

Advanced in vitro exposure systems

VITROCELL® FTIR



VITROCELL® FTIR



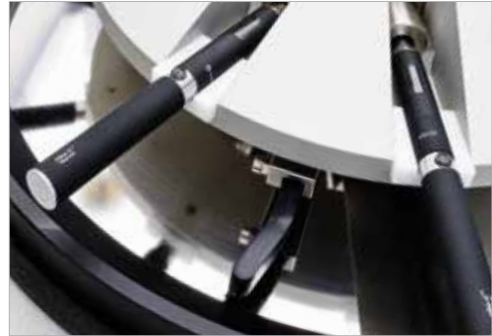
On-line gas analysis of electronic cigarettes

This setup was developed in close cooperation with Gasmeter. The system offers a puff-by-puff quantification of key constituents of aerosol from electronic cigarettes.

It is combined with the proven VC 1, VC 1 S-TYPE, VC 10® and VC 10® S-TYPE smoking machines and offers a fast evaluation of the aerosol in intervals of 1 s. Therefore it is a powerful alternative to classical chemical analysis which takes time-consuming steps by trapping, extraction, measurement and evaluation.



Quantification of constituents of e-cigarettes



Sampling and measurement system configuration:

1| Aerosol generated by VITROCELL® smoking machine

- HCl, ISO or CRM 81 regimes
- E-cigarette aerosol mixed with N₂ carrier gas
- Continuous purging after puff

2| Controller for carrier gas (N₂)

- N₂ flows from 50 ml/min up to 5.0 l/min
- Integrated mass flow controller

3| Hot Gas Mixer

- Heated line after mixing of carrier gas and aerosol

4| Gasmeter FTIR analyser

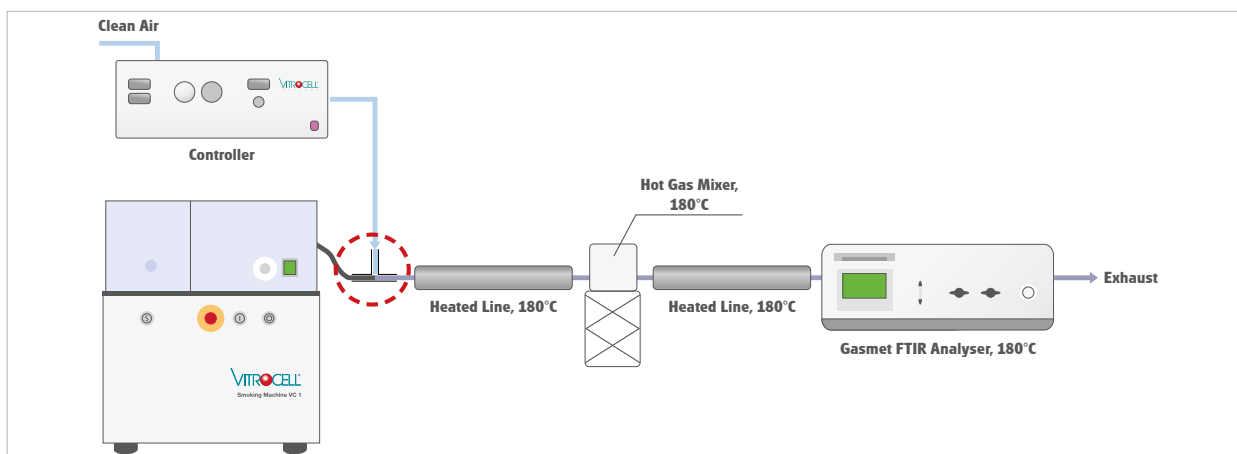
- Small volume sample cell, 200 cm path length
- Calcmet PRO software & RS-422 for fast measurement (1 s measurement interval)



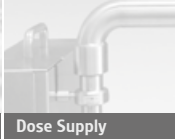
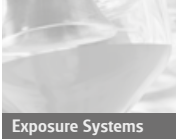
Smoking Machines VC 1, VC 1 S-TYPE, VC 10® and VC 10® S-TYPE

Controller

FTIR Analyser



Flow chart of VITROCELL® FTIR



Exposure Systems

Dose Supply

Dilution

Racks & Carts

Dose Monitoring

Skin Exposure

Auxiliary Equipment

Gasmet™ FTIR – Analytics – Calcmet™ Software

Application library can be customized:

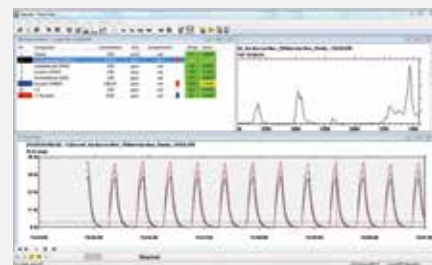
- Add flavor components
- Proprietary ingredients



Calcmet software with library

Results 1

Sample cell: 200 cm
 Heated Sample line: 4 m
 N₂ Carrier flow: 2.500 ml/min
 Measurement interval: 1 s
 No filter
 8 s exhaust time, 30 s frequency,
 square puff volume 55 ml

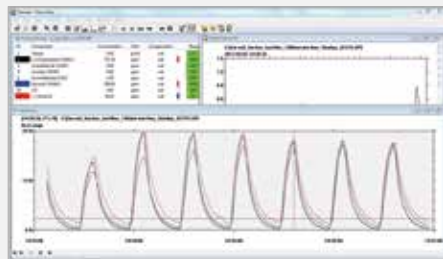


Puff-resolved e-cigarette data without filter

Black = 1,2-propanediol
 Blue = Glycerol
 Red = Nicotine

Results 2

Sample cell: 200 cm
 Heated Sample line: 5 m
 N₂ Carrier flow: 1.900 ml/min
 Measurement interval: 1 s
 Hot particulate filter
 8 s exhaust time, 30 s frequency,
 square puff volume 55 ml

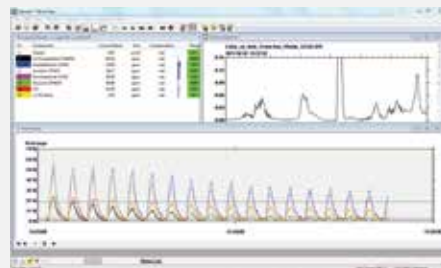


Puff-resolved e-cigarette data with filter

Black = 1,2-propanediol
 Blue = Glycerol
 Red = Nicotine

Results 3

Sample cell: 200 cm
 Heated Sample line: 5 m
 N₂ Carrier flow: 1.900 ml/min
 Measurement interval: 1 s
 Hot particulate filter
 8 s exhaust time, 30 s frequency,
 square puff volume 55 ml



End of cartridge leads to decomposition

Black = 1,2-propanediol
 Blue = Acetaldehyde
 Violet = Formaldehyde
 Green = Glycerol
 Red = CO
 Yellow = Nicotine

Summary

- Reliable, easy to use online analysis tool
- Wide range of components due to Calcmet library
- Fast response
- Ideal for quality control and dose monitoring

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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