Advanced in vitro exposure systems

Overview Dosimetry 2024

Edition March 2024

VITROCELL® SYSTEMS

Dose Monitoring

Overview

The determination of the delivered dose is essential to most applications, e.g. in toxicology or in pharmaceutical applications.

VITROCELL® not only provides equipment for the well-defined exposure of cells to these substances but also offers specialized solutions for various dosimetric approaches.

Deposited mass

QCM-Technology enables high-precision measurement with nanogram resultion within the exposure module.

QCM

Particle Concentration

Photometric real-time measurement in-line of aerosol flow without aerosol losses.

Photometer

Liquid Trapping

Accumulating chemical constituents and particles within the exposure module in trapping liquids.

Stainless Steel Insert

Particle Size & Structure

Collecting particles within the exposure module, e.g. fibres, for geometric and number analysis using TEM.

TEM Grid Insert

Particle Trapping

Accumulating Total Particle Matter (TPM) on cambridge filter pads in-line of aerosol flow for chemical and gravimetric analysis.

Cambridge Filter Pads

Gas Phase Monitoring

CO concentration as marker for delivered gas dose, in-line or from sampling bag.

CO Monitor

Gas Phase Key Components

Fast on-line evaluation of several gas constituents with FTIR technology.

FTIR

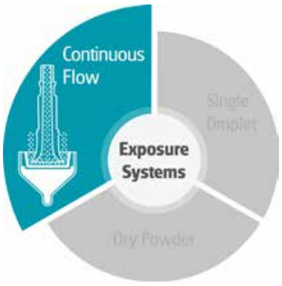
Full Gas Phase Analysis

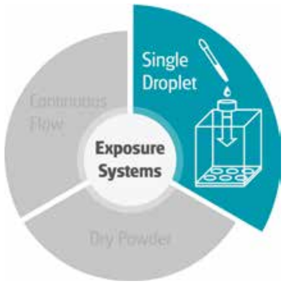
Chemical gas composition on-line with very high sensitivity using time-of-flight mass spectrometry (TOF-MS).

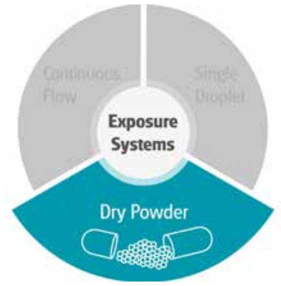
TOF-MS

Edition: March 2024

Due to the working principles of our different exposure systems, not every dosimetry method is suitable for every system. Here is an overview over all possible combinations:







Deposited Mass: QCM	X	X	Z
Particle Concentration: Photometer	X	X[1]	X
Liquid Trapping: Stainless Steel Insert	X	X	X
Particle Trapping: Cambridge Filter Pads	X	-	X
Particle Structure: TEM Grid Insert	X	X	X
Gas Monitoring: CO Monitor	X	-	-
Gas Key Components: FTIR	X	-	-
Full Gas Analysis: TOF-MS	X	-	-
Particle Size Spectrum	X[2]	X[1,2]	X[2]

z: not available right now, but under developement – ask us!
1: featuring separate probe in aerosol chamber
2: not a product distributed by vitrocell, but we can recommend the supplier

Most of the systems can be integrated into our one-stop graphical interface: VITROCELL® **Monitor Software!**

