Introduction of New Products

MultiBeam System
JIB-4600F

The newly developed JIB-4600F MultiBeam System unites the unique imaging and analytical capabilities of the High Power Optics employed in the TFE SEM and a high-performance FIB column in a highly efficient and powerful system. Together with the advanced software developed at JEOL, the JIB-4600F offers an easy-to-use tool for highly automated sample preparation combined with high-resolution imaging and sub-micron analysis of the specimen cross-section. This tool will help to significantly reduce the time it takes to find the answer for various research and industrial applications requiring materials and defect analysis.

Observation and Analysis
The High Power Optics developed for cross-section nanostructure characterization provides the guaranteed resolution of 1.2 nm at 30 kV, making observation at magnification higher than ×100,000 easily achievable which is important for process monitoring and defect identification. The JEOL patented High Power Optics is rated to produce a probe current up to 200 nA while maintaining a small probe size. The High Power Optics is suitable for a wide range of applications even at a low accelerating voltage. Under these conditions, the JIB-4600F MultiBeam System can offer enough current even when running the FIB process.

Processing
The newly developed high-performance FIB column achieves high-throughput milling with a beam current of 30 nA at 30 kV, to offer a substantial increase in productivity. It provides a stable and small ion probe even in the high current mode. The rapid scan mode makes preparation of thin TEM or bulk SEM samples an easy task with high-throughput rough pre-processing. The processing recipe mode offers various settings for process shape, ion beam diameter and ion beam dose at each gas deposition, rough pre-processing and final precise processing. In addition, the processing recipe helps to guarantee high reproducibility and reliability of results during the preparation of thin TEM samples, making it possible to repeatedly provide specimens having the same shape. The JIB-4600F offers a three-dimensional reconstruction application called S$^3$™ (Serial Slice and Sampling). Based on the unique features of the JEOL 3D system developed for TEM tilt series acquisition and reconstruction, the S$^3$™ module provides depth profile images for the sample cross-section in automatic serial processing mode.
Introduction of New Products

Electron Probe Microanalyzer
J X A -8230

The JXA-8230 is a newly developed Electron Probe Microanalyzer (EPMA). EPMA is an instrument that illuminates the specimen with an accelerated and finely focused electron beam (electron probe), and measures the wavelengths and intensities of characteristic X-rays, as well as the quantities of secondary and backscattered electrons from the specimen. This capability makes it possible to nondestructively analyze the specimen from micro to macro areas, with including constituent elements, concentrations, element distribution, surface morphology and mean atomic number.

The JXA-8230 achieves an integrated control of its various components using a personal computer: wavelength-dispersive X-ray spectrometers (WDS), an energy-dispersive X-ray spectrometer (EDS), an electron optical system, a specimen stage, etc. This sophisticated integration makes the JXA-8230 a state-of-the-art, hybrid EPMA, which enables you to perform measurement utilizing the features of each detector and compile versatile data as analysis results.

Features

Performance improvement in X-ray dispersion
Newly developed analyzing crystals are available. These are effective for very light element analyses and suitable for CHIME (Chemical Th-U-total Pb isochron method) age dating. You can combine these crystals with an optional panchromatic cathodoluminescence detector or an optional CHIME age dating program.

Efficient data acquisition
The JXA-8230 incorporates advanced analysis programs for line analysis and mapping, enabling simultaneous acquisition of electron images (SEI, BEI), WDS (up to five signals) and EDS signals of all detected elements, by means of either electron-probe scanning or specimen-stage scanning. In addition, the JXA-8230 can make use of the "EDS Active Map" function even during simultaneous measurement with multiple WDSs. Furthermore, a combined use with an optional silicon-drift detector (SDD), which requires no liquid nitrogen, enables you to easily perform efficient data acquisition.

Newly designed PC-GUI (graphical user interface)
A series of operations, from observing surface morphology and elemental analysis to data processing and outputting, can be seamlessly performed in a user-friendly personal computer environment. In addition, the new GUI provides "Click Point Analysis" function for starting analysis simply by clicking on a scanning image, and "User recipe" function that enables the creation of a customized recipe for frequently used analytical conditions. With these extensive functions, various operation styles can be chosen according to the level and needs of EPMA users. Highly reliable analysis results are obtainable with easy and efficient operation.

