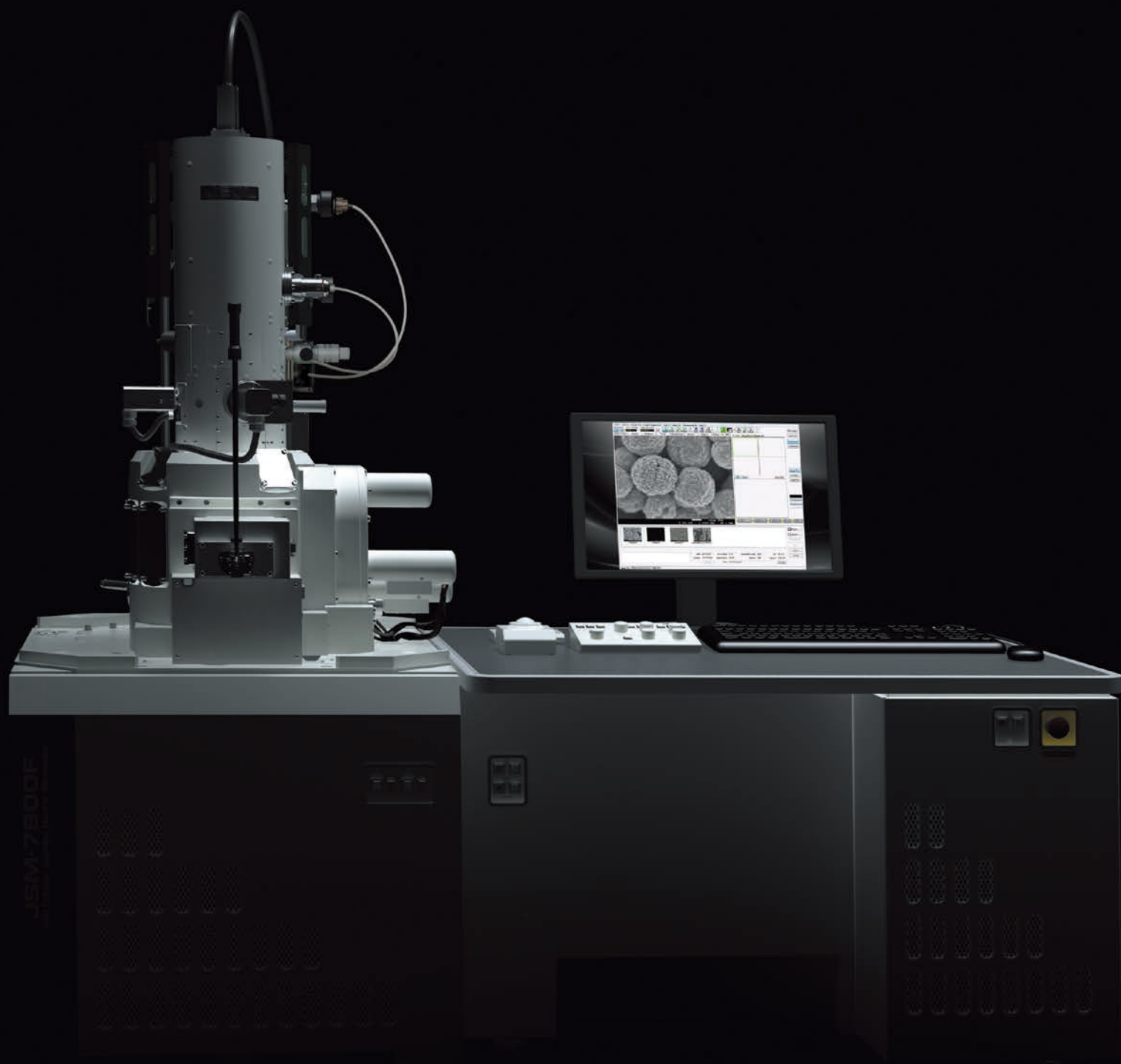


JSM-7800F

Field Emission Scanning Electron Microscope



We provide high performance

The Ultimate Research Tool for Multi-Disciplinary Research Institutions

Extreme resolution

The super hybrid lens (SHL) provides extreme resolution of 0.8 nm at 15 kV and 1.2 nm at 1 kV. With a very low incident electron energy, extremely fine surface structures are revealed. The distribution of materials can be observed even below 1 keV by selecting backscattered electrons with the energy filter.

