

Sample Preparation and Cleaning

HITACHI



IM4000II/
IM4000II-CTC



IM5000/
IM5000-CTC



ZoneSEMII



ZoneTEMII





Sample handling under inert gas conditions Air Protection sample transfer

Samples that oxidise or absorb moisture easily should avoid contact with the atmosphere to ensure their physical or chemical properties do not change prior to examination in the SEM. These samples need strict handling in an inert gas environment before and after preparation.

Hitachi's IM series and Hitachi SEMs can be equipped with our "Air Protection transfer" system to ensure a vacuum or inert gas atmosphere is maintained throughout the workflow.



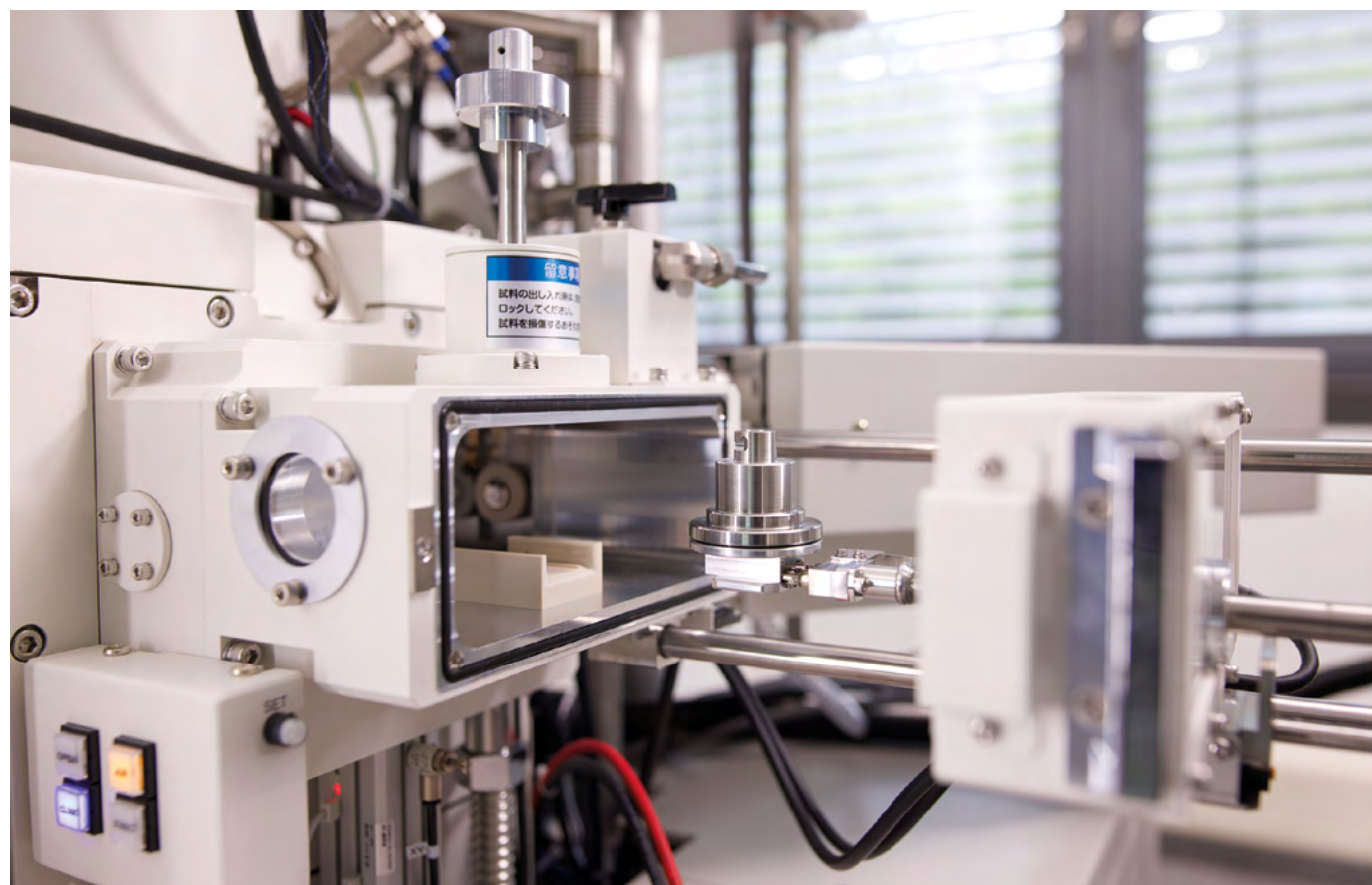
Air Protection

IM4000II
IM5000

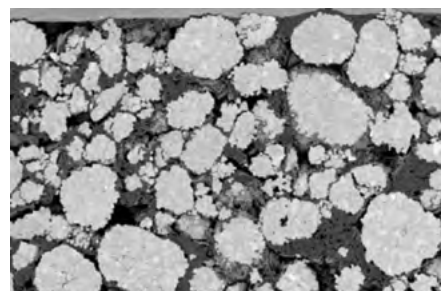
SU3800 | SU3900 | SU3800SE | SU3900SE
SU8600 | SU8700 | SU7000 | SU9600

NX5000
HF5000

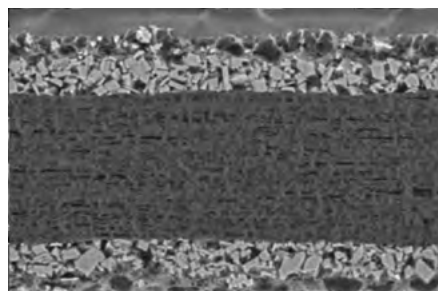
Each tool listed above can be equipped with "Air Protection transfer" so that complete handling in an inert gas or vacuum environment is ensured at all times.



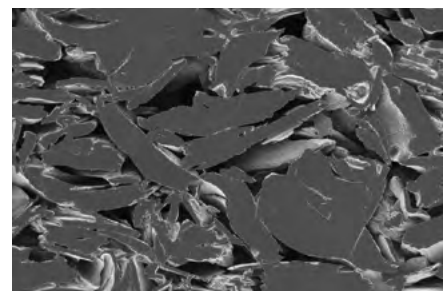
SEM sample airlock with Air Protection equipment