Edition: March 2024

Deposited Mass

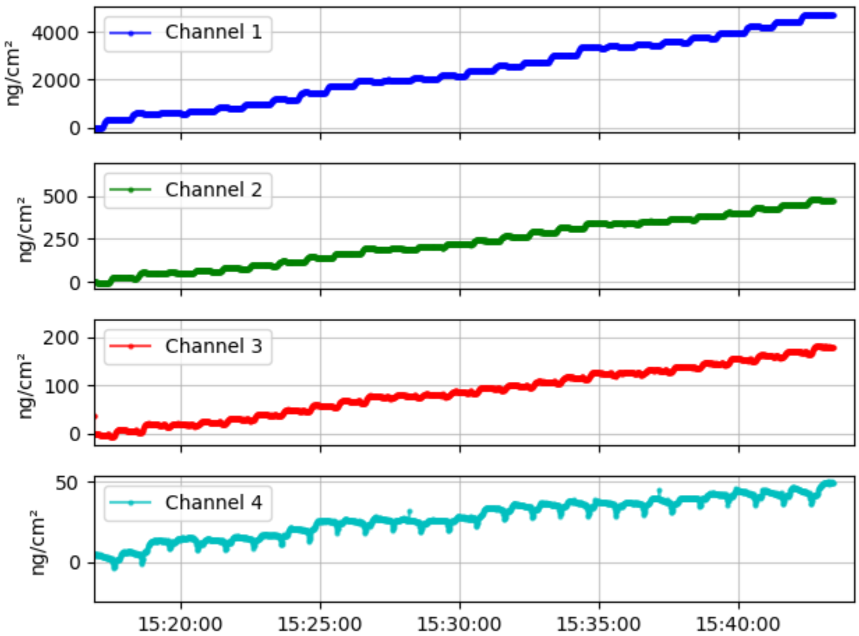
QCM 6 and sQCM 12

Whenever you need to determine the exact delivered dose to your cell culture, VITROCELL® QCM-Technology should be your choice.

Our sensors are placed right where the aerosol deposits the cell surfaces, mimicking nearly every aspect of a regular insert. Thus, their readout can be directly used as delivered dose to your cells, linearly spanning five decades of dosis (10 ng/cm² … >100 µg/cm²).

While QCM 6 is designed to mimic 6-well inserts (e.g. in continuous flow systems), our variant, sQCM 12, fits into 12-well compartments (e.g. in a VITROCELL® Cloud Alpha 12). It has been re-designed for maximum ease of use, allowing easy assembly and cleaning.

Furthermore, the sQCM 12 can be used for 24-well and 96-well setups as well.



Four QCM's surveying the applied dosis within one exposure module which realizes a consecutive dilution series

Particle Concentration

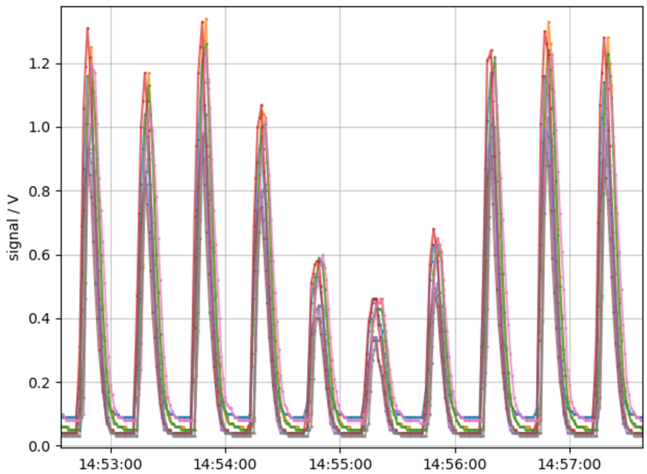
Photometer

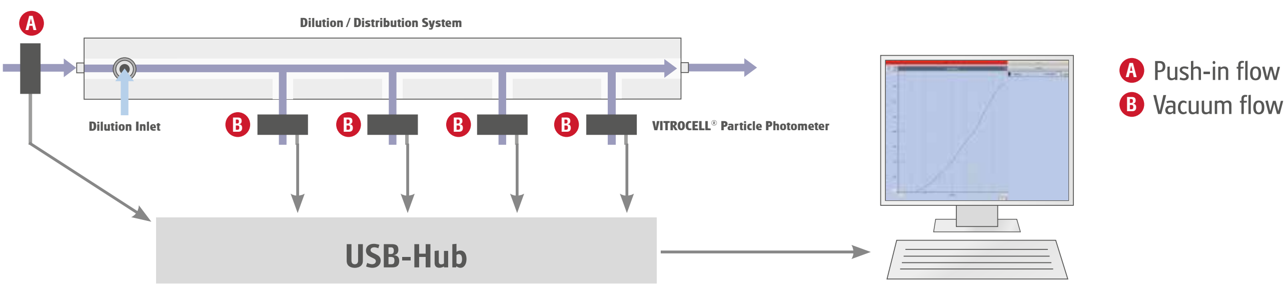
VITROCELL® Photometer 2.5 is a specialized tool enabling real-time in-line measurements of particle concentrations at various hotspots of your exposure setup.