Fast and high precision analysis

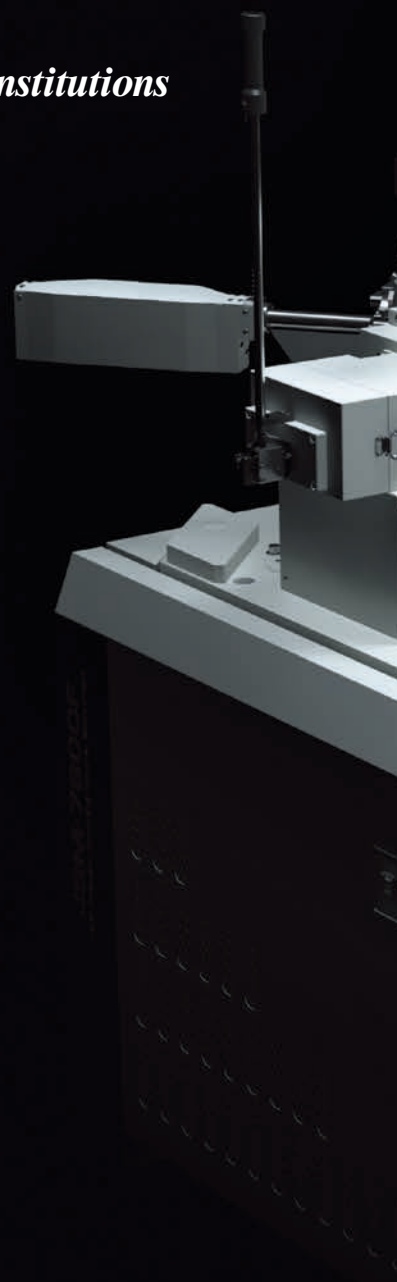
The High Power Optics composed of the in-lens Schottky FEG and the aperture angle control lens keeps the electron probe small even at large probe currents. A large probe current allows you to analyze samples quickly without sacrificing the precision and quality of the analyses. A variety of analytical systems including EDS, WDS, and EBSD are available. Distortion-free EBSD patterns are obtained for high precision crystal orientation analysis.

