



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**.

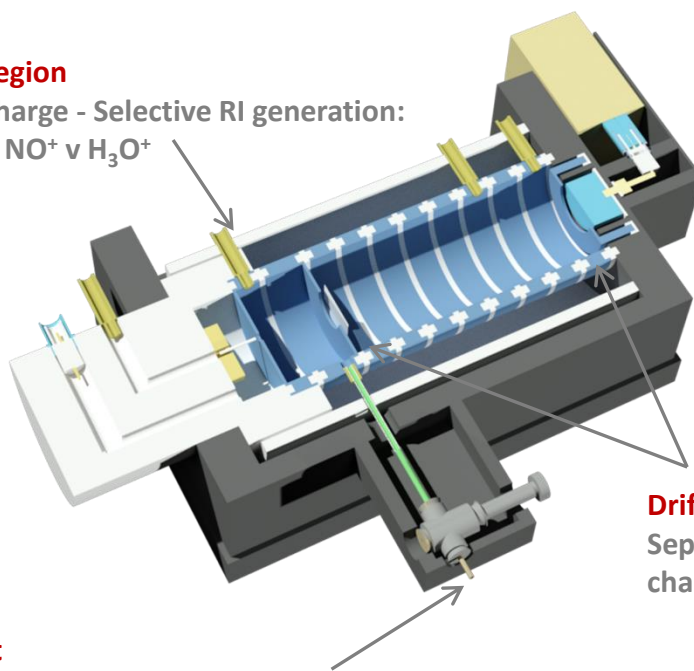


Advanced Ion Mobility Spectrometer - Advanced IMS

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:



Drift Tube

Separation based on mass, charge and cross section

Sample Inlet

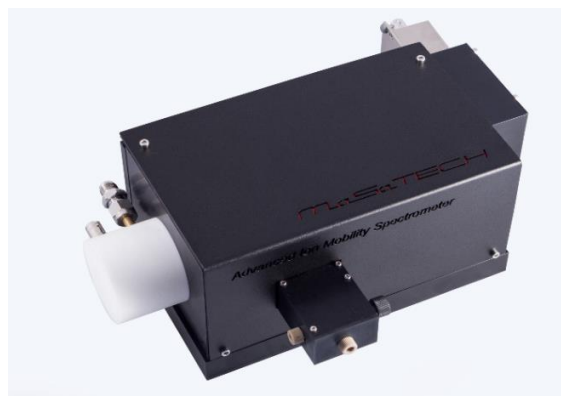
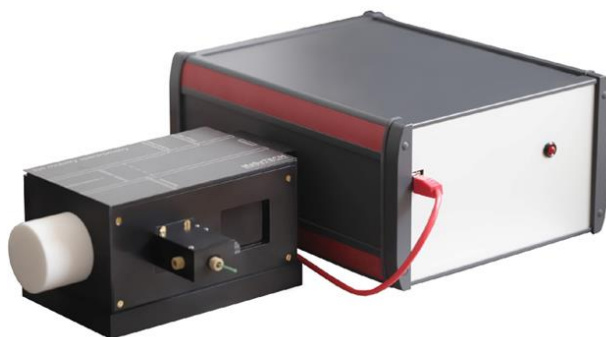
Trace Gas Detection, Surface Analysis, Liquid Analysis

- 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.

The AIMS Engine is a precisely constructed OEM product. The advanced ion mobility spectrometer is assembled by **non-radioactive plasma ionization source**. 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.



Configurable **AIMS** is designed for:

- Laboratory and R&D use
- Trace gases detection (**Ammonia, Amines, Acids**)
- **VOC/TOC monitoring**
- **Solids and surface analysis**
- Environmental monitoring
- Indoor/Outdoor air quality monitoring
- Chemical analysis , Interface to Gas Chromatograph
- Research laboratories



Sample inlet
1/16" connector

DT Working pressure	600-1200 mbar
DTY Working temperature	30-120 °C
Resolving power N ₂ /Air	100/90 FWHM
Sensitivity	Low 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

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

Main advantages of **PAIMS** are:

- High sensitivity
- **Real time response**
- High resolving power
- **Non-radioactive** plasma ionization source
- Operation at atmospheric and sub-atmospheric pressures
- Portability
- All working parameters adjustable by user
- Simple calibration

Portable Advanced Ion Mobility Spectrometer is designed for:

- Fast and remote monitoring of processes
- Contaminants detection (**Ammonia, Amines, Acids**)
- Trace gases detection
- **VOC/TOC monitoring**
- Environmental monitoring
- Indoor/Outdoor air quality monitoring
- Chemical analysis
- Interface to Gas Chromatograph
- Synchronization with GC Start
- Research laboratories



High precision shutter grid with **275µm** wire to wire distance

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.



