PETROGRAPHIC EXAMINATION OF MEDIEVAL POTTERY FROM TIBERIAS

ANASTASIA SHAPIRO

Thirteen samples of pottery, unearthed during the salvage excavation of a medieval-period building in Tiberias (see Stern, this volume), were chosen for petrographic examination (Table 1). All sampled vessels date to the Crusader-period occupation of the building (Phases 3 and 4; see Stern, this volume).

The thin-sections were prepared and examined under a polarizing microscope at magnifications from $\times 20$ to $\times 200$. Descriptions of the thin-sections were provided with the aid of charts and tables (Whitbread 1986:80). The following parameters were examined: mineralogy and approximate amount of silt-sized material and optical properties of the matrix; mineralogy of non-plastics and their

volume in the sherd;¹ grain size, shape and sorting. Firing temperature was estimated according to mineralogical changes.

The aim of the current study was to prove or refute visually determined similarities of the selected material to wares found at 'Akko, and, when different from the 'Akko material, determine their possible provenance.

As some of the samples discussed here are visually similar to the fabrics found at 'Akko, defined as 'Beirut' and 'Acre' Wares (Shapiro 2012:104–107), special attention was paid to these. The thin-sections were compared to those of similar wares from 'Akko, with the results presented below. The geological settings of the site vicinity were also considered.

Sample	Locus	Basket	Vessel	Fig. No. (see Stern,	Provenance
No.				this volume)	
1	111	1022/5	Cooking pot	7:2	Beirut Ware
2	111	1022/6	Cooking pot	7:3	Beirut Ware
3	111	1022/7	Bowl	7:4	Beirut Ware
4	107	1023/5	Jar	12:1	Tiberias vicinity
5	107	1015/1	Jar	12:2	Tiberias vicinity
6	103	1010/2	Baking dish	12:3	Beirut Ware
7	107	1023/4	Cooking pot	12:4	Beirut Ware
8	103	1014/1	Cooking pot	12:5	Beirut Ware
9	107	1020/2	Bowl	12:7	Beirut Ware
10	107	1020/1	Bowl	12:8	Beirut Ware
11	102	1005/1	Bowl	13:4	Acre Ware
12	106	1009/7	Bowl	13:5	Acre Ware
13	103	1007/1	Cooking pot	12:6	Northern Israel

Table 1. List of Thin-Sections

PETROGRAPHIC RESULTS

Beirut Ware

Five cooking vessels (Samples 1, 2, 6-8) and three bowls (Samples 3, 9 and 10) belong to a homogenous petrographic group. They are all characterized by a ferruginous, shalerich matrix, with a large amount of siltsized quartz. One bowl's (Sample 3) matrix is slightly more calcareous than the other samples. Sand-sized quartz inclusions are poorly sorted subrounded-to-angular grains, 0.1–0.5 mm large, comprising up to 11% of the sherd's volume, suggesting its classification as temper. Opaque rounded ore particles, varying from minute (0.02 mm) to sand sizes, and ferruginous shale fragments are present in small amounts. Chert, and possibly extremely eroded basalt grains, are sporadic if any. Based upon the optical properties of the matrix, firing temperature is estimated at 800-850°C. Some of the samples (6-9) have cracks inside, which are oriented parallel to the surfaces of the vessels. Temper-and-matrix composition of the samples is very similar to the examined Beirut Ware within the 'Akko collection, for which the Lower Cretaceous formations outcropping at the Mount Hermon foothills, Transjordan and the southern Lebanon Range were suggested as sources of raw materials (Waksman et al. 1999:7-8; Stern and Waksman 2003:173-175; Waksman et al. 2008; Shapiro 2012). As basalt does not crop out in Transjordan, this area should be excluded from the list of possible origins of these vessels.

Acre Ware

Two bowls (Samples 11 and 12) produced the same thin-sections. They have a ferruginous, slightly calcareous matrix containing silt-sized quartz. Most of the tempers are well-rounded to subangular quartz grains, partially oriented parallel to the vessels' surface. Plagioclase and chert are present sporadically. Temper constitutes 5–15% of the sherd's total volume. A considerable number of internal cracks are

oriented parallel to the surfaces of the vessel. The surface of the bowl (0.01-0.05 mm) is vitrified, as well as the groundmass of the sherd, which has vitrified spots and some rounded air bubbles that have vitrified inner surfaces. This effect can be a result of the presence of sea-salts in the paste, indicating that seashore sand and seawater were involved in preparing the paste for pottery production (Rice 1987:88; Orton, Tyers and Vince 1993:115-116; Shapiro 2012:104–105). Firing temperature is estimated at 750-800°C, based on the absence of carbonate material and optical passivity of the clay. Comparison with the examined medieval pottery from 'Akko showed that these two bowls are petrographically identical to Acre Ware, which was manufactured in 'Akko or nearby, utilizing upper Pleistocene formations of the vicinity as raw materials. Red hamra clay (distributed along the entire coastal plain between 'Akko and Nahariyya) was used as matrix, with coastal sand, characteristic of the shore south of 'Akko (personal observations), providing tempering material (Bentor 1966; Dan et.al. 1975; Sneh, Bartov and Rosensaft 1998). Seawater was used in preparing the paste, giving the effect of surface vitrification (Shapiro 2012).

