



Smithsonian Center for Materials Research and Education

Topics in Conservation Science

Lecture

Extra, Extra! Extra, Extra! Extra, Extra!

Assessing air Pollution in European Museums and Cathedrals



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In the framework of several EU projects on cultural heritage preservation, we have recently carried out studies in various museums and churches throughout Europe, to examine the effects of indoor and outdoor air pollution. In each case, gases, bulk aerosols and individual aerosol particles were studied. For microanalysis of single particles, we have investigated a dozen techniques in the past decades, but for wide, real-life applications, automated electron probe x-ray microanalysis has been the most rewarding. Different options for handling the large amounts of data generated by this technique, and for automated classification of particle types, have been examined.

Our recent methodological work includes the elemental speciation and low-Z element analysis using Monte Carlo quantification for thin-window Si(Li) detectors, analyses at liquid-nitrogen temperatures, and surface layer analyses for microscopic particles. Also, micro-Raman spectrometry was invoked for single particle analysis. Gaseous pollutants were analyzed by using passive gas diffusion monitors, bulk aerosols by X-ray fluorescence and ion chromatography and organic compounds by GC-MS; air movement and air leak measurements were based on releasing SF₆.

Studies include atmospheric aerosols in and around the Correr Museum in Venice, the Art History Museum in Vienna, the Royal Museum of Fine Arts in Antwerp and the Sainsbury Center for Visual Arts in Norwich. Another study concerned the possible accumulation of air pollutants in the interspace between the original medieval stained glass windows and the recently installed protective glazings, in majestic cathedrals and churches in Cologne, Paris and Troyes.

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