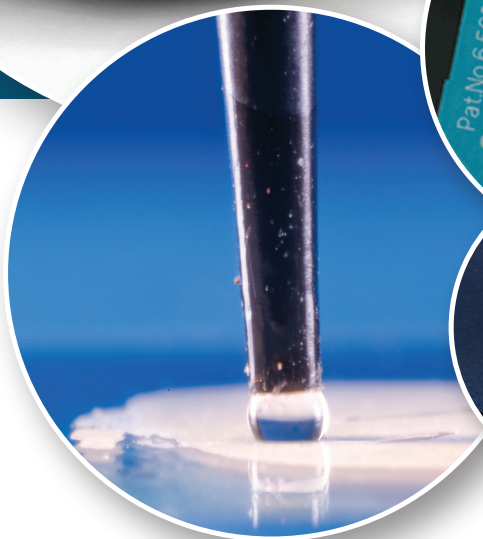


TriVersa NanoMate® LESA® with ESI chip® technology

Advion

Over 20 Years of Mass Spec Experience



The TriVersa NanoMate® LESA® is the latest in chip-based electrospray ionization technology from Advion. It combines the benefits of liquid chromatography, mass spectrometry, chip-based infusion, fraction collection and direct surface analysis into one integrated ion source platform. It allows scientists to obtain more information from complex samples than LC/MS alone.

The Advion ESI Chip®

The ESI Chip® unleashes the power of mass spectrometry through miniaturization. This microfluidic chip contains 400 nano-electrospray nozzles, etched in a silicon wafer. The fabrication method is highly reproducible to ensure the integrity and equal performance of each nozzle. The electrical field created by the nano-electrospray nozzle results in a highly efficient ionization and long lasting, stable sprays from μL of sample volume.

- Chips are available in three different nozzle emitter sizes from 2.5 μm ID to 5.5 μm ID
- Internal chip void volume in the μL range allows for 15 min spray time from only 3 μL sample
- Automated sample handling can deliver spray solvent from samples in 96, 384 or 1536 sample well plates
- Silicon chip design delivers superior electric field strength and ionization efficiency
- Internal counter-electrode allows spray sensing and recovery feature



Chip-based direct Infusion

The TriVersa NanoMate® is the only automated ion source platform that allows high throughput infusion experiments for small or large analytes in applications ranging from shotgun lipidomics, to non-covalent interaction studies (NCI), to protein characterization.

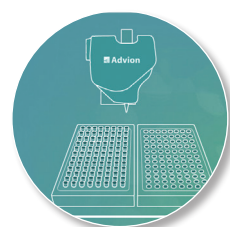
Typical Applications

- Lipidomics, Metabolomics
- Top-down Protein Identification and Characterization
- QA/QC of Antibodies
- Non-covalent Interaction studies (NCI)
- Glycan Analysis

Benefits

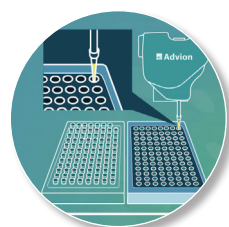
- Zero sample-to-sample carryover due to one tip, one sample, one nozzle workflow
- Stable nESI with long time sprays from μ L volume of samples
- High ionization efficiency, automated nano-electrospray
- High sample throughput from 96, 384 or 1536 well plates

3 step Infusion Experiment



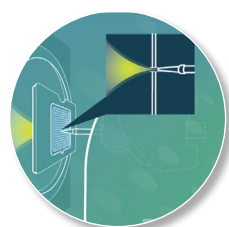
STEP 1

Tip rack and Sample well plate is placed in robot



STEP 2

Sample pick up from 96, 384 or 1536 well plate with dedicated Tip



STEP 3

Tip with sample makes contact with ESI chip and Infusion experiment is initiated

LC/MS with Fraction Collection for re-analysis by Infusion

The TriVersa NanoMate® was developed to operate as a nano-ESI ion source for LC/MS applications. Excess LC eluate can be utilized for additional fraction collection to create a physical storage of the LC/MS experiment and allows re-analysis of fractions of interest as identified by the online LC/MS run.