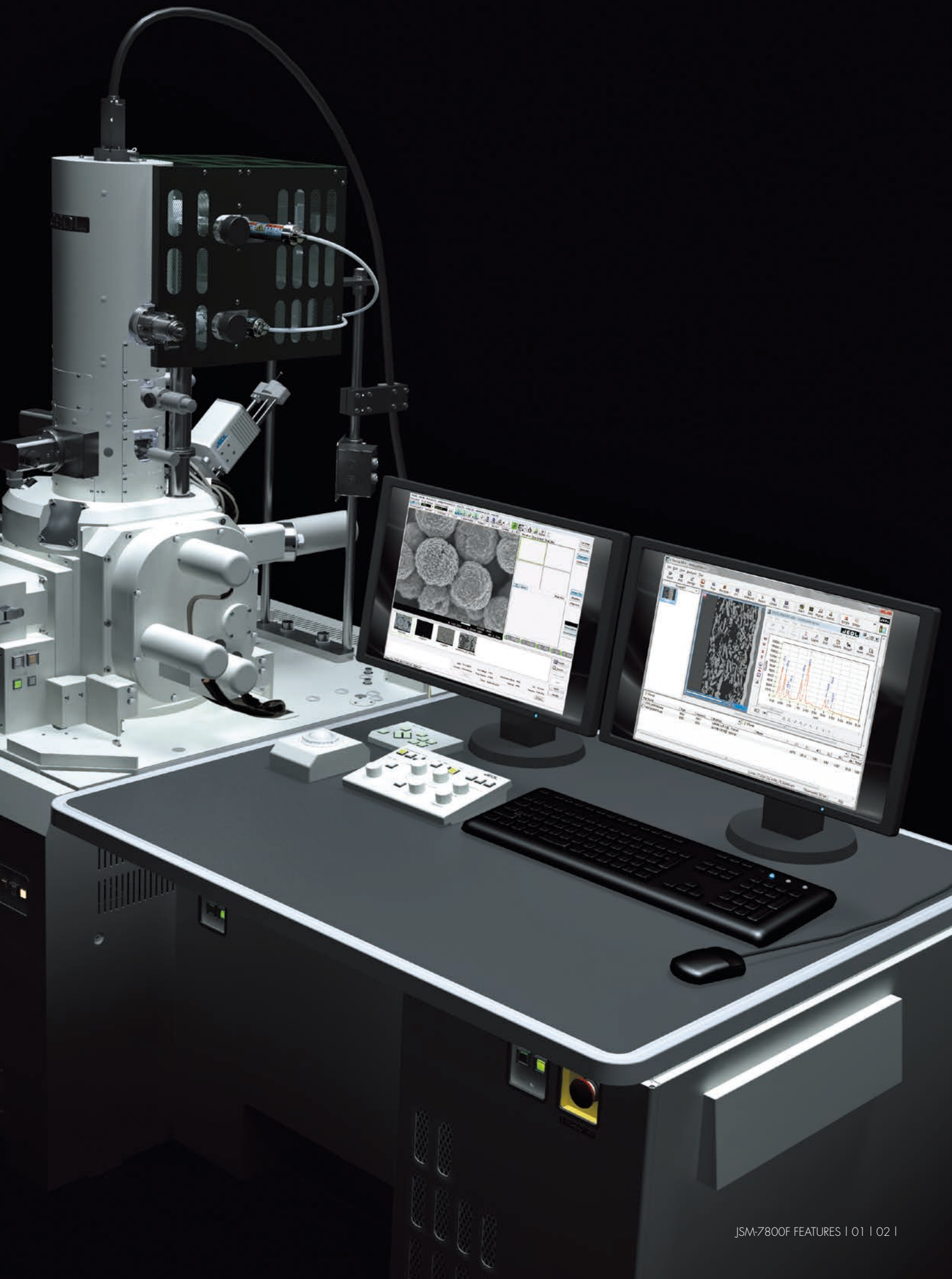
No limitation in specimens

The super hybrid lens is a field free lens at the analytical working distance. Magnetic samples can be observed and analyzed at high magnifications. Non-conductive samples are easily observed at low voltages with high resolution.

Field Emission Scanning Electron Microscope

JSM-7800F





Extreme resolution

High Resolution without restriction on specimen or analysis

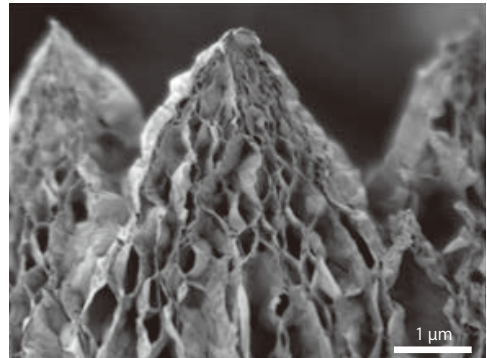
The super hybrid lens (SHL) with the Gentle Beam (GB) brings you closer to the nano-world. The super hybrid lens delivers superb high resolution even at extremely low incident electron energies for observation and analysis of nano-size structures. The super hybrid lens can be used to observe and analyze magnetic materials at high magnifications.

Observation of fine surface structure with the upper electron detector and GB

A bias voltage applied to a specimen holder improves resolution and improves detection efficiency of the upper electron detector.

0.08 kV was used for observation of Graphene. The super hybrid lens enables one to observe extremely fine structures at very low voltages.

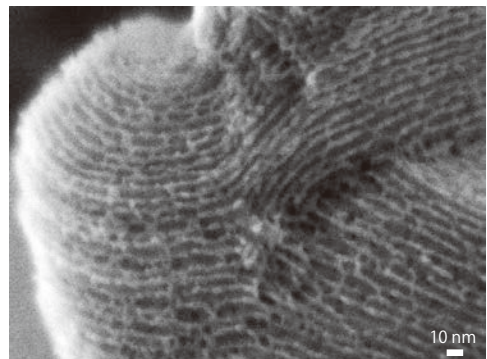
Specimen: Graphene
Accelerating voltage: 0.08 kV (GB)
original magnification: $\times 20,000$



Ultra high resolution with the Gentle beam

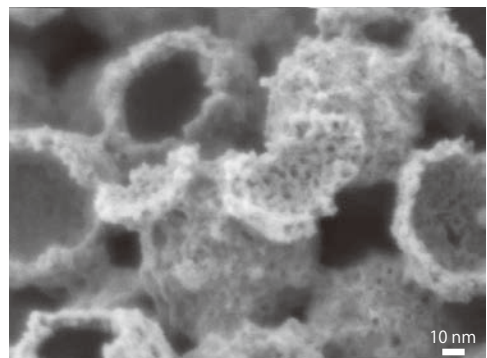
An extremely low electron landing energy was used to observe very fine pores with a few nm diameters.