They can operate under a wide range of sampling flow rates, typically 5 to 100 ml/min, with push-in or vacuum flow mode.

As they feature extremely low particle losses and are easily accessible, cleaning efforts are reduced to a bare minimum. They are easily combined with additional VITROCELL® dosimetry tools.

The newest version 2.5 can optionally be calibrated to our VITROCELL® Standard, making your values comparable world-wide without the need for conversion factors. By introducing a standard USB-C cable to connect to your PC or Laptop, it simplifies re-arrangements of your setup as you need it. This is fascilitated by their small diameter of 62 mm.





Liquid Trapping

Stainless Steel Inserts

Liquid trapping of aerosol constituents, whether particles or gases, is one of the most established methods to determine the delivered dose. It is an easy and hands-on approach to dosimetry, and can be used in every VITROCELL® exposition system. So maybe this is all you really want?

The inserts come in every size there is, from 6-well up to 96-well. Typical trapping fluids are water, phosphate-buffered saline (PBS) or dimethyl sulfoxide (DMSO). After exposition, different types of subsequent chemical or spectrometric analysis can be performed on the collected sample.

Additionally, VITROCELL® offers Kits for fluorescence spectrometry or Free Glycerol evaluation.

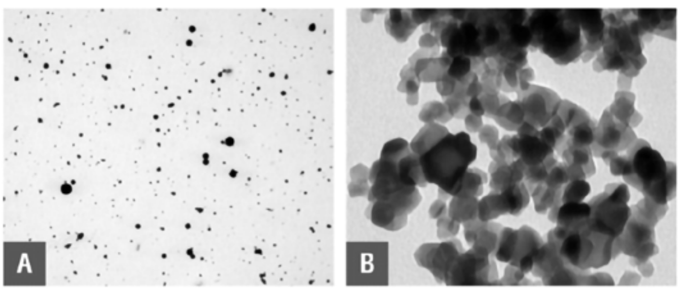
Particle Size and Structure

TEM-Grid Inserts

If you are mainly interested in the properties of your deposited particles and fibres on the micro- and nanoscale, you should consider collecting them directly on our VITROCELL® TEM Grid Inserts.

The grid, containing unaltered particles, can then be easily placed in a commercial TEM for analysis, ensuring no impact on particle size or structure.

VITROCELL® TEM Grid Inserts are available in 6-well or 12-well format and can be used in every exposure module with these sizes.



Picture Distribution of TiO_2 Particles in a 800-fold (A) and in a 125 000-fold (B) magnification (images courtesy of KIT)

Particle Trapping

Cambridge Filter Pads

VITROCELL® Cambridge Filter Pads are a well-established, standardized tool to characterize raw aerosol directly downstream of your aerosol source.

Being optimized for maximum retention efficiency, the accumulated Total Particle Matter (TPM) can be used for subsequent chemical and gravimetric analysis.

Thus, they are a very well comparable method to validate your aerosol source, or to remove particulate matter from your aerosol in order to focus on the complex gas phase.

Gas Phase Monitoring

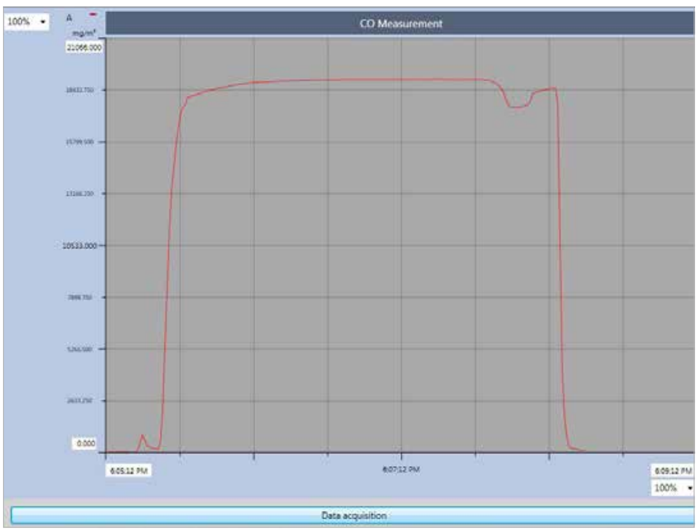
CO Monitor

If you want an easy and reliable in-line concentration monitoring for your carbon monoxide (CO) containing aerosol, the VITROCELL® CO Monitor might be just for you!

