



ADVANCED **I**ON **M**OBILITY **S**PECTROMETRY

We are **IMS**



About us

MaSaTECH company was founded in 2013. In order to provide analytical instrumentation for high sensitivity and real time detection. We are interested in R&D of high resolution and high sensitivity IMS products for various fields of use. Our interest is to share our skills and knowledge from IMS field with our partners. As an original equipment manufacturer we can easily customize and tune our products for specific application, which meets our vision to bring the ion mobility spectrometry technique beyond the limits of possible.

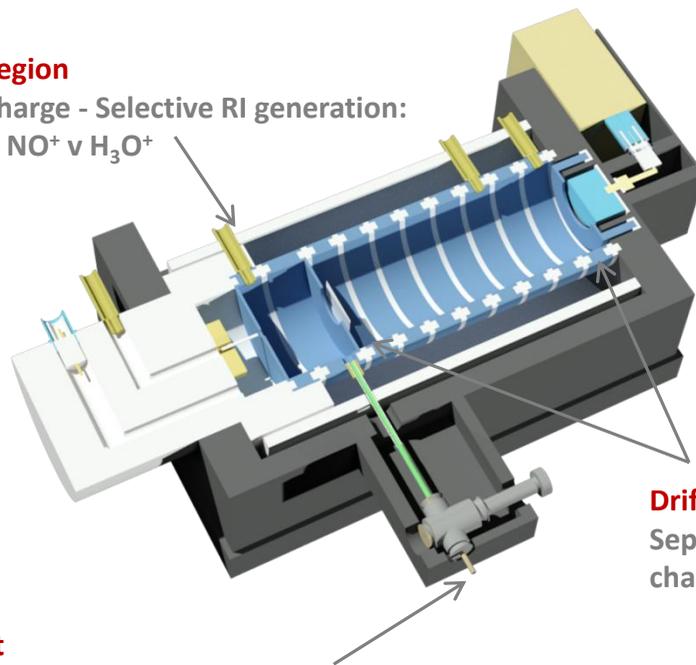


Advanced Ion Mobility Spectrometer - Advanced IMS

The Advanced Ion Mobility Spectrometer (AIMS) developed by MaSaTECH company offers resolution up to 100 FWHM, what is sufficient for separation of isomeric compounds. The big advantage of AIMS is its ability to work with atmospheric air as a buffer gas. This advantage reduces the operating costs to zero. The high sensitivity of IMS technique is in the MaSaTECH AIMS instrument improved by the corona discharge (CD) ionization source. Among the other advantages like non-radioactivity and higher ion yield generation, offers the CD selective reactant ions generations.

Ionization Region

Corona Discharge - Selective RI generation:
 $\text{NO}_3^- \vee \text{O}_2^- \mid \text{NO}^+ \vee \text{H}_3\text{O}^+$



Drift Tube

Separation based on mass, charge and cross section

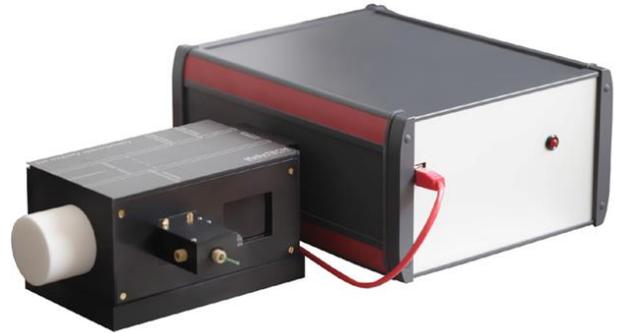
Sample Inlet

Trace Gas Detection, Surface Analysis,
 Liquid Analysis

- high resolving power and sensitivity
- non-radioactive plasma ionization source
- operation at atmospheric and sub-atmospheric pressures
- selective reactant ions formation
- combination with other separation techniques
- full control of all operation parameters
- fast monitoring of processes
- VOC/TOC monitoring
- trace gas analysis
- liquid analysis
- analysis of solids and surfaces
- explosives detection
- drug quality control

