



Effects of Mortar Sample Preparation Approaches on X-Ray Fluorescence Spectrometry (XRF) Data

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Introduction

Mortar is a mixture of lime, cements or both mixed with water and sand. Mortars are used as a paste to bind building blocks together such as stones, concrete blocks and bricks. Non-hydraulic lime mortars from an archaeology site were analyzed via X-Ray Fluorescence Spectrometry (XRF). XRF spectrometry is a valuable tool for archaeology; it can be used for analyzing materials such as ceramics, pigments, metallic objects, stone and glass. The XRF is a non-destructive instrument that provides speed, accuracy and precision. XRF spectrometry is used to determine elements within a sample ranging from Mg to U.

Methods and Materials

- Samples were retrieved from the Coriglia, Castel Viscardo archaeology dig (Umbria, Italy)
- 8 mortar samples were collected - Loci 8, 22, 36, 149, 271, 521, 522, and 579
- Each sample was analyzed at 10 different locations (twice at each location) in three forms
 - Intact, ground, fused
- 120 seconds per analysis

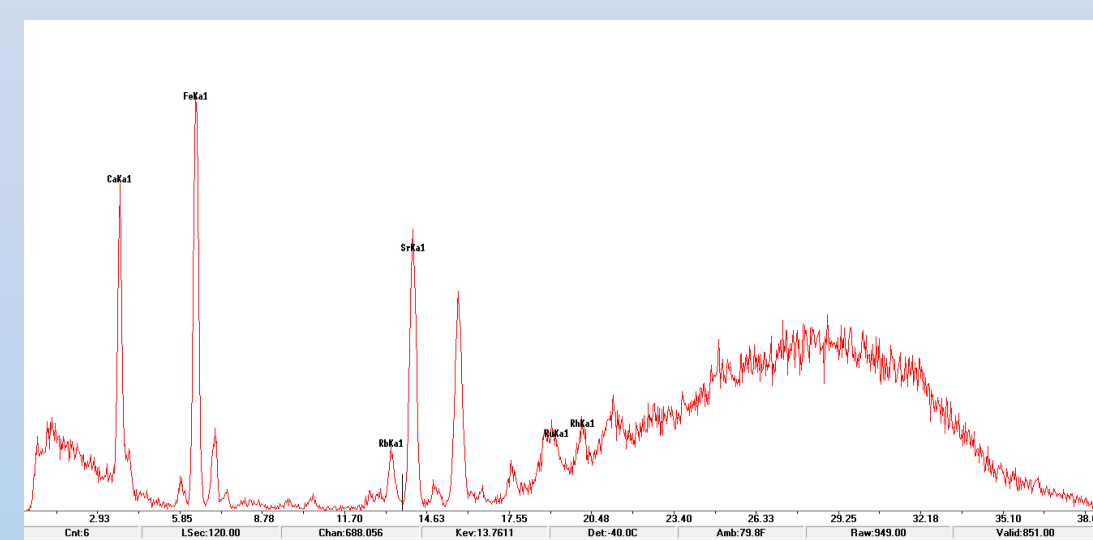


Instrumentation

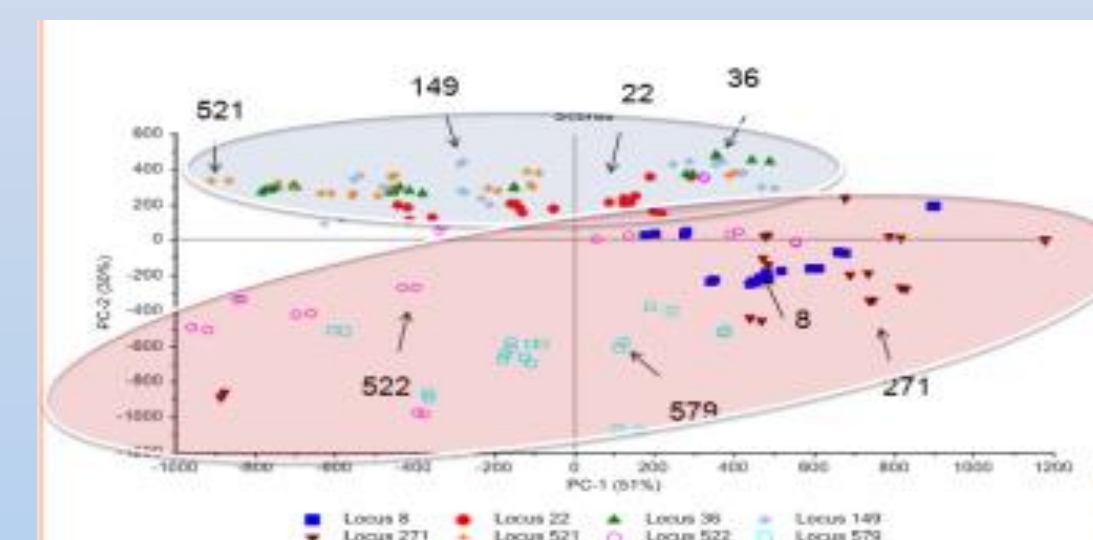
- Bruker Tracer III-V+ portable XRF
- Instrument settings: 40 keV x-ray energy and 25 μ A current