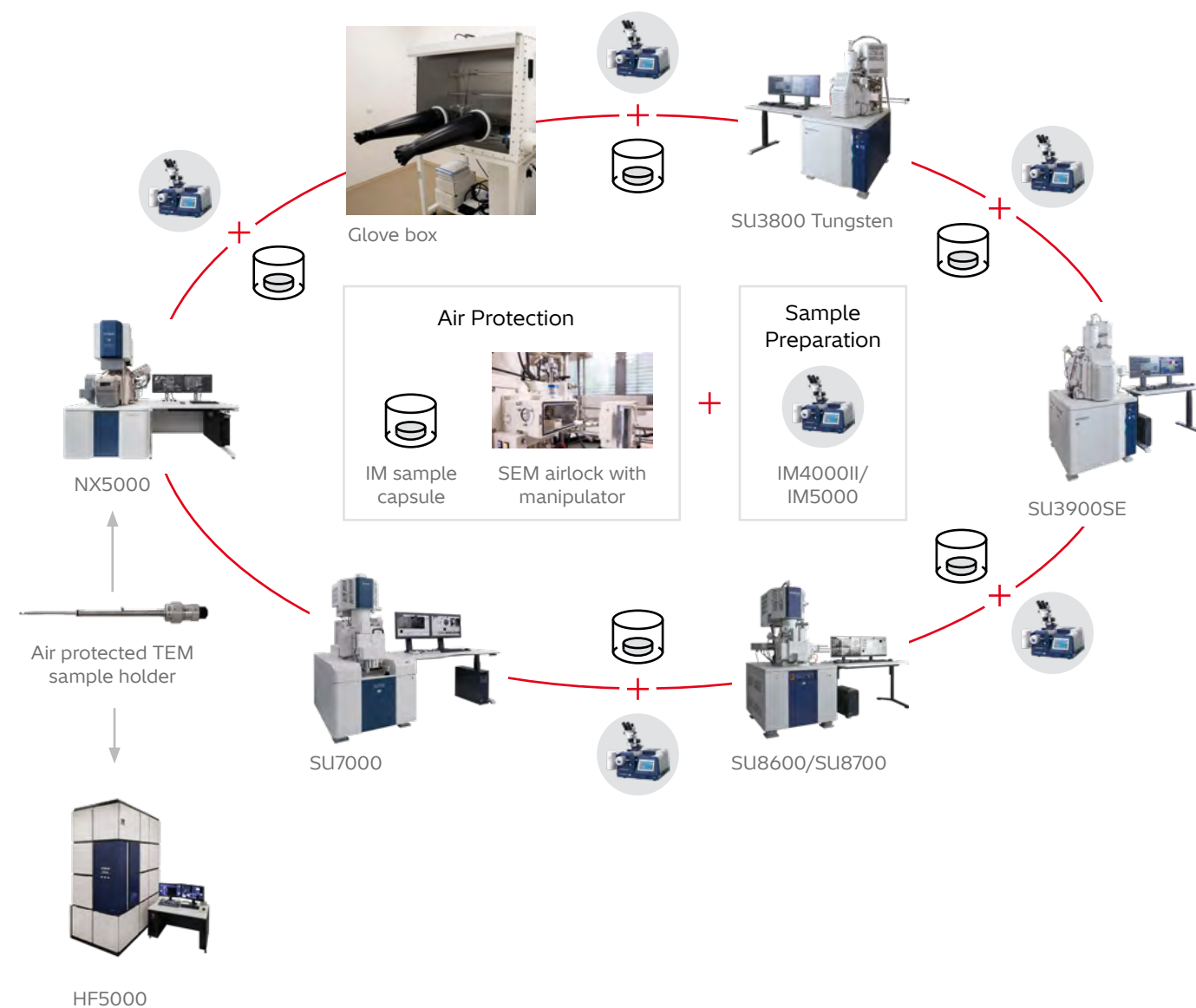
LiB NMC Cathode



LiB Separator



LiB Anode



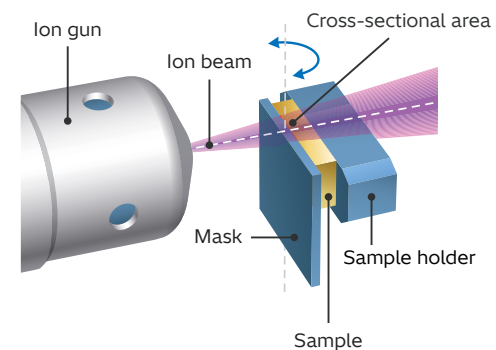
IM Series Argon Ion Milling Systems

A powerful alternative to FIB for fast, wide-area sectioning.

The IM series systems are indispensable for SEM sample preparation whenever internal structures need to be studied. They