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NON-DESTRUCTIVE PHYSICAL MEASUREMENTS FOR THE STUDY OF MUSEUM ENVIRONMENTS AND CHARACTERIZATION OF ARCHAEOLOGICAL ARTIFACTS

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Abstract
The techniques that allow to characterize an artefacts are numerous and the choice of a particular methodology is imposed by problems relating to the object under consideration and the questions to which we want to answer.
It is in this context that the present work is placed. This has involved the characterization of artefacts from several archaeological sites, both of land and sea, of the island of Pantelleria (Sicily). Moreover, in view of place in a museum environment the artefacts characterized, microclimate investigations were carried out on the Medieval Castle of the island, the site identified for the construction of a temporary exhibition of these objects.

The existence on Pantelleria of this important monument, and the presence of several archaeological sites on the territory, gave us the opportunity, during the stage for the drafting of the work thesis of the master STOre in "***Storia e tecnologie dell'oreficeria***" (University of Palermo), to characterize some of the valuable artifacts discovered in various excavations sites.
The development of the work has been focused primarily on the assessment of the thermo hygrometric conditions of the Castle (*the container*) in order to assess the physical agents that characterize the microclimatic environment.

Fig 1. Medieval Castle, Pantelleria (Sicily).

These analyzes concerned:

- Detection of thermal anomalies on the Castle's walls by thermo camera FLIR T250,
- Measurement of the water content on the wall surfaces by contact probe Text 606-2,
- Instantaneous and continuous detection of temperature and relative humidity values by probes U12-012 Hobo Data Logger Temp / Rh / Lux / Ext.

The data thus obtained were processed and compared with the UNI NORMAL 10829:1999. The average values of temperature (°C), relative humidity (RH%) and illuminance (lux) recorded differ from the ranges required by the regulations (19-24 °C and 40-60%) for optimal storage of various archaeological artefacts considered for the present study [1].

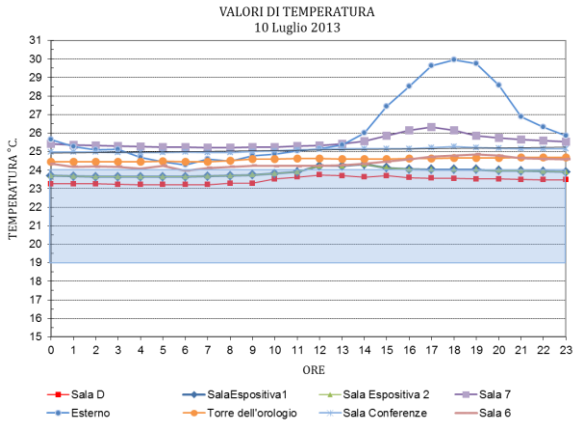


Fig 2. Average hourly temperature values recorded for all environments investigated, acquired during a day in the period monitored, and their comparison with the average values obtained in outer.

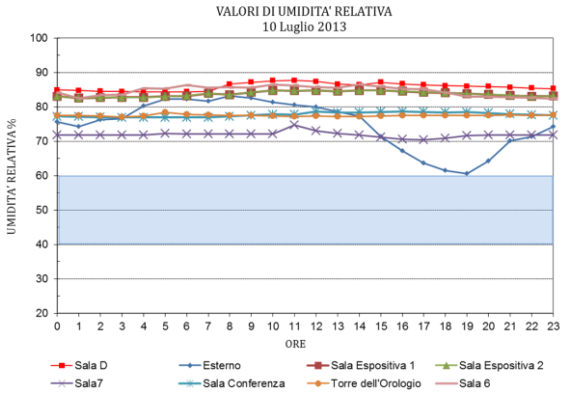


Fig 3. Average hourly values of relative humidity recorded for all environments investigated, acquired during a day in the period monitored, and their comparison with the average values obtained in outer.

The information obtained by the monitoring carried out during the summer for a period of two weeks, have allowed us to verify that although there is a good inertia of the building to the daily changes in temperature and humidity, the microclimatic condition is not optimal for storage/exposition of archaeological artefacts. The acquired data showed that, for all the

monitored period, the average values of temperature and relative humidity calculated is confined outside of the ranges recommended.

Having analyzed the container, the archaeological artefacts discovered in the various excavation sites of the island were characterized.

Fig 4. Some of the precious objects characterized coming from several archaeological sites on the island of Pantelleria.

The objects subjected to XRF measurements [2-5] are from sites: Mursia, Scauri and Cala Tramontana. The measures have allow, in some cases, to respond to the hypothesis of use of the artefacts (Fig 4).

The apparatus used for the characterization of the elemental chemical composition of the surface portions constituents the artefacts is an XRF spectrometer (Bruker AXS, mod. ARTAX 400). The detector consists of a SDD (Silicon Drift Detector) with a resolution <115 eV (@ 5.9 keV). The target of the X-ray generator is in Mo and is equipped with a system of punctual collimation.

