

Macro-XRF scanner

Study of Gold-Silver alloys by the Moche in the Tomb of the Lady of Cao

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Most of the Cultural Heritage artifacts have a multilayered structure, not only all types of paintings, which are composed at least by two layers, but also gilded or silvered metals, tumbagas, bronzes with patina, corroded silver and so on.

EDXRF is the only suitable technique available for in situ non invasive analyses that is intrinsically three dimensional (due to the penetration capability of X Ray photons).

Most of the object found in the tomb of the lady of Cao (300-400 A.D.) are sufficiently small to be analyzed by new compact and light EDXRF scanning system for the study of small metal objects and for painting modeling testing.

Recent measurements using portable energy-dispersive X-ray fluorescence and a light and small Macro-XRF scanner, carried out on 41 nose decorations from the tomb of the lady of Cao (300-400 A.D.) demonstrated that, at least in several, but maybe in many more cases, mercury amalgamation was employed by the Moche for joining together gold and silver sheets. In fact in a few cases, the presence of mercury was clearly detected in the Ag/Au interface, but its absence is not a negative demonstration, because generally mercury fully evaporates during heating of the soldered objects.

As a matter of fact, mercury occurs as a native metal and as cinnabar (mercury sulfide = HgS). This last was widely employed in the ancient world as a red pigment.

Cinnabar mining dates to 1000 B.C. in Mexico, and cinnabar occurrences are known in Peru, particularly in Huancavelica. In ancient Peru cinnabar was used as a decoration on gold masks, as a pigment on murals, as a cosmetic and for funeral preparation.

The use of mercury for amalgamation in the New World is an open question. However, systematic measurements and evidence of mercury traces in gold objects from Peru and Colombia enforced the hypothesis that the use of mercury was known in the ancient Andes.

In this presentation we show the experimental set-up and the results of the Macro-XRF scanner measurements and digital X ray Radiography.