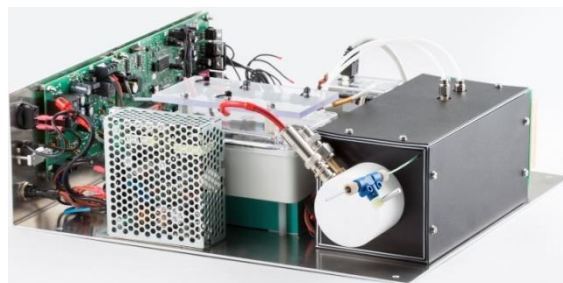
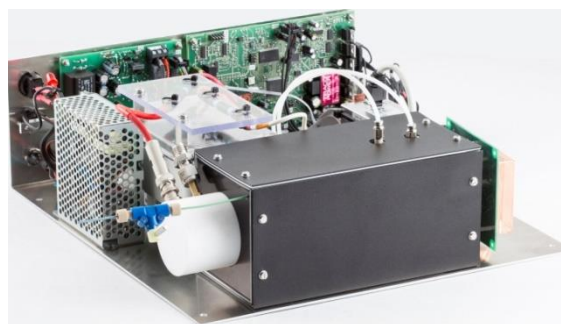
Working pressure	600-1200 mbar
Working temperature	30-140 °C
Resolving power N ₂ /Air	90/100 FWHM
Sensitivity	Low ppb
Drift gas flow	500-1200 ml/min
Sample gas flow	2-500 ml/min
Drift field intensity	200-560 V/cm
Polarity	Positive/Negative
Ionization source	Corona Discharge
Pre-separation	MCC-GC
Power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



OEM Advanced Ion Mobility Spectrometer

MaSaTECH **OEM-AIMS** Module is full-power analytical instrument. The module is ideal for users who have interest to integrate IMS to them solution. The **OEM Advanced Ion Mobility Spectrometer** offers wide range of setups. It is ideal for users, who are interested in powerful analytical instrument with requirement on integration. The **OEM-AIMS Module** presents all advantages of **IMS** technique. All operation parameters are fully adjustable by the user, making this instrument suitable for integration to various analytical applications as well like for clean room monitoring in semiconductor industry.

Drift Tube Working pressure/ Adjustable	600-1100 mbar
Drift Tube Operation temperature / Adjustable	30-100 °C
Resolving power	80 FWHM
Sensitivity	ppt-ppb
Drift gas flow	500-1300 ml/min
Drift gas quality	Purified Air/ N2
Sample gas flow	2-500 ml/min
Drift field intensity	200-560 V/cm
Polarity	Positive/Negative
Ionization source	Corona Discharge
Power supply	24V
Response time	< 1 seconds
Communication	USB 2.0 / TCP-IP
Dimensions (mm)	350x320x115



Main advantages of **OEM-AIMS** are:

- High sensitivity
- **Real time response**
- High resolving power
- **Non-radioactive** plasma ionization source
- integrability
- Simple calibration

OEM-AIMS is designed for:

- Fast monitoring
- Contaminants detection (**Ammonia, Acids...**)
- Trace gases detection
- **VOC/TOC monitoring**
- Environmental monitoring
- Indoor/Outdoor air quality monitoring
- Chemical analysis
- Interface to GC or to MCCGC

Custom solutions

Each custom solution we made for our customers is exciting as it all the time teach us something new :) and this is why we love our work.

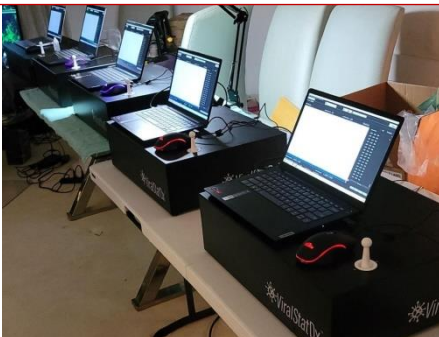
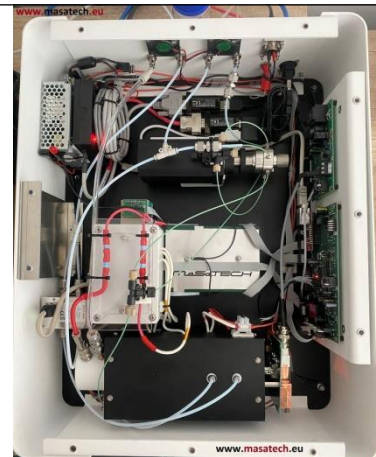


