

# EOASIA'13

15<sup>th</sup> European Conference  
on Applications of Surface  
and Interface Analysis

13 – 18  
October 2013  
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Cagliari,  
Sardinia (Italy)

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**15th European Conference on Applications of Surface and Interface Analysis**

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**Conference Venue**

**Forte Village, Pula  
Cagliari, Sardinia, Italy**

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## Microstructural features of human bones and funerary practices in Mount Sirai (Sardinia)

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### 1. Introduction

In attempt to set up a useful methodology for the investigation of burned human remains in archaeological, anthropological and forensic fields, we decided to compare the most common protocols for the study of bone bioapatites (Fourier Transform Infrared spectroscopy, FT-IR, and X-ray Diffraction, XRD) to those deriving from the application of X-ray scattering techniques using synchrotron radiation. By these techniques we expect to take advantage of the wider and more dynamic qualities of such a valuable tool in order to examine a higher number of samples in a very short time compared to conventional techniques, meanwhile assessing its applicability in the archaeological field.

### 2. Results

The Phoenician-Punic settlement of Mount Sirai in Southern Sardinia offers the opportunity to examine funeral remains of two kinds: inhumation and incineration [1]. The powder X-ray diffraction technique, augmented with IR spectra, allowed us to verify whether the bodies had been cremated (according to phoenician mode) or inhumated (Carthago influence) (Fig. 1). This was ascertained by using the Rietveld approach for fully interpreting the diffraction patterns [2].

Exposition of human bodies to high temperatures results in typical patterns for the IR bands of the bioapatite phosphate groups (Fig. 2) and in sharper peaks for both the IR spectra [3] and XRD pattern, even in a multiphase matrix (Fig. 3). This was evidenced in a series of experiments carried out on Mount Sirai bone specimens. Two of these samples (one inhumated and one incinerated) were also analyzed through synchrotron XRD giving results in full agreement with those obtained with the "traditional" tools. These findings point out the possibility of extending the scope of our research to a more precise determination of the degree of lattice disorder and average size of the crystallites by using synchrotron light. The possibility of a quantitative analysis is a further opportunity for special specimens.

### References

- [1] G. Piga, M. Guirguis, P. Bartoloni, A. Malgosa, S. Enzo, *Int. J. Osteoarchaeol.* 20: 144–157 (2010);

- [2] G. Piga, A. Malgosa, T. J. U. Thompson, S. Enzo, *Journal of Archaeological Science*, 35 2171–2178(2008).
- [3] G. Piga, M. Guirguis, P. Bartoloni, A. Malgosa, S. Scognamillo, M. L. Ganadu, S. Enzo *New Trends in Archaeological Sciences*, pages 145–165, 2008, ed. NOVA Science Publishers Inc.

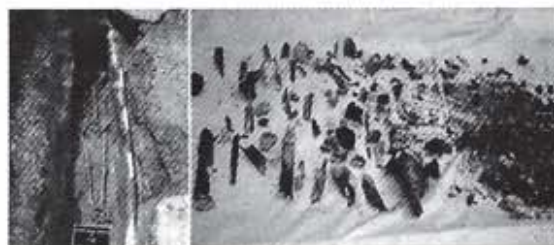


Figure 1: Inhumated and incinerated remains

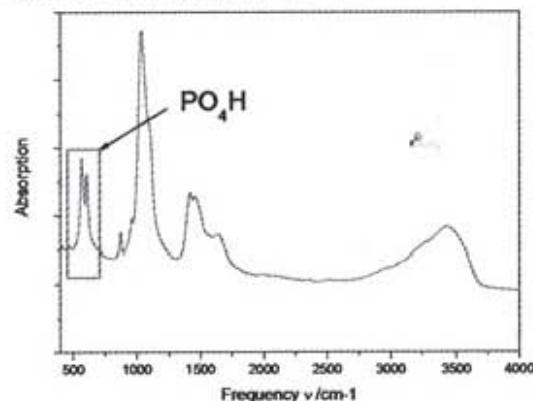


Figure 2 FT-IR spectra of human bones

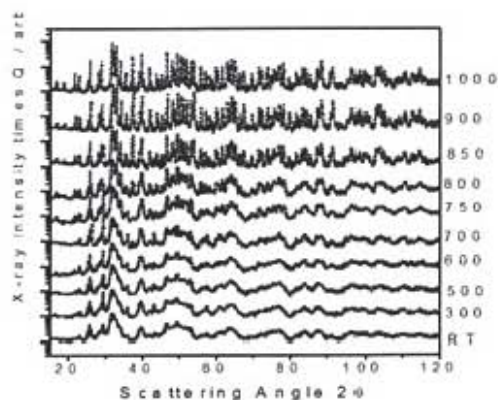


Figure 3 XRD spectra of human bones exposed to different temperatures

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Figure 1 Inhumated and incinerated remains

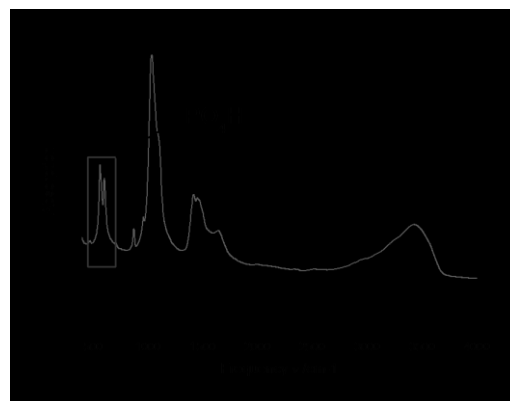


Figure 2 FT-IR spectra of human bones

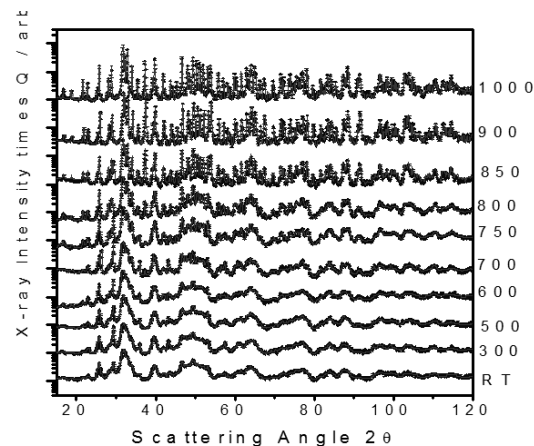


Figure 3 XRD spectra of human bones exposed to different temperatures