



MEMORI

The MEMORI Dosimeter for Indoor Environment



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Aim of MEMORI

The main aim of the MEMORI project is to provide the conservation market with innovative, non destructive, early warning technology for easy assessment of environmental impact on indoor cultural heritage. In addition evaluation of impact of indoor air pollution on cultural heritage objects will be performed. Finally an improved preventive strategy will be developed to secure the conservation of movable cultural assets in protective enclosures, exhibition and / or storage.

An Innovative Measurement Technology

The MEMORI dosimeter combines the advantages of the **Early Warning dosimeter for Organic materials (EWO)**, and the **Glass Slide Dosimeter (GSD)**, Fig. 1a. The calibration of the dosimeter response has been performed on laboratory exposure to controlled doses of pollutants and on indoor field exposures with simultaneous measurements of climate parameters and pollutants. Dose-response functions for the environmental effect were found from statistical evaluation of field data obtained indoors [1]. Recommended levels of the dosimeter responses for indoor environments in cultural heritage locations have been suggested for both the EWO dosimeter [2] and for the GSD dosimeter [3].

The **MEMORI dosimeter** Fig. 1b, will be sensitive to the main degrading components of indoor environments in a synergistic manner. The MEMORI dosimeter will be sensitive to:

- Indoor climate and light
- Photo-oxidising gases
- Organic acidic gases

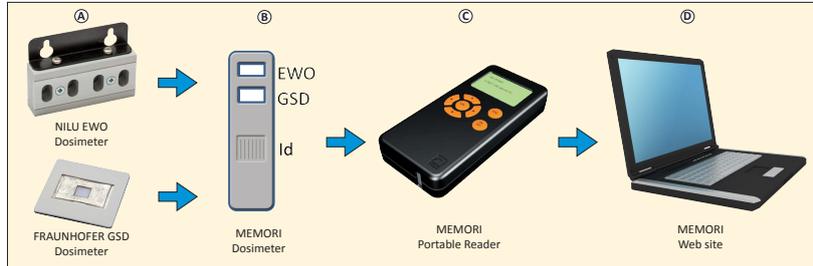


Fig. 1. The MEMORI Measurement Technology for Indoor Environments.

The **MEMORI portable reader**, Fig 1c, for in situ measurements and results evaluation has been developed and a first prototype is under construction. The handheld reader will:

- Improve the functionality of the dosimeter
- Reduce the time needed for evaluation of results
- Make the system flexible

Connected to the MEMORI dosimeter and reader, a software and a web based system are designed to visualize and interpret the results from the reader.



Fig. 2. The Lithuanian Theatre, Music and Cinema Museum is one of the End-users in the MEMORI project.

The **MEMORI web site** will provide:

- Info on air quality risks
- Related preventive conservation measures
- Guidelines on how to improve the air quality indoors

By detection of the common major damaging factors, the MEMORI dosimeter will be a useful **early warning system** to be used by museums, Fig 2, historic buildings, archives and libraries.

Assessment of Impact on Organic Materials

In MEMORI samples of organic materials are exposed to organic acids in accelerated laboratory tests, Fig. 3.



Fig. 3. Accelerated ageing of cellulosic materials exposed to acetic acid in the laboratory at NILU.

A large range of advanced analytical techniques are used to understand the response of the organic materials to the pollution exposure. Active and passive sampling is used to measure pollutant levels in the laboratory exposures and in protective enclosures in museums, with and without pollution adsorbing media installed.

Changes of material properties such as; the increase in oxidation and in glass transition temperature indicating increasing stiffness of varnishes, colour change in lead based pigments, changes in fibre morphology of parchments, colour change of leather and parchment, decrease in the degree of polymerisation of cellulose and increased crystallization of amino acids in wool due to the exposure to acetic and formic acid have been observed.

Mitigation Methods and Improved Preventive Conservation

MEMORI will do research to improve measures for mitigation of degradation caused by air pollution inside enclosures. This will require novel sensor systems, such as the MEMORI dosimeter. The mitigation studies will also focus on volatile emission rates from construction materials and the use of absorbents and anoxic enclosures.

Guidelines related to the application of the MEMORI technology will be developed in order to provide the conservation community with an improved preventive conservation strategy.

References:

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More information

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