Sophisticated SEM imaging function
Scanning images, such as secondary and backscattered electron images, are displayed in real time with high resolution of 1280 × 960 pixels, thus enabling you to observe still images in a bright room. In addition, since the operation device and GUI for the JXA-8230 are shared with JEOL FE-SEMs, it is convenient to acquire the skill when you already use an FE-SEM. Furthermore, in the observation of X-ray images, since you can superimpose multiple X-ray images on a scanning image in real time, you can easily search a field of view for analysis (area of interest).

Turbo molecular pump is a standard configuration.
Since a turbo molecular pump is adopted as a main pump, a clean vacuum is obtained and also, operation energy and heat exhausted to the environment can be reduced to a low level.

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The scanning electron microscope (SEM) is an easy-to-use, fast characterization tool for revealing fine structures of specimens, which cannot be viewed by an optical microscope. In addition, the SEM can rapidly analyze constituent elements in specimens. Thus, the SEM is widely used in all research fields, as well as for industrial applications, ranging from development of new products to quality control. Now, requirement for SEM is much easier operation comparable to optical microscope. To adapt the SEM to versatile applications, JEOL has developed high-performance SEM series that incorporate newly designed software for easier SEM operations.

The JSM-6510 series is equipped with a general-purpose specimen chamber, which enables observation of specimens up to 150 mm in diameter. The JSM-6610 series accommodates a large-specimen chamber and a large specimen stage, for observation of specimens up to 200 mm in diameter.

You can easily search for areas of interest by taking an image of a specimen with a CCD camera and acquiring this color image into stage navigation software. An enlarged CCD image is equivalent to \( \times 1 \) for the JSM-6610 series, and equivalent to \( \times 2 \) for the JSM-6510 series. This feature enables you to view wider fields, which are difficult to see with the SEM.

SEM images provide high resolution (several hundreds of times greater than optical microscope), and also, the focal depth of SEM is several tens of times greater than optical microscope. These advantages are suitable for observation of complicated structures, enabling you to easily measure lengths and heights on specimen surfaces.

By installing an energy-dispersive X-ray spectrometer (EDS) in the SEM, you can nondestructively analyze constituent elements in a microarea down to 1 µm size while observing this small area, in a very short time. EDS-embedded analytical scanning electron microscopes (ASEM), —JSM-6510A, JSM-6510LA, JSM-6610A, JSM-6610LA— enable you to efficiently perform overall processes from observation to analysis.

To meet demand for “observation of a nonconductive specimen as it is,” low-vacuum SEMs (JSM-6510LV, JSM-6510LA, JSM-6610LV, JSM-6610LA) are available. Furthermore, you can easily learn how to maintain the instrument using a video displayed on a SEM monitor screen, for example, the method of replacing a filament. Thus, high performance of the instrument, including a high resolution of 3 nm, can be produced anytime.
Introduction of New Products

**Thermal FE SEM**

**JSM-7600F**

The JSM-7600F, a new lineup of JEOL FE-SEM series, is a state-of-the-art thermal FE-SEM that successfully combines ultrahigh-resolution imaging with optimized analytical functionality. In addition, the JSM-7600F incorporates a large specimen chamber. This uniquely designed chamber, which accommodates a 200 mm diameter specimen, is optimized for a large variety of detectors for secondary electrons, backscattered electrons, EDS, WDS, EBSD, CL, etc.

**Features**

- Ultrahigh resolution comparable to the cold cathode FE-SEM.
- In-Lens Thermal FEG.
- Aperture angle control lens automatically optimizes the spot size at both high and low currents for both analysis and imaging.
- High probe current up to 200 nA (at 15 kV) for various analytical purposes (WDS, EDS, EBSD, CL, etc.)
- Built-in r-filter enabling user selectable mixture of secondary electron and backscattered electron images.
- Gentle Beam mode for top-surface imaging, reduced beam damage and charge suppression.
- Eco design for energy conservation.

**MultiBeam System**

**JIB-4500**

The JIB-4500 MultiBeam System achieves surface/internal 3D imaging and analysis with simple operation. In addition, this innovative system has optimum geometry for all functions from FIB milling, SEM observation to various analyses such as EDS, EBSD and CL.

**Features**

- Combining a high-resolution LaB₆ SEM and a high-performance FIB.
- Multifunctional specimen chamber.
- High-sensitivity multi-imaging.
- Cross-section preparation for SEM and thin-film preparation for TEM.
- S³™ (Serial Slice and Sampling) for 3D imaging.
- Sophisticated user interface.