



The sandstone's chromatic alteration of the florentine cultural heritage

S. Vettori (1), E. Pecchioni (2), E. Cantisani (3), M. Ricci (1), F. Fratini (3), and C.A. Garzonio (1)

(1) Department of Construction and Restoration, University of Florence, Italy, (2) Earth Science Department, University of Florence, Italy, (3) CNR ICVBC, Institute for Conservation and Promotion of Cultural Heritage, Florence, Italy

Pietra Serena is one of the materials more used in Florentine architecture. It is a sandstone that outcrops in the hills north of the city in the municipality of Fiesole and it has been employed mainly for ornamental purposes. This litotype belongs to the Macigno Formation (Oligocene Upper- Miocene Lower) which consists of beds of turbiditic sandstones separated by pelitic levels which are the finest components of each single turbidity layer. Petrographically, Pietra Serena can be defined as a medium-coarse-grained greywacke made of quartz, feldspars, micas, fragments of metamorphic and magmatic rocks. The clayey matrix is quite abundant, mainly composed by illite, kaolinite and chlorite-vermiculite (present only in some quarries).

It is well known that the processes of decay of the sandstones are related to the type of matrix, the amount of cement, the kind of clay minerals and to the pore size distribution, which lead to water infiltrations, swelling of the clay minerals, separation of the clayey matrix, with resulting exfoliation and peeling of the stone artefacts.

Pietra Serena has a bluish-grey colour in fresh cut, but many times it is easily oxidized acquiring an ochraceous-reddish brown colour on buildings. Such changes in colour, appear to be due in part to the oxidation of iron, proceeding very quickly from the surface to the inside, though the cohesion is not affected. It is possible to hypothesize that the chromatic changes not necessarily involve a progressive state of alteration of the artefact, but they may often to represent a natural patina acquired with the time. Nevertheless it is necessary to remember that the oxidized layer and its hardness could also be the result of treatments performed in the past.

In Florence, several monuments and buildings are affected by such phenomenon, in particular it is possible to note an intense and diffuse reddish colouring on the Pietra Serena utilized for columns and for façade's decorations. In this work, both mineralogical-chemical and petrographical analyses on several Florentine artworks, and experimental tests on samples of Pietra Serena coming from different quarries in the surroundings of Florence were carried out. This procedure become relevant in order to verify the more probable causes involved in this frequent chromatic alteration.