

## **ATMOSPHERIC PARTICLES AND PREVENTIVE CONSERVATION**

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Preventive conservation implies, i.a., the characterization of the atmospheric environment around monuments or cultural heritage (CH) items, with the intention to improve the conditions and to contribute to the preservation of CH items. While earlier, much interest was on e.g. sulphur dioxide and its effect on buildings, the focus has now shifted to the indoor environment and to atmospheric particles in, e.g., museums.

Analytical chemistry does play a key role in the chemical characterisation of the environment and it appears that X-ray spectrometry (XRS), in its many forms, is one of the most relevant analysis techniques, as it is in CH research in general. We have, over the last decade, intensively used various forms of XRS, together with ion chromatography, micro Raman analysis, on-line soot determinations, etc., to identify particle types and their sources, while also gaseous indoor pollutants were assessed. In each case, both bulk aerosols and individual aerosol particles were studied. For microanalysis of single particles, we investigated a dozen techniques, but for wide, real-life applications, automated electron probe x-ray microanalysis was most rewarding.

We have first studied atmospheric aerosols in and around e.g. the Correr Museum in Venice, the Art History Museum in Vienna, the Royal Museum of Fine Arts in Antwerp, the Sainsbury Center for Visual Arts in Norwich and the caves with prehistoric rock paintings in Altamira. Very recently, measurements were done in the Metropolitan Museum of Art in New York and the Wawel Castle in Cracow, in Italian and Polish mountain churches, in a number of museums in Belgium, and in cathedrals with medieval stained glass windows. E.g. in the Correr museum, it appeared that the particles that were most threatening for the Bellini paintings were released by the deteriorating plaster renderings, and could be avoided by plastifying the museum walls, while in the Wawel Castle, outdoor pollution particles, like fine soot from diesel traffic and street deicing salts, brought in by visitors, were found to be most worrisome.

Urgent questions that are far from having been solved at this moment pertain to the deposition processes from the atmosphere to the CH items, the critical surface interactions that take place on the CH items, and the establishment of suitable particle concentration standards.