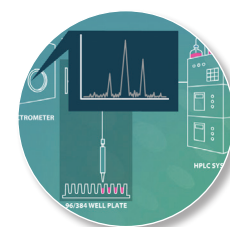
Typical Applications

- Metabolite Identification
- Protein Biomarker Discovery
- QA/QC of Antibodies
- Top-down/bottom-up Proteomics
- Protein PTM analysis

Benefits

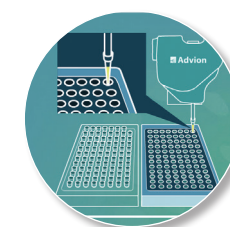
- More time across an LC/MS peak for more information from complex samples
- Integration with RAD detectors, external fraction collectors and UV detectors for increased workflow flexibility
- Qualitative and quantitative information with a single LC/MS run

3 step LC/MS Experiment with Fraction Collection



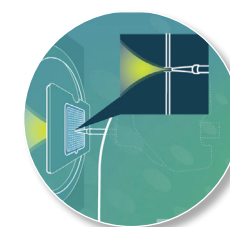
STEP 1

TV connects with HPLC and MS to act as nano-ESI ion source and fraction collector



STEP 2

Fractions are simultaneously collected during the LC/MS analysis



STEP 3

Fractions of interest are re-analyzed by Infusion

Liquid Extraction Surface Analysis (LESA®)

Liquid Extraction Surface Analysis (LESA®) was developed in collaboration with Dr. Gary van Berkel from the Oak Ridge National Laboratories. Its unique surface extraction via a liquid droplet held in suspension (liquid junction) allows a novel approach for spatially resolved analysis of biological and technical surfaces of interest. The pipetting accuracy of the TriVersa NanoMate enables high sensitivity experiments with a spatial resolution of 1 mm on target.

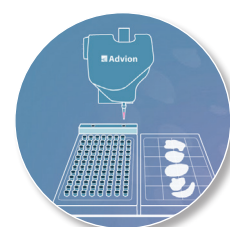
Typical Applications

- PK/PD analysis of small molecule drugs
- Spatially resolved Lipidomics
- Biofilm analysis from medical devices
- Direct protein analysis
- Bacteria and fungi from culture

Benefits

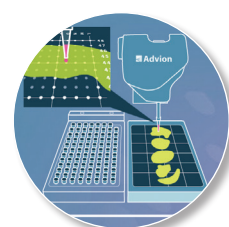
- Fast, simple and direct analysis
- 1 mm spatial resolution
- Liquid extraction and nESI based analysis
- High sensitivity due to nESI ionization and analyte extraction into only 1 μ L of solvent

3 step LESA experiment



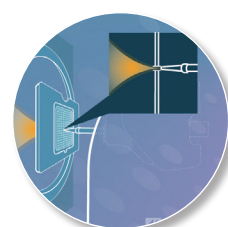
STEP 1

Solvent reservoir is filled, Tips loaded and Surface mounted on Adapter plate



STEP 2

Robot aspirates extraction solvent into tip and starts extraction process at selected surface location