Detection of explosives

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

Food quality control

The next nice custom solution made by MaSaTECH. The IMS with 6/2 valve from VICI. The system have integrated machine learning with real time classification. It will be used for food quality control.



Saliva Test

The AIMS OEM modules used for saliva test. In collaboration with ViralStat DX.

OPTIC4 - AIMS

The most advanced injector OPTIC4 Interfaced to AIMS. In collaboration with GL Sciences.



Control Software

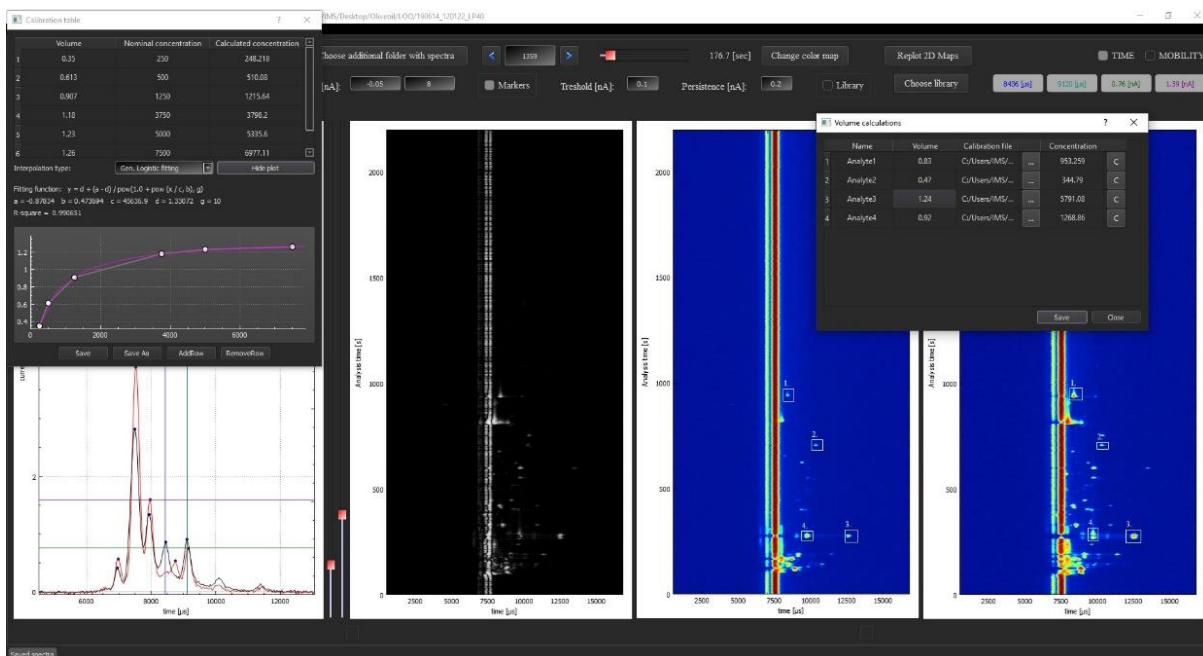
For comfortable work with our advanced ion mobility spectrometer we developed a control software that offers **full and intuitive control of our instruments**. The AIMS control software is a part of each spectrometer. In addition we offer also the customization of our software for integration or synchronization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

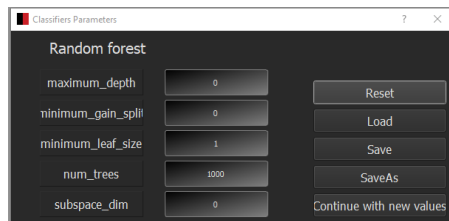
Show Saved Spectra

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.