With its low minimum sampling gas flow (0.3 l/min), high selectivity and broad concentration range (0...20.000 ppm), it is suitable for nearly every application.

Each unit is delivered turnkey, with inline reading and recording using the VITROCELL® Monitor software.

The underlying technology allows to monitor some more characteristic gas components as well, and up to three of them at the same time – don't hesitate to ask us for specifics, if you want more out of your VITROCELL® CO Monitor!



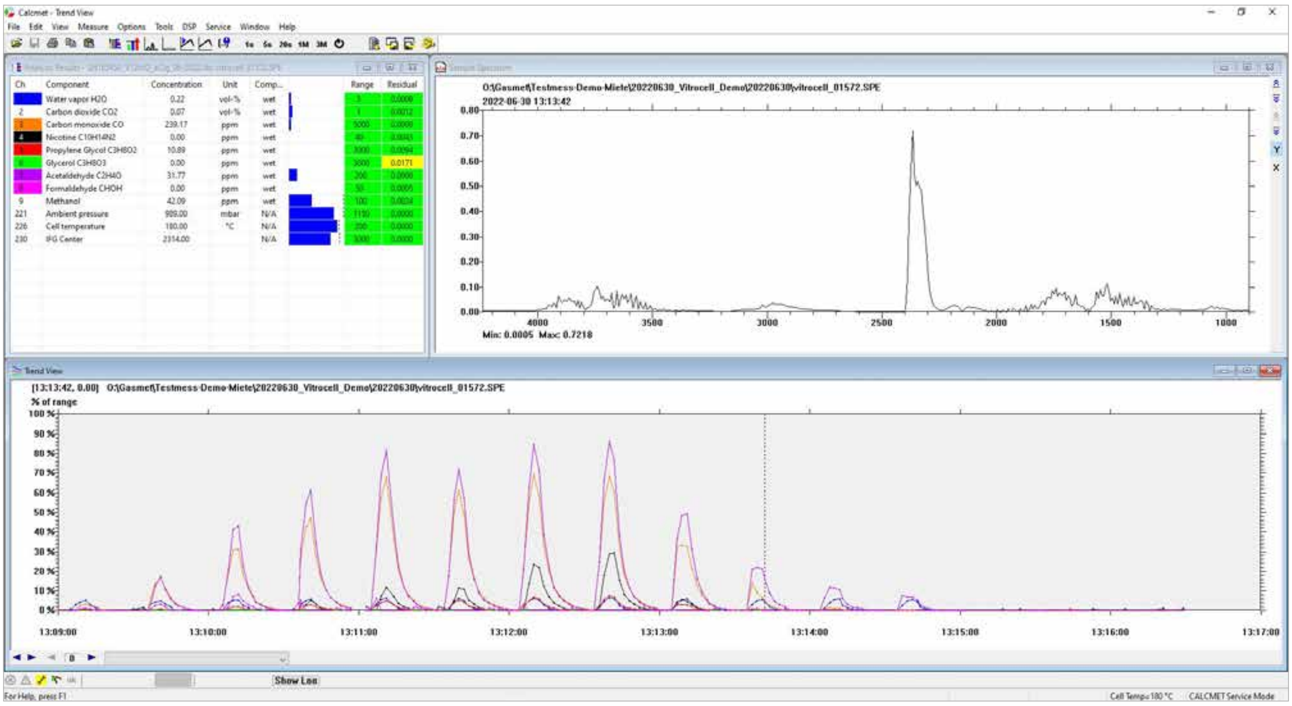
Gas Phase Key Components

FTIR

If you need a more sophisticated method to analyze up to 50 gas constituents in-line with a time resolution of 1 s, you may want to use the VITROCELL® FTIR Gas Analyzer.

The analyt is diluted by a carrier gas (typically N_2), and the absorption IR-spectrum captured continuously. Very fast Fourier Transforms of these spectra allow for fast and quantitative measurements of your gas matrix, giving you the possibility to use complex gas mixtures while retaining full dosimetry for every component.

