

IONOPTIKA

ion beam technology

J105 SIMS

ToF SIMS with
Unparalleled Sensitivity

www.ionoptika.com



The J105 SIMS

The J105 SIMS is a state-of-the-art 3D imaging ToF SIMS that delivers class-leading sensitivity with exceptional imaging and mass spectrometry performance. Combining innovative design and cutting-edge science with a comprehensive list of features, the J105 re-defines what ToF SIMS can do.

Perform rapid 2D and 3D imaging with high-resolution cluster ion beams delivering exceptional molecular sensitivity. With a range of high-performance ion beams to choose from, and performance that is always independent of the sample, the J105 SIMS provides the tools to tackle any analysis situation.

Benefits

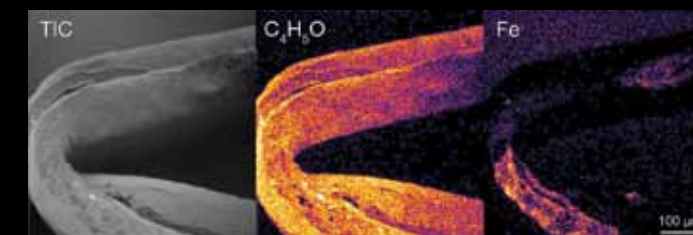
- Rapid high-resolution 2D and 3D molecular imaging.
- Consistent mass accuracy and mass resolution across all samples, independent of sample height.
- Unrivalled sensitivity and imaging MS performance with our patented Water Source.
- Range of high-performance ion beams to suit every application.
- High mass accuracy and tandem MS for accurate peak assignment.
- Full cryo-sample handling capabilities.

3D MS imaging

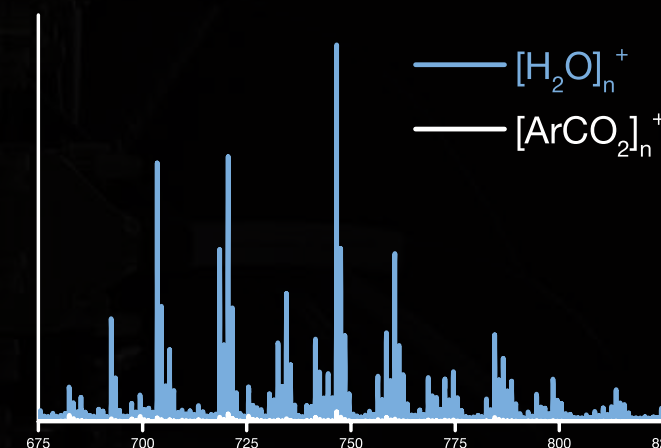
Obtain high-resolution 3D chemical images without running a “sputter-only” cycle ever again! Thanks to the unique combination of high-performance cluster ion beams and innovative buncher-ToF analyser, analysis and low-damage etching on the J105 occur simultaneously. As cluster beams are used for analysis, “sputter-only” cycles are not needed and every layer is analysed, making the J105 SIMS an extremely accurate tool for 3D imaging and depth profile analysis.

Consistent performance across all samples

It's not always practical to obtain perfectly flat samples for every experiment, and with the J105 SIMS you no longer need to! The J105's innovative design decouples the primary beam from the ToF analyser, delivering consistent mass accuracy independent of sample height. So even complex 3D structures such as stents, scaffolds, and fibres can be analysed without loss of performance.



Analysis of a heart stent. Mass accuracy is maintained across the entire sample, despite the complex topography.



Unrivalled sensitivity

Utilising Ionoptika's world-renowned cluster beam technology, the J105 delivers unrivalled sensitivity to intact molecular species, essential for advanced applications and high-resolution imaging.

Now featuring the new Water Cluster Source, this exciting new technology offers greatly enhanced sensitivity and superior imaging capabilities of intact molecular ions, e.g. lipids, drugs, and metabolites.

“Over the last 12 years very significant advances in bio-analysis have been made possible through the application of this unique and versatile instrument.”

John Vickerman

Emeritus Professor, University of Manchester

The J105 at a glance

With a host of exciting features, the J105 is the ideal tool for a range of applications.

