

THE POTENTIAL MECHANISM OF BLACK CRUST DEVELOPMENT ON THE HISTORIC BUILDINGS IN CAIRO AND VENICE

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The development of black crusts on natural stones of historic buildings is mainly related to the surrounded polluted atmosphere. The blackening of surfaces is caused, in fact, by the accumulation of air pollutants produced by human activity, especially carbon particles originating from the incomplete combustion of fossil fuel. Investigations of the chemical composition of such layers in the monuments can be the basis for planning suitable strategies for the protection and conservation of the built cultural heritage. Cairo (Egypt) and Venice (Italy) are two cities with a large amount of cultural heritage buildings; moreover, they suffer high level of air pollution. Black crust with the hosted stones from different sites in Historic Cairo, as well as samples of different archaeological sites in Venice city, were collected and analyzed by using several techniques: polarizing optical microscopy (OM), scanning electron microscopy coupled with energy-dispersive X-ray spectrometry (SEM-EDS), infrared spectroscopic techniques (FT-IR) and laser ablation inductively coupled mass spectrometry (LA-ICP-MS).

The characterization of such samples provided information on the chemical composition of black crusts, the state of conservation of the substrates and the crust-stone interactions. The chemical study highlighted a different pattern of elements within the two cities.

Regarding the black crusts of Cairo, results suggest that the air pollution in Cairo is mainly related to vehicular traffic. Indeed, in the city there is high vehicular traffic almost 24 h a day and the direct impact of vehicle emissions is particularly severe.

Samples from the Venice show different composition in terms of heavy metals with respect to Cairo that can be explained with the emission from several industries sited in the near industrial center of Porto Marghera and Island of Murano. Moreover, the fuels used for marine transportation, which is abundant into the area, have a slight different fingerprinting in terms of metals with respect to the vehicles.

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