



**IONICON**  
A N A L Y T I K



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# ***PTR-MS***

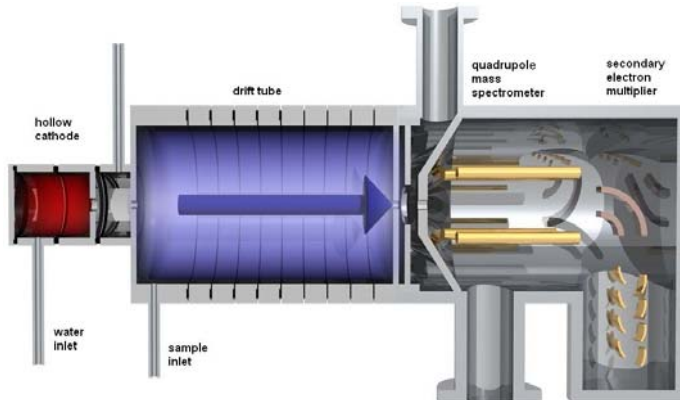
PROTON TRANSFER REACTION – MASS SPECTROMETRY

- > Very low detection limit (pptv-range)
- > Real-time quantification of compounds
- > Online VOC monitoring
- > No sample preparation – direct injection



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## > The Technology

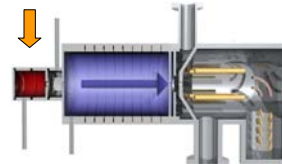


**PTR-MS** THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

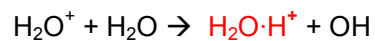
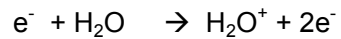


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The ion source:



- $\text{H}_3\text{O}^+$  is produced
- Protonated water

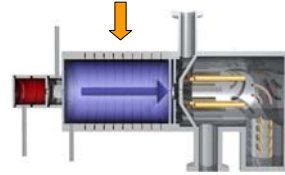
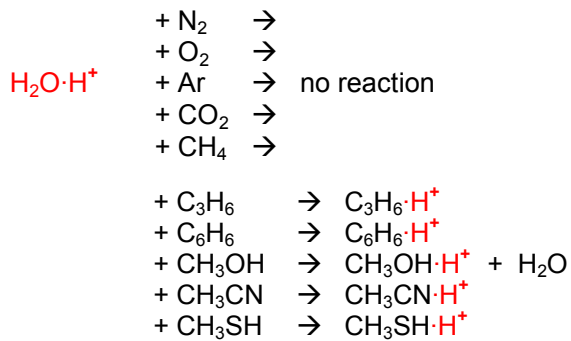


**PTR-MS** THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS



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The reaction chamber:



**PTR-MS** THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

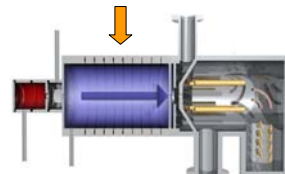


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The reaction chamber:

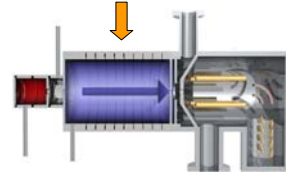
- No reaction with common constituents of air
- No loss of primary ions
- Trace gas concentration is linear to ion count rates

➔ Very low detection limit of down to 5 pptv



**PTR-MS** THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

The reaction chamber:



- Proton Transfer Reaction – ionisation method
- Ultra soft technique compared to charge transfer or electron impact

➔ Very low mass fragmentation

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Mass Fragmentation:

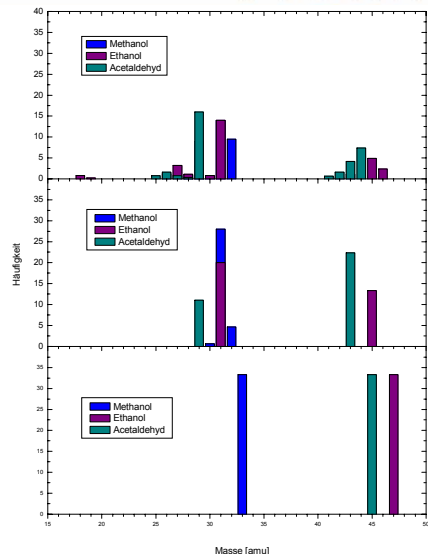
Electron impact  
about. 70eV



Charge transfer  
with Xe<sup>+</sup>



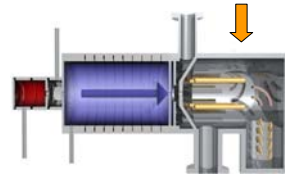
**PTR-MS**





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The detection system:



- Quadrupole mass spectrometer
- SEM / Channeltron detector
- Quantification of trace compounds

➔ Very fast - response time about **100 ms**

**PTR-MS** THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS



> The advantages:

- Detection threshold of down to 5 pptv
- Real-time online measurement
- Soft ionization method – low fragmentation
- No sample preparation – direct injection
- Fast and accurate quantification of masses

**PTR-MS** THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

> The PTR-MS product range:



Over 100 instruments sold to Europe, USA,  
Canada, Australia, Japan, New Zealand, China,  
Korea...

**PTR-MS** THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

HIGH SENSITIVITY  
**PTR-MS**



- Ultra-Sensitive
- Real time
- Online VOC detector
  
- 5 pptv
- 1 – 512 amu  
(2048 on request)

THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

## STANDARD PTR-MS



- Sensitive
- Real time
- Online VOC detector

- 30 pptv
- 1 – 512 amu

THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

## COMPACT PTR-MS



- Compact
- Real time
- Online VOC detector

- Short start up time
- Small and light
- Easy to handle
- 1-300 amu
- 500 pptv

THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS



Customized...  
**PTR-MS**  
...Solutions

→ tailored to your needs!

Measurement campaigns  
with several PTR-MS  
systems:

- in the air
- in the sea



THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS



> Application fields of PTR-MS:

Environmental research

- Atmospheric chemistry
- Emissions control
- Leaf wounding VOC detection

Food and aroma research

- Coffee headspace measurement
- Aroma science
- Nose space air analysis





## > Application fields of PTR-MS:

### Ambient air control

- Indoor air VOC detection
- Cleanroom environment analysis

### Industrial applications

- Waste incineration process control
- Production process control
- Quality control
- Cleanroom testing in microelectronics industry

**PTR-MS** THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

# PTR-MS



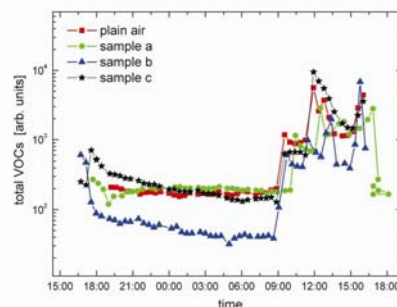
THE SOLUTION FOR ONLINE TRACE GAS ANALYSIS

## > Indoor air quality measurement

– VOC detection in offices, buildings, cars, planes...



- Real time monitoring
- Total VOC concentration
- VOCs can be harmful
- Sick building syndrome



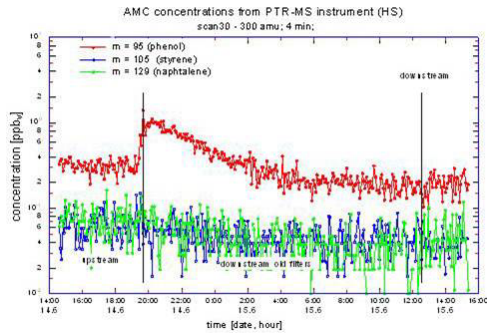
- > Cleanroom AMC monitoring
  - Airborne molecular contamination
  - Microelectronics industry



Picture: copyright by AMTC



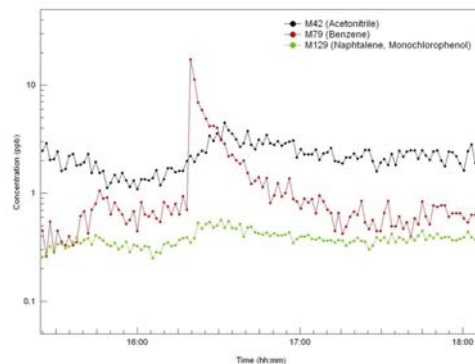
- Hazing of wafers, optics
- Production downtime
- Real time
- Online
- Process analysis