NEW Water Cluster Source

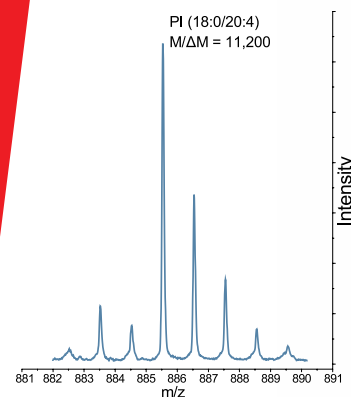
- Water Source upgrade for GCIBs.
- Increase secondary ion yield by up to 500x compared with Ar gas.
- Greatly reduced fragmentation and very low surface damage.
- Image low abundance analytes with unprecedented clarity at resolutions down to 1.5 μm .

Choice of Ion Beams

- Choose up to 3 different primary ion beams, covering a wide range of applications and budgets.
- The J105's unique design allows any ion beam to be used without impacting performance.
- Gas cluster ion beams for analysis of biological samples to 1.5 μm resolution.
- C60 cluster beam for the best of both worlds – low fragmentation and small spot size.
- Gold cluster beam for very small spot size and elemental analysis.

Specialist Analysis Software

- Analysis built around imaging, with real-time spectral/image scanning.
- Quickly identify patterns within the data, find related peaks, and make tentative assignments.
- Fast image mode – view even large data sets on a laptop.
- Convenient export tools for common data formats such as HDF5 and imzML.



Unique Analyser

- The unique buncher-ToF analyser delivers high mass resolution no matter what ion beam is in use.
- High mass accuracy (< 5 ppm) is maintained across all points on a sample, even on very rough samples.
- Transmission is maintained even on highly curved surfaces.
- Gives you confidence in the raw data, making analysis faster and easier.

Tandem MS Mode

- For definitive peak assignment, tandem MS mode is included as standard.
- Select the parent ion of interest and fragment it in a high-energy collision cell, producing a characteristic fragment spectrum.
- Combined with consistent high mass accuracy and mass resolution, the J105 provides all the tools to make accurate assignments with confidence.

Cryo Sample Handling

- Liquid nitrogen cooling available as standard.
- Maintain temperatures down to 100 K at both main sample stage and the sample insertion lock.
- Full stage mobility even at 100 K for large-area tiled analysis.
- New ultra-low humidity glove box available for air/water sensitive samples.
- Easily integrates into the cryo-workflow for sensitive biological and materials analysis.
- Accommodates samples up to 6mm in height.

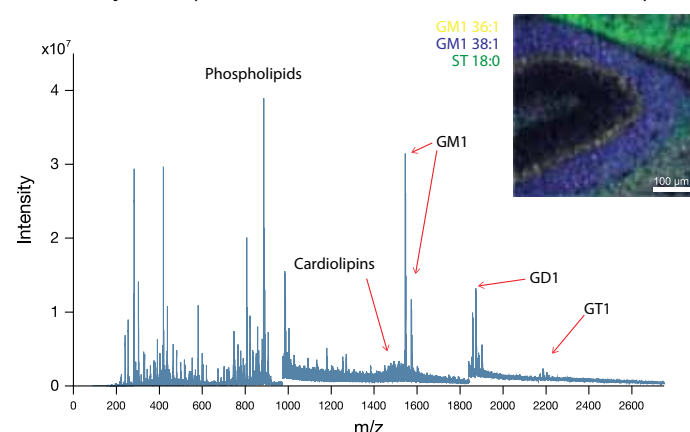
Applications

Biological Analysis

Originally designed for biological analysis, the J105 is equipped with a host of features to get the best results from any biological sample.