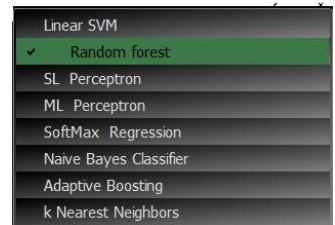


ChemoMetrics / Machine learning classification

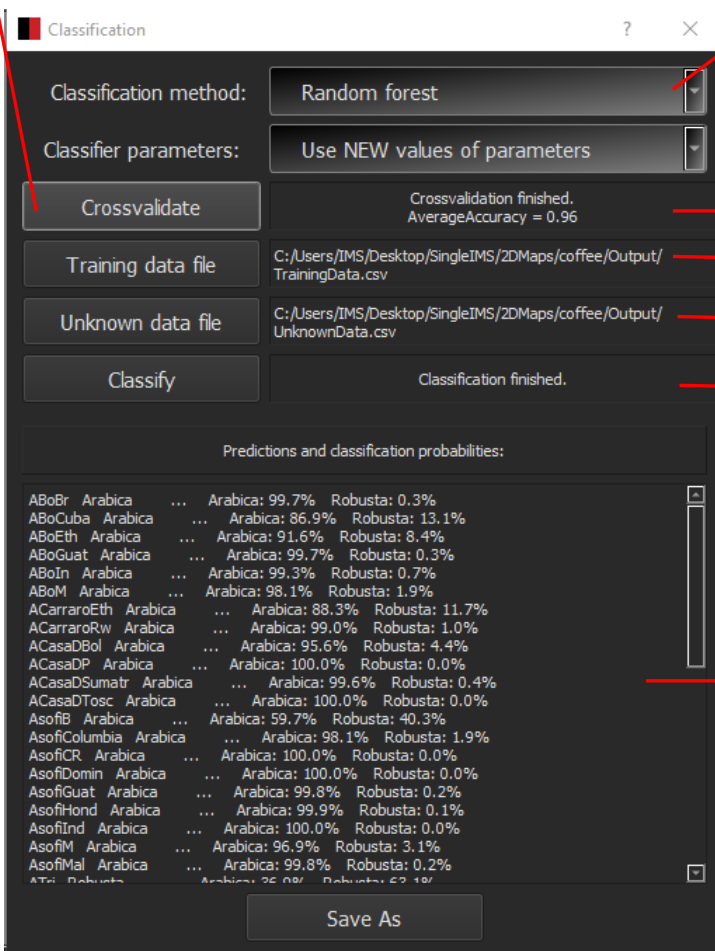
The MaSaTECH ChemoMetrics software is made for classification based on advanced mathematical and statistical functions. The ChemoMetrics has implemented PCA and machine learning functions.



User have possibility to **modify parameters** of classifier



classification methods



Calculate **average accuracy** of model

Select **Training data file**

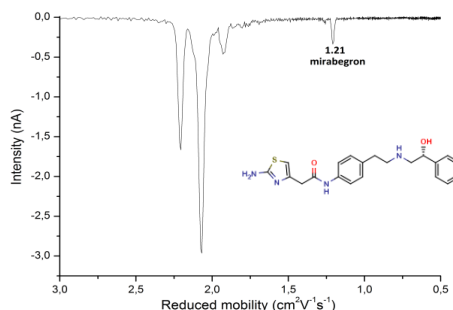
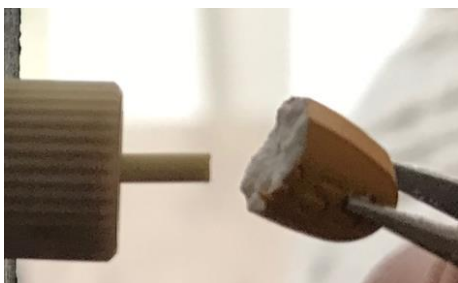
Select **Unknown data file**

Press for **classification**

Results gives class information and percentage affiliation to each group.

Trace Gas Detection

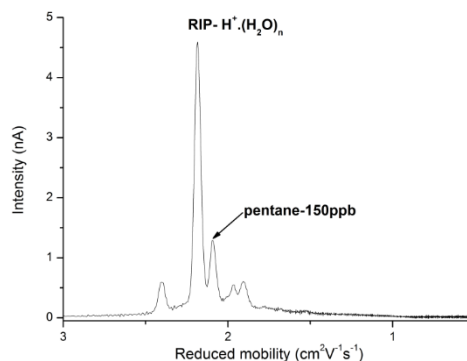
The capillary sample inlet allows simple detection of trace compounds in the gas phase and also allows combination with additional sampling techniques. The AIMS instrument offers fast response and high sensitivity (*ppb-ppt* range). The AIMS can be used for direct attach of the sample in front of capillary,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