The system comes with many standard gas constituents already pre-configured for analysis, but can be adjusted to your needs as well. Just ask us!



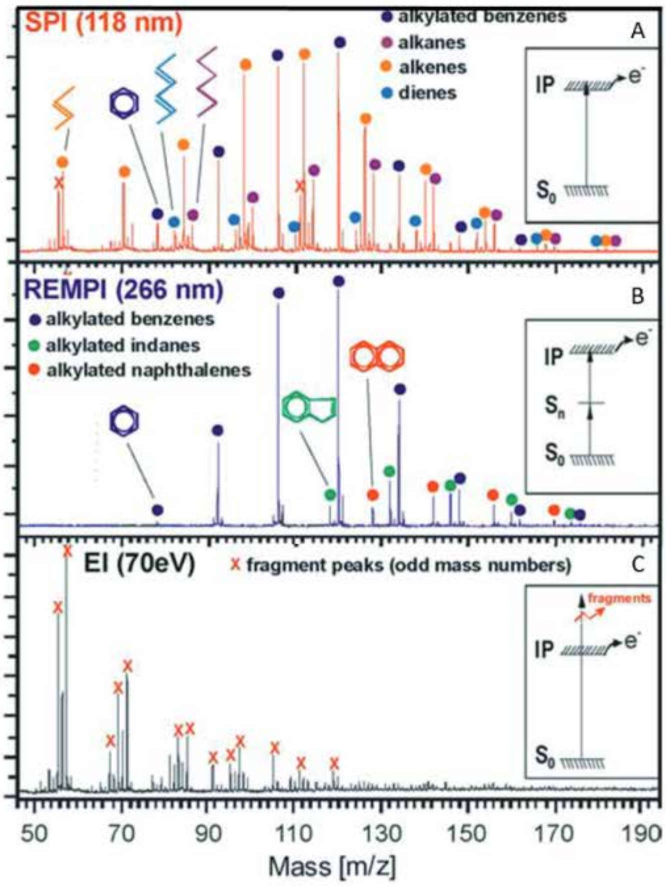
Full Gas Analysis

Time-of-Flight Mass Spectrometer

Your gas phase is full of non-trivial components, and you need a high precision quantification of this complex gas matrix? VITROCELL® and Photonion can still tend to your needs!

Our Time-of-Flight Spectrometer can generate a full mass spectrum within milliseconds. For this, the system uses three different, but combinable ionization modes to tackle various scopes of work.

Discover the rich possibilities of this intriguing piece of high-tech!



Single-Photon Ionization (SPI) uses energy-rich UV-radiation to directly ionize atoms and molecules without destroying them. It features a detection limit for most organics as low as ppb concentrations.

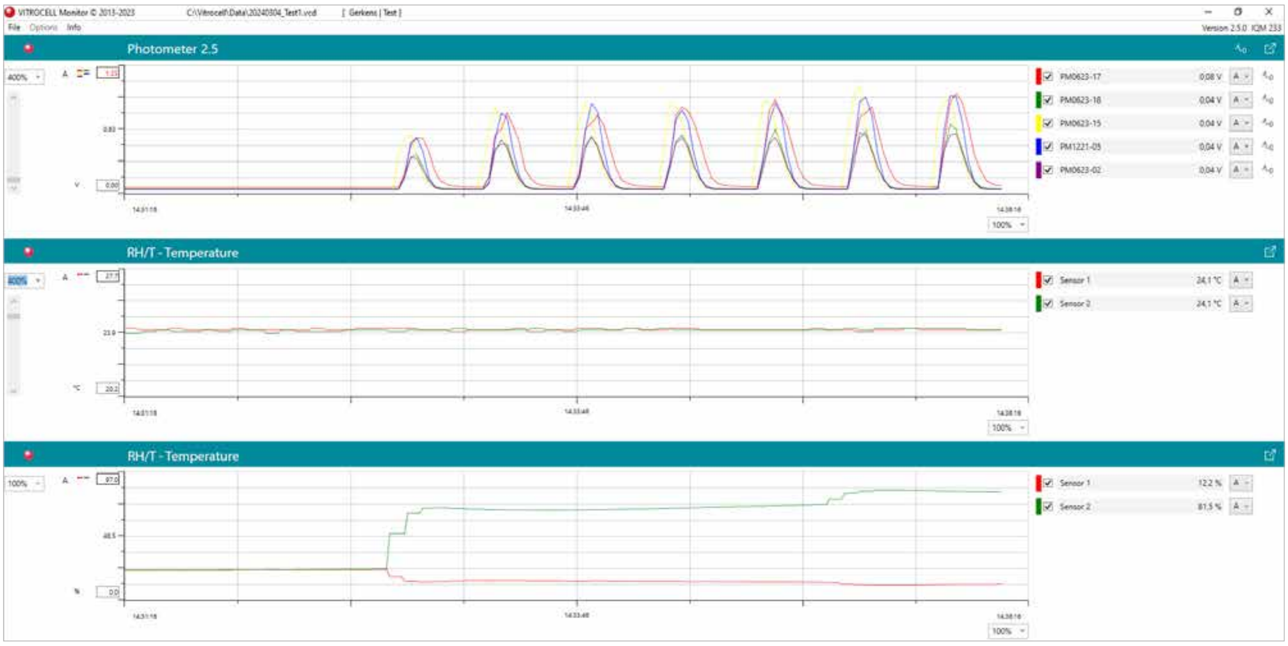
Resonance Enhanced MultiPhoton Ionization (REMPI) is a two-step ionization process with superior selectivity and sensitivity for aromatics, as both steps can be fine-tuned to target molecules. Thus, even ppt concentrations can be measured!

