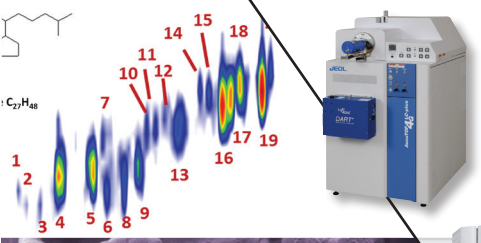
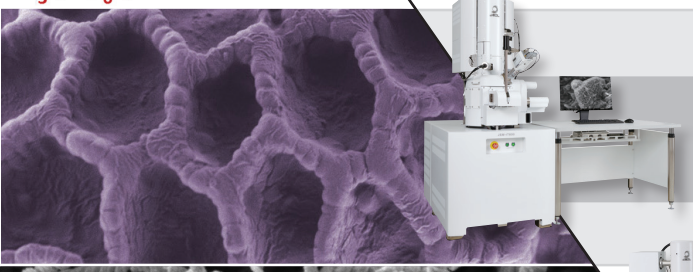
JEOL

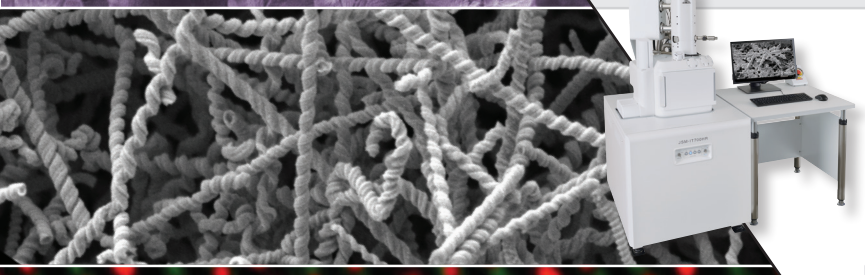
Product Lineup

SMART • FLEXIBLE • POWERFUL

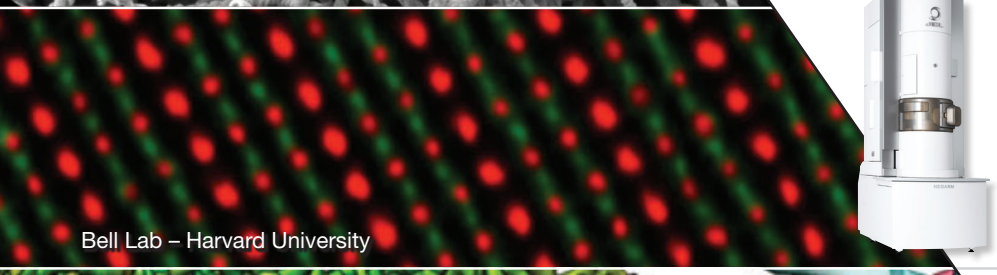




STEP INTO THE WORLD OF JEOL

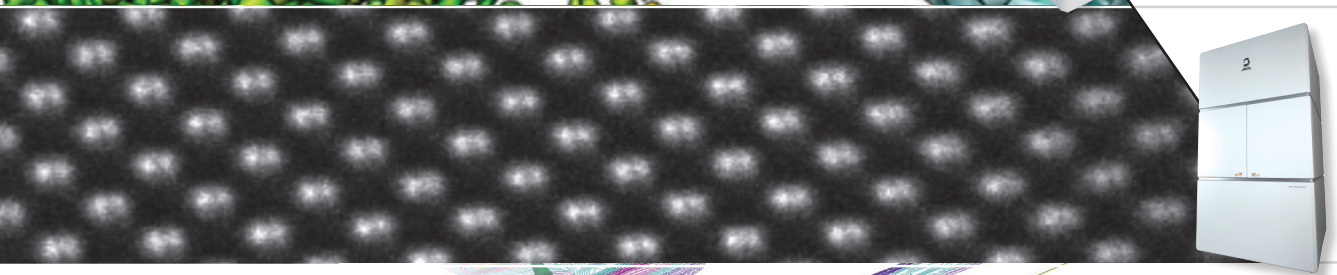


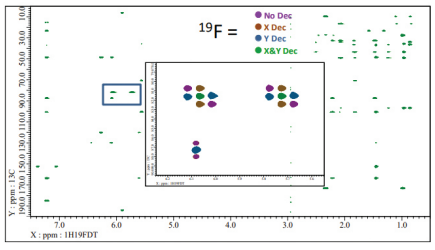
SEM
TEM
SAMPLE PREP
NMR
MASS SPEC
EPMA
LITHOGRAPHY

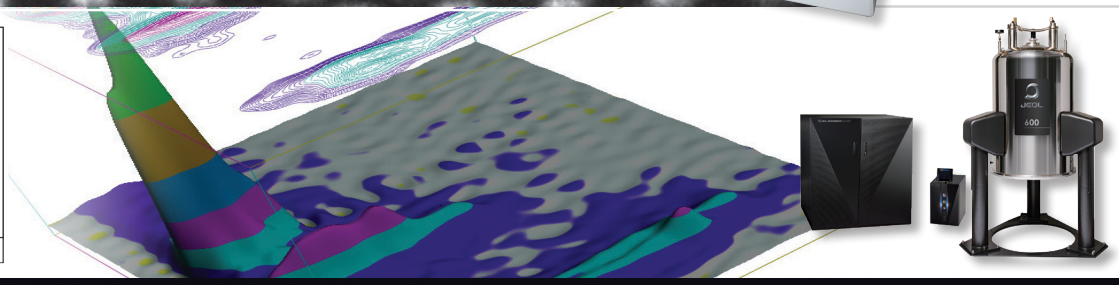


Bell Lab – Harvard University

Osaka University

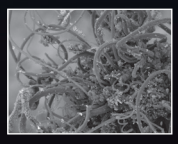
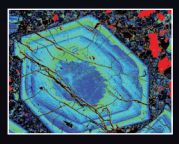
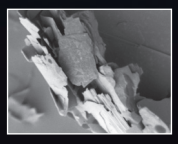






JEOLUSA.COM

HIGH RESOLUTION SEM

JSM-IT800 SERIES

ULTRAHIGH RESOLUTION FIELD EMISSION SEM

The IT800 series of Schottky Field Emission SEMs with embedded JEOL Energy Dispersive X-ray (EDS) streamlines operation and workflow efficiency. Elegant functionality, ultrahigh resolution, and powerful software enable seamless acquisition of data from observation to elemental analysis and subsequent reporting.

The IT800SHL is JEOL's flagship FE SEM with sub-nm resolution, up to 2,000,000X magnification and an accelerating voltage range of 0.01 to 30kV, making it possible to acquire stunning details of nanostructures alongside comprehensive elemental analysis.

Key Features:

- *Versatile electromagnetic/electrostatic hybrid lens design for outstanding imaging and analysis performance*
- *NEOENGINE — intelligent automated electron beam control*
- *Advanced auto functions including beam alignment, focus, and stigmation*
- *In-lens field emission gun*
- *Aperture Angle Control Lens (ACL) for superb resolution at any kV or probe current*
- *Beam Deceleration (BD) mode reduces effects of lens aberrations at the sample*
- *Large specimen chamber with multiple ports*
- *Montage images and elemental maps*
