m
Max. Sample Size	70mm in Diameter x 30mm in Height		80mm in Diameter x 35mm in Height
<b>Image system</b>			
Frame Memory	High Speed Mode (320x240) : Preview mode Low Speed Mode (640x480) Photo Mode1 (1280x960) Photo Mode2 (2560x1920) Sampling Photo mode3		
Automation Function	Auto Start, Auto Focus, Auto Stigmator Auto Contrast & Brightness		
Image Format	BMP, JPG, PNG, TIFF		
Data display	Magnification, Detector Type, Accelerating Voltage, Vacuum mode, Logo(text), Date and time, Micron marker		
<b>Vacuum System</b>			
Vacuum mode	High & Low Vacuum system		High Vacuum System
Vacuum Pump	Rotary Pump + Turbo Molecular Pump [Full Automation System]		
<b>Control system</b>			
OS	Microsoft Windows® 7		
CPU	Intel® Core™		
Memory / HDD	4GB / 500GB		
Interface connector	USB 2.0		
<b>Dimensions and weight</b>			
Main Unit	390(W)x380(D)x560(H)mm, 80, 83, 88kg		
Controller Unit	390(W)x325(D)x560(H)mm, 37kg		
Rotary Pump	400(W)x160(D)x340(H)mm, 24kg		
Installation room	Room temperature : 15°C~30°C / Humidity : 70% or less / Electric power : Single phase 200~240 AC, 1KW, 50/60Hz		

## Example of Installation Layout



- Specifications of Operating Computer are subject to change
- A table with casters is not recommended



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