Advanced in vitro exposure systems

VITROCELL®
sQCM 12
Dry Powder Kit

VITROCELL® SYSTEMS

VITROCELL® sQCM 12 Dry Powder Kit

For inline Dose Monitoring in PowderX

Background

The assessment of dry particles is a significant challenge in toxicology and related fields. Particularly in nanoparticle research, the deposition of dry particles onto surfaces such as quartz crystal sensors (QCM) often results in irregular deposition patterns and poor surface bonding, leading to unreliable data.

The sQCM 12 sensor, developed by VITROCELL®, offers a high-sensitivity platform capable of detecting mass changes in nanogram ranges. However, reliable measurement with a QCM requires a rigid layer of deposited material.

Solution

The more or less loose filling of deposited dry particles needs to be transformed into a rigid layer. This transformation is achieved by a stabilizing post-treatment in order to ensure reproducible and consistent results.

The new VITROCELL® Dry Powder Kit provides the means to such a stabilization within the PowderX, through an intuitive and user-friendly post-processing procedure. It offers a streamlined and reliable workflow for the exposure and analysis of dry particles.

Before exposure to particles, the sQCM 12 sensor is installed with its oscillator and connected to the monitoring software, ensuring precise setup. Up to three cell cultures, compatible with 12-well or 24-well formats, are then positioned in the heated module block and prepared for the experiment.

Following exposure and retake of the cell cultures, the Dry Powder Kit is used to stabilize the sedimented particles on the sQCM 12 quartz crystal surface.

It is important to note that this method is unsuitable for powders that form a viscous layer upon contact with liquids, as this can compromise measurement accuracy and reliability.

The PowderX control software provides step-by-step guidance for the post-processing procedure, minimizing errors and ensuring ease of use.

VITROCELL® DryPowder Kit for PowderX

Preparation of Dosimetry and cell culture

Step by step guidance by PowderX

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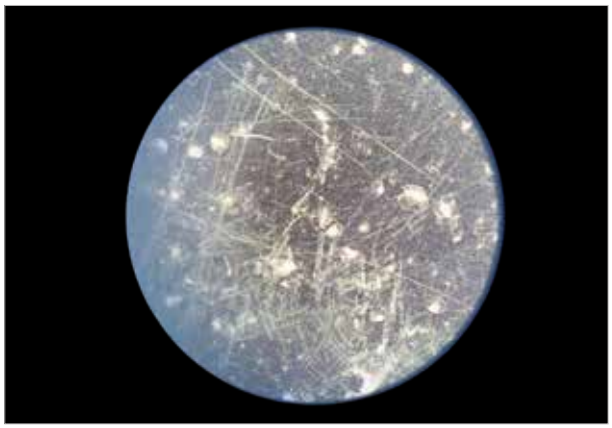
Data Monitoring and Analysis

Throughout the process, data is recorded and visualized using the VITROCELL® Monitor Software, with all results securely stored for subsequent analysis and reporting.

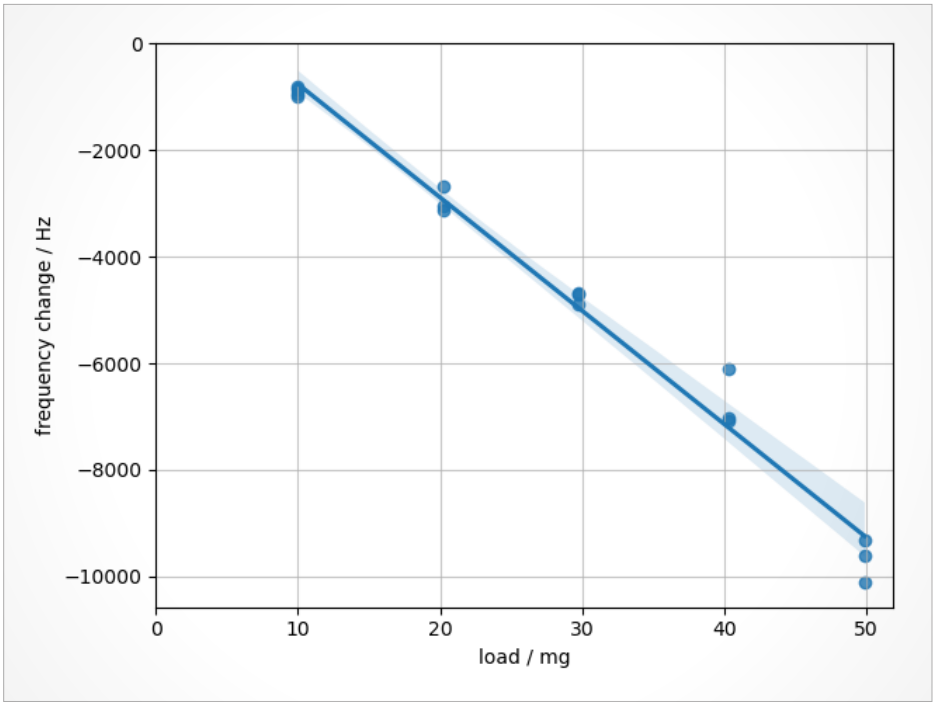
After post-treatment, the once loose filling of particles forms a rigid layer of particle mass, allowing to calculate mass deposition using Sauerbrey's equation. A very good linearity of total particle load, aerosolized by PowderX, to primary response signal of sQCM 12 has been shown.

After one-time calibration to a reference method (e.g. gravimetric), this subsequently allows for easy and convenient dosimetry of the deposited powder directly within PowderX.



Stabilized layer of TiO_2 particles on the gold surface of sQCM 12.

Four sQCM 12 were loaded in parallel with aerosolized dry powder (TiO_2). Five independent experiments using different amounts of material show a very high comparability of the four sQCM 12 readouts and their measurement positions. A clear linear response of the raw sensor signals ("frequency change") to total aerosolized mass ("load") has been demonstrated.



Features:

- Detecting mass changes of dry particle deposition (ng/cm²)
- Kit to transform dry particles into a rigid layer
- Intuitive step-by-step guidance by software
- Very good linearity of particle load
- Proven sQCM 12 handling
- Limitation: unsuitable for particles which form viscous layer

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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