



Archaeological Samples: From Collection to Analysis

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Introduction

Archaeological excavations often uncover items such as pottery; the specific uses of these are unable to be determined from solely the context of the site. In order to give perspective on both the site and the individual items found, organic residues that are found within the pottery can be analyzed using mass spectrometry and colorimetric techniques. This can give insight into the possible uses of different samples. Additionally, the soil samples from the site can help to confirm the use of a specific area. Samples from two archaeological dig sites in Italy were taken, Coriglia and the Cave. The difference in these two sites were compared, and analysis of pottery and soil samples from both of these sites has been conducted.

Site and representative samples

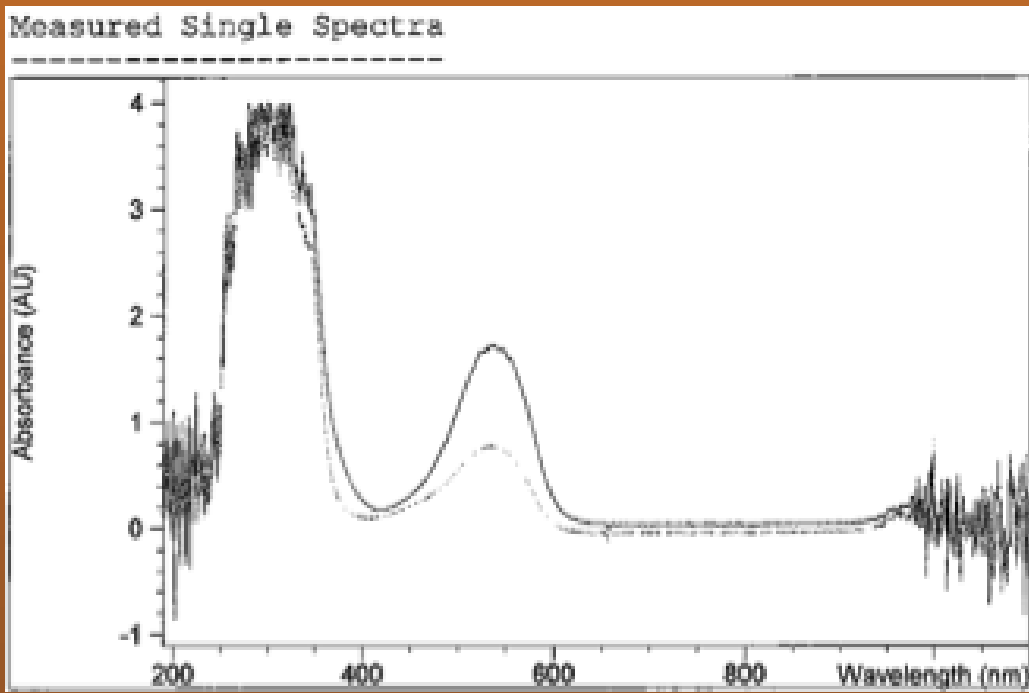


Clockwise from top left: West bulk of trench C, sample pottery, previous seasons’ pottery fragments, trench C, center: sample pottery

Results	Phosphorus	Nitrogen (Nitrate)	Nitrogen (Nitrite)
Bulk Sample (Cave)	$1.88 \times 10^{-3} \text{ M}$	$4.61 \times 10^{-6} \text{ M}$	$1.14 \times 10^{-5} \text{ M}$
Soil near Amphora (Cave, 36)	$4.25 \times 10^{-3} \text{ M}$	$1.04 \times 10^{-5} \text{ M}$	$2.57 \times 10^{-5} \text{ M}$
Bulk Sample (C, 27" W)	$1.54 \times 10^{-3} \text{ M}$	0 M	0 M
Soil near pottery (C, 536)	$1.61 \times 10^{-3} \text{ M}$	$1.06 \times 10^{-6} \text{ M}$	$3.80 \times 10^{-6} \text{ M}$
Pottery (C, 536)	$4.02 \times 10^{-3} \text{ M}$	$1.54 \times 10^{-6} \text{ M}$	$2.63 \times 10^{-6} \text{ M}$

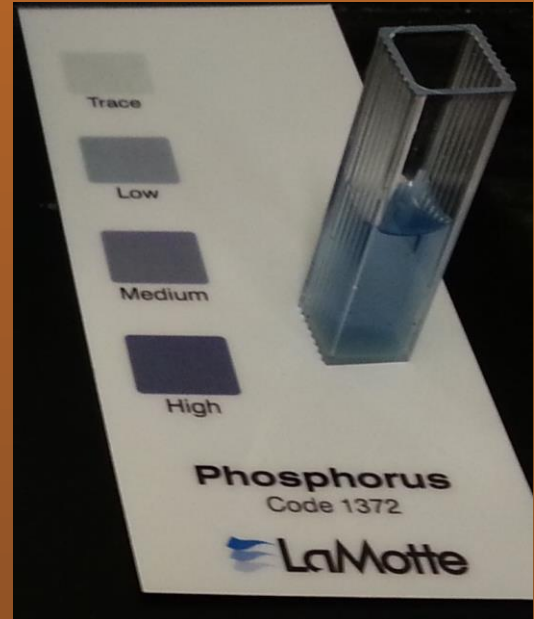
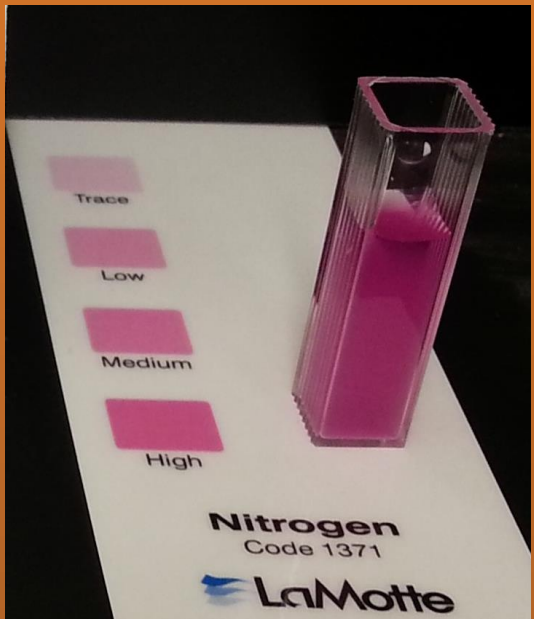
Result trends

- Concentrations of soil near pottery higher than bulk
- Concentration of pottery higher than surrounding soil
- Nitrate vs. nitrite concentrations
- Unstable color
- Inconsistent results
- Homogeneity of samples
- One test per sample



Nitrogen Spectrum

Nitrogen Test



Phosphorus Test

Project Results & Future Directions

Collection methods

- Contaminated sample collection area
- Fingerprint residue
- Collection apparatus

GC-MS

- Solvent polarity
- Method development
- QuEChER method

Organic Matter Titrations

- Ferrous-ammonium sulfate
- Potassium dichromate
- Cave – 11.13%
- Trench A – 3.16%

References

1. E.S. Chernetsova, G. E. M., I.A. Revelsky, DART mass spectrometry and its applications in chemical analysis. *Russian Chemical Reviews* **2011**, *80* (3), 235-255

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