High-resolution lipidomics

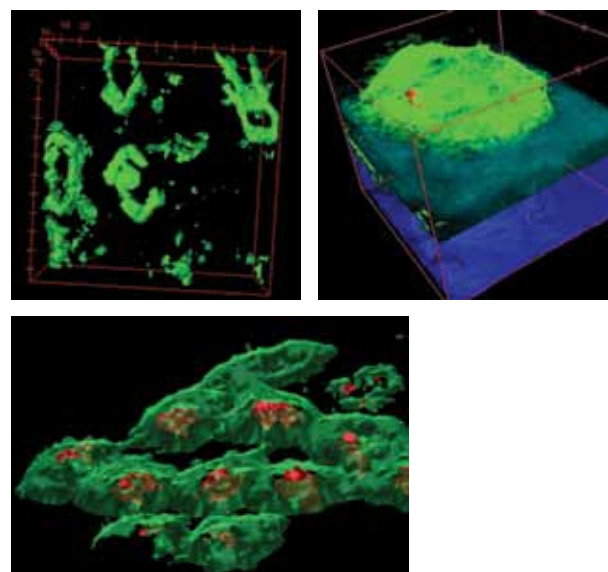
High-performance Gas Cluster Ion Beams greatly increase the yield of high-mass molecular ions, e.g. lipids, producing incredibly rich spectra even at resolutions down to 1.5 μm .



Highly detailed mass spectrum obtained on mouse brain tissue. Inset: high-resolution lipid imaging of hippocampus.

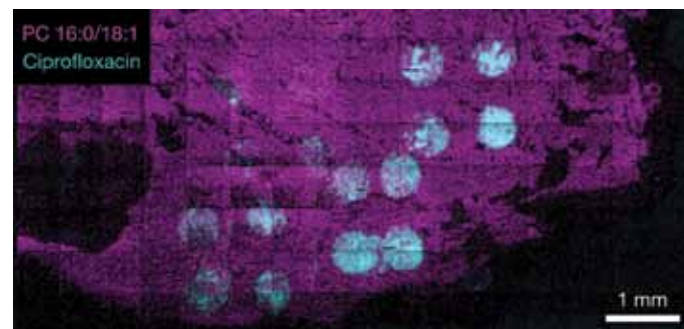
3D imaging

Large cluster beams produce very little fragmentation and sub-surface damage, making them ideal for 3D biological analysis. Analysis and low-damage etching are continuous and concurrent on the J105, as secondary ions are collected whenever the ion beam is on, resulting in very high depth resolution.



Drug imaging with water clusters

The new Water Cluster add-on for GCIB delivers unprecedented molecular sensitivity. Image low abundance species such as drugs and metabolites at high resolution and with greater clarity.



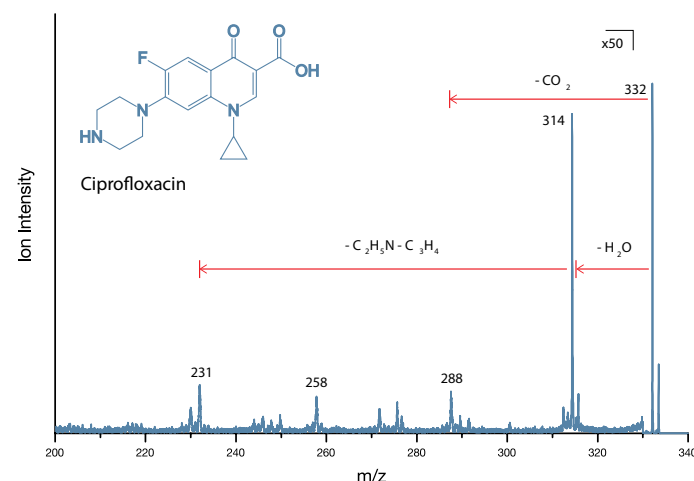
Imaging drops of ciprofloxacin on tissue at different concentrations with a water cluster beam. Using a water beam provides up to 500x increase in sensitivity vs a standard Ar or ArCO₂ cluster beam.

Frozen-hydrated analysis

To obtain the most reliable results from biological systems, frozen-hydrated analysis is proven to be one of the most effective methods. The J105 seamlessly integrates into the cryo-workflow, with glove box and liquid nitrogen cooled sample handling system included as standard.

Make assignments with confidence

Spatial resolution, mass resolution, and consistent mass accuracy all combine to make peak identification a routine procedure, even on rough or curved samples. For definitive assignments, tandem MS mode is available as standard.



MS² spectrum of a compound detected in tissue at m/z 332.15, suspected to be ciprofloxacin. Signature peaks at 314, 288, and 231 confirm the assignment.