- > Waste incinerator dioxin emissions monitoring
  - Dioxin surrogates and VOC detection
  - Process control



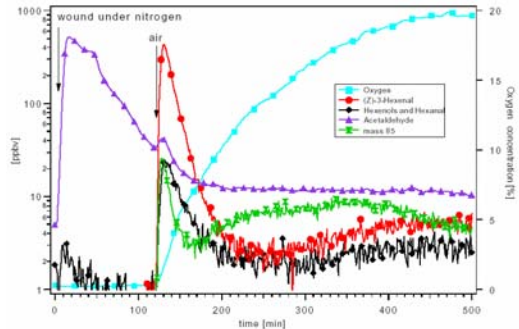
- Harmful dioxin
- Burning process
- High time resolution
- No sample preparation



- > Leaf wound compound measurement
  - Real-time PTR-MS application
  - Wound reactions after cutting



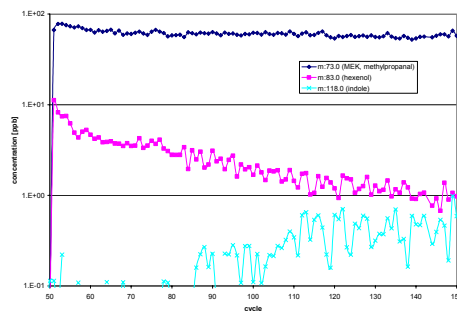
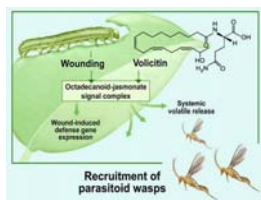
- Leaf aldehydes
- Leaf alcohols



- > Plant defense mechanisms
  - Caterpillar attack
  - VOCs are released, wasps are attracted



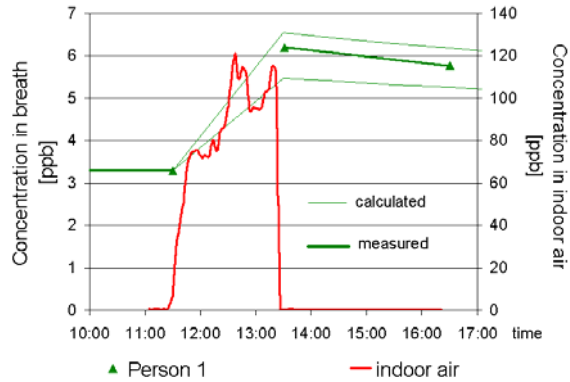
Picture: Held



- > Effects of passive smoking
  - Acetonitrile in the breath of non-smokers
  - Quantification of harmful passive smoking



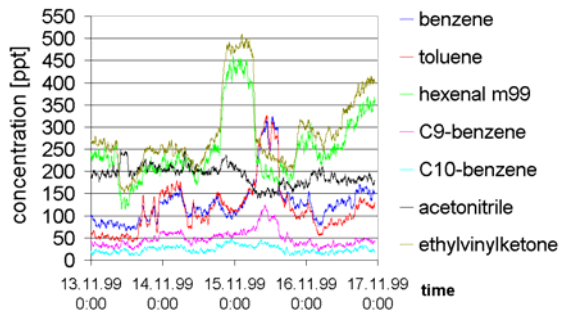
Picture: Pixelquelle.de



- > Environmental pollution analysis
  - VOC measurement in 3105m
  - at the meteorological station Sonnblick



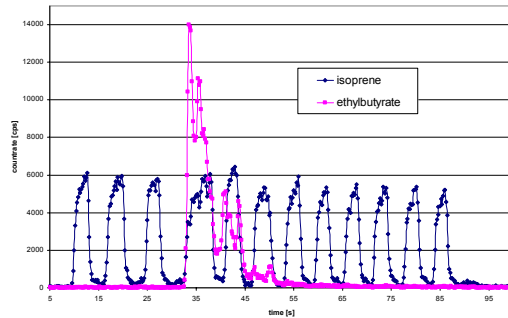
ppt-levels  
voc detection



- > Food and flavor science
  - Nose space air analysis
  - Swallowing of strawberry flavored drink