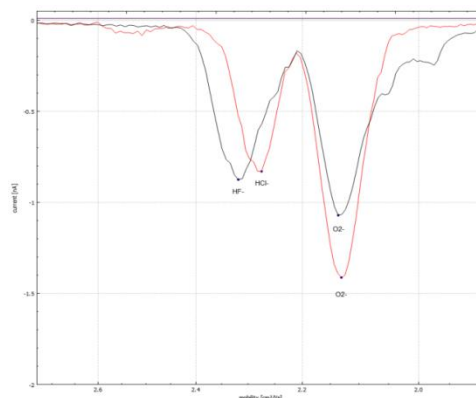
Detection of alkanes

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.



Total Acids and Amonia Monitoring

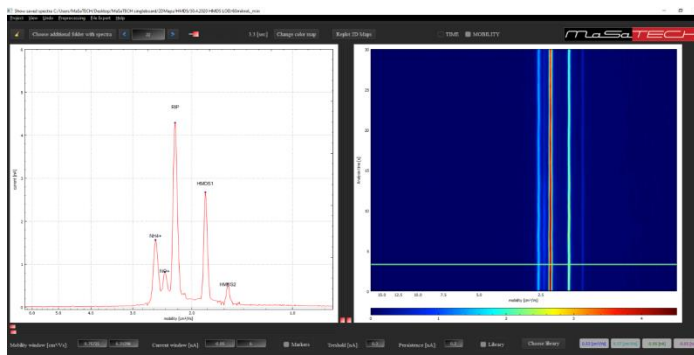
The IMS from MaSaTECH offer low ppb-ppt sensitivity for **Total Acids** (SO₂, HCl, HF, F₂, Cl₂, Br₂) and **Amonia** detection. MaSaTECH offering 24/7 monitoring of this compounds. Monitoring of this compounds is important in semiconductor industry. In many semiconductor applications need to be presence of **acids** and **ammonia** monitored at low ppb level.



IMS response for HCl and HF

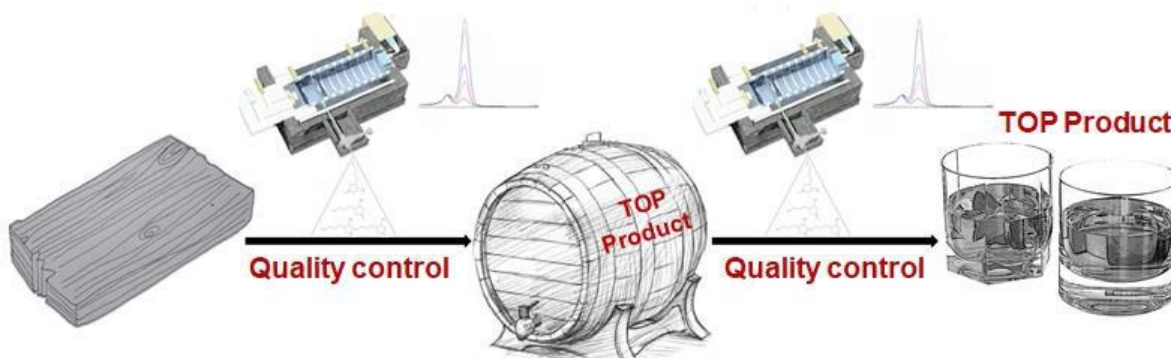
Hexamethyldisilazane (HMDS) detection by PAIMS

The HMDS $C_6H_{19}NSi_2$ of molar mass 161.4 g/mol, is frequently used in various fields like semiconductor industry, photolithography, electron microscopy and many others. The LOD of HMDS was determined 7.5 ppb.

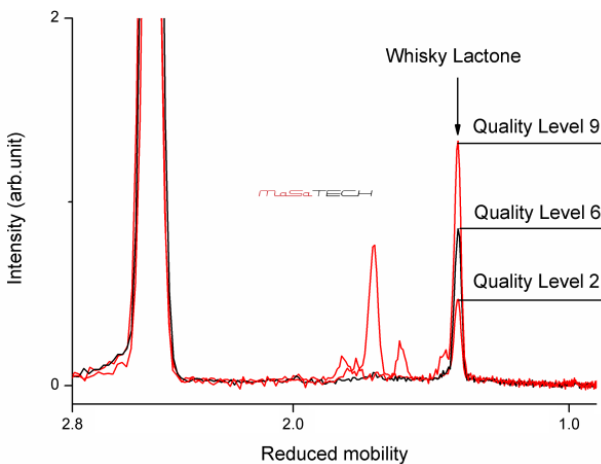


IMS response on 300 ppb of HMDS. Left IMS spectrum measured in reduced mobility mode, Right 2D map of 30s record time

