

Archaeometric Analysis of Wall Paintings from the Sandrigo Estate (Aquileia) Characterization and analysis for the attribution to a chronological framework

Authors: Yarden J. Tsfoni (Università degli Studi di Padova), Simone Dilaria (Università degli Studi di Padova), Clelia Sbrolli (Ca' Foscari University of Venice), Daniela Cottica (Ca' Foscari University of Venice)

Background and Archaeological Context

Aquileia is an ancient Roman city in Northeastern Italy, founded in 181 BC. The focus of the study is the site of the Sandrigo Estate, located on the eastern bank of the fluvial port of Aquileia. Ongoing excavations by Ca' Foscari University of Venice in the Sandrigo Estate uncovered the remains of a multiphase residential building: Its fragmentary wall paintings were analyzed in this study. The target of the research is the compositional analyses of wall paintings and pigments to define possible chronological attributions based on the making techniques of the raw materials used in their production.

Aim of the Research and Techniques

12 representative wall painting fragment samples analyzed to establish a possible chronological framework based on compositional features of the plaster layers and identification of pigments. The aim of the research is to understand the evolution of stylistic and petrographic techniques observed in the wall painting fragments and subsequent pigments.

Two key analytical methods were utilized for the research: Optical Microscopy (PPL-OM and XPL-OM) as well as Raman spectroscopy. Optical microscopy, both in plain-polarized and cross-polarized light, was used to characterize and categorize the wall mortars into groups based on their shared characteristics. This provided information on the raw materials and techniques used in their production. Additionally, it provided a comprehensive characterization of the preparation layers and pigment application in the wall painting fragments. Raman spectroscopy techniques were applied to the pigments found on the outermost layers of the wall painting fragments to characterize the pigments.

Results: Mortars characterization

The characterization of wall painting preparation layers via optical microscopy was employed to determine the number and type of mortar layers. Three key layers were determined: intonaco/intonachino, arriccio, and rinzafo.

The characteristics of the Intonaco/intonachino layers are crucial to determine a possible chronology of the nuclei based on the production techniques implemented, specifically the presence or absence of sparry calcite and the progressive amount of fluvial sand in the late antique intonachino layer, according to Dilaria et al. 2021. For this study, the arriccio layers do not present peculiar evolution over time.

Rinzafo layers analyzed, due to the lack of *in situ* preservation, were not representative of the assemblages and therefore unusable for chronological discrimination. In some samples, up to 7 layers were preserved.