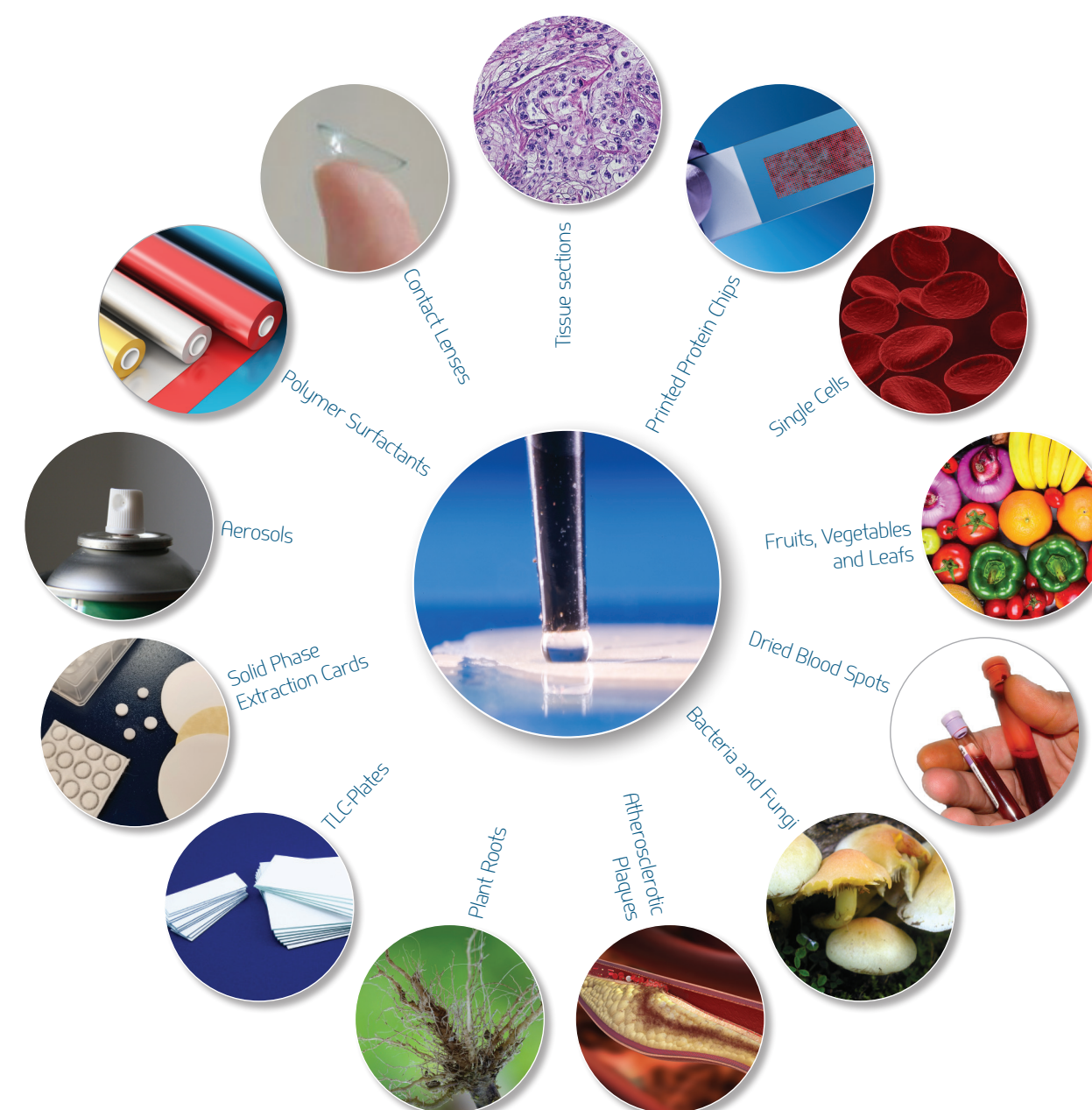


STEP 3

Extracted Analytes are ionized by Infusion nano electrospray analysis

Variety of Surfaces for LESA sampling

Successful LESA experiments can be achieved from a wide variety of surfaces including: animal whole body or organ sections, polymers, medical devices, bacteria grown on agar plates, and plant materials such as roots, leaves and peels.



Liquid Extraction Surface analysis coupled with LC (LESAPlus LC)

LESAPlus LC experiments can be executed through the Developers Kit software extension and allows for the added benefit of separation. Spatial resolution can be improved to 400 μm on target and once the extract is placed in the loop of the on-board 6 port valve, an nLC/MS experiment can commence.