are ideal for when high-quality, millimetre-scale cross-sections or surfaces are needed and conventional mechanical preparation methods don't give satisfactory results. The two systems IM4000II and IM5000 are presented on the following pages.

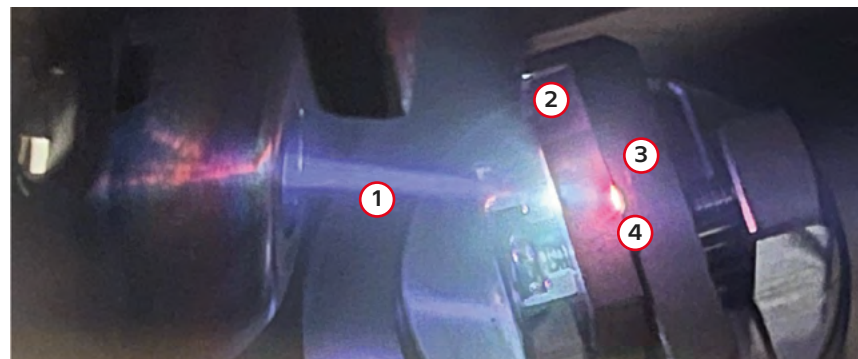
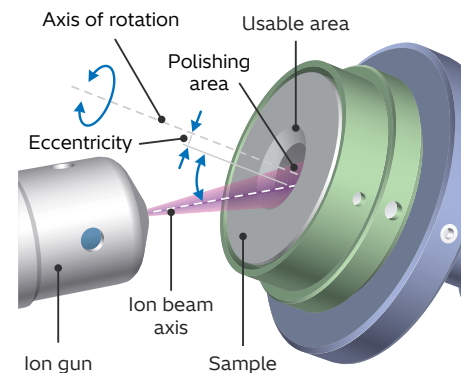
Cross-section preparation