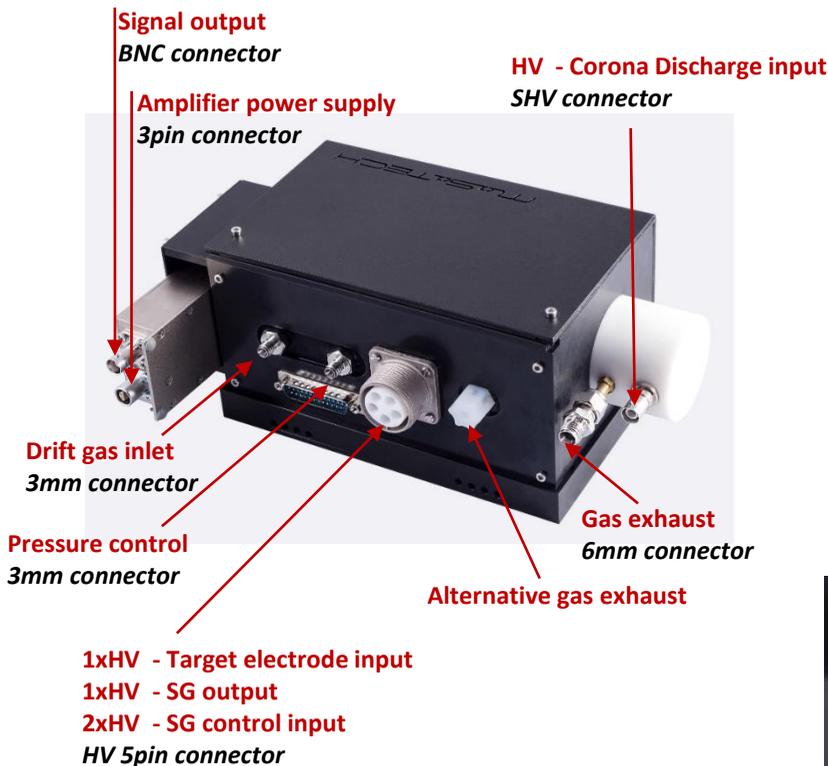
Configurable AIMS

Configurable AIMS offers wide range of setups. It is ideal for users, who are interested in full control of AIMS parameters. The configurable AIMS is composed of AIMS engine and AIMS Control unit. Individual parts may be optionally arranged, what makes it ideal for industrial and R&D applications.

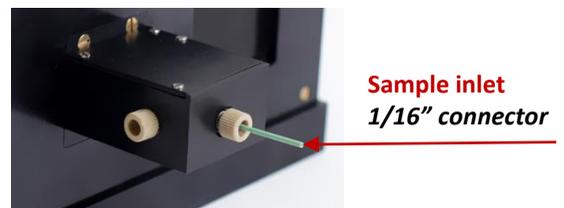


AIMS Engine

The AIMS Engine is a precisely constructed OEM product. The advanced ion mobility spectrometer is assembled by nonradioactive plasma ionization source, also designed for easy interface to GC or MCCGC. All operation parameters of AIMS-engine are fully adjustable by the user (working pressure, temperature, drift and sample gas flow rate, drift field intensity, shutter grid pulse width, duty cycle and so on), what making this instrument suitable for research in laboratories as well as for direct application in the industry.



Working pressure	600-1200 mbar
Working temperature	30-120 °C
Resolving power N ₂ /Air	100/90 FWHM
Sensitivity	ppb
Drift gas flow	500-1200 ml/min
Sample gas flow	5-500 ml/min
Drift field intensity	200-560 V/cm
Polarity	Positive/Negative
Ionization source	Corona Discharge
Power supply	250V / 24V



AIMS Control Unit

The AIMS control unit allows easy management of all operation parameters of AIMS Engine.



- 250V or 24V power supply
- two bipolar 15kV high voltage modules for control of AIMS drift field intensity and ionization source
- floating HV input/output for Bradbury-Nielsen shutter grid control
- bipolar output for aperture grid control (0 - +/- 150V)
- 16bit data acquisition card
- +/- 15V output for amplifier supply
- + 24V output for compressor or small membrane pump
- 5V TTL output for synchronization of accessories with AIMS duty cycle
- TCP/IP connector for PC control and data recording

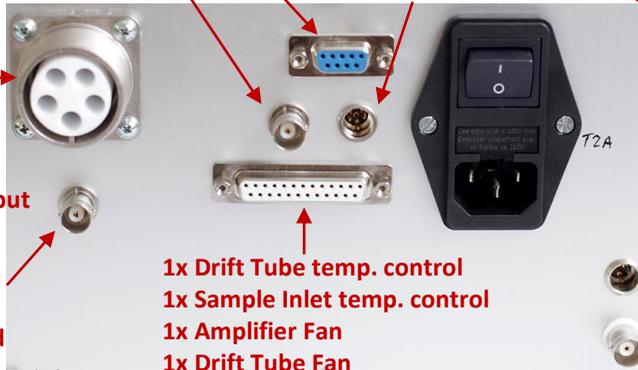
Firmware upgrade
RS232 connector

Sync TTL output
BNC connector

Pump power supply
3pin connector

1x +/- 10kV output
1x +/- 15kV output
1xHV - SG input
2xHV - SG control output
HV 5pin connector

