

Advanced in vitro exposure systems

VITROCELL® Photonion



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Fast on-line measuring system for chemical gas analysis

Photonion has developed a new on-line real-time measuring system for chemical gas analysis based on time-of-flight mass spectrometry (TOF-MS). This technology is now integrated in the VITROCELL modules in order to analyse the sampling at the spot where the cells are exposed.

Three different ionization techniques are applicable:

- single photon ionization (SPI) with a special VUV excimer source or laser VUV source
- resonance enhanced multiphoton ionization (REMPI) with a laser beam
- electron impact ionization (EI).

SPI and REMPI are considered as soft ionization techniques allowing the acquisition of mass spectra with nearly no

fragmentation. A heated transfer line allows direct gas analysis of e. g. engine exhaust, cigarette smoke or e-cigarette vapors.

Gaseous samples are addressed continuously by the Photo-TOF-MS mass spectrometry system at a flow rate of approx. 2ml/min. Depending on the ionization technique various relevant species can be ionized by SPI, REMPI or EI. After the ionization, the formed ions are accelerated into the reflectron time-of-flight mass analyzer where they are separated due to their different mass to charge ratios.

A typical TOF mass spectrum can be generated in some milliseconds. This fast on-line measurement system is a selective and sensitive analytical method to investigate complex gas mixtures such as from combustion processes.



Unique flexible heated transfer line and customized sampling solution for the VITROCELL® exposure module.





Exposure Systems

Dose Supply

Dilution

Racks & Carts

Dose Monitoring

Skin Exposure

Auxiliary Equipment

VUV-photo ionization (SPI):

Universal soft ionization of organic compounds

VUV lamp with 9.8 eV - 10.78 eV (126 nm - 115 nm) or Nd:YAG laser with third harmonic generation VUV-cell with 10.5 eV (118 nm)

- detection limits for most organics in ppb region

Laser-photo ionization (REMPI):

Superior selectivity and sensitivity for aromatics (optional)

Fixed frequency (266 or 248 nm) or tunable lasers (OPO) in wavelengths range 206 nm - 300 nm

- detection limits for most aromatics in low ppb or ppt region

Electron ionization (EI)

Standard fragmenting ionization technique (optional)

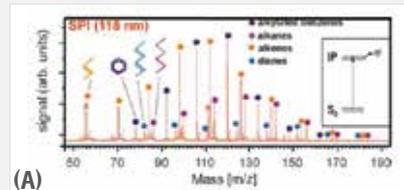
70 eV for mass spectra with standard fragmentation (NIST) or tunable from 5 eV to 90 eV (special setup)

- detection limits in ppm - ppb range

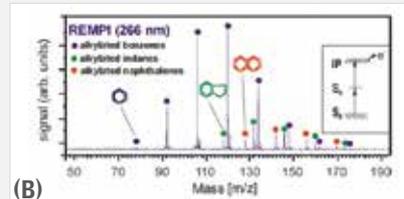
Multiplexing ionization mode (MIM)

Achieving SPI, REMPI and EI results simultaneously (optional)

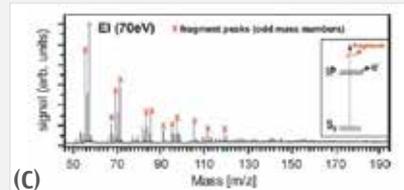
The ionization methods (REMPI/EI/SPI) can be operated quasi-simultaneously via multiplexed acquisition methods.



(A)



(B)



(C)

Direct inlet TOFMS of diesel fuel headspace, recorded with (A) single photon ionization (SPI), (B) resonance enhanced multiphoton ionization (REMPI) and (C) electron impact ionization (EI).



Technical Data

TOF-mass analyzer

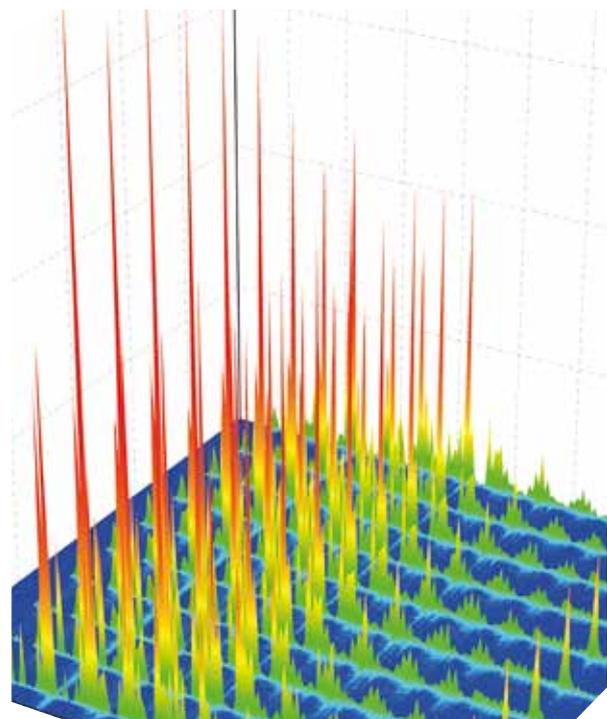
- Direct reflection time of flight mass spectrometer (flight path 0.9 m)
- Mass range: 10 – 2000 Th (m/z) (standard configuration)
- Mass resolution: $m/\Delta m = 2000$
- Mass accuracy: 100 ppm
- Maximal primary data acquisition rate: 100 kHz

Rack configuration

- 2x19"-module rack
- Dimensions 1.200 x 800 x 1.300 mm (W x D x H)
- Power supply 100-230 V, 50/60 Hz

Data acquisition and visualization software

- Data is displayed in real time
- Actual measured mass spectra and the variation of selected ions is displayed
- Data can be exported (formats e.g.: txt, CSV)
- Customer specific data analysis software available.



3 D graph showing different constituents of the gas phase from 10 puffs of a 3R4F cigarette.

About VITROCELL®

VITROCELL® exclusively concentrates on the developing, producing, installing, training and servicing of advanced *in vitro* exposure systems.

The VITROCELL® Systems' team is driven by their vision for new in-vitro standards through state-of-the-art technology, highly qualified workmanship and absolute client dedication. VITROCELL® has successfully collaborated with clients from leading research institutes, contract research organizations, regulatory authorities or industrial laboratories across the world. Working with our team experts, all modules have been tailored to create durable and complete turnkey-systems for *in vitro* inhalation toxicology. Gases, environmental atmospheres, nano particles and complex mixtures are analyzed on lung cells at the air/liquid interface using these systems. VITROCELL® technologies are also applicable to solutions for skin research.

Over a decade of devotion to research in this specific field has given our team of design & precision manufacturing specialists the opportunity to mentor highly diversified and complex projects **from conception to completion**. We strive to become a constructive member of each research team, providing support when it is needed, advice when it is required and modules of the highest quality, which are even polished by hand before leaving here to be integrated into your workspace. Every piece of our German engineered equipment is manufactured to the highest of standards – yours.

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