Easily prepare high-quality, planar sections through any material, including laminated and composite structures, without mechanical damage in widths from 0.5-40mm. Heat sensitive materials such as polymers can also be processed using the optional temperature-controlled cryogenic stage. A sample height of up to 8mm also allows sectioning of for thick specimens.



Surface polishing (flatmilling)

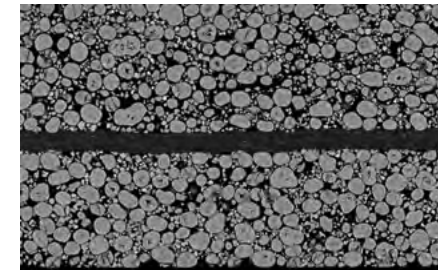
Easily remove mechanically induced damage in pre-polished surfaces on samples up to 50mm in diameter and 25mm in height. By freely selecting the angle of incidence of the ion beam, various effects can be achieved, from surface smoothing and cleaning for EBSD analyses to relief generation through selective sputtering.



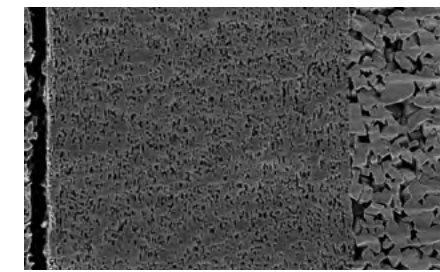
Insight into the IM5000 sample chamber during cross-sectioning of an NMC LiB cathode.

- 1 Argon ion beam
- 2 Mask
- 3 Sample stub
- 4 Sample

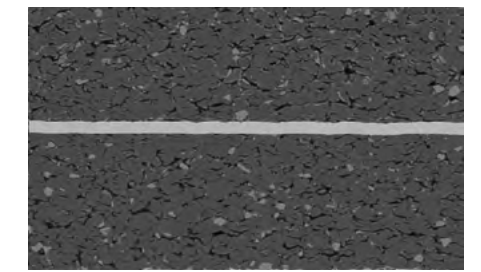
Energy systems



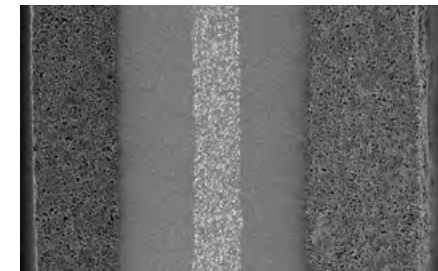
LiB NCM Cathode



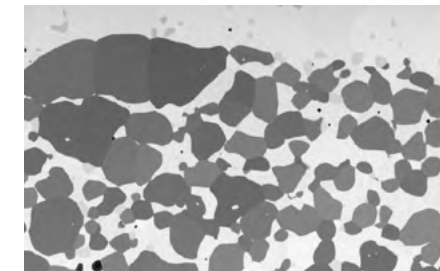
LiB separator film



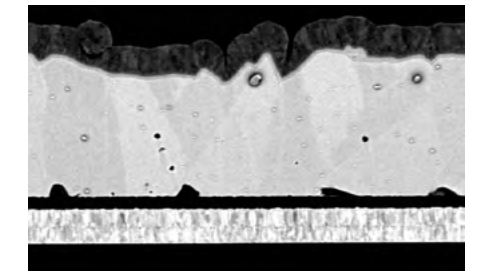
LiB Anode



Polymer fuel cell

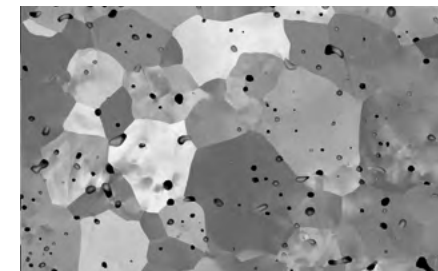


Ceramic fuel cell (La-Ce/NiO)