+/- 150V output
for Aperture Grid
BNC connector



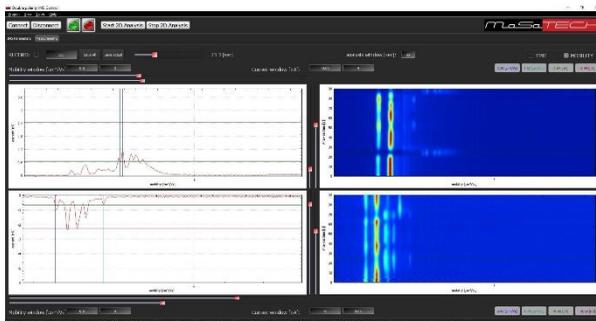
1x Drift Tube temp. control
1x Sample Inlet temp. control
1x Amplifier Fan
1x Drift Tube Fan
25pin connector

Amp. power supply
3pin connector

Signal input
BNC connector

Double AIMS Control Unit

The Double AIMS Control Unit was developed for control of two AIMS engines. This unique control unit allow manage two AIMS instruments at the same time and also measurement in positive and negative polarity without the need of switching between polarities.



Portable AIMS - PAIMS

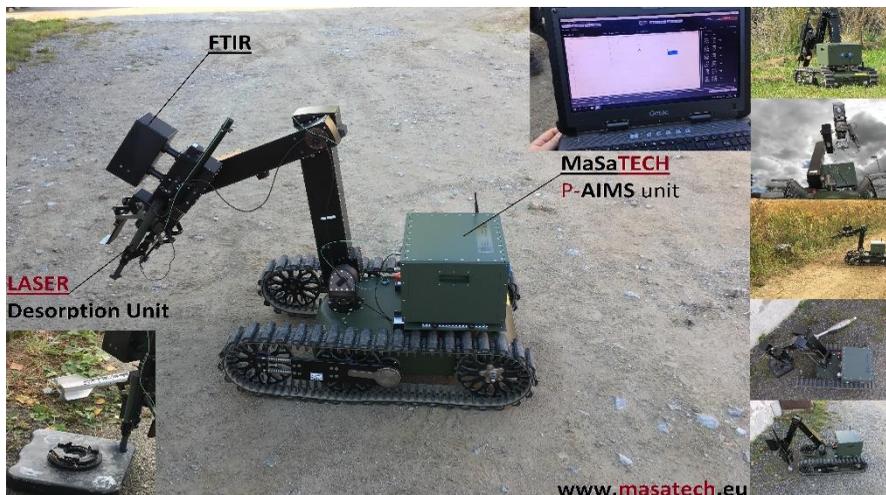
Portable AIMS is small compact analytical instrument. The AIMS engine, AIMS control unit, two digital mass flow controllers and pressure controller are integrated in the box. The **PAIMS** offers wide range of setups. It is ideal for users, who are interested in powerful analytical instrument with requirement on portability.



Working pressure	600-1200 mbar
Working temperature	30-120 °C
Resolving power N ₂ /Air	90/100 FWHM
Sensitivity	ppb
Drift gas flow	500-1200 ml/min
Sample gas flow	2-500 ml/min
Drift field intensity	200-560 V/cm
Polarity	Positive/Negative
Ionization source	Corona Discharge
Power supply	24V
Connectivity	USB 2.0
Dimensions (mm)	352x305x142

PAIMS- Security Applications

The work at sub-atmospheric pressure, sensitivity below 1ng, high resolving power in combination with LASER desorption technique makes **PAIMS** excellent for security applications like explosives and illegal drugs detection.



*The unmanned vehicle equipped with **PAIMS** and LASER desorption unit for detection of explosives. In collaboration with Warsaw Military University of technology.*

PAIMS- as a GC detector

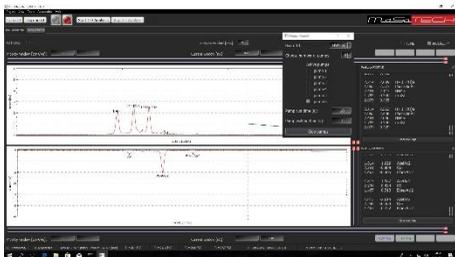
The IMS as a GC detector will give additional dimension to each GC. The best IMS parameters like resolving power, sensitivity and working temperature makes **PAIMS** best solution for interface to GC. The **GC-IMS** combination will improve the separation power of the instrument. The 2D output RetentionTime X IonMobility will give additional dimension to your GC. The MaSaTECH offering complete solution for Interface of our **PAIMS** to GC. The **PAIMS** offer Synchronization with GC start, 2D maps RetentionTime X IonMobility record, post process data analysis, identification, quantification and classification.