Results

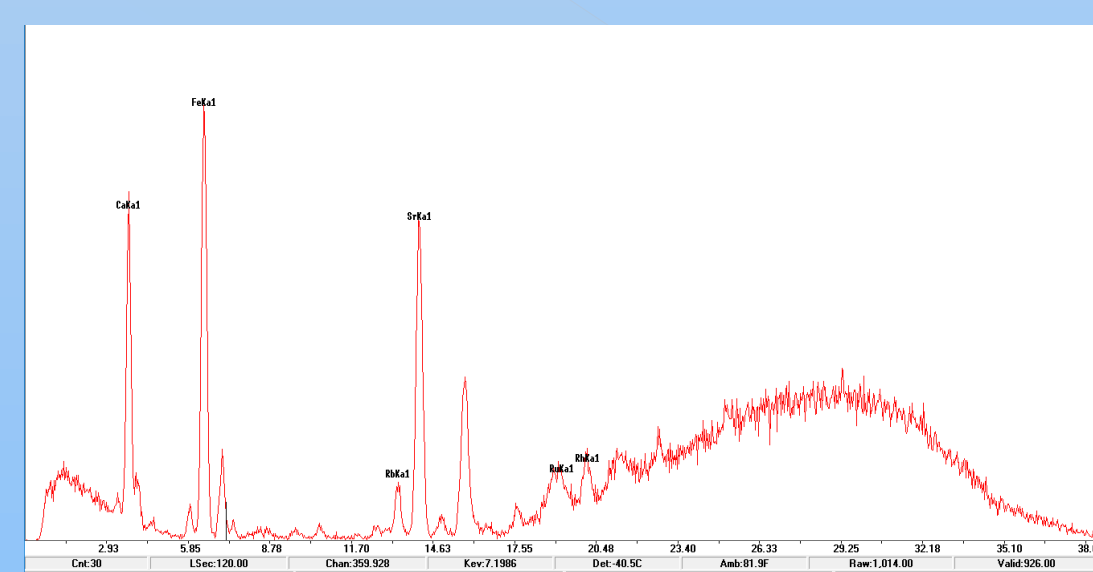
Intact Locus 8 XRF Spectrum



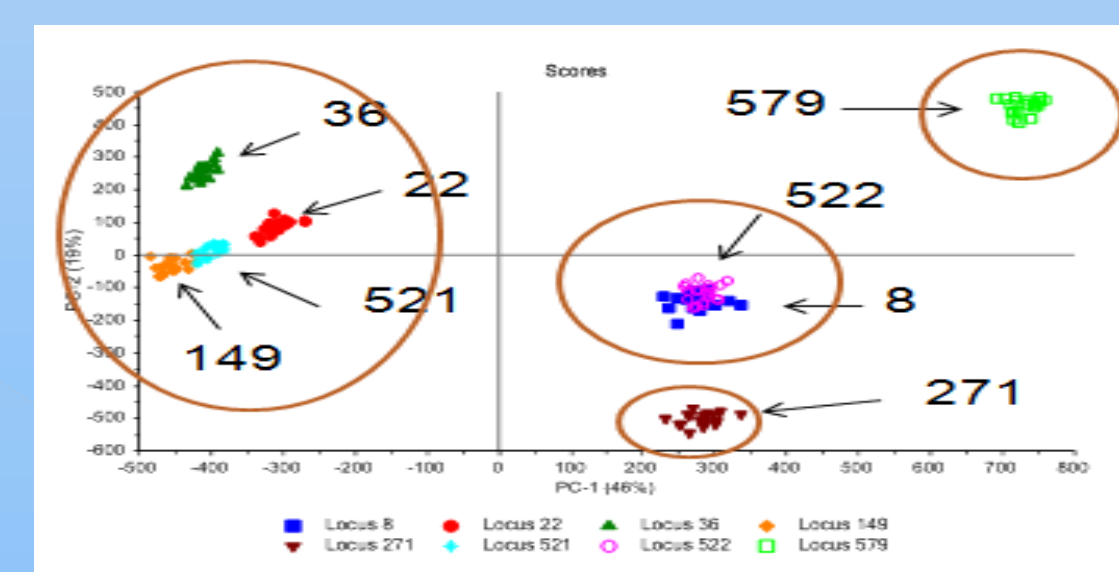