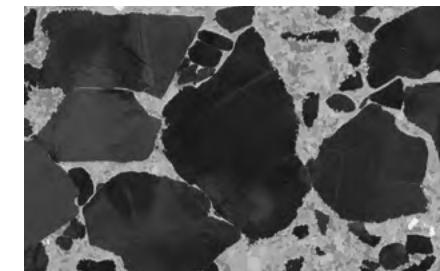


CIGS solar cell

Metals



Tungsten alloy

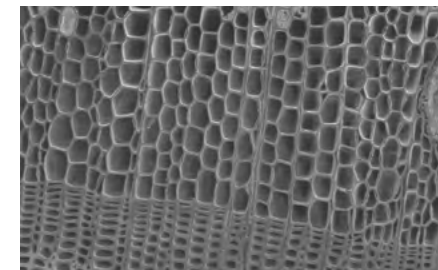


Boron nitride

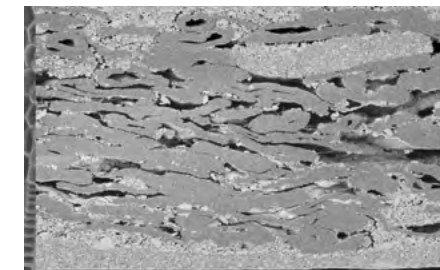


Zinc coating on steel

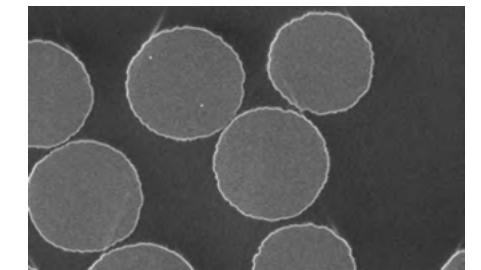
Organics



Wood

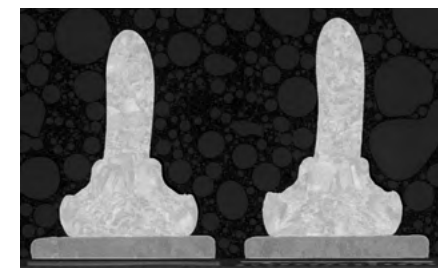


Paper

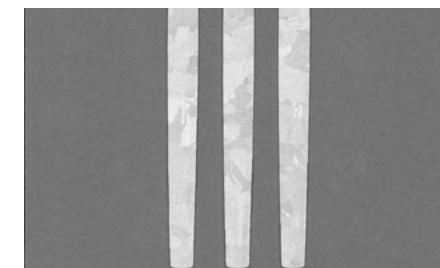


Carbon fibre reinforced plastic

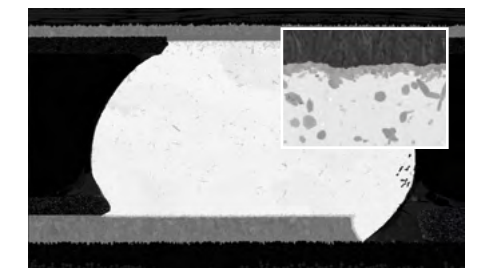
Semiconductors



Chip bonding wires



Cu TSV



Bonding ball on PCB

IM4000II/ IM4000II-CTC

Standard Ar⁺ ion cross-section and surface polisher



The IM4000II is a modular computer-controlled argon ion polishing system that can be configured as a pure surface polisher, as a cross-section polisher or as a hybrid system, depending on the desired functionality. With a beam energy selectable in 100eV steps from 0.1keV to 6.0keV, a wide range of applications can be covered, from the finest polishes to larger cross-sections. In cross-section operation, IM4000II achieves a maximum removal rate in Si of 500µm/hour (6keV, protrusion over the mask edge 100µm, stage oscillation ±30°).

Functions such as auto-start/time preselection, interval polishing or two-stage processes are available. The IM4000II-CTC offers the option of process temperatures down to -100°C in cross-section operation.



