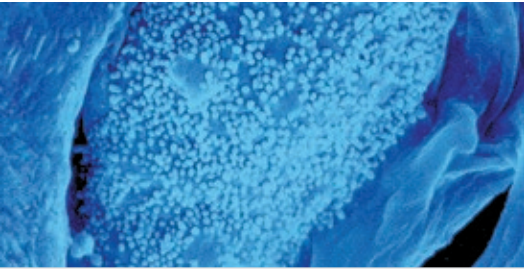


Advanced in vitro exposure systems

VITROCELL® Cloud  MAX



VITROCELL® Exposure Systems for Inhalation Toxicology

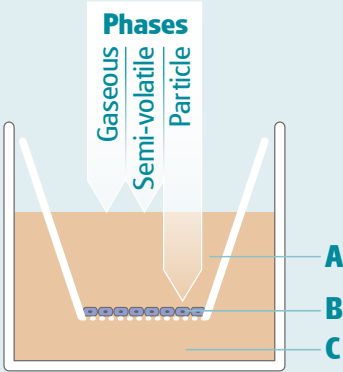
Direct Exposure Technology at Air/Liquid Interface

In response to the scientific need to expose in physiologically relevant conditions, VITROCELL® Cloud exposure modules have been specifically designed and engineered to enable direct exposure of mammalian cells or tissue at the air/liquid interface where the cell systems are not covered with culture media. Researchers can thus use all cell types cultivated on microporous membranes. This approach allows for more credible and authentic results than by submerged exposure due to a closer replication of the human physiology.

The exposure of mammalian cells or tissues to airborne substances is frequently performed under submerged conditions. Here, the test substances are dosed into the culture media. This procedure results in an undesired interaction of the formerly airborne substances with the media causing limitations for authentic analysis.

The advantages:

- No losses
- No dissolution
- No reaction of constituents with culture media
- High sensitivity



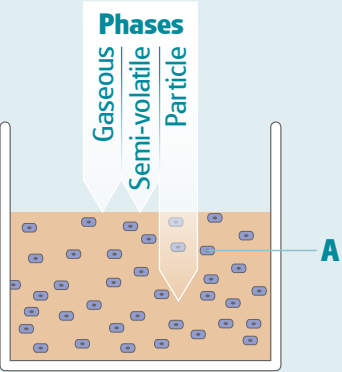
The diagram shows a cross-section of a petri dish. A vertical arrow labeled 'Phases' points downwards, with 'Gaseous' at the top, 'Semi-volatile' in the middle, and 'Particle' at the bottom. The dish contains a layer of orange liquid (media) at the bottom. A layer of blue cells is on a white membrane just above the media. Labels A, B, and C point to the media above cells, cells on membrane, and media below cells respectively.

Submerged Cultivation and Exposure in Incubator

A Media above cells
B Cells on membrane
C Media below cells

Interaction of test components with culture media

Low sensitivity



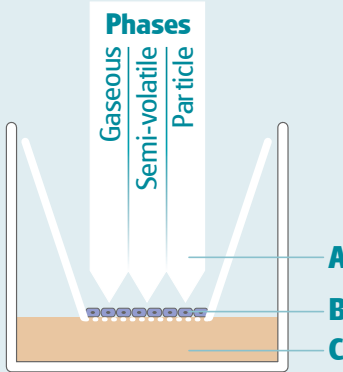
The diagram shows a cross-section of a petri dish. A vertical arrow labeled 'Phases' points downwards, with 'Gaseous' at the top, 'Semi-volatile' in the middle, and 'Particle' at the bottom. The dish contains a layer of orange liquid (media) at the bottom. Blue cells are suspended throughout the media. Label A points to the cells in media.

Suspension Cultivation and Exposure in Incubator

A Cells in media

Interaction of test components with culture media

Low sensitivity



The diagram shows a cross-section of a petri dish. A vertical arrow labeled 'Phases' points downwards, with 'Gaseous' at the top, 'Semi-volatile' in the middle, and 'Particle' at the bottom. The dish contains a layer of orange liquid (media) at the bottom. A layer of blue cells is on a white membrane just above the media. Labels A, B, and C point to the direct exposure of test atmosphere to cells, cells on membrane, and media below cells respectively.

Air / Liquid Cultivation and Exposure in Exposure Module

A Direct and controlled exposure of test atmosphere to cells
B Cells on membrane
C Media below cells

No losses
No reaction of principle components with culture media

High sensitivity of system

VITROCELL® Cloud α MAX

Smallest nebulization volumes and high deposition efficiency

The VITROCELL® Cloud Alpha MAX is our newest innovation in the Cloud family and presents a great leap forward in automated exposure of cell cultures. It combines high throughput testing with ease of use. The development is based on the well-known and frequently published VITROCELL® Cloud formats (6-, 12- and 24-well). It's functionality enables fully automated processes with an all-in-one control unit. Everyday experiments at the air/liquid interface have never been easier.

The new Cloud Alpha MAX series was developed as a result of numerous customer requests and is now capable to expose mammalian cell cultures in 6-, 12- or 24-well sized cell culture inserts. All commercial brands are supported.

The Cloud system is suitable for nebulization of solutions and suspensions. Possible fields of application are screening of inhaled drugs, toxicity testing of inhaled substances such as chemicals or nanoparticles and virus research.



The system has integrated controllers for the aerosol generators, adjustable via touchscreen.

Ideal for small quantities of test substance

The VITROCELL® Cloud Alpha MAX is designed for lower nebulization volumes and very high deposition efficiency.