- *Smile View Lab for data management and report generation*
- *"Live" analysis with integrated JEOL EDS elemental screening*
- *High spatial resolution imaging and analysis of nanostructures*

JSM-IT700HR

INTOUCHSCOPE™ FIELD EMISSION SEM

The JSM-IT700HR is a compact, versatile Field Emission SEM that offers Smart-Flexible-Powerful performance at a great value. Our unique in-lens field emission gun and advanced electron optics deliver large probe currents while maintaining a small probe making this microscope ideally suited for imaging and analysis of nanostructures. This highly versatile SEM is compact in design yet is equipped with a large chamber and both High and Low Vacuum modes for managing a wide variety of specimen types in their native state. The JSM-IT700HR can be outfitted with our fully embedded EDS microanalysis system providing EDS spectrum in real time during image observation.

Key Features:

- *In-lens field emission gun delivers ≥300nA to the specimen*
- *Aperture Angle Control Lens (ACL) for high resolution at any kV or probe current*
- *Advanced auto functions including beam alignment, focus, astigmatism correction*
- *High and Low Vacuum modes*
- *Large specimen chamber with multiple ports*
- *Mechanically eucentric, large, 5-axis automated specimen stage mounted in the chamber*
- *Navigation is easy with embedded color camera (Stage Navigation System)*
- *Zeromag simplifies navigation providing a seamless transition from the optical image to live SEM image. All data is linked for instant map of analysis positions.*
- *"Live" analysis with integrated JEOL EDS*
- *Automated montage includes EDS maps (with JEOL EDS)*
- *SmileView Lab for data management and report generation*
- *Step-by-Step auto function guided operation for the new or occasional user*
- *Small footprint and easy maintenance (no cooling water required)*