Air Protection

Product Features

- Single, robust and maintenance-friendly Penning-type ion gun with independent control of beam current and acceleration voltage. Allows high current density ion beams at all acceleration voltages (0-6kV).
- Cross-sectional milling rate of 500µm per hour in Si (100µm protrusion, stage oscillation +/-30°). Surface polishing can be carried out at tilt angles from 0° to 90°, angle can be changed during the process.
- Large sample chamber with a fully retractable multi-axis stage attached to the chamber door to accommodate the various application modules.

Optional Accessories

- Flatmilling module for specimens up to 50mm Ø and 25mm high.
- Cross-section equipment for standard samples up to 20mm wide/12mm deep/8mm high.
- Cross-section holder for large samples up to 35mm wide/17mm deep/8mm high.
- Stereo microscope (also with camera connection) for live process observation.
- Vacuum/Inert gas transfer of oxidation-sensitive specimens, for cross sections and surface polishing.
- Dedicated low-thermal-mass cryo cross-section holder for fast and accurate cryo milling.

Extensions and additional functions for IM



Flatmilling set
Polishing of grindings up to 50mm Ø and 25mm Ø



Cross-section module
Preparation of cross sections



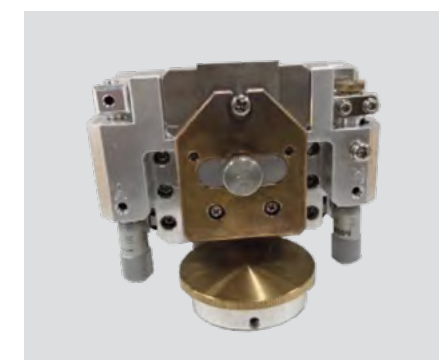
Active cryo cooling
Of cross-sections using liquid nitrogen



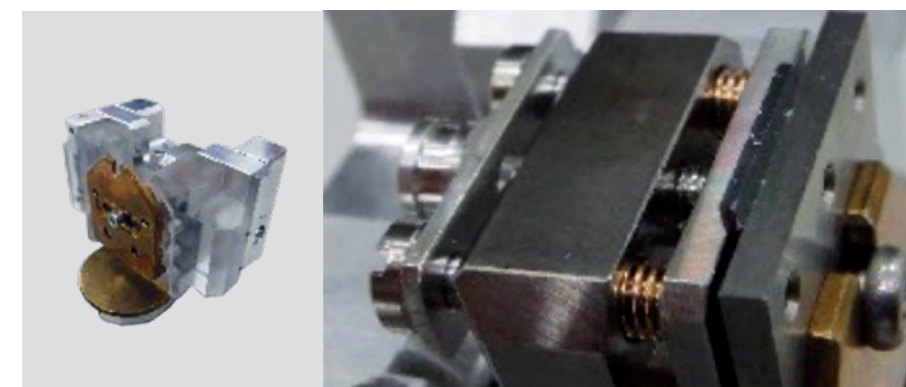
Zoom Stereo OM
For process observation in real time. With binocular or trinocular and C-mount camera adapter



Air Protection Module
Vacuum or Inert gas transfer for cross-sections and surfaces



Cross-section holder for large samples
Up to 35mm width, 17mm depth, 8mm height



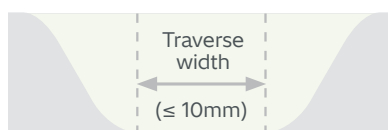
Thermally optimised cryo cross-section holder
Made of polycarbonate, samples are pressed against the cooled mask by spring force for optimum heat transfer. Only for CTC version



Air Protection

IM5000/ IM5000-CTC

High-performance Ar⁺ ion polisher



Variable width cross-section with lateral movement of the sample.

The IM5000 extends the cross-sectioning capabilities of the IM4000II with wider cross-sections up to 40mm, and higher milling speed. Optional sequential processing of multiple individual positions is also possible whilst addition of the optional multiple sample holder, allows automatic processing of up to 3 samples.

The IM5000 is equipped with a more powerful ion gun with a removal rate of over 1mm per hour. With the IM5000-CTC, cryo cross-sections of variable widths are also possible at adjustable process temperatures down to -100 °C.

