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MICRO-CHEMICAL ANALYSIS OF AIR POLLUTANTS FOR PREVENTIVE CONSERVATION RESEARCH

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Non-destructive research techniques are a powerful tool to monitor the deterioration processes affecting cultural heritage (CH) objects.

The small size of Radiello® diffusive samplers allowed measuring the concentrations of gaseous pollutants very discretely in CH buildings, even inside museum showcases. The investigated gaseous pollutants were NO_2, SO_2, O_3, HCOOH and CH_3COOH as they can form a serious threat for the CH collections. Their analyses were carried out by means of ion chromatography (IC) and UV/VIS spectrophotometry.

Particulate pollutants were collected with the use of a Berner cascade impactor on different substrates (Ag and Si) for size segregated single particles and a Plexiglass® filterholder unit on Nuclepore® membranes for bulk particles. The chemical composition and size characterization of atmospheric particulate pollutants nowadays can be obtained by computer-controlled electron probe microanalysis (CC-EPMA) at the single particle level and energy-dispersive X-ray fluorescence (EDXRF) for bulk analysis.

Particulate and gaseous pollutants have been collected in European churches and museums in order to achieve an integrated view of the environment and the possible threatening factors for the deterioration of works of art. Samples were taken indoors, inside showcases and outdoors of the museums and churches.

EDXRF results showed an accumulation of particulate pollutants in some of the monuments due to the visitors and activities taking place in the indoor environment.

From the obtained results for the gaseous pollutants it can be clearly seen that outdoor generated pollutants as NO_2, SO_2 and O_3 had lower concentrations indoors than in the outdoor air. However, acetic and formic acid had higher concentrations inside museum showcases and galleries compared to outdoors as they are mainly generated from indoor sources.