PROPAINT

(EU project FP6, SSP no 044254)

The EU PROPAINT project – Improved protection of paintings during exhibition, storage and transit

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Introduction

The EU PROPAINT project (SSPI-044254) "Improved Protection of Paintings during Exhibition, Storage and Transit" aimed to provide conservation staff and stakeholders with innovative protection treatments used as a preventive conservation measure for paintings during exhibition, storage and transit. A detailed study was performed of the protection effect of microclimate frames (mc-frames) and varnish treatments for paintings. The following main objectives were investigated:

- Evaluation of the protective effect of mc- frames for paintings.
- Evaluation of the physical-chemical state and protective effect of varnishes on paintings.
- Contribution to preventive conservation strategy and standards for mc-control for paintings on display, in storage and in transit.
- Optimisation of microclimate-control and design of new mc-enclosures.

Results from the PROPAINT project

Measurements were performed in 11 museums in Europe and overseas using dosimeters developed in previous EU projects: 1. The Early Warning Organic (EWO) dosimeter (Norwegian Institute for Air Research, NILU, Norway) from the EU MASTER project (EVK4-CT-2002-00093); 2.The Resin Mastic (RM-PQC) and Lead coated Piezoelectric Quartz Crystal (L-PQC) dosimeters (Birkbeck College, University of London, UK) from the EU projects MIMIC (EVKV-CT-2000-00040); 3.The Glass Slide Dosimeter (GSD) (Fraunhofer Institute, ISC, Germany) from the EU AMECP project (EV5V-CT-92-0144). Concentrations of inorganic (NO_2, SO_2, O_3) and organic (CH_3COOH, HCOOH, HCOH, TVOC) gaseous air pollutants were measured with diffusive passive samplers. Climate parameters (T, RH, Light / UV) were measured by the museums. Design and materials of the mc-frames were registered and ventilation rates measured by CO_2 decay.

The inorganic gases are ventilated into rooms and frames from the outdoors and low concentrations were measured inside the mc-frames. Highest concentrations were measured inside mc-frames at central city sites and for less well sealed mc-frames.

Monitoring location, Apsley House, London, managed by English Heritage.

The organic gases are emitted from materials inside the frames and high concentrations of VOCs were measured inside the mc-frames.

The EWO and RM-PQC, were sensitive to photo oxidation and measured high values outside the mc-frames. The GSD and L-PQC dosimeters, were sensitive to organic acids and measured high values inside the frames. Statistical environmental dose – dosimeter response functions were produced. The combined use of two types of dosimeters made possible more complete evaluation of the environmental conservation conditions for the paintings.

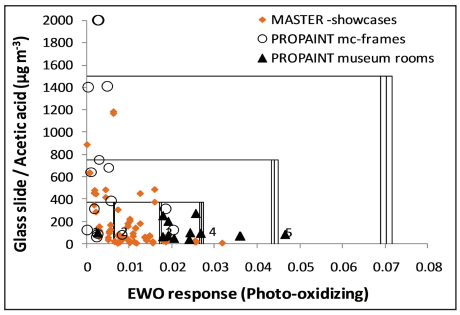


Figure 1: PROPAINT dosimeter results

The quality of indoor environments as measured by the PROPAINT dosimeters was reported in a "location - tolerability diagram".

Determined expectation	EWO-G dosimeter response level after exposure.				
	1	2	3	4	5
Archive store	**Expected environment (acceptable)**	Environment could be better	Environment is poor	Something is wrong with control	Serious problem with building or control
Purpose built museum	Environment is very good	**Expected environment (acceptable)**	Environment could be better	Environment is poor	Something is wrong with control
House museum	Excellent environment	Environment is very good	**Expected environment (acceptable)**	Environment could be better	Environment is poor
Open structure	Dosimeter is not responding	Excellent environment	**Environment is very good**	**Expected environment (acceptable)**	Environment could be better
External store with no control	Dosimeter is not responding	Dosimeter is not responding	Excellent environment	Environment is very good	**Expected environment (acceptable)**

Figure 2: Location - tolerability diagram (Developed by Centre for Sustainable Heritage, UCL, UK)

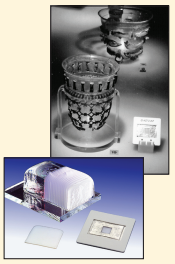
Six different types of varnishes (Natural resins: dammar and mastic. Synthetic resins: Paraloid B72 and MS2A with and without light stabilizer; Tinuvin 292) were subjected to accelerated ageing (NO_2, CH_3COOH) in the lab and to natural exposure inside and outside mc-frames in end user museums for about two years. It was found that:

- Strong natural ageing reticulation and polymerisation reactions made artificial ageing effects difficult to interpret for natural resins.
- Tinuvin 292 reduces cross linking and polymerisation reactions depending on the ageing conditions, and is extremely efficient in preventing the oxidation of Dammar triterpenoids under all artificial ageing conditions tested.
- Exposure to high concentration of acetic acid gives oxidation that seems to annul the protective effect of Tinuvin 292 in dammar resin samples.
- Significant change was observed for varnish samples that had undergone accelerated ageing using glacial acetic acid vapour.
- For B72, DSC, DMA, ATR/FTIR and SIMS measurements, and AFM, showed a difference between samples exposed inside and outside of mc-frames in a number of the end users locations.
- For MS2A, DSC and ATR/FTIR measurements showed differences between samples of MS2A with Tinuvin, and between MS2A and MS2A with Tinuvin, exposed inside and outside of a showcase (Uffizi gallery)
- MALDI_MS showed measurable differences between samples of resin mastic and dammar varnish exposed inside and outside of mc-frames in two locations.

Effect Dosimeters for Museum Environments

The NILU EWO-G dosimeter

The Birkbeck PQC dosimeter



The Fraunhofer Glass dosimeter

The SIT-Artyd microclimate frames

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*PROPAINT Consortium

Varnish treatment

(Image courtesy of www.gainsboroughproducts.com)

Norwegian Institute for Air Research · Birkbeck University of London · Tate Britain · RDAFA.SC Danish School of Conservation · Statens Museum for Kunst · SIT International Transporters · Fraunhofer Institut für Silicatforschung · National Museum in Krakow · University of Pisa