Product Features

- Single, robust and maintenance-friendly Penning type ion gun with independent control of beam current and acceleration voltage. Allows high current density ion beams at all acceleration voltages (0-8kV).
- Flexible selection of cross-section widths is achieved by moving the sample relative to the ion beam, with cuts from 1mm to 40mm wide possible.
- Cross-sectional milling rate of 1000µm per hour or more.
- In Si (100µm protrusion, stage oscillation +/-30°) Surface polishing can be carried out at tilt angles from 0° to 90°, angle can be changed during the process.

Optional Accessories

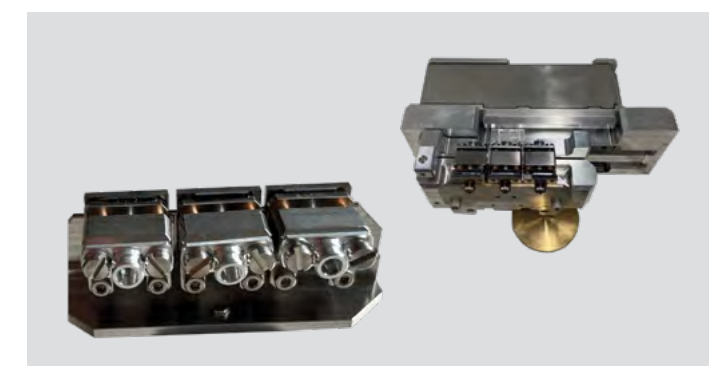
- Flat milling module for specimens up to 50mm Ø and 25mm high.
- Multiple cross-section holders for up to 3 samples up to 15mm wide, or one sample up to 50mm wide.
- Advanced Control Software for additional parameter control with a simple PC-based user interface.
- Vacuum/Inert gas transfer function of oxidation-sensitive specimens, for cross sections and surface polishing.
- Dedicated low-thermal-mass cryo cross-section holder for fast and accurate cryo milling.
- Pressing/clamping stubs for rapid cross section sample loading without the need for adhesives.

All extensions and additions the same as IM4000 are available, **PLUS** the following options below, exclusive to IM5000:



Advanced Control Software

External operating software with an extended range of functions, for example allowing sequential milling of several cross-section positions.



Multiple/Large Sample Holder

Extended traverse range of 40mm allows sequential automatic processing of several individual samples or even a single sample up to 50mm wide.



Positioning Microscope for Pressing/Clamping Holder

Alternative to the mechanical sample positioner specifically for spring pressing/clamping holders (cryo and multiple cross-section holders).

UV-Ozone Sample Cleaner for SEM and TEM

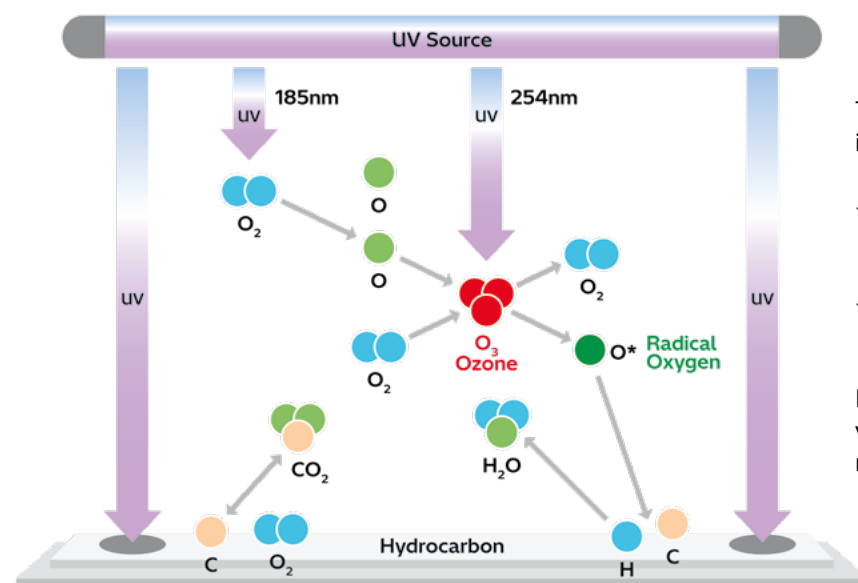
Gentle removal of hydrocarbon contamination