JSM-IT500

VERSATILE RESEARCH SEM

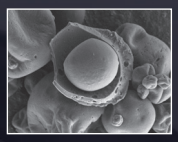
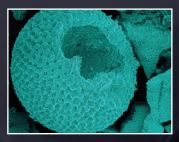
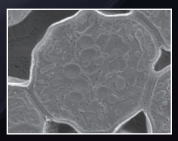
The latest innovations for our InTouchScope™ series SEMs are designed to make SEM accessible to everyone. All controls are at your fingertips with an intuitive software interface. Navigation across the sample is seamless — quickly go from an optical image to high resolution SEM imaging and analysis. The high resolution W filament gun (LaB_6 option) offers unsurpassed low kV performance. Embedded EDS brings fast quantitative elemental characterization.

We offer high vacuum and low vacuum models with or without our embedded EDS system [JSM-IT500, JSM-IT500A, JSM-IT500LV, JSM-IT500LA]. The large sample chamber features multiple ports optimally positioned for analytical attachments such as EDS, EBSD, CL, WDS, chamberscopes, heating/cooling sub-stages, etc. The specimen stage is mounted inside the chamber enabling users to secure large, heavy and odd shaped objects on the stage with clear positioning prior to evacuating the chamber.

Key Features:

- *High throughput microanalysis with analytical models with full integration of EDS with "Live" analysis*
- *High resolution with unsurpassed low kV performance*
- *High vacuum to expanded pressure in low vacuum mode*
- *Zero mag — Simplifies navigation and enhances throughput. Seamless transition from optical to SEM image*

HIGH RESOLUTION SEM

JSM-IT200 INTOUCHSCOPE

COMPACT, VERSATILE, HIGH THROUGHPUT SEM

When you need higher resolution, imaging with multiple detectors, elemental analysis, and a range of acceleration voltages at high or low vacuum, all in an easy-to-use SEM, the JSM-IT200 is a great value with the functionality you'd only expect from high end SEMs.

Key Features:

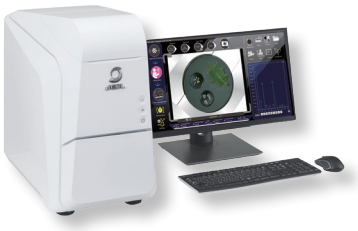
- *Zero-Mag streamlines navigation and throughput, with true integration of optical and SEM imaging*
- *Multi-Touch screen control and/or keyboard/mouse*
- *Simultaneous multiple live image and movie capture*
- *Automatic SEM condition setup based on sample type*
- *Live remote viewing — full remote control*

Optional Advanced Functions:

- *Analytical models include fully-embedded EDS with "Live" analysis and advanced functions (drift compensation, quant map, mapping filter, multi-area, line scan)*
- *Low vacuum models include high sensitivity solid state backscatter detector (composition, topgraphic, and variable shadowed images)*

BENCHTOP SOLUTIONS

JCM-7000 NEOSCOPE™



HIGH PERFORMANCE BENCHTOP SEM

This 4th generation Neoscope incorporates advanced technology and functions that make it simple for users at any skill level to obtain outstanding SEM images and elemental analysis results in minutes. It is equipped with a large chamber, high and low vacuum modes, secondary and backscatter electron detectors, real time 3D imaging, highly-advanced auto functions and the option to add a fully embedded EDS with real time, 'Live' analysis.

Key Features:

- ***Zeromag** — Simplifies Navigation and enhances throughput. Provides a seamless transition from an optical (or holder graphic) to SEM image*
- *Highly-advanced Auto functions for automatic condition setting and image formation in minutes*
- *High resolution (100,000X) and large depth of field*
- *High and low vacuum modes for managing a wide variety of samples*
- *Large chamber: maximum sample size 80mm (D) × 50mm (H)*
- *Advanced functions built-in such as: Automated montage and Live 3D Imaging*
- *Option: Fully embedded EDS with Live (real time) analysis*
- *Smile View™ Lab for integrated management of image and analysis data*

SAMPLE PREPARATION

CROSS SECTION POLISHER

The JEOL Cross Section Polisher utilizes a broad argon ion beam for SEM specimen preparation. The instrument enables preparation of truly representative cross sections of composites of hard and soft materials free of artifacts and distortions.

The principle of operation is as follows: a region of the specimen not covered by a masking plate is milled away and polished to a smooth surface finish. A mask-less operation utilizing a rotation holder is also available for flat surface milling preparation of powders, wires, and large metallurgical mounts.