Fast Quantification of Whisky Lactone in Oak Wood by AIMS



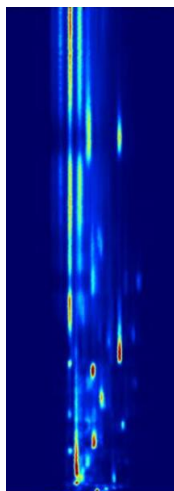
Whisky lactone (WL) in oak staves / barrels has the biggest share in the resulting taste of beverages. The quantity of WL in oak wood have strong effect on quality of final products. Based on WL quantity, the barrel's staves are divided into ten categories. This categories are category1 (0-7 $\mu\text{g/g}$),, 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

Food quality control

The IMS as stand alone instrument or in combination with pre separation technique like GC is ideal for food quality control. Our IMS supported by our classification software was successfully used for various food quality control applications.

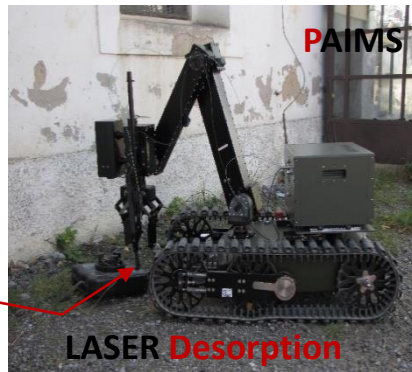
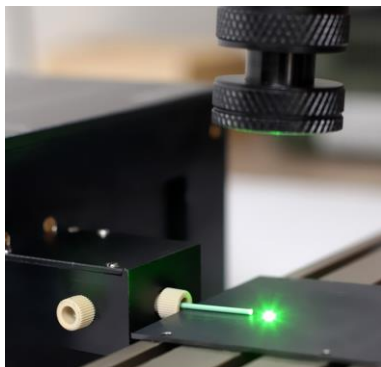
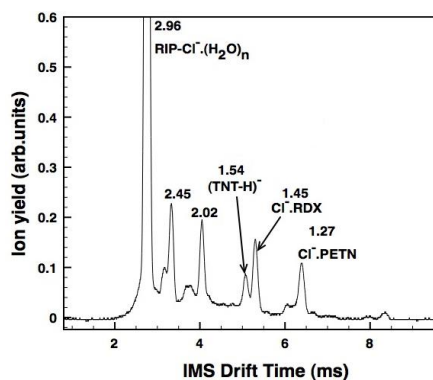


Solids and Surface Analysis

The new Surface Sampling Method 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.

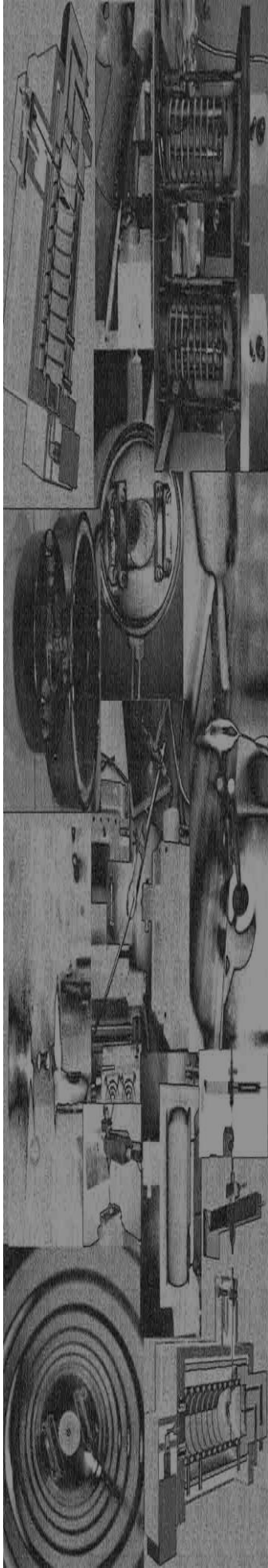
Explosives detection

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.





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Because we live for science