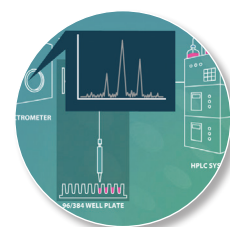
Typical Applications

- Spatially resolved Lipidomics
- PK/PD analysis of small molecule drugs
- Peptidomics

Benefits

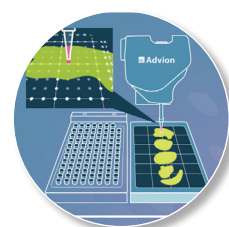
- Direct analysis from surface of interest
- 400 μm spatial resolution
- Liquid extraction and ESI based analysis
- High sensitivity due to added chromatographic separation
- Derivatization prior to LESAPlus experiment
- Analysis of complex mixtures and isobaric compounds

3 step LESAPlus LC Experiment



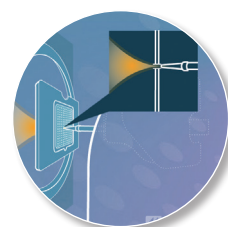
STEP 1

TV is reconfigured for LESAPlus and makes connection with LC system and MS



STEP 2

Robot dispenses extraction solvent via a fused silica capillary and starts extraction process at selected surface location



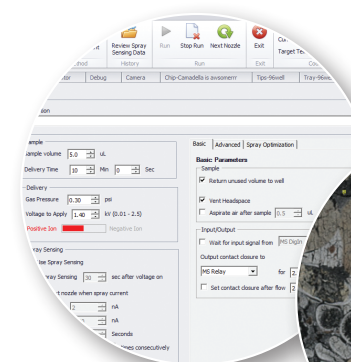
STEP 3

Extract is aspirated into a loop of the on-board 6 port valve and injected into the nLC/MS

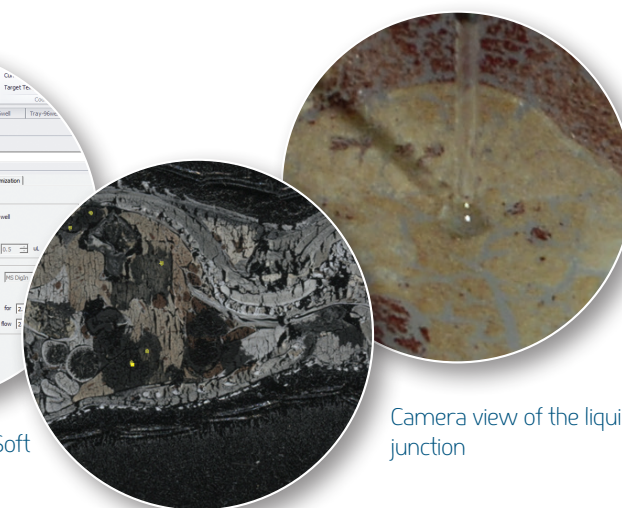
ChipSoft® Operating Software and Developers Kit Option

The TriVersa NanoMate® LESA® is operated by a proprietary software program called ChipSoft. It is used to set all parameters of system operation including sample volume, spray voltage, pressure and polarity as well as temperature, spray times and extraction parameters for LESA. ChipSoft is compatible with all PC architectures and versions of Windows.

- Spray sensing is a unique feature of the TriVersa NanoMate® that allows an emitter/nozzle to switch mid run to recover from potential spray failures or instabilities.
- The Developers Kit Software extension gives full control over the TriVersa NanoMate® robot and provides options for custom method development, like LESAPlus LC, surface modifications for LESA or complex mixing experiments in NCI studies.
- The camera feature allows direct visualization of the LESA liquid junction and supports optimal solvent control during method development for LESA and LESAPlus LC



Method screen in ChipSoft



Camera view of the liquid junction

Graphical sample selection for LESA experiments

Customer Testimonials

Advion's ion source technology has been used by customers in biotechnology companies, universities and research centers around the world. Since its debut in 2002, the TriVersa NanoMate has been cited in over 500 peer-reviewed publications and countless contributions to scientific meetings and conferences.