Key Features:

- *Clean polished cross section of hard, soft, and composite materials*
- *Clean mirrored surface with minimal strain or distortion*
- *Wide area cross sections (up to several mm across)*
- *Easy touch panel operation*

Cooling CP Advantages:

- *Liquid Nitrogen cooling prevents thermal damage to materials with low melting and low glass transition points*
- *Air Isolation transfer system protects samples that are sensitive to air exposure*

COATERS

SMART COATER

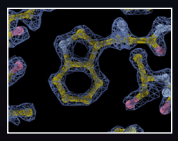
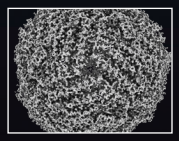
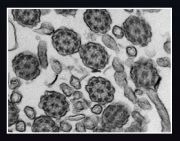
This simple-to-use sputter coater features fully-automated vacuum and sputtering. Insert your samples, turn the unit on and select the sputtering time. The chamber will evacuate and sputtering will begin automatically. When the unit is powered down, it vents to atmosphere.

CARBON COATER

JEOL's fully automated carbon coater features fully-automated vacuum and carbon evaporation. Ideal for X-ray applications (EDS), CL or backscatter electron imaging.

This simple-to-use carbon coater features fully automated vacuum and carbon evaporation.

CRYO EM — MULTIPURPOSE TEM

CRYO ARM

FIELD EMISSION CRYO-EM

The CRYO ARM™ 200 and CRYO ARM 300 are equipped with a Cold Field Emission gun (Cold FEG), an in-column Omega energy filter, a side-entry liquid-nitrogen cooling stage and an automated specimen exchange system, is a cryo-electron microscope (cryo-EM) that enables observation of bio-macromolecules at cryo-temperature. The automated specimen exchange system features storing of up to 12 samples. In addition, the system allows for the exchange of an arbitrary one or more samples, thus enabling flexible scheduling. Furthermore, the combined use of a newly-designed in-column Omega energy filter and a Hole-free Phase Plate dramatically enhances the contrast of TEM images of biological specimens.

Key Features:

- *200kV and 300kV models*
- *Automated specimen exchange system*
- *Cold Field Emission Gun*
- *In-column Omega Energy Filter*
- *Automated image acquisition software for Single Particle Analysis*
- *Optional Hole-free Phase Plate*
- *Auto adjustment functions*

JEM-1400FLASH

IMAGING AND CRYOMICROSCOPY EXCELLENCE IN A 120KV TEM

The JEM-1400Flash is the TEM of choice for those looking for the ultimate in 120kV performance. This compact, versatile, easy-to-use TEM is suitable for biological, polymer, and materials science applications. Equipped with a high-sensitivity sCMOS camera, the JEM-1400Flash offers new “Flash” for TEM users via powerful new functions, including an ultra-wide area montage system and an OM (optical microscope) image linkage function.

Key Features:

- *High resolution/high contrast imaging*
- *Outstanding S/TEM analytical performance*
- *Elemental mapping with the latest large-area SDD detectors*
- *Cryomicroscopy, 3D tomography*
- *Wide-area montaging — Limitless Panorama*
- *OM image linkage (picture overlay)*

JEM-2100PLUS

MULTIPURPOSE TRANSMISSION ELECTRON MICROSCOPE

The JEM-2100 Plus is a multipurpose 200kV LaB6 TEM that provides solutions for a wide range of applications from materials science to medical/biological studies, all at a low cost of ownership.

Operation is intuitive and uncomplicated. The “TEM Center” software displays column controls, STEM operation, and camera operation compactly in a single screen.

To acquire images and diffraction patterns there is an optional JEOL-made bottom-mount camera called the “Matataki Flash” camera with a cutting-edge sCMOS sensor.

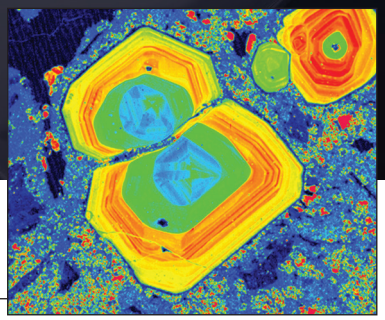
The advanced control system allows integration of STEM, EDS, and EELS as well as remote operation.

The patented JEOL Alpha Selector™ allows a user the selection of a variety of illumination conditions, ranging from full convergent beam to parallel illumination. Lorentz microscopy is a standard feature of this microscope. A high contrast aperture is available for any choice of polepiece, allowing high contrast imaging and simultaneous EDS.

