ʿAtiqot 96, 2019

Petrographic Examination of Plaster Samples from the Iron Age Site at Rosh Pinna (Jaʿuna)

Anastasia Shapiro

Introduction

The study of plaster samples unearthed during two seasons of excavations at the Iron Age site in Rosh Pinna (see Stepansky, this volume) is of archaeological interest, the more so, since plaster from such an early period is rarely found in excavations in the country (Bahat 1986:86).

Five samples were collected and selected for petrographic examination: three from Area A (2002) and two from Area C (2003). Thin-sections were prepared and examined under a polarizing microscope at magnifications ranging from ×20 to ×200. The main aim of this examination was to determine the mineralogical composition of the plaster and to obtain information about technological aspects of how the plaster had been prepared.

All plaster samples uncovered at Rosh Pinna date from the Iron Age. They were not found *in situ*, i.e., affixed to the walls of a building, but derived from a destruction layer dated to Iron IIA. The plaster debris was originally part of an Iron I–IIA structure that most probably stood in Area A and to its west, outside the excavation area (see Stepansky, this volume). Notably the three samples from Area A are composed mostly of thin layers of plaster while the two samples from Area C have much thicker layers.

Materials and Terminology

Upon examination under a microscope, the thickness and composition of each plaster layer was recorded. The samples are described from inside outward, the direction being easily determined by the coat of color that consistently 'finished' each layer. The term 'lime' used in this report denotes 'burnted lime' or 'quicklime', the material used for plastering, which is produced by firing chalk or limestone at temperatures exceeding 850ºC (Vadsturp 2001).

The reddish colored 'wash' or 'coating' on the plaster is made of ocher, either pure or mixed with lime in varying proportions. Ocher, a natural mineral pigment in shades of red, yellow and brown, is composed of iron oxides, such as goethite, limonite and hematite, sometimes together with manganese oxide and varying amounts of clay (Tomkeieff 1986:80).

This coloring material covers the exterior surface of the plaster layer, filling in pores, and smoothing and leveling the surface. The interface between color coating and plaster layer provides information about the technological process and work routine: a sharp boundary between the two indicates that the color coating had been applied over fully-dried plaster, while a blurred boundary shows that it had been applied over fresh, wet plaster.

PETROGRAPHIC DATABASE[1]

1. Sample 109-1037, Area A.
Six layers of plaster, varying in thickness between 1 and 7 mm. This sample differs from the others in its gray color, an indication that it must be of different mineralogical composition.

The first two layers of plaster are the thickest (4 and 7 mm respectively). They are composed of gray-colored lime, containing many minute iron oxide particles interspersed with light brown spots. Possibly the lime had been mixed with some kind of clay. The color coating of these two layers consists of ocher mixed with lime (ratio 1:1). The other four layers are thin and dark, mainly composed of lime with sporadic, minute iron oxide inclusions. These layers were coated with ocher, creating sharp boundaries with one another.

This sample of plaster possibly originated in the vicinity of W4 or to its west, beyond the boundary of the excavation area (see Stepansky, this volume).

2. Sample 103-1005, Area A.
Eight layers of plaster, varying in thickness between 1 and 4 mm. They comprise burned lime with sporadic chalk inclusions (diam. c. 1.5 mm) and minute particles of iron oxide. The plaster layers in this sample are grayish in color, possibly resulting from extreme heat exposure at the time when the plastered building was destroyed by fire (see Stepansky, this volume). All but one of the color coatings are ocher mixed with lime; the exception is a coating of pure ocher. All eight layers have a blurred border of contact between coating and the actual body of plaster.

3. Sample 115-1026, Area A.
Seven thin layers of white plaster, varying in thickness between 1 and 3 mm. All the layers are of the same lime composition; chalk (a single fragment for the whole thin-section) and iron oxide inclusions are sporadically present. No charred materials were observed, probably due to the high firing temperature reached during preparation of the lime. Negative impressions of burned-out organic material can be distinguished. In this sample, one layer was coated with pure ocher, most likely applied on dry plaster, which created a sharp boundary. The coating on the other six layers consisted of lime mixed with a little ocher, applied on wet plaster body, creating a blurred boundary.

[1] The sample number comprises the locus and basket numbers.

4. Sample 27-172, Area C, Sq 2.
Four layers of plaster, each with a reddish coating. There is relatively little variation in the mineralogical composition of the plasters, and likewise, the coatings are similar to one another in composition.

