

Book of Abstracts



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ATMOSPHERIC POLLUTION AS A CAUSE OF DEGRADATION OF STONE MATERIALS USED IN CULTURAL HERITAGE: POTENTIALITIES OF SPECTROMETRIC ANALYSIS

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ABSTRACT

As known, the deposition of atmospheric pollutants on stones is one of the most important causes of deterioration which affects the facades of buildings and monuments.

Black crusts represent a typical degradation form of carbonate stones (such as limestone and marble), which is due to the interaction between substrate and atmosphere.

In this work, an integrated analytical approach was used to study black crusts covering the stone surface of some monuments belonging to the European historical heritage: the Cathedral of St. Rombouts in Mechelen (Belgium), the Corner Palace in Venice (Italy), and the Church of St. Eustache in Paris (France).

The analytical methods used are polarising optical microscopy (POM), scanning electron microscopy coupled with energy-dispersive X-ray spectrometry (SEM-EDS), infrared spectroscopic techniques (FT-IR), and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS).

The research done highlights how the application of LA-ICP-MS to the study of black crusts on monuments allows not only to determine the concentration of a high number of trace and rare earth elements, but also to evaluate the degree of contamination according to the variable climatic conditions and the environmental pollution which characterize the cities taken into account.

In this specific study case, through the utilisation of LA-ICP-MS, we aim at a dual purpose: (a) evaluating the degree of contamination of the examined stones (by determining the variability of trace element concentrations from unaltered substrate to black crust), according to climatic conditions, atmospheric pollution and exposure of buildings to wash-out; b) defining the outdoor conditions of the examined monuments through a geochemical characterisation.