Specimen: Meso-porous silica
Accelerating voltage: 1 kV (GB)
original magnification: $\times 400,000$



This specimen is porous carbon material. The extremely low energy incident electron probe clearly shows holes of a few nm.

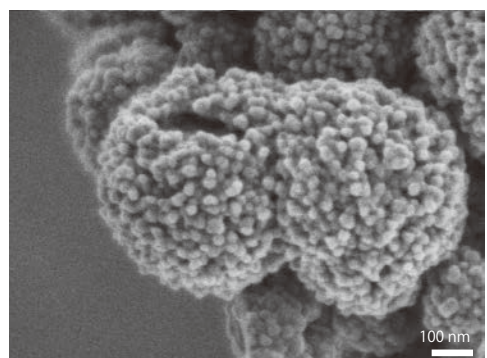
Specimen: Au@Carbon
Accelerating voltage: 0.3 kV (300 V) (GB)
original magnification: $\times 500,000$
The specimen courtesy of **Prof. Dr. Ferdi Schüth**
Department of Heterogeneous Catalysis
Max-Planck-Institut für Kohlenforschung



Magnetic materials

The super hybrid lens allows you to study magnetic materials at high magnifications.

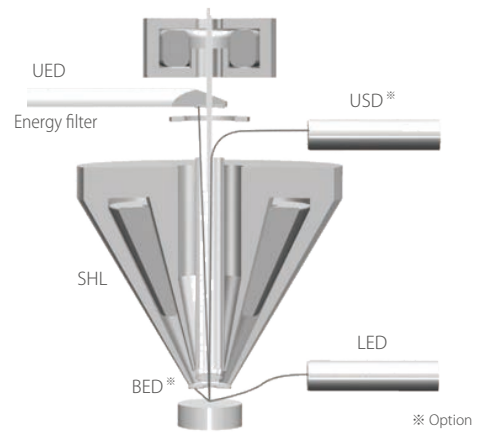
Specimen: Fe₃O₄ Nano particles
Accelerating voltage: 1 kV (GB)
original magnification: $\times 100,000$
Specimen courtesy of **Dr. Takanari Togashi, Prof. Tadafumi Adschiri**,
Advanced Institute for Material Research,
Tohoku University



Electron energy selective detection system

Four kinds of detectors and electron energy filter

The energy filter is placed between the upper electron detector (UED) and the upper secondary electron detector (USD). Secondary electrons and backscattered electrons are separated and detected simultaneously with these two detectors.



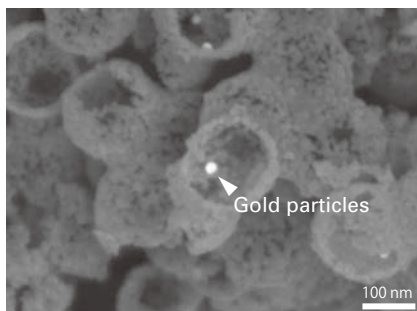
Information selective upper detectors

The upper detector

The upper detector detects higher energy electrons which pass through the energy filter.

The contrast generated by the difference of density is observed.

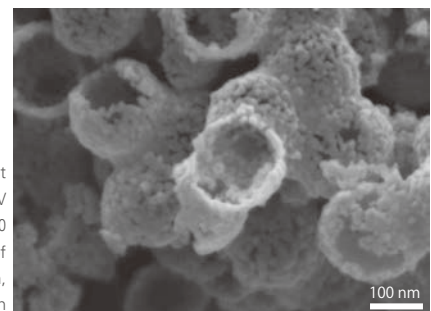
Specimen: Au@TiO₂ catalyst
Accelerating voltage: 2 kV
original magnification: $\times 150,000$
The specimen courtesy of
Prof. Dr. Ferdi Schüth,
Max-Planck-Institut Mülheim



The upper secondary electron detector

The upper secondary electron detector detects secondary electrons separated with the energy filter.