Key Features:

- *Wide range of selectable objective lenses based upon your application requirements (UHR, HR, HT, HC, Cryo)*
- *Fine probe analysis and Nano Beam Diffraction. Probe size <1nm*
- *Superb and effortless atomic/lattice imaging capabilities <0.14nm with Point-Point resolution guaranteed as low as 0.194nm with the UHR Objective lens*
- *Cryo screening capabilities*
- *Crystallographic Micro Electron Diffraction option*
- *Tomography-capable offering a large range of tilt (¬+80°) and the ability to acquire 3D images with simple operation*

EPMA — SXES — E-BEAM LITHOGRAPHY

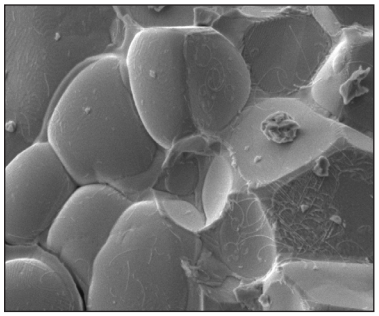


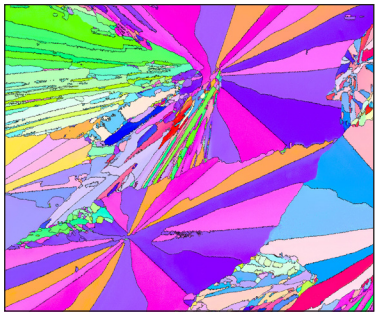
ELECTRON PROBE MICROANALYZER (EPMA) JXA-IHP200F AND JXA-ISP100

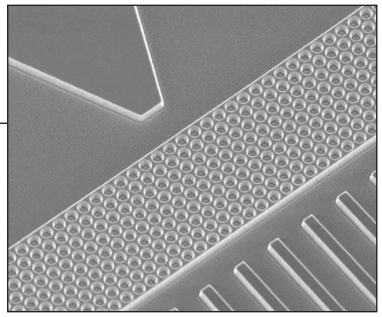
EPMA allows for high speed, high accuracy qualitative and quantitative in-depth surface analysis as well as area analysis. A non-destructive technique, EPMA utilizes X-ray spectrometry to determines chemical composition of small amounts of solid materials. JEOL's new state of the art, top of the line, research grade EPMA series provides both high imaging resolution and analytical resolution with a very high and stable probe current for optimum analytical performance. A new GUI provides a simplified work flow called "Easy EPMA." New features include customizable configuration of spectrometers and crystals optimized for the required application. Field Emission and W/LaB_6 models.

Key Features:

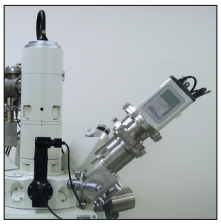
- *Customizable configuration of spectrometers and crystals optimized for the required application*
- *Performs both beam scanned line scans and maps as well as large area line scans and maps with stage scanning*
- *A 30mm² integrated and embedded UTW-SDD-EDS system with high sensitivity including an in situ aperture wheel for ultrahigh beam current operation without compromising EDS spectrometer resolution and "Live" survey EDS acquisition to easily help find elements of interest*
- *Specimen chamber supports both a panchromatic high bandwidth imaging CL and a fully quantitative hyper-spectral CL (xCLent V System) with no loss of a WDS or any limitation on image collection*
- *Supports the installation of JEOL's Soft X-Ray Emission Spectrometers (SXES and SXES-ER) for ultralight elements and chemical state analysis*



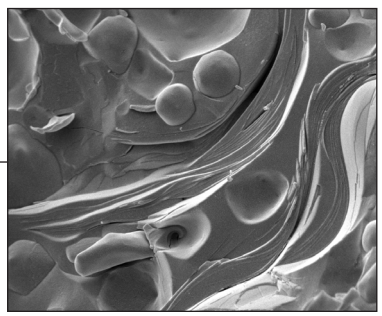




SOFT X-RAY EMISSION SPECTROMETER FOR FE-SEM AND EPMA

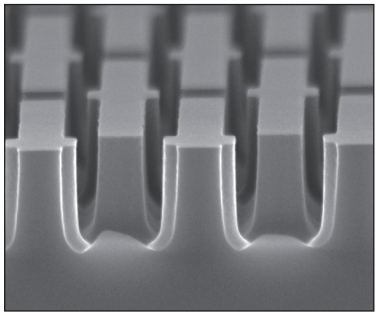


The SXES can detect ultra-soft X-rays in the energy range of 50-210 eV. The high spectral resolution (0.3eV) of the SXES allows for the Nitrogen Kα and Titanium Lℓ lines to be separated. Ultra-low energy, low-concentration sensitivity enables detection of Li even at low single digit weight percent concentration. The SXES features chemical state analysis capability and detects differences between conduction band and valence band electrons when they emit X-rays, allowing the distinction between bonding and crystal structure in samples containing the same elements.