PCA of All Intact Data



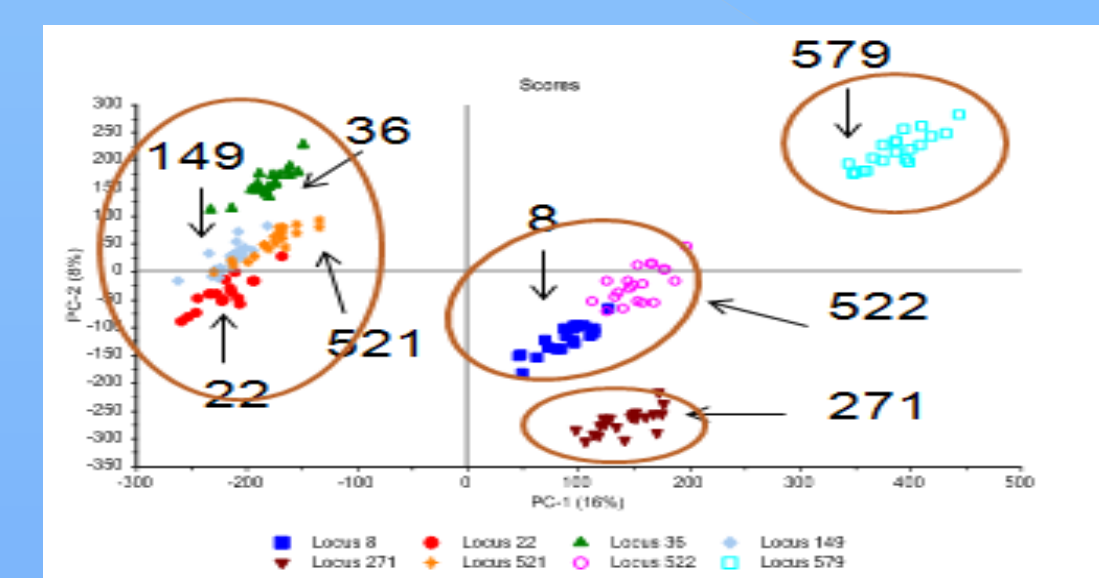
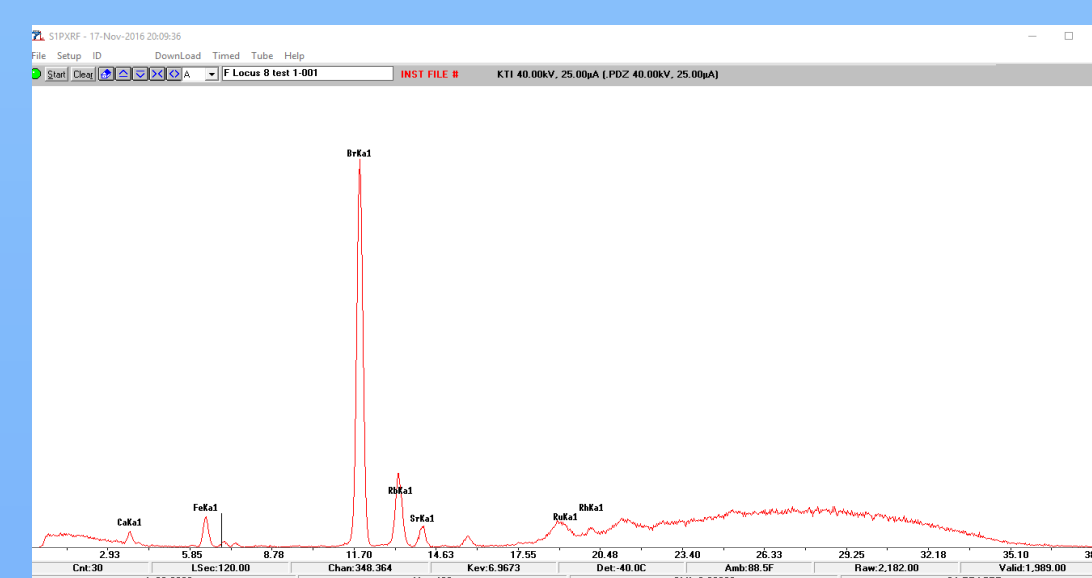
Ground Locus 8 XRF Spectrum