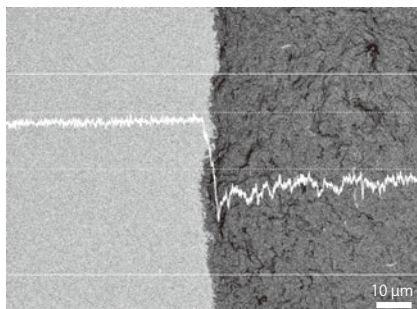
Specimen: Au@TiO₂ catalyst
Accelerating voltage: 2 kV
original magnification: $\times 150,000$
The specimen courtesy of
Prof. Dr. Ferdi Schüth,
Max-Planck-Institut Mülheim



Upper detector and the energy filter to observe composition contrast

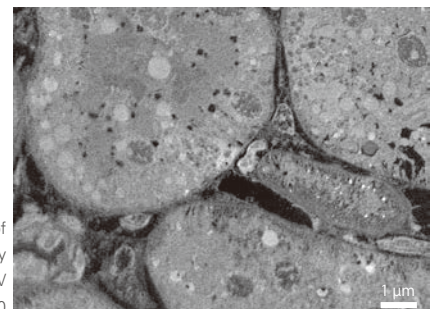
Diamond (left) and graphite (right) show the contrast due to the difference in density by detecting elastically scattered electrons selected with the energy filter.

Specimen: Diamond, Graphite
Accelerating voltage: 1 kV
original magnification: $\times 1,000$
Density: Diamond 3.51 g/cm³
Graphite 2.25 g/cm³



At a very low landing electron energy an ultra-thin section of mouse kidney was observed without staining by detecting backscattered electrons.

Specimen: Ultra-thin section of
mouse kidney
Accelerating voltage: 1 kV
original magnification: $\times 1,500$

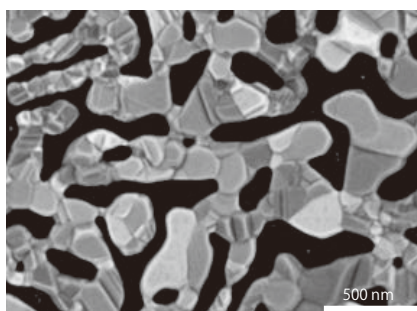


Backscattered electron detector (BED)

The backscattered electron detector is a semiconductor detector placed directly above a specimen.

It detects low angle backscattered electrons at short working distance.

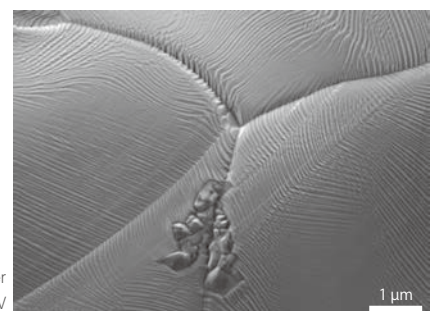
Specimen: Evaporated gold
on carbon
Accelerating voltage: 3 kV



The lower electron detector (LED)

The lower electron detector is mounted on the specimen chamber and detects fine steps on specimen surface.

Specimen: Copper in silver
Accelerating voltage: 3 kV

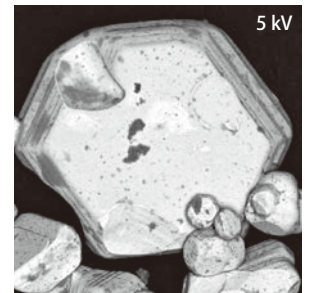
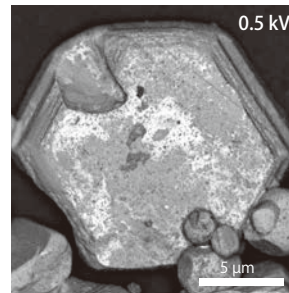


Elemental Analysis

Distribution of thin film revealed at low voltage

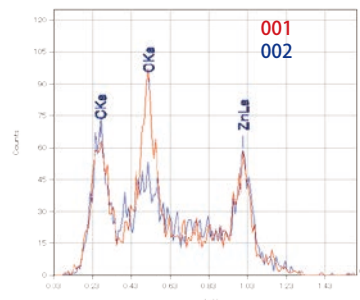
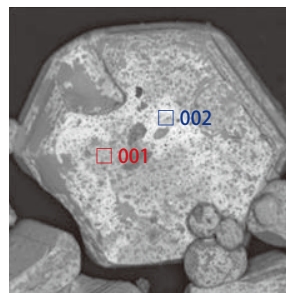
The distribution of very thin film on the surface of ZnS powders is visible more clearly at 0.5 kV than at 5 kV.