High time resolution

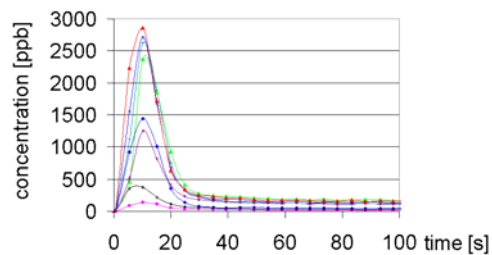


- > Food aroma research
  - Coffee head space measurement
  - Instant coffee aroma when adding boiling water



Picture: Pixelquelle.de

High time resolution



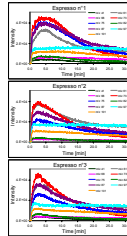
— acetaldehyde  
— 3-methylbutanal  
— methylfuran  
— furfural  
— acetone  
— methylpropanal  
— 2,3butanedione  
— 2methylbutanal  
— 2,3-pentanedione

## > Flavour Science

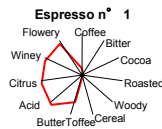
Prediction of the overall sensory profile of espresso coffee by on-line headspace measurement



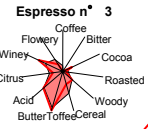
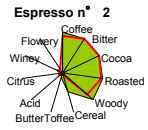
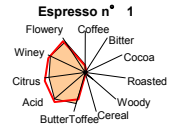
Picture: Pixelquelle.de



Sensory evaluation:



MODELIZATION

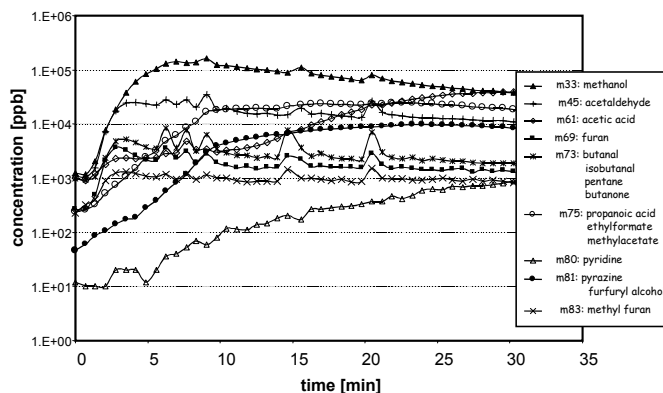


Sensory profile (trained panel)

Predicted sensory profile

## > Food processing research

- Roasting of arabica beans
- Production process control



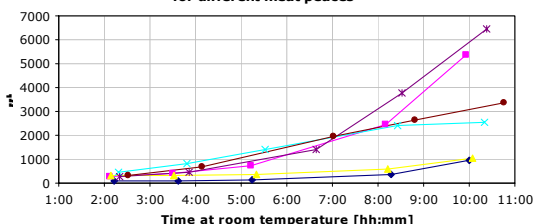
## > Food quality control

- Ageing process of meat
- Correlation between bacteria population grow and compounds measured



Picture: Pixelquelle.de

Sum of ethylacetate, methylpropionate and propylformate for different meat peaces



## > Acknowledgments:



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Université de Neuchâtel

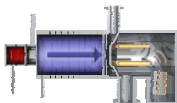


Prof. Ray Fall, Prof. A. Guenther,  
Dr. T. Karl, Boulder, Colorado



Dr. M. Staudinger, D.I. M. Mandl  
ZAMG Salzburg





## Conference Announcement:

3<sup>rd</sup> International PTR-MS Conference 2007  
University Center Obergurgl, Tyrol, Austria.  
27. Jan. 07 – 1. Feb. 07

Information and Registration:

[www.ptrms-conference.com](http://www.ptrms-conference.com)

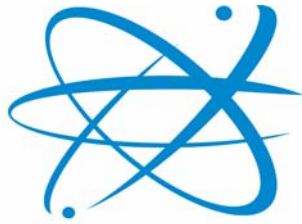
*hands-on*  
**PTR-MS**  
2007

## Training Seminar:

“hands-on PTR-MS” 2007  
University Center Obergurgl, Tyrol, Austria.  
1. Feb. 07 – 3. Feb. 07

Information and Registration:

[www.ptrms-conference.com](http://www.ptrms-conference.com)



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