UNIVERSITY OF BIRMINGHAM
"The TriVersa NanoMate revolutionized nanospray."
Dr. Helen Cooper, Professor, School of BioSciences



UNIVERSITY OF SOUTHERN DENMARK
"Essential for any Lipodomics Laboratory."
Christopher S. Ejsing, PhD, Associate Professor



MAX PLANCK INSTITUTE OF MOLECULAR CELL BIOLOGY AND GENETICS DRESDEN, GERMANY
"We have built our lab around the TriVersa NanoMate."
Dr. Andrej Shevchenko, Research Group Leader



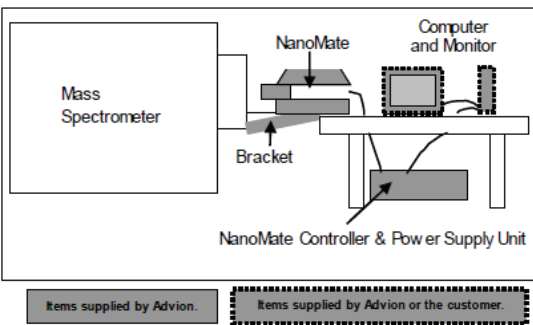
MAX PLANCK INSTITUTE OF CHEMICAL ECOLOGY JENA, GERMANY
"You purchase the TriVersa NanoMate for one purpose, but it allows you to develop many applications."
Dr. Aleš Svatoš, Research Group Leader



INSTITUTE FOR RESEARCH IN BIOMEDICINE BARCELONA, SPAIN
"If I could, I would have a TriVersa NanoMate on all of our mass spectrometers"
Marta Vilaseca, PhD, Mass Spectrometry Core Facility

Specifications and Installation Considerations

The Advion TriVersa NanoMate® is compatible with mass spectrometers from all major vendors ranging from FT and Orbitrap technology to TOF, IonTrap, QQQ and their combinations via individual MS brackets.



Dimensions	Length	Width	Height
NanoMate (with cover)	48 cm	35 cm	37 cm
NanoMate Controller & Power Supply Unit	38 cm	43 cm	13 cm

An area approximately 0.9 m x 0.9 m is required for the NanoMate Controller and Power Supply Unit, Computer Monitor, and Computer. These components must be placed within 0.9 m of the NanoMate.
Visit www.advion.com to see pictures of the NanoMate on several different mass spectrometers.

System and Space Requirements

Gas Supply	60 to 100 psi (4 to 7 bar) >95 % Nitrogen 1/8" tubing
Gas consumption	600 mL/min
Solvents	LC/MS grade solvents
Weight	22 kg (robot)
Line Voltage	100 to 240 VAC @ 47 to 63 Hz
Outlets	3, each rated at 5A
Altitude	Up to 6560 ft (2000 m) above sea level
Temperature	59 to 75 F (15 to 24 C)
Relative Humidity	40 to 60 % (non-condensing)

Currently supported Vendors are Agilent, Bruker, Sciex, Shimadzu, Thermo and Waters

Founded in 1993, Advion became one of North America's largest bioanalytical Contract Research Organization (CRO), operating nearly 60 high performance LC/MS/MS systems in 3 facilities across the USA. This unrivalled expertise in mass spectrometry was further leveraged a decade ago when the company expanded into making the worlds premier ion source for the most demanding applications, the TriVersa NanoMate®. All in partnership with leading mass spectrometry vendors and researchers across the globe. For the last 6 years Advion has developed the expression® compact mass spectrometer (CMS) in partnership with academic and industry collaborators and since 2015 we are a whole subsidiary of Bohui Innovation Technology Co. Ltd. with a strong commitment to expand our range of performance oriented and affordable mass spectrometers, automated ion source platform and innovative sample introduction solutions in a global and customer focused manner.

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expression® CMS



Plate Express®



TriVersa NanoMate®



ESI Chip™



LESA® and
LESAplus LC