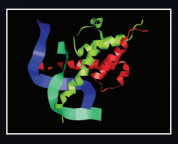
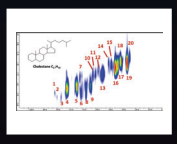
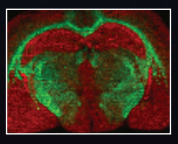


DIRECT WRITE E-BEAM LITHOGRAPHY

This new generation of e-beam introduces the capability of writing ultrafine patterns at a high rate of speed directly onto substrates with minimum idle time during the exposure process. Maximum scanning speed has been increased to 125 MHz (the world's highest level) for high speed writing applications. JEOL has more than 50 years of dedicated Direct Write EBL experience and the largest service support staff in the industry.



NMR AND MASS SPEC

JNM-ECZ400S

400 MHZ NMR FOR ROUTINE LIQUIDS

The JNM-ECZS series is a next generation 2-channel NMR spectrometer that incorporates ultrahigh accuracy RF circuitry utilizing the latest digital high frequency technology. Designed for routine open access operation, this compact spectrometer is equipped with many functions normally only found on research models and supports many advanced NMR experiments. Coupling the use of advanced software with highly reliable automation, all routine daily measurements can be automated. With the use of the autotune SuperCOOL NMR probe the JNM-ECZ400S NMR Spectrometer realizes outstanding sensitivity for its class.

JNM-ECZR SERIES

400 MHZ TO 1 GHZ NMR FOR RESEARCH LIQUIDS AND SOLIDS

The JEOL ECZR NMR spectrometer series represents the latest in digital and high frequency NMR technologies. Improved reliability and a more compact size are made possible by incorporating the latest advanced integrated circuits. It supports greater expandability including: multi-channel operation, high-power amplifiers, high-power gradient amplifiers, and other accessories. Advanced software and automation enable highly sophisticated measurements to be carried out while most routine measurement operations can be performed automatically. Many types of NMR probes such as the UltraFast MAS solid state NMR probe and UltraCOOL cryogenic solution NMR probe are available.

ACCUTOF™-DART® 4G

THE AMBIENT IONIZATION TOOLBOX™

The AccuTOF-DART 4G is a simple, robust and versatile atmospheric pressure ionization high-resolution time-of-flight mass spectrometer (API-HRTOFMS). When combined with the revolutionary Direct Analysis in Real Time (DART) ion source (patented by JEOL in 2005), the AccuTOF-DART 4G exponentially improves the MS workflow and is a powerful problem-solving tool for a wide range of applications.

Key Features:

- *Open air ionization — rapid analysis minus the chromatography*
- *Fast problem-solving*
- *No sample preparation — no solvents or waste*
- *Wide analytical range*

ACCUTOF™ GCX-PLUS

THE ULTIMATE IN GC-MS ANALYSIS

The AccuTOF GCx-plus gas chromatography/time-of-flight mass spectrometer features high resolution, accuracy, and sensitivity. In combination with comprehensive 2D gas chromatography (GCxGC), the GCx offers powerful chromatographic separation and high-resolution mass spectra. It is ideal for analysis of GC-HRMS and GCxGC -HRMS data sets from complex mixtures such as crude oil, impurities in products, feedstocks and fine chemicals, and environmental contaminants.

Key Features:

- *GC separation and high-resolution exact mass analysis*
- *High speed data acquisition for GCxGC*
- *Optional EI/FI/FD, EI/PI and CI source*
- *Optional direct probes*
- *Integrated analysis and reporting*

SPIRALTOF™-PLUS

ULTRA-HIGH MASS RESOLUTION MALDI-TOFMS

The SpiralTOF-plus is a MALDI-TOFMS incorporating an innovative SpiralTOF ion optical system that increases the ion flight path to 17m in a figure eight trajectory that fits into a small console. The SpiralTOF defines a new standard in MALDI-TOFMS performance and provides state-of-the-art analytical solutions for a wide range of research areas such as functional synthetic polymers, materials science, and biomolecules.