The PAIMS in combination with Agilent GC. In collaboration with Ingenieria-Analitica – Barcelona.

Double AIMS - DAIMS

The **DAIMS** is equipped with two high-resolution ion mobility spectrometers continuously working in positive and negative polarity. Thanks to the plasma ionization source and the continuous operation in both polarities, **DAIMS** offers the highest sensitivity for volatiles organic compounds (VOCs), toxic organic compounds (TOCs), acids and industrial pollutants. The additional advantage of **Double Advanced Ion Mobility Spectrometer** is its 6 independent sample ports, which allow air quality monitoring from 6 independent points from a distance of up to 50 meters.



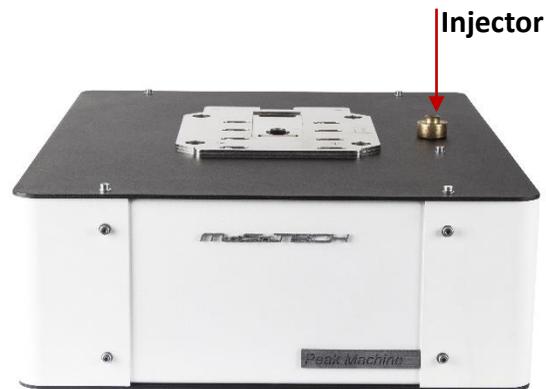
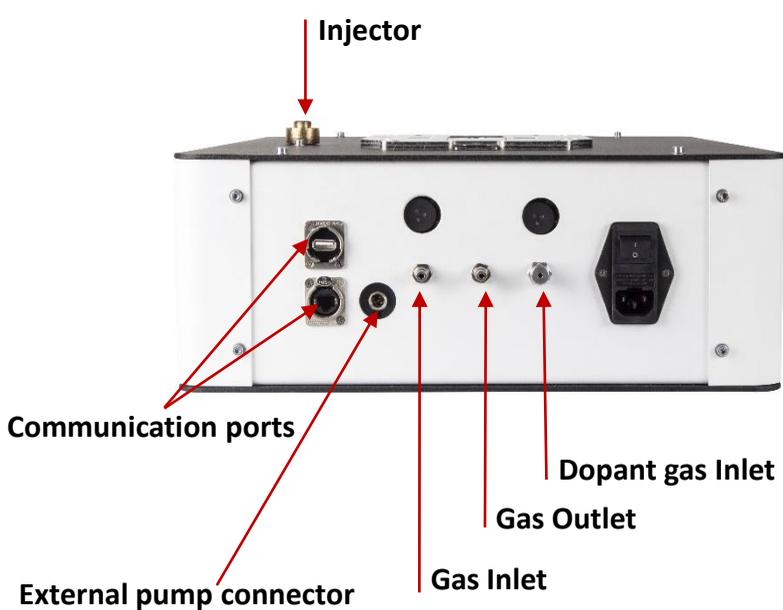
MCCGC-IMS Peak Machine

The PeakMachine allows two dimensional separation of volatiles compounds presented in complex matrix. The combination of Multi Capillary Column GC (MCCGC) with ion mobility spectrometer makes this instrument excellent for analysis of liquid and solids samples via the headspace technique. The PeakMachine operates in atmospheric as well like in subatmospheric pressure. The AIMS working temperature 30-140 °C and resolving power up to 100 FWHM makes this instrument appropriate for analysis of flavors and odors presented in complex matrixes. The Peak Machine also allows plugin of dopant gas (Reactant ions modifier) to IMS what increase the selectivity of instrument for targeted compounds.