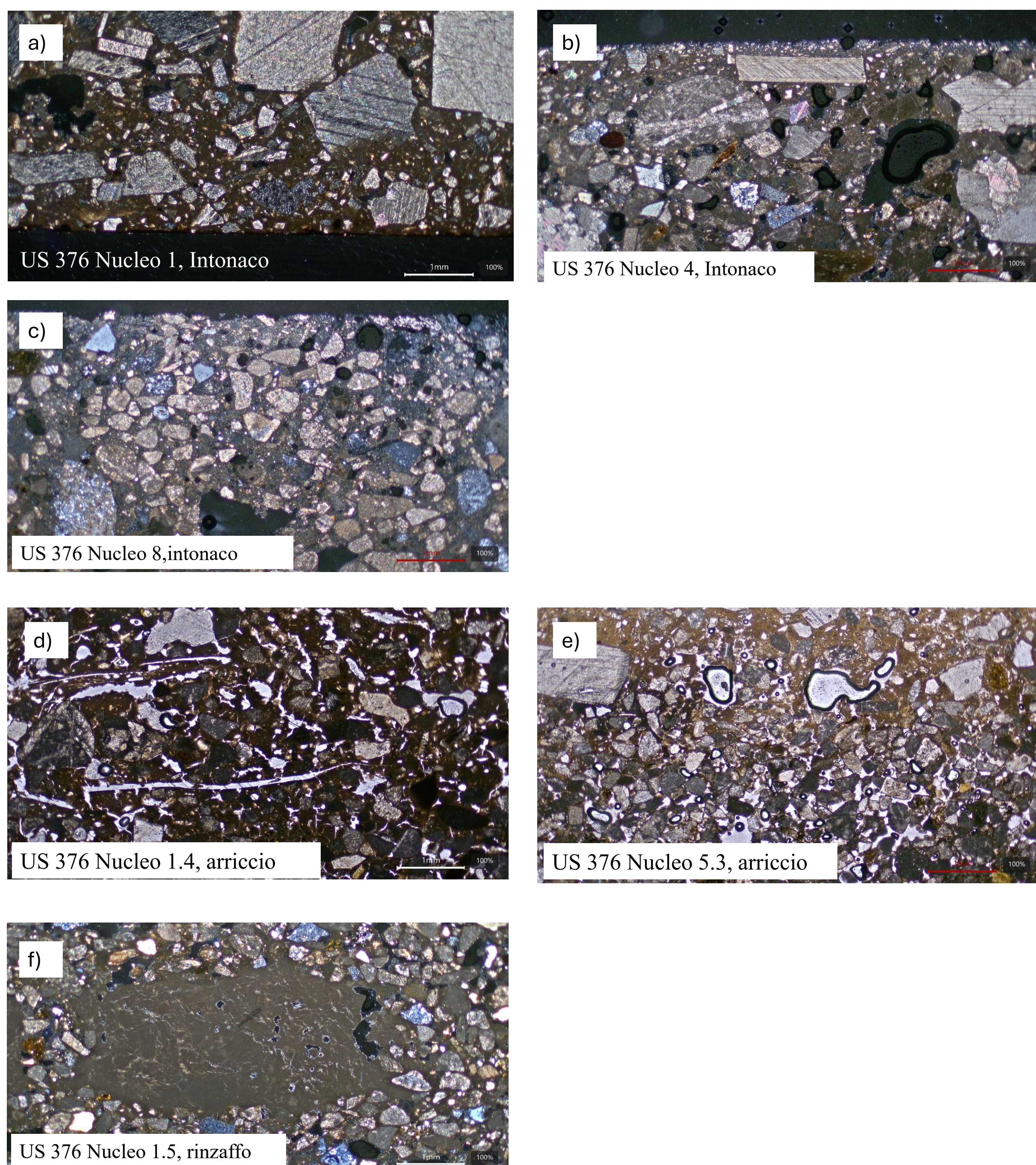


Fig. 1. a) Representation of an intonachino layer related to the I-IV style of wall painting. b) Representation of an intonachino layer related to the Middle Imperial period. c) Representation of an intonachino layer related to the Late Antique period. d-e) Arriccio layers do not show major changes over time. f) Representation of a rinzafo layer.