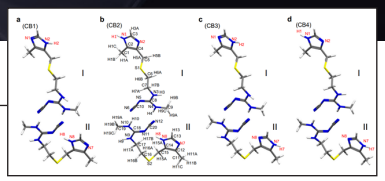
Key Features:

- *MALDI Imaging with "perfect focusing" ion optics — no loss in ion transmission due to beam divergence*
- *High resolution mass spectra are acquired for the entire image*
- *High resolution and mass accuracy are not lost for samples that are not perfectly flat*
- *High-speed data acquisition reduces imaging time*
- *No PSD artifacts — "clean" low-mass background*
- *TOF/TOF option with high resolution single isotope precursor selection for MS/MS imaging*

JMS-TQ4000GC

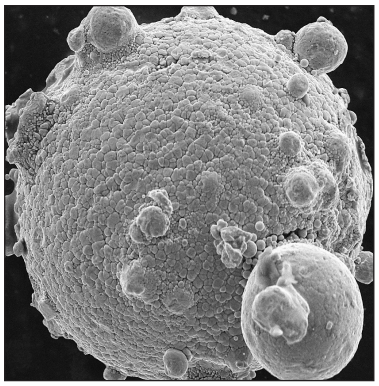
GC-MS/MS FOR TRACE QUANTITATION

The JMS-TQ4000GC is an ultrahigh-speed triple-quadrupole mass spectrometer that accurately measures trace or residual pesticides in agricultural materials, trace levels of regulated chemicals in tap water, and simplifies quantitative analysis of persistent environmental pollutants such as dioxins and PCB's.



Key Features:

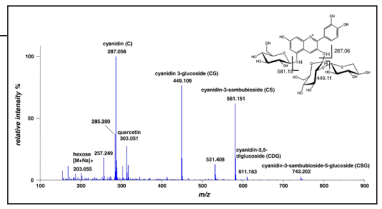
- *Short collision cell for higher sensitivity, higher throughput with shorter acquisition times*
- *Fastest SRM switching speed in the industry — 1000 transitions/sec*
- *EI (standard), CI, and PI (optional) sources*
- *Easy to clean and maintain*
- *Powerful and easy-to-use software for data analysis and reporting*
- *Direct Probes: Direct insertion probe (DIP) and direct exposure probe (DEP)*
- *Single quadrupole MS also available*



JMS-Q1500GC

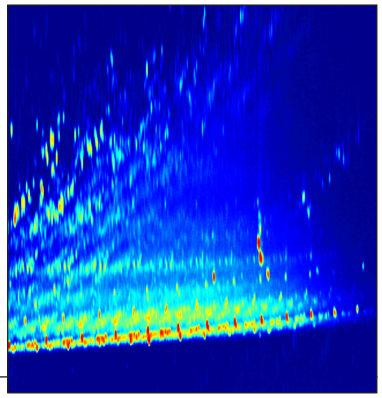
SINGLE-QUAD MASS SPECTROMETER

This 5th generation Single-Quad Mass Spectrometer system offers high sensitivity and fast analysis for a wide range of applications such as environmental analysis for agrichemicals and mold odor, material analysis, and aroma analysis. Equipped with the largest hyperbolic quadrupoles in its class, it provides superb ion transmission for large ion volumes, resulting in a wide dynamic range.

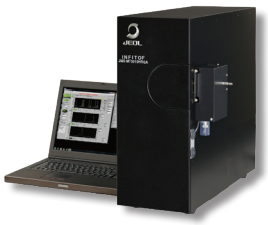


Key Features:

- *High performance maintained over a long period of time by combination of a pre-filter, hyperbolic quadrupoles, and a conversion dynode secondary-electron multiplier (SEM)*
- *EI (standard), CI, and PI (optional) sources*
- *Direct Probes: Direct insertion probe (DIP) and direct exposure probe (DEP)*
- *Easy to clean and maintain — ion source can be removed without tools*

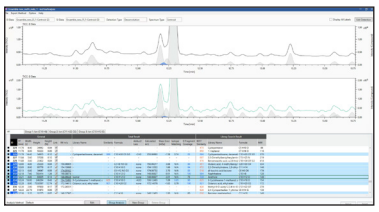


JMS-MT3010HRGA



INFITOF MULTI-TURN TIME-OF-FLIGHT MASS SPECTROMETER

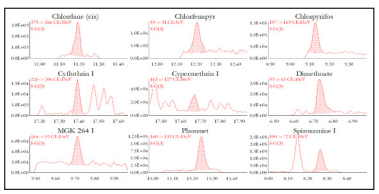
Designed for real-time, direct gas introduction and analysis, the InfiTOF is a unique, compact mass spectrometer that makes it possible to obtain high resolution with a small ion flight path design. With its high mass resolving power, this system can be used to determine elemental compositions for ions within the range of *m/z* 1 - 1,000. The hydrogen ion H+ can be detected with this powerful, multi-turn and multi-segment breakthrough in technology.