Specimen: ZnS powder

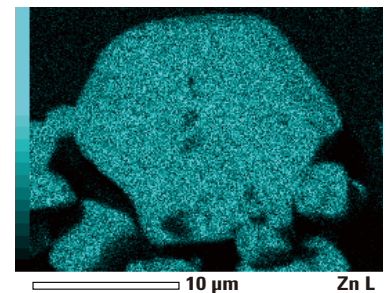
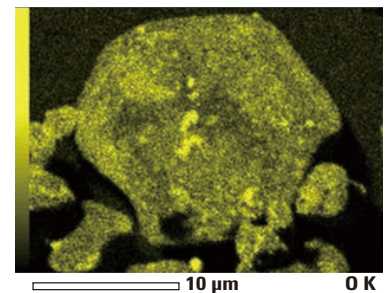


Elemental analysis of a very thin film at very low landing energy

The qualitative analysis and elemental maps are acquired at 1.2 keV. The super hybrid lens with the gentle beam produces large probe current at low voltages. You can analyze thin film quickly.



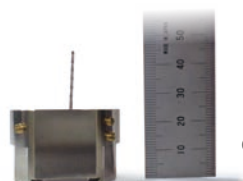
Specimen: ZnS powder
Accelerating voltage: 1.2 kV (GB)
Probe current: 5 nA
Original magnification: x5,000



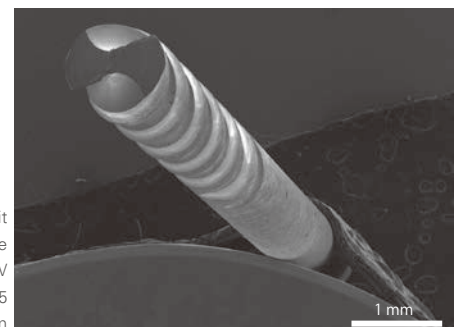
Large Depth of Focus (LDF) mode

Large depth of focus with LDF mode

The large depth of focus mode provides much larger depth of focus than a conventional SEM does. You can focus even on a very rough surface as a drill bit demonstrates on this example. The large depth of focus mode lets you observe a large area at high tilt angle with minimum image distortion. You can analyze a large area with EBSD as well as EDS for elemental mapping.



Specimen: Drill bit
LDF mode
Accelerating voltage: 15 kV
Original magnification: x 25
WD: 40 mm



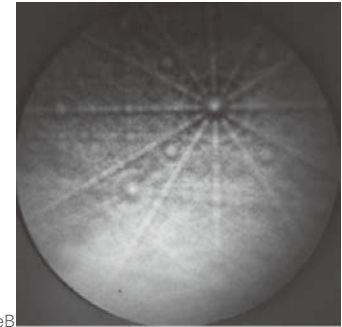
Crystal Orientation Analysis

Electron backscatter diffraction (EBSD) analysis of magnetic specimens

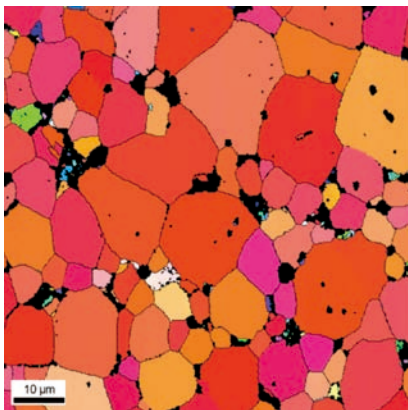
Neodymium magnet is used in hybrid cars. Neodymium magnet is rapidly oxidized after mechanical polishing.

The cross section polisher (CP) was used to make a specimen suitable for EBSD analysis.

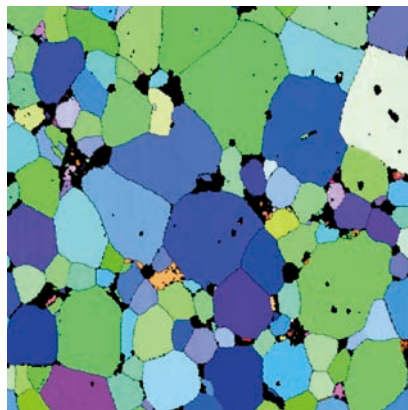
The super hybrid lens does not form a magnetic field around a specimen at the working distance for EBSD analysis. You can obtain distortion-free EBSD patterns for high precision analysis.