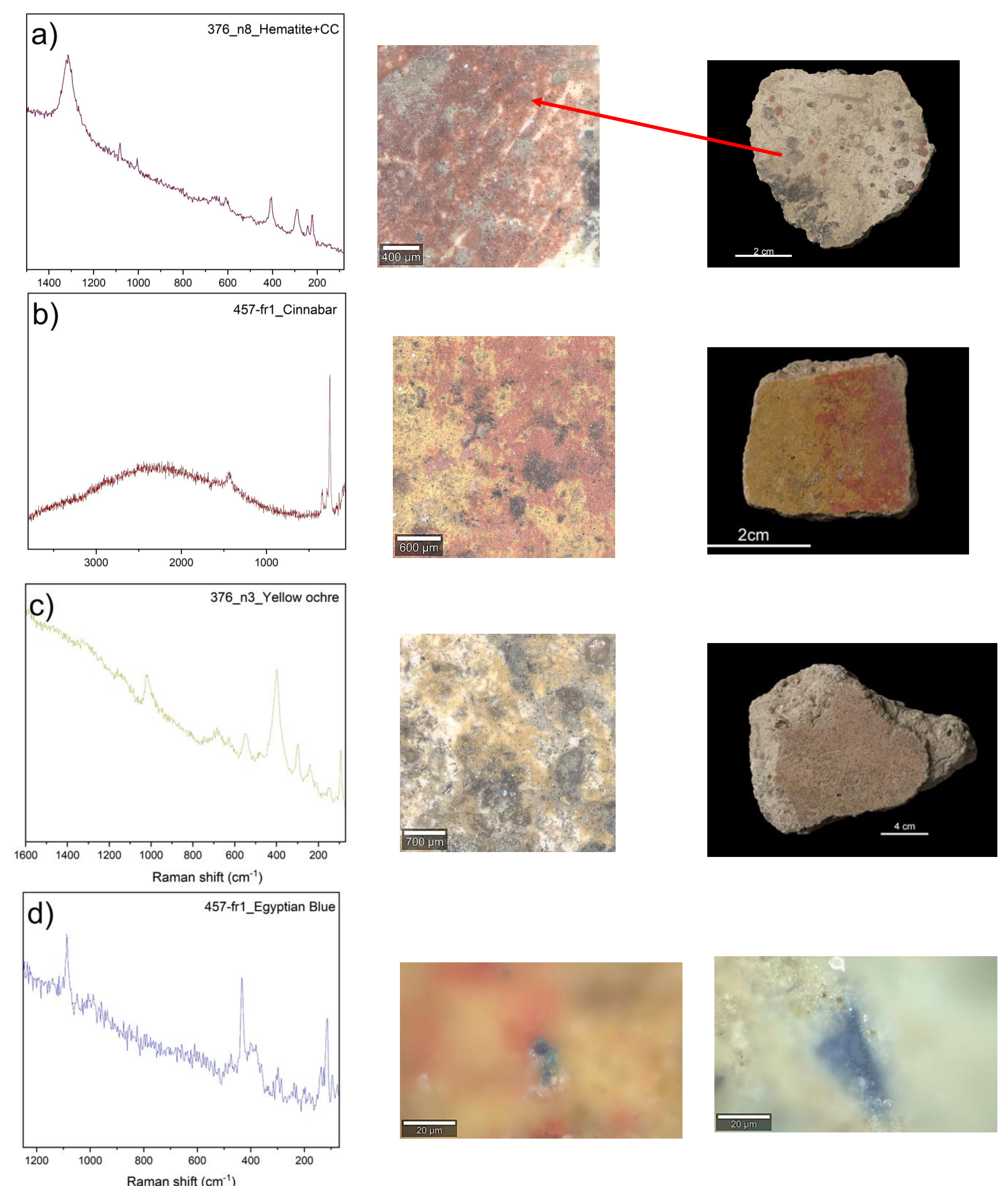


Fig. 2. Results of Raman spectroscopic analysis showing usage of pigments well-known in the Roman world as described by Vitruvius. a) hematite b) cinnabar c) goethite d) celadonite and Egyptian blue.

Based on the characterization of the wall painting plaster layers, a chronology, in conjunction with archaeological data and comparative studies, was determined primarily based on changes in techniques as seen in the intonaco/intonachino layers. Samples US 376 Nucleo 1, 2, 5, 5B, 6 and US 27 Nucleo 11 are related to the I-IV style (Late Republican – High Imperial), noticeable due to the intonaco/intonachino layers having a thickness between 0.60 and 1.50 cm as well as being primarily composed of the aggregate of mechanically crushed sparry calcite (figure 1a). Samples US 376 Nucleo 3, 4, and US Nucleo 12 could more closely resemble samples related to the Middle Imperial period (?) with intonaco/intonachino layers less than 0.60 cm and aggregates which include sparry calcite mixed with local sands such as carbonatic clasts, chert, and quartz (figure 1b). Sample US 376 Nucleo 8 is the only sample closely resembling those of the Late antique period (4th-5th century AD) with an intonaco layer between 0.2 and 0.4 cm and a clear lack of sparry calcite in the aggregate portion. The aggregates are primarily composed of local sands such as chert, quartz, and sandstones. US 376 Nucleo 8 resembles an arriccio layer despite the presence of a pigment application.

Results: Pigments

The analyzed pigments included all of those typical in the Roman styles of painting tradition, as described by Vitruvius. These pigments include hematite (figure 2a), goethite (figure 2c), celadonite + Egyptian blue (figure 2d), and carbon black. The presence of expensive pigments such as cinnabar (figure 2b) testifies to a wealthy patron.

Conclusive remarks

The wall painting fragments from the Sandrigo Estate in Aquileia provided key insights into the chronology of the wall painting nuclei based on the evolution of mortar recipes and technique (in particular intonachino layers) as already observed in previous studies (Dilaria et al, 2021). Most of the wall painting plasters can be categorized as pertaining to the typical production techniques in use in Aquileia up to the High Imperial period, due to the coherent use of sparry calcite in the intonachino. Three samples (N3, 4, 12) present a higher concentration of local sands, which could be referred to the Middle imperial periods, while N8 closely resembles samples from late antiquity, due to the use of a thin layer of intonachino entirely made with local fine sands with no sparry calcite. In addition, wall painting pigments align well with the traditional Roman palette known to the region and throughout the Roman world, while particular mixes (celadonite and Egyptian Blue) and cinnabar testify careful application of painting techniques

Bibliography

Dilaria et al. 2021, Dilaria S., Sebastiani L., Salvadori M., Secco M., Oriolo F., Artioli G., Caratteristiche dei pigmenti e dei tectoria ad Aquileia: un approccio archeometrico per lo studio di frammenti di intonaco provenienti da scavi di contesti residenziali aquileiesi (II sec. a.C. - V sec. d.C.), in M. Cavaliere, P. Tomassini (dir.), La Peinture Murale Antique Méthodes et Apports d'une Approche technique, Actes du colloque international (Louvain-la-Neuve, 21/04/2017), AIRPA 3, Roma, 125-148.

Yarden.j.tsfoni@gmail.com, simone.dilaria@unipd.it, clelia.sbrolli@gmail.com, cottica@unive.it