Layer I is 4 to 5 mm thick. It is composed of lime (90% of the volume) with sporadic chalk inclusions (diam. c. 1.5 mm), minute particles of iron oxide and a single, 0.8 mm large, sub-rounded fragment of burned organic material that appears dark gray to black in thin-section. One silt-sized olivine grain was noted. The layer is coated with a colored wash, creating a sharp boundary with the plaster and filling in pores. The coloring material is composed of chalk (c. 40%), iron oxides (c. 55%) and burned organic material (c. 5%). All components are silt-sized.

Layer II is 5 to 7 mm thick. Its composition is very similar to that of Layer I. The differences are in the amount of chalk inclusions (c. 12% of the volume) and the presence of sporadic inclusions of ashes and pellets of lime mixed with aggregates of iron oxides. The layer is coated with a wash of ocher mixed with chalk (c. 15% of the volume), which was applied to a wet plaster body, creating a blurred boundary.

Layer III is 5 mm thick. Its composition is identical to that of Layer I. The color coating is ocher, with a sharp boundary between it and the plaster body.

Layer IV is 3 to 4 mm thick. Its composition is comparable to that of Layer II, with similar amounts of chalk inclusions and the presence of few silt-sized olivine grains. The differences are in the presence of a significant amount of dark brown to very dark brown iron oxides (close to 5% of the volume), and sporadic burned organic material. The layer is coated with a colored wash, composed of iron oxide (c. 70%), chalk (c. 25%) and minute, burned organic material (c. 5%), separated from the plaster body by a sharp boundary.

5. Sample 23/24-166, Area C, Sq 3.[2]
Four layers of plaster with reddish color coating in between, varying in mineralogical composition.

Layer I is 3 to 4 mm thick. Based on the presence of several relatively large chalk pieces (3 × 3 to 5 × 7 mm) embedded in it, this seems to be the layer originally attached to the wall. Its composition is identical to that of Layer I of sample 27-172, and it is coated with an ocher wash, with a clear albeit diffuse boundary with the plaster body.

Layer II is 6 to 9 mm thick. It is composed mainly of lime with sporadic chalk inclusions, specks of iron oxides and a small quantity of minute black dots of charred organic material. The layer is coated with a colored wash, comprising 85% lime-mixed with minute specks of charred organic material, and 15% iron oxides. There is a sharp boundary between the wash and the plaster body.

[2] Plaster fragments were collected from both sides of W511 and put into a single basket. The fragments from both L23 and L24 derive from the same elevation (483.00–483.45 m asl).

Layer III is about 3 mm thick. Its composition is similar to that of Layer II—mostly lime, with c. 3% lime with iron oxide material and pure iron oxide inclusions. The layer is coated with an ocher wash, with a clear, but not very sharp boundary between it and the plaster body.

Layer IV is 4 to 5 mm thick. It is composed of c. 90% lime and c. 10% inclusions of limestone grains and iron oxide particles (0.5–0.7 mm) and of charred organic fragments (0.8–4.0 mm). The layer is coated with a colored wash, composed mainly of iron oxide material with c. 25% lime, which has a blurred boundary with the plaster body.

CONCLUSIONS

All the examined samples comprise plaster layers coated with coloring material. The plaster is made mostly of well-prepared, burned lime with small amounts of chalk, iron oxide and, in some of the samples, charred organic inclusions. The layers are 1 to 9 mm thick. Composition of the coatings varies from pure ocher (iron oxides) to 85% lime mixed with ocher. The coatings form thin layers (0.05–0.10 mm), covering the plaster surfaces and partially filling in the pores. The boundaries between plaster body and color coatings are either sharp and clear or blurred, depending on whether the color was applied over dry or wet plaster.

The overall impression is one of a well-developed plaster technique, indicated both by the preparation of the raw material and the application of the plaste. The color-coating of the walls attests that esthetics were also deemed important. Plaster inter-layering reveals that the interior of buildings had been plastered several times in the course of routine repairs or during renovations.

The petrographic examination of the plaster samples from the excavation at Rosh Pinna provides valuable information concerning the quality of materials and the technology used to coat the inner walls of Iron Age buildings.

REFERENCES

Bahat D. 1986. The Excavations at Sasa 1975. In M. Yedaya ed. *The Western Galilee Antiquities.* Tel Aviv. Pp. 85–105 (Hebrew).

Stepansky Y. This volume. Settlement Remains from the Iron Age, Hellenistic, Roman–Byzantine and Early Islamic Periods on the Ancient Tell of Rosh Pinna (Ja‘una).

Tomkeieff S.I. 1986. *Dictionary of Petrology, English-Russian*. Moscow (Russian).

Vadstrup S. 2008. *Conservation of Plaster Architecture on Facades: Working Techniques and Repair Methods for Plaster Decorations on Facades*. https://docplayer.net/3182045-Conservation-of-plaster-architecture-on-facades-working-techniques-and-repair-methods.html (accessed July 4, 2019).