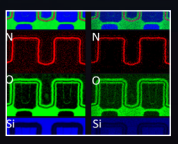
The InfiTOF is ideal for monitoring trace impurities in semiconductor process gases, evolved gases from catalytic reactions, vapor epitaxy and more. InfiTOF instantly separates isobaric gases such CO and N_2, or N_2O and CO_2, for continuous monitoring without chromatography.

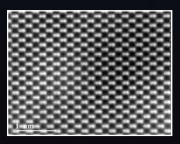
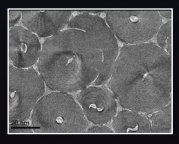
Key Features:

- *High mass resolving power*
- *Capable of "In-situ" analysis and high-resolution monitoring*
- *Capable of measuring hydrogen ions*



ATOMIC RESOLUTION TEM



JEM-ARM300F2 GRAND ARM™2

ATOMIC RESOLUTION TRANSMISSION ELECTRON MICROSCOPE

The newest offering in the Atomic Resolution analytical Microscope (ARM) Series incorporates several new features and builds on the proven technology inherent to the ARM family of instruments, making the GRAND ARM2 the preferred choice for all aberration-corrected electron microscopy needs. A new pole piece design accepts dual large-area EDS detectors, enabling high-speed, high-sensitivity chemical characterization without sacrificing spatial resolution. Automated HT settings, corrector alignment routines, and lens optimizations promote ease-of-use while providing the ultimate in functionality and performance. Standard features such as a cold field emission gun, a hybrid HAADF detector for increased S/N throughout the entire 40-300kV operating range, and enhanced light element contrast via e-ABF imaging, solidify the GRAND ARM2 as a high-performance analytical instrument with unparalleled flexibility.

Key Features:

- *No compromise in spatial resolution — new pole piece design yields increased EDS solid angle without sacrificing resolution*
- *Mitigation of environmental effects — new enclosure reduces impact of air flow, temperature changes, and acoustic noise*
- *Ultimate functionality — automated HT settings, corrector alignments, and optimized lens routines promote ease-of-use*

NEOARM

WORLD'S LEADING RESEARCH ATOMIC RESOLUTION MICROSCOPE

Built upon the proven platform of the JEM-ARM200CF, the next-generation NEOARM provides users the ultimate in flexibility for both high-spatial and high-energy resolution, yielding superior imaging and spectroscopy capabilities down to the atomic scale, from 30 — 200 kV.

Key Features:

- *Ultra-stable Cold FEG provides a high-brightness source with a smaller probe size, while maintaining a narrow energy spread for improved EELS results*
- *Second-generation ASCOR Cs Corrector compensates higher-order aberrations; combined with the CFEG, this enables atomic-resolution imaging and spectroscopy, down to 30 kV*
- *Dual, large area EDS detectors provide up to 2.2 sr of solid angle for high-throughput spectroscopy*
- *New hybrid HAADF and dedicated ABF detectors enable high-contrast, atomic-scale imaging, irrespective of accelerating voltage*

MONOCHROMATED NEOARM

Spot-IN and Spot-OUT

- *High Performance Dual Wien-filter Monochromator System*
- *True round monochromatic beam*
- *Atomic resolution at any energy resolution*

JEM-F200

MULTI-FUNCTIONAL NEXT-GENERATION 200KV TEM

Designed to meet today's diversified needs. A user-oriented integrated control environment has been developed while maintaining cutting edge imaging and analytical performance.

Key Features:

- *Cold FEG electron source*
- *Dual large solid angle EDS available*
- *Quad lens condenser system*
- *Advanced scanning system, including de-scan*
- *PicoStage for precise, high speed sample movement*
- *Intuitive user interface*
- *Automated specimen holder insertion*

JEM-ACE200F

NEW HIGH THROUGHPUT ANALYTICAL ELECTRON MICROSCOPE

The ACE200F is a high throughput TEM designed for device characterization including morphological observation, critical dimension measurement, elemental analysis, local strain analysis, and dopant concentration measurement. The ACE is ideally suited to meet the semiconductor industry demand for fast, stable, and highly resolved data acquisition.

Key Features:

- *Full automation or semi automation for high accuracy and high throughput*
- *Analytical microscope equipped with Cold FEG*
- *Supports automated and recipe-driven/scripted data acquisition and processing*
- *HAADF, LAADF, BF, SE signals*
- *Cs-correction, dual EDS detectors, EELS options*

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