



“STUDY OF PIGMENTS IN ETRUSCAN TOMBS IN SORANO OF ITALY”

POSTER SESSION



UNIVERSITÀ
DEGLI STUDI
FIRENZE

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Abstract

This research work presents the study of pigments in the Necropolis of San Rocco in Sorano (area of Sovana), Italy. The necropolis is noteworthy not so much for its enormous size, but for the many different types of tombs it contains. The research was carried out in the Etruscan monolithic tombs, dating from 3rd - 2nd century B.C. The most important Etruscan tombs in Sorano which were studied are the Tomb “Hildebrand” and the Tomb of the “Winged Demons”.

The method which was used to identify pigments [1] is the portable non-destructive technique: pXRF. This technique has been chosen because it is impossible for part of the frescoes to be transferred to the laboratory and they cannot be sampled, which is a destructive method. The operating principle of XRF is the X-ray fluorescence spectroscopy and it is used for both qualitative and quantitative elemental analysis of solids, gases and liquids samples. The results of the measurements in the Etruscan tombs in Sorano showed that they consist of the following pigments: yellow ochre, red ochre, calcite and carbon black. Corresponding pigments, according to the literature, have been used in the necropolis of Cerveteri [2] and the tomb “Dell ‘Orco” in the necropolis of Tarquinia [3].

1. Introduction

“Hildebrand Tomb”

On a high podium, the three sides of the funeral complex, carved directly to the tuff rock, have a monumental facade that dominates the entire valley and is accessible via two lateral stairways. Dating from the III-II century B.C., the “Hildebrand” Tomb is the most famous monument in the necropolis of Sovana and among the most important in the whole of Etruria. The columns supported a relief frieze decorated with a series of griffins, with a female figure lifting them from the tail, and alternating with rosettes. The only remaining column, in the capital of which anthropomorphic figures are recognized, supports a remnant of lacunar ceilings. Inside, at the bottom, you can see the remains of the painted plaster [4].

“Winged demons” tomb

The Tomb of the “Winged Demons”, representing the theme of the deceased's journey to the Hereafter. Based on the architectural typology and the character of the sculptures, the tomb can be dated to the second half of the third century B.C. and represents the most significant example of a shrine tomb with a reclining figure, carved to the tuff rock. Inside the tomb, we can see a deep central compartment with a statue carved also in the tuff. The statue of a deceased half-lying on the *Kline*, holding a cup in its hand and retaining part of the stucco coating and the original colours, which was red for the uncovered parts and white for the tunic and for the cloak [5].



Fig 1. “Hildebrand” Tomb



Fig 2. “Winged Demons” Tomb

2. Experimental work

The measurements of pigments in the tombs of the Etruscans were conducted using the pXRF Spectroscopic technique. Spectroscopic techniques are used in order to answer various questions concerning the structure, the pigments identification [6], and the qualitative and quantitative analysis of the elements of various compounds.

The spectroscopy of the pigments was carried out on the spot on the murals and the statue, in the tombs of the Etruscans without the need for sampling and transport to the laboratory. The instrument used for the measurements was the Thermo Fisher Scientific portable XRF Niton XL5 spectrometer.