This is important when only small quantities of material are available or when expensive test substances need to be tested. The non-cell exposed area is reduced significantly by direct nebulization into exposure chambers with reduced chamber volume.

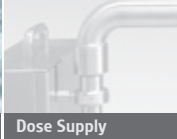
A set of 3 nebulizers allows for simultaneous testing of 3 concentrations, or a combination of Microbalance, control liquid and suspension of the test substance.



3 positions can be exposed while 3 positions are prepared. Different chamber volumes available. Picture shows the Quartz Crystal Microbalance Sensor in right position.



Exposure Systems



Dose Supply



Dilution



Racks & Carts



Dose Monitoring



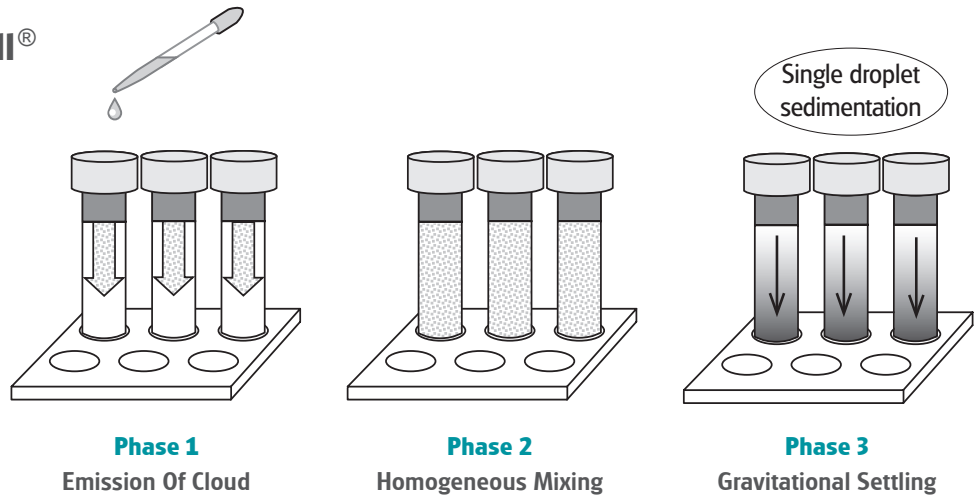
Skin Exposure



Auxiliary Equipment

How the Vitrocell[®] Cloud works

After pipetting the suspension, exposure to the cell cultures takes place in three phases:



Choice of three types of nebulizers



The system comes with a choice of 3 types of vibrating mesh nebulizers having droplet MMAD ranges of 2.5 – 6.0 μm , 2.5 – 4.0 μm and 4.0 – 6.0 μm .

Recommended nebulisation volumes are 10 – 40 μl . So the device is particularly suitable for testing whenever small quantities of testing materials are available.

Dosimetry using Quartz Crystal Microbalance (QCM)



The QCM sensor is integrated in the Cloud Alpha MAX exposure module. It is capable of measuring the deposited mass at a resolution of 10 nanogram/ cm^2 per second.

Results are reported online by the VITROCELL[®] Monitor software. Data is presented in graphs and stored in MS Excel[®].

Features

- Lowest nebulization volumes: $\leq 40 \mu\text{l}$ per exposure and well
- High deposition efficiency
- Cloud dynamics by vibrating mesh nebulizers
- Easy handling with no external air-flow required
- High reproducibility
- Air Liquid Interface (ALI) exposure
- Direct and efficient guidance of substance exposure to the cells
- 80, 40, 10 mm tube length

VITROCELL® Cloud Alpha – Touch Screen Display

for easy definition of the experimental parameters



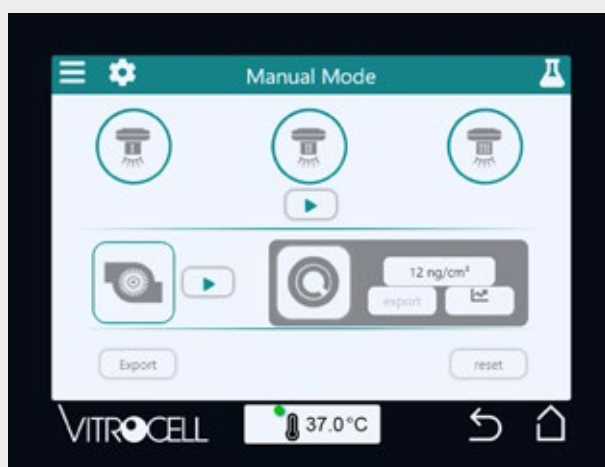
Home Screen

After defining the sequence of an experiment, there is only a single tap on the “Start”-Button required to perform a completely automated exposure. This ensures higher reproducibility and gives a perfect ease of use. The deposited particle mass is monitored by the integrated microbalance dosimetry tool (option).



Recipes

Recipes may be set according to the experimental design. The integrated nebulizer and linked output rate data base allows to use the nebulizer as a reservoir and generate an aerosol out of a defined volume. Alternatively a time-based nebulization may be chosen. Additionally, settling and evacuation times (for the optional PowerVent version) may be defined according to individual needs.



Manual Mode

While offering fully automated, recipe-controlled experiments, the VITROCELL® Cloud Alpha control unit has the option to control each of its functions manually. There is only a touch of your finger required to switch individual nebulizers on or off, evacuate the exposure chamber after an experiment or toggle a LED light for better visibility.

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:



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