

GLASS DOSIMETERS AS EARLY WARNING SYSTEMS FOR ENVIRONMENTAL IMPACT

Use of glass dosimeters

The dosimeters differ in their composition and are good for different monitoring conditions and exposure times. Together we will decide which dosimeter is best suited for your purposes.

The freshly prepared and ready-to-use dosimeters will be either shipped to you with installation directions or, if so preferred, installed by our technicians.

The glass dosimeters are good to monitor different conditions at different locations, e.g. prevailing in

- display cases,
- storage rooms,
- transport boxes or containers,
- outdoor areas,
- protective glazings for stained glasses.

Upon expiry of the predetermined exposure time, you will return the dosimeters (along with silica gel) to our laboratory. Within a few weeks you will receive your full report on the quality of your installation site.

We will match the findings against our database of glass dosimeter studies from all over the world, started in the mid 1990's.

Glass Dosimeter Campaigns / Overview

- Evaluation of protective glazing e.g. in York, Canterbury, Leon, Assisi, Cologne, Erfurt
- Evaluation of museum indoor climate, evaluation of showcases e.g. in London, Dresden, Vienna, Geneva, Stuttgart, Berlin, Coburg, Würzburg
- Outdoor measurements e.g. Brandenburger Tor (Berlin), World-wide studies for industrial clients
- Monitoring of overseas transport containers e.g. USA to Singapore

For more information on our glass dosimeters and to place your order, please contact:

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Glass dosimeters as early warning systems for environmental impacts

Common systems for the detection of environmental impacts measure only current impacts on the object. The dosimeter developed by the Fraunhofer Institute for Silicate Research ISC can measure the integrative influence over the entire period of exposition. These integrative results allow a much more significant statement about the environmental impacts on the object. The glass dosimeters from the Fraunhofer ISC offer an easy method to monitor storage rooms, display cases or even transport systems.

The method is licensed in Germany as German Technical Guideline VDI 3955/2.

The development of the glass dosimeter

The glass dosimeter was developed within the European-Project AMECP (1993 - 1996): Assessment and Monitoring of the Environment of Cultural Property.

The objective of the project was:

- to develop a glass based sensor to facilitate the assessment of environments as well as
- highly sensitive glasses, for different environments
- which can react to humidity and acid pollutants
- allowing to quantify the corrosion rate

The project was funded by the EC (EV5V-CT92-0144 AMECP).

The production of glass dosimeters

A glass block is molten from pure oxides (for content see table below):

- Slices with a thickness of 0.7 cm are cut off
- Surface treatment, e. g. fire polishing
- Integration into a frame system for easier handling and shipping

Three different types of dosimeter are available, as listed.

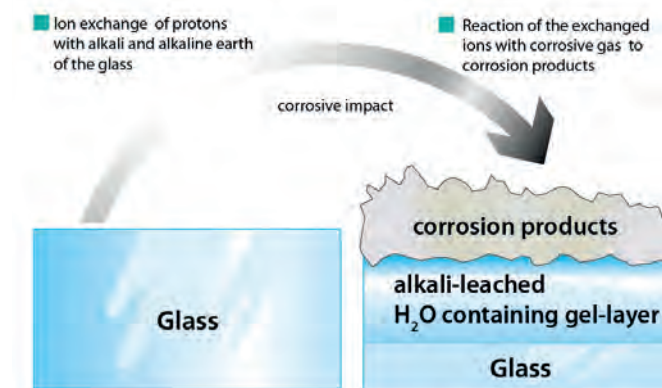
Type of glass	SiO ₂	K ₂ O	CaO
M 1.0	59.8	20.2	20.0
MI	53.1	18.0	17.8 (+ 11.1 others)
MIII	62.3	9.9	27.8

data in Mol-%

The glass dosimeter principle

The glass chips are very sensitive to environmental impacts, especially to organic acids, temperature and relative humidity. This leads to a corrosion of the glasses which can be observed as:

- Leaching of potassium and calcium ions
- Formation of a gel layer, which contains H₂O
- Formation of a corrosion crust



The dosimeters are read by measuring the water content (with Fourier transformed infrared spectroscopy FTIR) in the glass chip before and after exposition. The amount of water is directly linked to the condition prevailing at the exposition site. Also the surface and corrosion products will be analysed more in detail.