

DETERMINATION OF GOLD LEAF THICKNESS OF PRE-COLOMBIAN GILDED COPPER OBJECTS BY ENERGY-DISPERSIVE X-RAY FLUORESCENCE SPECTRA

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During March 2007, a large number of pre-colombian gold objects from the Museum “Tumbas Reales de Sipán were analyzed with a portable equipment for Energy-Dispersive X-Ray Fluorescence (EDXRF)-analysis. This equipment is characterized by a small size Ag-anode X-ray Tube, working at 30 kV and 100 μ A maximum voltage and current.

The majority of the Sipán objects revealed to be gilded copper, and an important question was, therefore, to determine the thickness of the gold-plating from the EDXRF-spectra.

Following methods were tested to this aim and verified:

- the ratio ($K\alpha/K\beta$) for Cu depends on the gold leaf thickness;
- the ratio ($Cu-K\alpha/Au-L\alpha$) depends on the gold leaf thickness;
- the ratio ($Au-L\alpha/Au-L\beta$) depends on the gold leaf thickness.

The first ratio, ($Cu-K\alpha/K\beta$) only depends on the Au-leaf thickness, and not on the geometry or other factors. However, the Cu- $K\beta$ line has not always a good statistics or is sufficiently “clean”; the second ratio ($Cu-K\alpha/Au-L\alpha$) is statistically relevant, but has not a general meaning, depending on the geometrical arrangement and on the X-ray tube output and filtering; the third ratio

($Au-L\alpha/Au-L\beta$) is also statistically relevant, but it’s only weakly depending on the gold leaf thickness.

Using the three previously cited methods (or only one or two of them) the thickness of the copper gilded objects turned out to be relatively constant, with a mean value of about 3 μ m.