



Use of diffusive sampling in museums and archives

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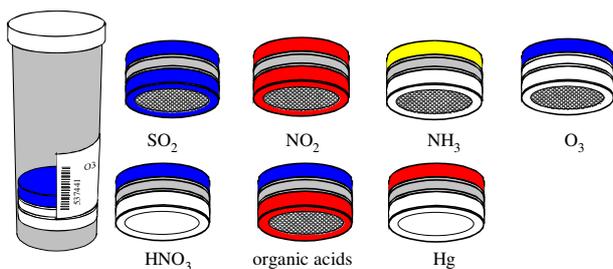
Introduction

IVL has run networks using diffusive samplers for air quality monitoring since 1985 [1]. The technique has many advantages, such as no electricity requirement, samplers are small and light-weight, no field calibration or technical personnel are needed at the sampling site, which gives no restrictions in the choice of sampling sites. Due to the very large measuring range diffusive samplers are used to measure air quality in remote rural background sites [2] as well as in busy streets in megacities. The technique is often used to validate local as well as regional dispersion models.

Diffusive sampling is also ideal for indoor sampling especially in museums, because sampling is silent and can be performed inconspicuously with discretion [3]. Long-term integrative techniques are advantageous for sampling around objects of cultural heritage. The time resolution needed for atmospheric corrosion data is almost always more than a month, often a year, and the use of sophisticated and expensive instruments for real-time measurements is therefore not necessary. Furthermore, many locations of interest have no access to electricity, which usually excludes instrumentation and sampling requiring pumps. Indoor air quality can affect human health [4] as well as the corrosion rate of precious objects [5]. Since indoor pollutants can come from indoor as well as outdoor sources, it is advantageous that diffusive samplers can also be used to measure gas concentrations in the air entering a building.

Theory

IVLs badge type samplers are fully based on the theory so that experimentally determined uptake rates don't have to be used, which is a great advantage [6]. IVL has developed samplers for NH₃, SO₂, HCl, Cl₂, HF, HCOOH, CH₃COOH, NO₂, HNO₃, O₃ [7] and Hg, see www.diffusivesampling.ivl.se.



Samplers are marked with different colours depending on the gas and the sample is identified by a barcode.



Measurement of corrosion rate and concentrations of organic acids in the storage room of the ethnographic museum in Stockholm.



Measurement of personal exposure.

Consult IVL

IVL offers analysis of gas concentrations in ambient and indoor air world-wide using diffusive samplers. Samplers and mounting equipment are sent out to the customer together with sampling instructions. After exposure the customer sends the samplers back to IVLs accredited laboratory for analysis.

We can also offer design of monitoring strategies as well as investigations to solve specific problems. Except specific diffusive samplers, two kits of samplers are available, one for indoor air and another for corrosion studies in ambient air.

Organic acids in museums

Gaseous organic acids are very corrosive on certain objects in museums. Only a small fraction of all items in a museum is exhibited. The rest is kept in storage rooms that often has no air ventilation. These objects will then be exposed to very high concentrations of organic acids originating from wood or paper in the storage rooms. IVLs diffusive sampler is often used to identify polluted rooms.

A recently started project

Mould growth is an increasing problem in churches and cultural heritage buildings in Sweden. The renovation cost for one single church have in one instance reached beyond a staggering 2 million EUR. IVL Swedish Environmental Research Institute has initiated a research project funded by The Church of Sweden and The Swedish National Heritage Board. In the project the macro- and micro-climate around and in four churches in relation to building construction and physical properties are studied. In addition, mould damage in the church buildings are documented, and organic acids and their potential degradation effect measured.



Mould in Sparlösa church.

References

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