Working pressure	600-1200 mbar
Working temperature	30-140 °C
Resolving power N ₂ /Air	90/100 FWHM
Sensitivity	Low ppb
Drift gas flow	500-1200 ml/min
Sample gas flow	2-500 ml/min
Drift field intensity	200-560 V/cm
Polarity	Positive/Negative
Ionization source	Corona Discharge
Pre-separation	MCC-GC
Power supply	250V / 24V
Connectivity	TCP/IP, USB 2.0
Dimensions (mm)	490x390x150

MCCGC-IMS Peak Machine



Air Purification Systems

Zero air generator is, with its maximum gas flow 3L/min and contaminants concentration below 1ppm, able to supply two AIMS instruments at the same time. The generator is composed of rechargeable cartridges that can be easily regenerated and reused. The color indicator shows the condition of the scrubbers. The zero air generator contains: compressor, cooling system, water condenser, membrane dryer and set of air purifiers.



Closed circuit module continuously refilters the AIMS working gas in the closed circuit. The refiltered air with contaminants concentration below 0.1ppm is excellent for long term continuous work of AIMS. Three indicators show the condition of all three scrubbers. Rechargeable cartridges can be easily regenerated and reused.

Control Software

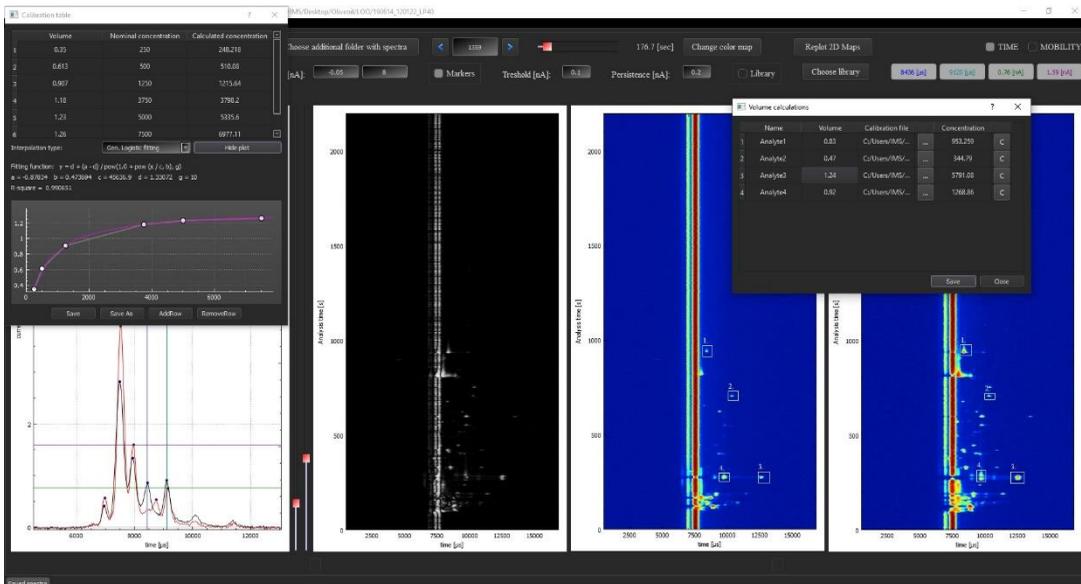
For comfortable work with our advanced ion mobility spectrometer we developed a control software that offers full and intuitive control of our instruments. The AIMS control software is a part of each spectrometer. In addition we offer also the customization of our software for integration or synchronization with other instruments.

IMS - Control

IMS Control allow setup of all AIMS working parameters, data collection as well like online peaks identification. Peaks identifications in MaSaTECH control software is based on derivation of AIMS spectra. The reduced mobility of each peak together with its intensity is automatically shown on the screen.

Show Saved Spectra

The MaSaTECH software allows comfortable post processing of the recorded results. The software also allows to compare two 2D maps and analyze the differences of each AIMS spectrum. The peak track function, library implementation and quantification is part of MaSaTECH Show Saved Spectra Software.

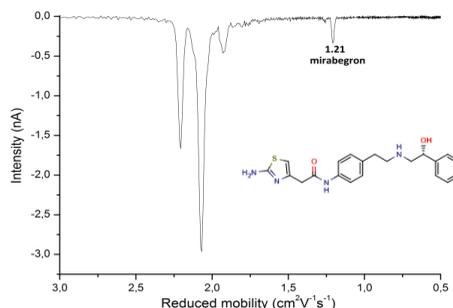
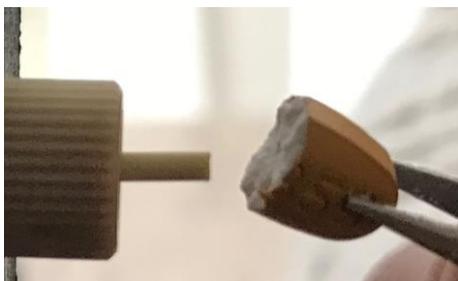


ChemoMetrics

The MaSaTECH ChemoMetrics software is made for big data classification based on advanced mathematical and statistical functions. The ChemoMetrics has implemented PCA and machine learning function.