In the case of the object catalogued as " *stone matrix for fusion of bronze* ", the XRF analysis, on different parts of the object, indicate that there are areas rich in tin (Sn), confirming the hypothesis of the archaeologists on its use as a fusion matrix.

a)

b)

c)

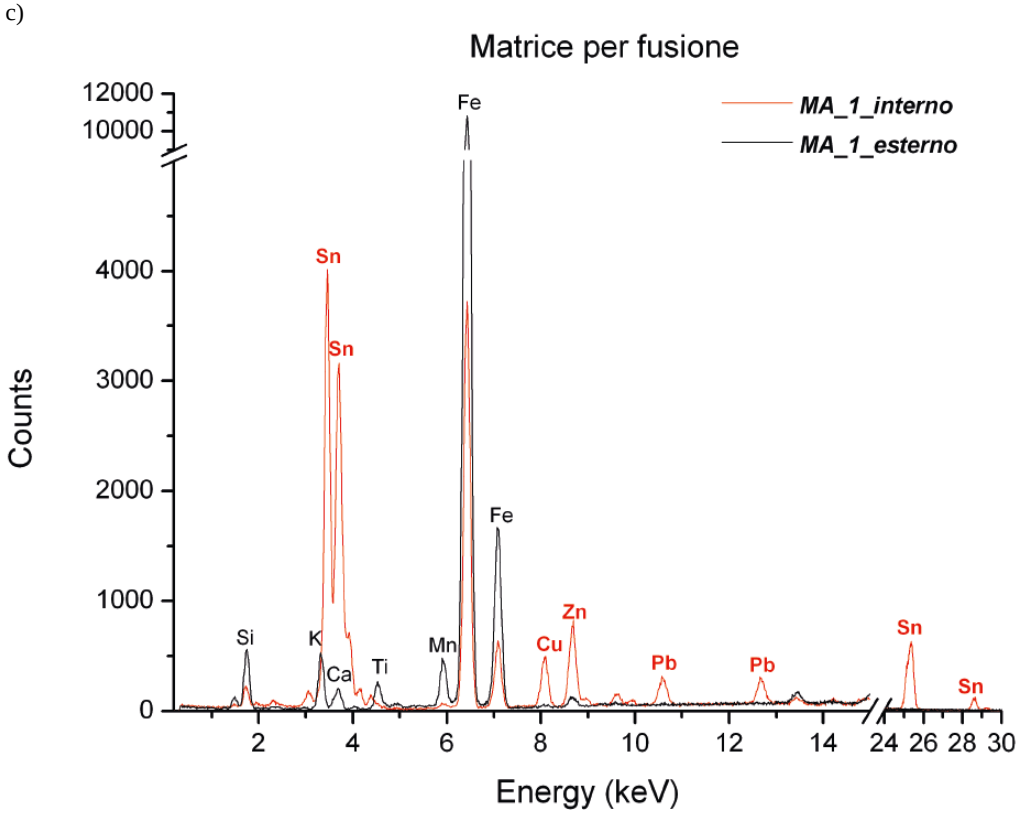
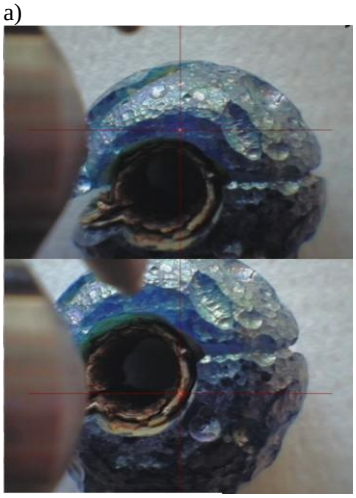


Fig 5. a) the inner side of the bronze fusion matrix and b) the external side of the bronze fusion matrix c) XRF spectrum of the specimen MA_1

The case of the find for years known as "*bead of cobalt coated with gold foil*", is emblematic. By XRF analysis (Fig. 6), the bead is in fact constituted by a silicate matrix (silicate of calcium and copper) in which the cobalt is absent, and where the hole is covered with an iron and copper lamina.

a)



b)

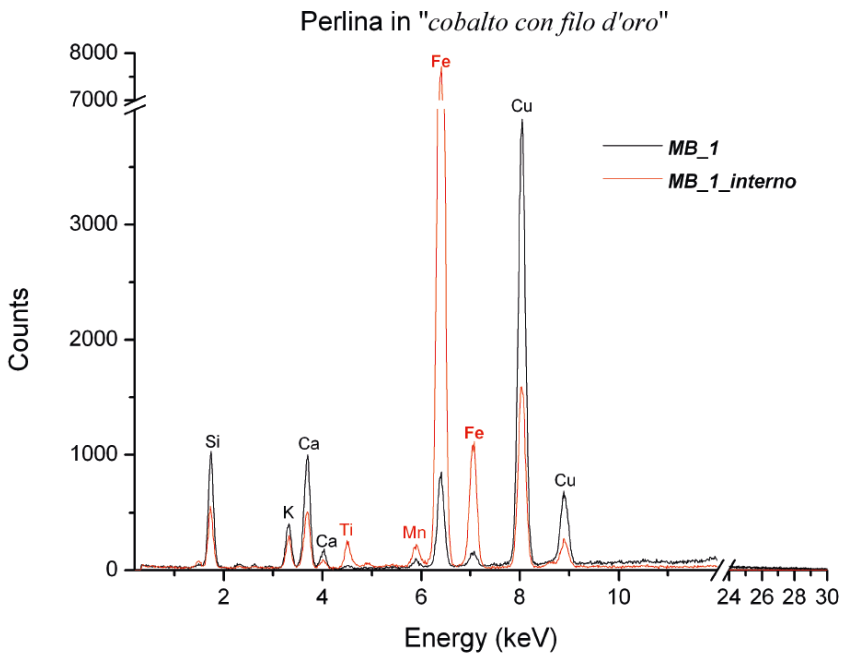


Fig 6. a) sample MB_1, cobalt bead b) XRF spectrum of the sample MB_1

The archaeometric approach has allowed then to answer some questions posed by archaeologists regarding the intended use of some artefacts found at the sites of the island.

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