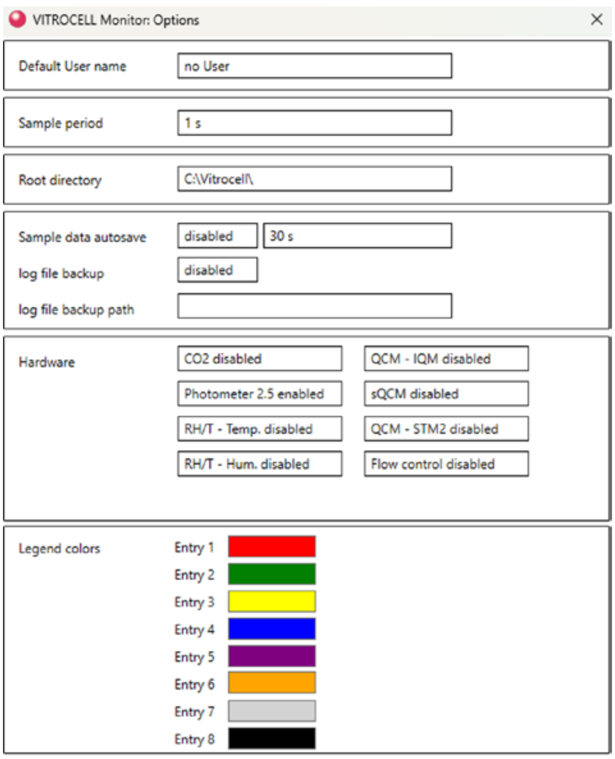
Electron Ionization (EI) is a standard method to strip down any molecule into fragments, which can then be analyzed individually. This is a mere explorational approach to what is going on in your gas phase.

Data integration

VC Monitor Software

You can combine multiple VITROCELL® dosimetry options in your experiment. VITROCELL® Monitor Software facilitates the integration of your different online data streams in just one user interface, giving you live feedback over what is going on in your experiment.





Keep your documentation safe and simple using the optional GLP-module, featuring intervention protocolling and raw data encryption. Review your stored data, evaluate points of interest directly within the graphical interface, and prove that your data is still un-altered using the build-in automatic detection.

Tidy-up your data interface by using the many options, or enable autosaving and backups to ensure data integrity during long-term recordings.

Export your measurements into a standardized csv format for further processing, without hampering with your original raw data.

VITROCELL® Monitor Software – your one-stop solution.


VITROCELL
+AN
+AN
3
2
1

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.

For more information please scan the QR-Code:

VITROCELL® Systems GmbH
Fabrik Sonntag 3
79183 Waldkirch
Germany

Tel. +49 7681 497 79-50
Fax +49 7681 497 79-79
Email: info@vitrocell.com
www.vitrocell.com

VITROCELL® SYSTEMS