Trace Gas Detection

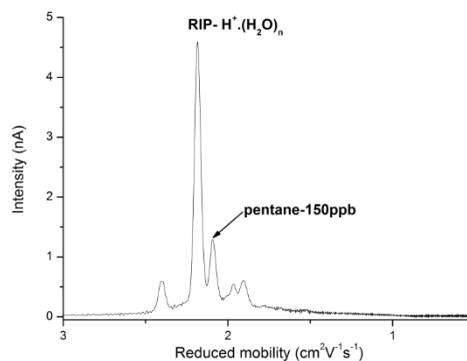
The capillary sample inlet allows simple detection of trace compounds in the gas phase and also allows combination with additional sampling techniques. The AIMS instrument offers fast response and high sensitivity (*ppb-ppt* range). The AIMS can be used for direct attach of the sample in front of capillary, for head space sampling, for monitoring of ambient air or for online monitoring of processes.



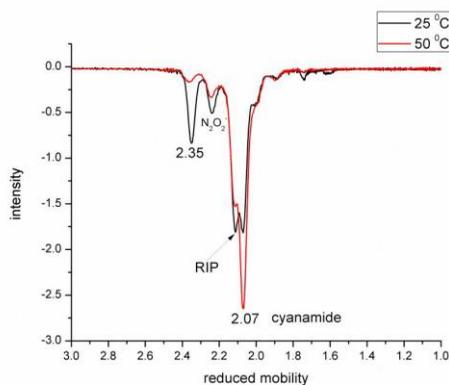
Direct attach of Betmiga pill and mirabegron response in negative polarity (molar mass 396.506 g/mol)

Detection of alkanes

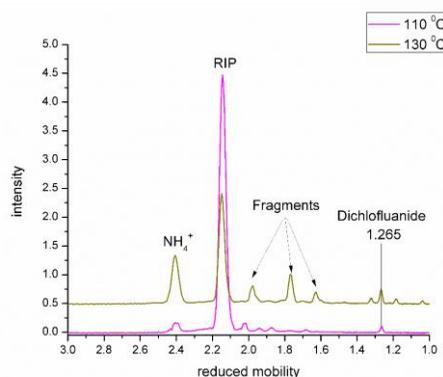
MaSaTECH also offers custom solutions for trace gases detection. One of such application is detection of alkanes. The detection of alkanes is challenging due to fact, that their proton affinity is lower than water, what makes proton transfer reaction ineffective. MaSaTECH developed the technique which allows detection of alkanes at the ppb level.



Detection of pesticide residue

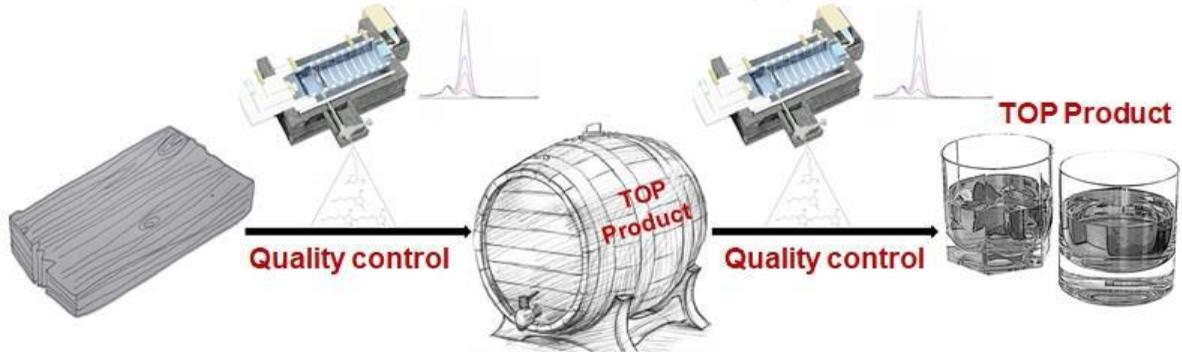


Cyanamide in negative polarity (molar mass 42,04 g/mol)