Materials Analysis

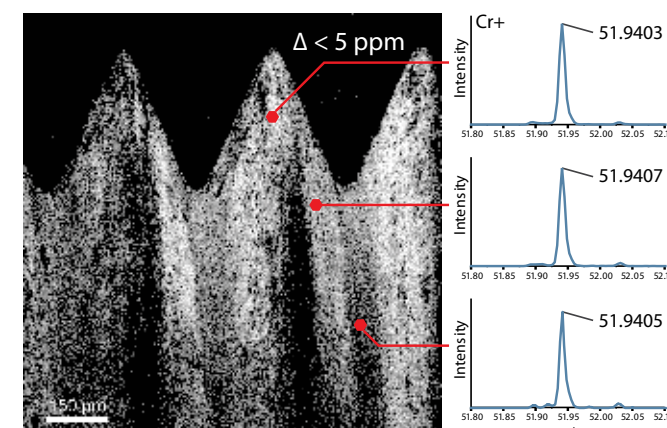
The J105 has a versatile range of features that make it ideal for materials analysis applications.

An ion beam for every type of sample

With up to 5 different ion beams to choose from, including GCIB, C60, gold cluster, oxygen, and caesium sources, and with a range of spot sizes and currents available, there is an ion beam to suit every type of sample.

Curved, rough, or topographic samples

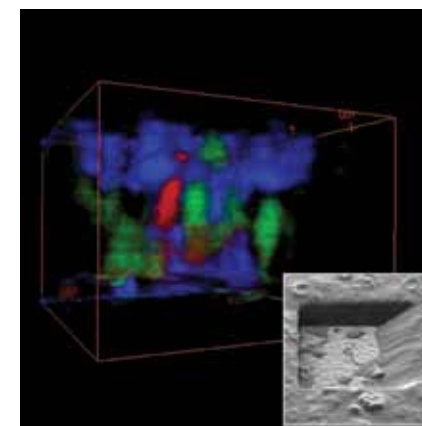
Thanks to its clever design, the J105 delivers consistent mass accuracy and mass resolution across all samples, independent of changes in sample height.



Comparison of the Cr⁺ peak obtained at various locations across an M1.6 screw thread. Mass accuracy varies by less than 5 ppm across the full depth of the sample.

3D Polymer analysis with GCIB

Analyse faster and deeper than ever before with the latest high-performance gas cluster ion beams. Ideal for polymer and buried interface analysis.



Large volume 3D analysis of a mixed polymer. Analysed volume is 250 x 250 x 70 μm , acquired in just 9 hours. Inset: Image of analysis crater.

“Annotation of the data-rich spectra generated from these complex samples is really helped by the high mass accuracy of the analyser.”

John Fletcher

University of Gothenburg

Options

ION BEAM	SPECIES	ENERGY RANGE	MIN. SPOT SIZE	APPLICATIONS
GCIB SM	Ar_n , $(CO_2)_n$, $(H_2O)_n$	20-70 kV	1.5 μm	Organic/biological materials, polymers, depth profiling, heterostructures
GCIB 40	Ar_n , $(CO_2)_n$, $(H_2O)_n$	10-40 kV	3 μm	Organic/biological materials, polymers, depth profiling
IOG C60-40	C_{60}^+ , C_{60}^{++} , C_{60}^{+++}	10-40 kV	300 nm	Organic/biological materials, inorganics, metals
IOG 25	Au^+ , Au^{++} , Au_2^+ , Au_3^+	5-25 kV	150 nm	Semiconductors, metals, inorganic materials
FLIG 5	O_2 , Cs	0.2-5 kV	15 μm	Semiconductors, depth profiling

Key Features

- High-resolution 2D & 3D imaging SIMS with unprecedented sensitivity.
- Mass accuracy and mass resolution that are independent of sample height and ion beam.
- High mass accuracy and tandem MS for accurate peak assignment.
- Range of high-performance ion beams to suit every application.
- Full cryo-sample handling capabilities.
- Patented Water Cluster Source.

Let us show you what the J105 SIMS can do

For further information about our instruments or to arrange a demonstration, please email us at sales@ionoptika.co.uk or visit our website at www.ionoptika.com/j105-sims.

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“The decoupling of the sputtering process from the ToF measurement brings many practical advantages in the quality and speed of data acquisition.”

Nick Lockyer

Professor, University of Manchester