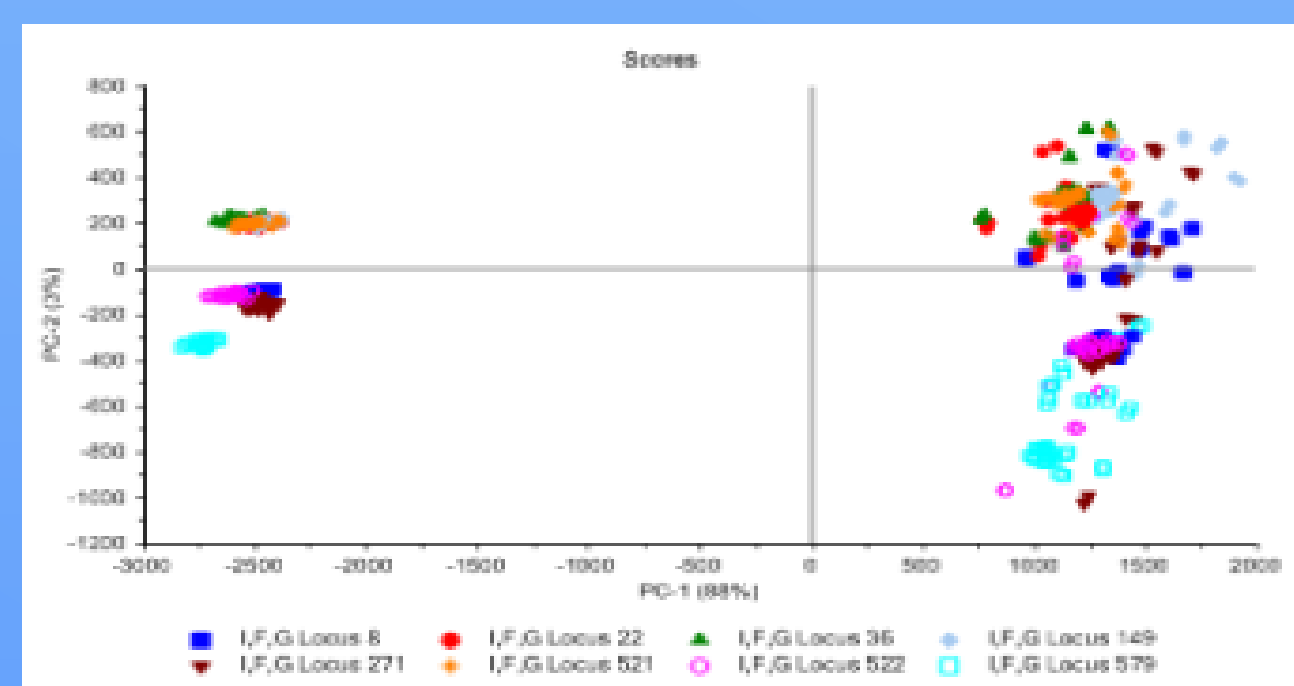
PCA of All Ground Data



Fused Locus 8 XRF Spectrum PCA of All Fused Data



PCA of All Data Together (Intact, Ground, Fused)



Conclusions

- The major goal of this research was to demonstrate that the form of the samples should not matter and should be able to draw the same conclusions.
 - This goal was accomplished
- We can therefore move forward with collecting data on site only and have greater confidence in the results
 - This is ideal as it's preferred to collect data at site non-destructively and not have to collect samples to bring back to the lab
- The study allowed for the identification of the main elements in mortars that differentiate their chemistries.
 - Calcium, Strontium, and Rubidium
 - These results agree with previous studies done on wall mortars from Coriglia

Acknowledgement

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