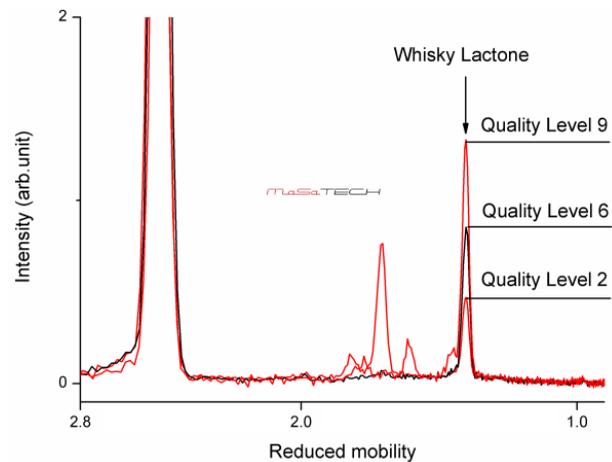


Dichlofluaniid in positive polarity (molar mass 333,22 g/mol)

Fast Quantification of Whisky Lactone in Oak Wood by AIMS



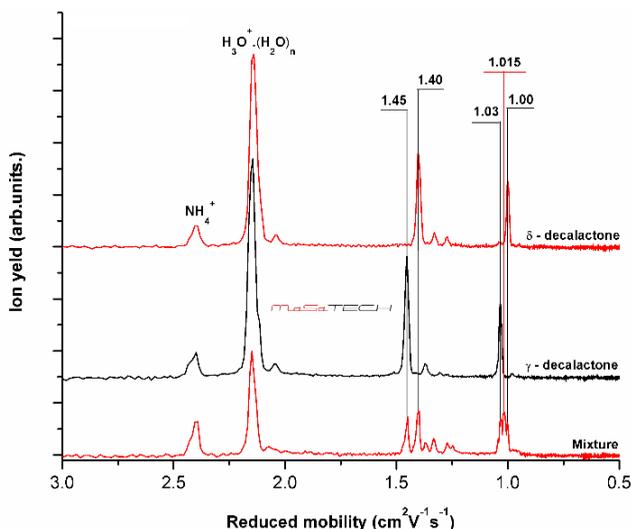
Whisky lactone (WL) in oak staves / barrels has the biggest share in the resulting taste of beverages. The quantity of WL in oak wood have strong effect on quality of final products. Based on WL quantity, the barrel's staves are divided into ten categories. This categories are category1 (0-7 $\mu\text{g/g}$),, category 10 (63-70 $\mu\text{g/g}$). In this application report we are introducing the ion mobility spectrometer as useful tool for fast monitoring and quantification of whisky lactone in oak wood.



The AIMS response for oak wood samples of categories 2, 6 and 9

Separation of Isomeric Compounds by AIMS

The high resolution Ion Mobility Spectrometer allow fast recognition and identification of isomeric compounds. It is also possible to use it for study of isomeric dimer complexes formed in reaction region of IMS.



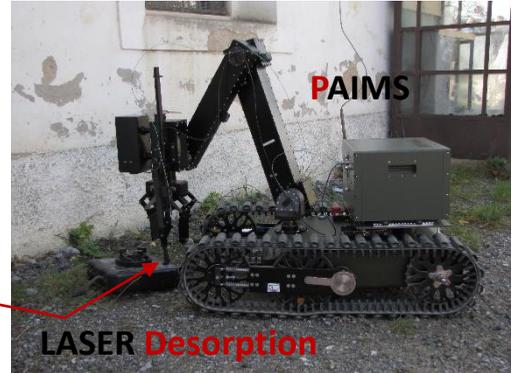
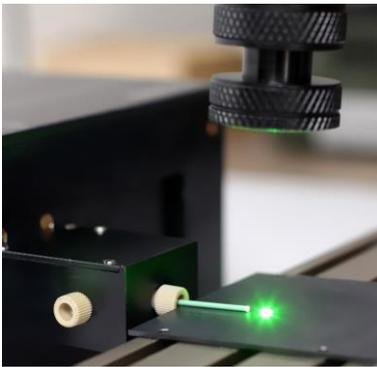
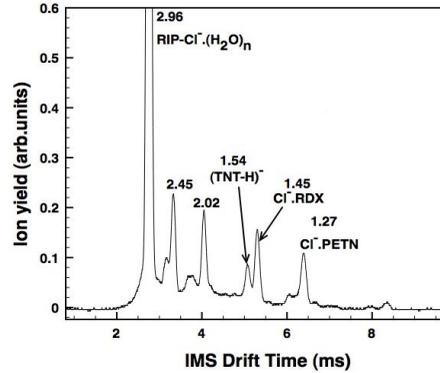
The products of δ -decalactone and γ -decalactone (170,25 g/mol) isomers are shown on Figure. As we can see, the both isomers results in formation of two IMS peaks with reduced mobility 1.45 and 1.40 $\text{cm}^2\text{V}^{-1}\text{s}^{-1}$. In the case of mixture we can see both dimers with reduced mobility 1.03 and 1.00 $\text{cm}^2\text{V}^{-1}\text{s}^{-1}$. In addition to those dimers, we also observed asymmetric dimmer complex with reduced mobility 1.015 $\text{cm}^2\text{V}^{-1}\text{s}^{-1}$ formed from both isomers.