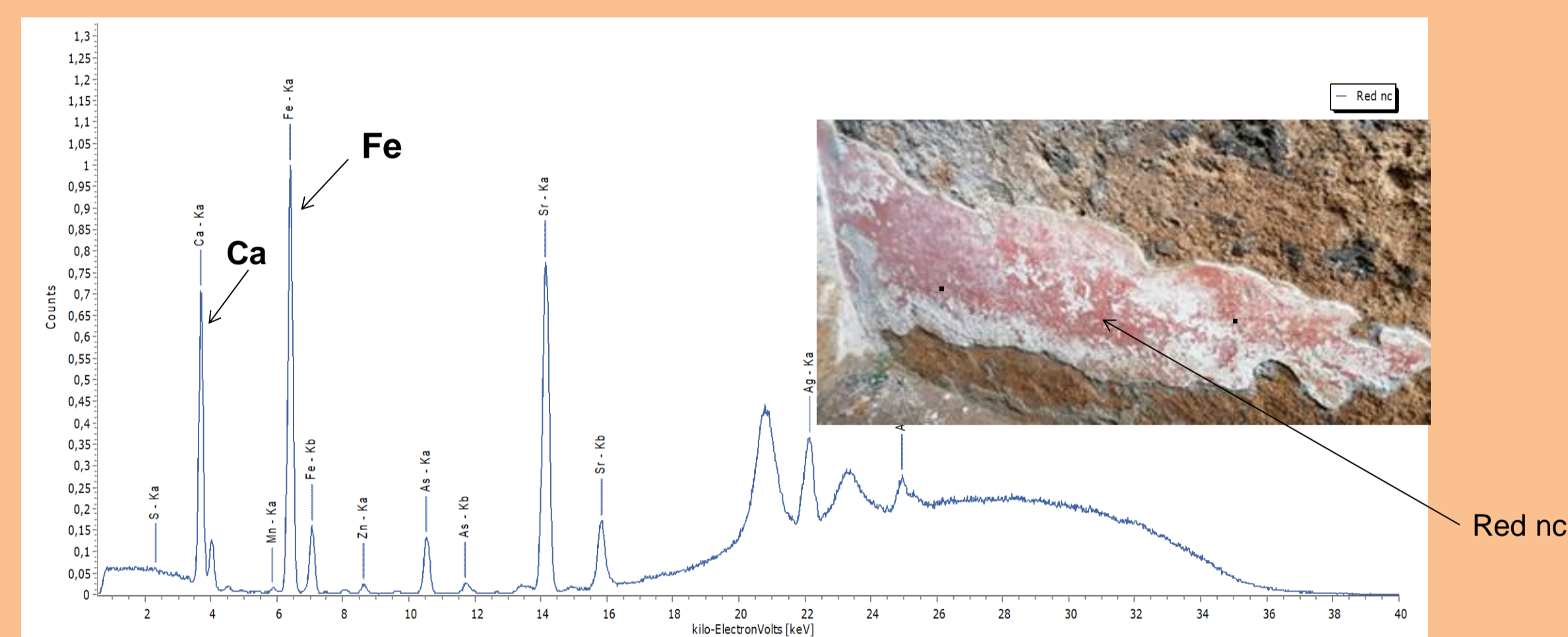
FULL SPECIFICATIONS

Analytical Range	Mg-U
X-Ray Source Type	X-Ray Tube: Ag anode (6-50kV, 0-500uA, 5W max, Dynamically adjustable current for optional sensitivity on every analysis
Spot Size	Standard: 8mm collimation Optional:3mm small-spot collimation
Operating Environment	Temperature: 0°C to 50°C , Humidity: 10% -90% relative humidity noncondensing
Software	Support Software: NitonConnect PC software

In total, 18 measurements were carried out with the XRF spectroscopic technique and the colors studied were : red, dark red, orange, yellow, black and white.