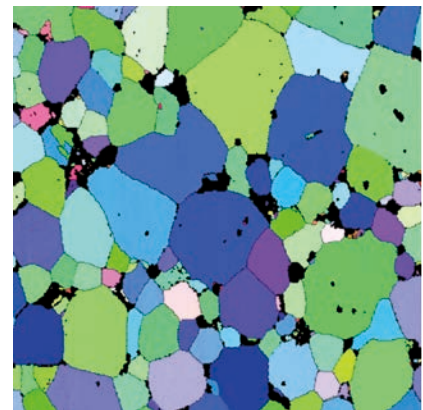
EBSD pattern from NdFeB



IPF Map (ND)

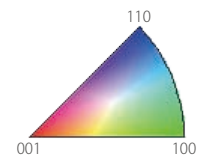


IPF Map (TD)



IPF Map (RD)

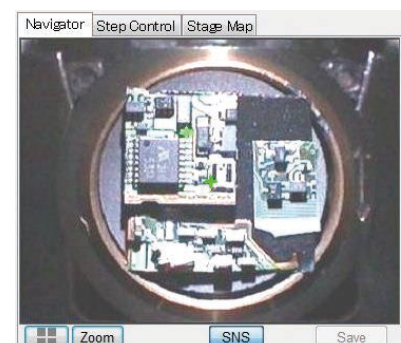
Number of points: 161548
Phases: Nd₂Fe₁₄B₄
Dimensions: X Max: 111.75 microns,
Y Max: 77.94 microns
Step: 0.25 microns



Stage navigation system (SNS)

Survey specimen quickly

The image is linked to the X and Y coordinates of the specimen stage. You can move the specimen stage to any point by selecting a point on the image. You can select an area of interest easily and move the specimen stage quickly even on a large specimen on which you cannot observe the entire area at the lowest magnification of the SEM.



JSM-7800F

Specifications

Standard Specifications

• Resolution	0.8 nm (15 kV), 1.2 nm (1 kV), 3.0 nm (5 nA, WD10 mm, 15 kV)	• Specimen stage	Fully eucentric goniometer stage
• Image type	Secondary-electron image, Backscattered-electron image	X	70 mm
• Accelerating voltage	0.01 kV to 30 kV	Y	50 mm
• Probe current	A few pA to 200 nA	WD (Z)	2 mm to 41 mm
• Magnification	× 25 to × 1,000,000	Tilt	-5 to +70°
• Electron gun	In-lens Schottky field-emission gun	Rotation	360°
• Aperture angle control lens	Built-in	Motor control	5 axes
• Objective lens	Super Hybrid Lens (SHL)	• Specimen holders	For 12.5 mm diameter × 10 mm thick For 32 mm diameter × 20 mm thick
• Objective lens aperture	4 steps, XY fine-movement capability	• Specimen exchange chamber	Load lock chamber Type 2 (100 mm diameter × 40 mm height)
• Auto functions	Focus, Stigmator, Brightness, Contrast	• Evacuation system	SIP, TMP, RP
• Recipe functions	Standard operation conditions, User operation conditions		

Options

• Energy dispersive X-ray spectrometer (EDS)	• Chamber camera
• Wavelength dispersive X-ray spectrometer (WDS)	• Specimen holder
• Electron backscatter diffraction (EBSD)	A variety of optional specimen holders are available
• Backscattered electron detector (BED)	• Specimen stage
• Upper secondary electron detector (USD)	Type 2 (110 mm × 80 mm) Type 3 (140 mm × 80 mm)
• Stage navigation system (SNS)	• Specimen exchange chamber
	Type 1 (up to 150 mm diameter specimen) Auto load lock chamber (up to 200 mm diameter specimen)

Installation Requirements

• Power	Single phase, 100 V AC, 50/60 Hz, 4 kVA maximum Approximately 1.3 kVA Approximately 0.8 kVA (Energy saving mode)	• Dry nitrogen gas	0.45 MPa to 0.55 MPa
• Grounding	Less than 100 Ω	• Installation room	Floor space: 3,000 × 3,000 mm or more Ceiling height: 2,300 mm or more Door width: 1,000 mm (W) × 2,000 mm (H) or larger Temperature: 15 to 25 °C, Humidity: 60% or less
• Coolong water	20 °C ± 5 °C		

**Specifications subject to change without notice.*



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