Solids and Surface Analysis

Two different Surface Sampling Methods have been developed for Advanced IMS. These methods are based on the desorption of the samples from the surface and subsequent detection by AIMS with capillary inlet.

Explosives detection

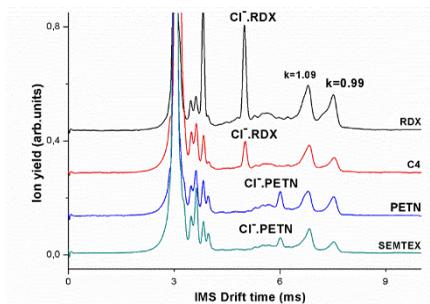
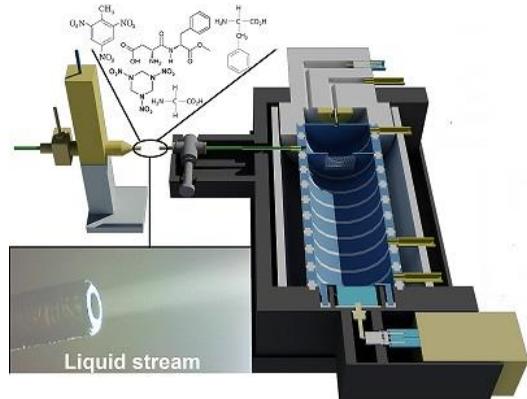
The Laser desorption - AIMS technique was tested for the detection of explosives. The explosives were detected directly from the surface without any further preparation. Measured sensitivities are 100 pg for TNT, 500 pg for RDX, and 1.8 ng for PETN.



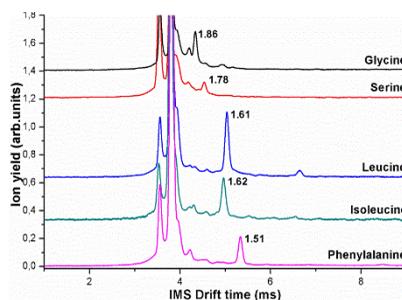
Liquid Analysis

MaSaTECH also offers module for analysis of liquids. Liquid sampling module (LSM) allows simple analysis of liquids with AIMS. This technique is based on introduction of a droplet stream to the AIMS reaction region. The main advantages are:

- wide range of liquid flows
- sampling of any liquid, NO need for special solution
- simple interface to Advanced IMS



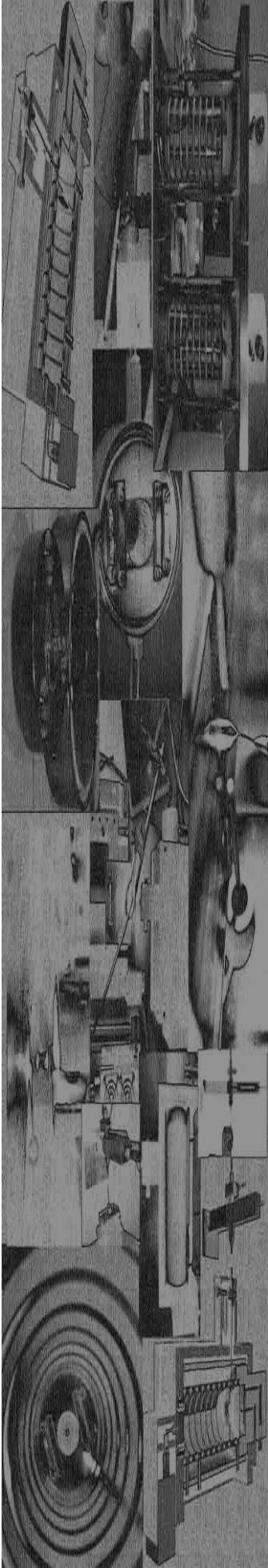
Detection of explosives dissolved in oil



Detection of amino acids dissolved in water



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Because we live for science