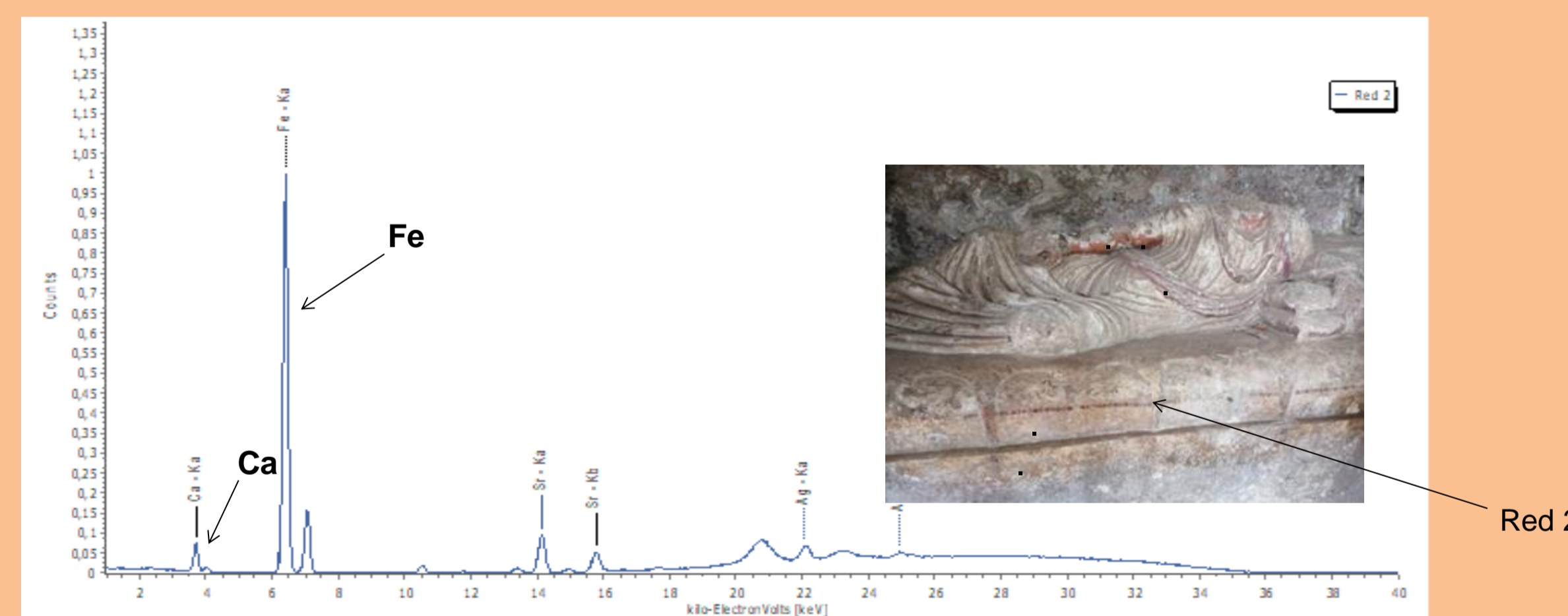
3. XRF characterization

“Hildebrand” Tomb



Colour	Elements	Traces	Pigments
Red	Fe, Ca	K, Sr, S, Ti, Mn, As	Red ochre
White	Ca	S, Fe, Sr, Mn	Calcite or Gypsum

“Winged Demons” Tomb



Colour	Elements	Traces	Pigments
Red	Fe, Ca	S, K, Ti, Mn, Sr	Red ochre
Dark Red	Fe, Ca	S, K, Ti, Sr, Mn	Red ochre, Carbon black
Orange	Ca, Fe	K, S, Ti, Mn, Sr	Red ochre, Calcite
Black	Fe, Ca, K	S, Ti, Zn, Mn, Sr	Carbon black
Yellow	Ca, Fe,	As, K, Mn	Yellow ochre
White	Ca	S, K, Fe, Ti, Mn, Sr	Calcite or Gypsum

4. Conclusions

The results of this research indicated that: red consists of red ochre, black is made of carbon black, yellow is made of yellow ochre, and white is made of calcite. In addition, dark red consists of red ochre and carbon black, and orange is made up of red ochre and calcite.

Traces of the elements As, Mn, Ti, Zn in yellow and red pigments may indicate impurities in the ores and in principle [7]. Mn, Fe, Sr, in white pigments are related to the composition of the painting substrate[3].

The results of XRF pigment measurements in the Etruscan tombs in Sorano, Italy, are consistent with the results of other studies in relation to the detection of pigments for other Etruscan tombs. Especially, Bordignon (2007) analyzed the pigments from Necropolis in Cerveteri and found red ochre, yellow ochre, carbon black [2]. Also, Sodo (2008) studied the pigments in the Tomb “Dell ‘Orco” in the necropolis of Tarquinia and found red ochre, cinnabar, yellow ochre, calcite, and carbon black [3].

Acknowledgements

We would like to thank the town hall of Sovana for providing help with conducting the measurements.

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