SEM, STEM and TEM users know the problem: High-resolution imaging is often impaired by the build-up of a hydrocarbon contamination in the observation area. This is usually caused by gaseous hydrocarbons that are continuously deposited during observation due to the energy transfer of the electron beam. The source of these hydrocarbons may be due to non-optimal chamber vacuum, which can typically be improved with plasma cleaners,

In most cases, however, the observation objects and sample holders themselves are the dominant source of contamination. Here, plasma treatment often proves to be too aggressive in the sense of altering or even destroying the sample. Hitachi's Zone cleaners for SEM and TEM offer a clever, gentler alternative, based on ultraviolet light and free oxygen radicals. They offer fast and thorough removal of hydrocarbon contamination with significantly reduced energy input compared to plasma cleaners, meaning even sensitive light element materials which are easily damaged by plasma cleaning can be effectively cleaned.

The sample cleaners in the Zone product family are equipped with UV lamps with wavelengths of 185nm and 254nm, which attack hydrocarbon bonds, break up oxygen molecules and generate reactive components in the form of ozone.

The chamber pressure can be adjusted to optimise the cleaning mechanism between more oxidative or more physical depending on the type of sample.

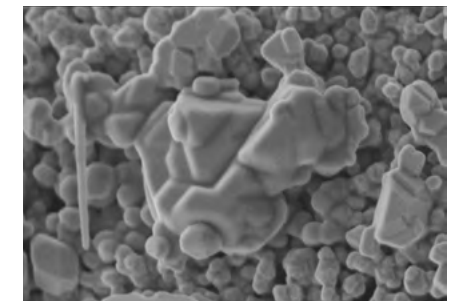


The basic principle of the Zone product is to use 2 different UV wavelengths:

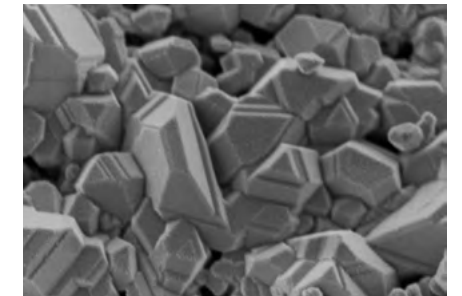
- 254nm for hydrocarbon cracking, destroys Ozone and produces high energy Oxygen.
- 185nm Ozone production, hydrocarbon cracking.

Performed in atmosphere or partial vacuum, surface is cleaned and may become hydrophobic.

ZoneSEMII



Before ZoneSEMII

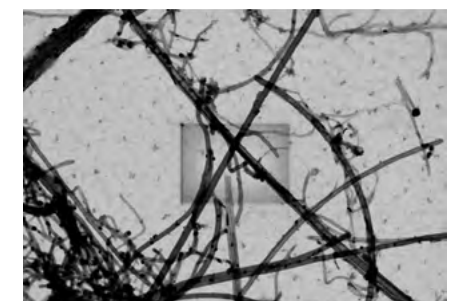


After ZoneSEMII

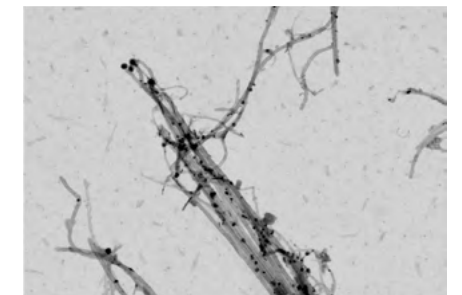
Product Features

- For samples up to 100mm Ø and 37mm high.
- Cleaning and storage function.
- Recipe memory.
- Typical process times 5-15 minutes.

ZoneTEMII



Before ZoneTEMII



After ZoneTEMII

Product Features

- Access for up to 5 TEM sample holders (configurable).
- Cleaning and storage function.
- Recipe memory.

Not sure which product aligns with your needs?

Our experts are here to provide guidance and help you make the best choice.

Speak with an expert >

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