Tiberias Ware

Two jars (Samples 4 and 5) have a foraminiferous marl matrix, where the foraminifera compose 12-15% of the volume of the sherd. Some silt-sized to fine sand-sized (0.1 mm large) plagioclase and olivine grains are present. Additional sand-sized particles (0.2-0.5 mm large) of quartz and eroded basalt grains are present in small numbers (1-2 per section) in each section, as well as chalk and mud balls. Firing temperature is estimated at 750°C, due to the stage of decomposition of the carbonate material of microfossils. The firing was executed in an oxidized atmosphere which gave the sherd a light brown (tan) color. Possible sources of nearby raw materials are: (1) the marl of the Bira formation, cropping out only a few kilometers to the north, and on a hill southwest of Tiberias (Sneh 2008); and (2) Taqiya marl, which can be found about 2 km to the north of Tiberias, between Giv'at Hanamala and Majdala Beach (Sneh 2008). Basalts are common in the vicinity of Tiberias, and their sporadic presence can point to very accurate mining and careful preparation of pastes. Plagioclase and olivine grains present in the sherds derived from eroded basalt as well.

A pottery kiln, which may be part of a larger industrial area, was revealed in southern Tiberias (Stern 1995). The kiln, dating to the Early Islamic period, yielded vessels of a buff to tan shade. Although the pottery finds were not analyzed, its external appearance leads us to suggest that the same source of raw material served for these vessels and for the jars examined here.

Other Fabrics

One cooking pot (Sample 13) has a ferruginous slightly silty matrix, to which rounded, rather well-sorted quarts sand was added in small amounts as temper. The sand composed about 10–12% of the sherd's volume, and its grains are 0.5–0.7 mm on average. Due to the optically passive clay minerals, firing temperature can be estimated at 800°C. The mineralogical composition of this sherd does not allow us to determine its exact provenance, although nothing suggests that the source would not be somewhere in northern Israel.

CONCLUSIONS

The examined pottery assemblage forms three petrographic groups, two of which are represented by two samples only. One sherd did not fall into any of these petrographic groups. Two groups share petrographic features with two groups of medieval pottery from 'Akko, and were therefore labeled with the same names: Beirut Ware and Acre Ware, which indicate their provenance.

Beirut-Ware vessels (both cooking and table ware) are frequently unearthed at medieval sites in Israel and abroad (Avissar and Stern 2005:6–

9, 19–22, 91–94, 96–99, Pls. II:1–3, VI:1–5, 8, XXVI, XXVII), although their provenance is usually termed Lebanese (Stern and Waksman 2003:169–170, 173–175; Shapiro 2012).

Acre Ware, represented by two bowls, is rarely found outside of 'Akko, where they were manufactured (Stern and Waksman 2003:168– 169, 173–175; Shapiro 2012). It is therefore surprising to encounter this ware so far from its place of origin. Further careful reading of the medieval pottery assemblages and petrographic examination of similar Acre Ware samples may shed light on whether these vessels were exclusively domestic in nature or whether they were traded as well and if so, how distant was their distribution?

The final group is represented by two jars, for which the Tiberias vicinity was suggested as the most possible provenance. The examination of microfauna (foraminifers) revealed that Tagiya marl was most likely used for these vessels. Although this marl is widespread in Israel (Bentor 1966:72-73) and was frequently used for pottery production in ancient times (Goren 1995:302; Glass et al. 1993:278), it is suggested here that the examined jars were manufactured in Tiberias or its very close vicinity, based on two pieces of evidence. First, the basalt, plagioclase and olivine grains present in the thin-section originate in basalt formations, and these are present in and around Tiberias. Secondly, a visual examination of the pottery from the above-mentioned kiln (Stern 1995) suggests that the same fabric was in use in Tiberias some four centuries earlier. Although no analysis was conducted on the vessels found in the kiln, it is reasonable to propose that the source of raw material was the same for both cases. Examples of prolonged use of the same source of clay for pottery production over hundreds and even thousands of years of human history are known (Goren 1995:303; Glass et al. 1993:277; Shapiro, forthcoming). Further petrographic analysis of the pottery vessels from the kiln may help support or refute this preposition.

Finally, a single cooking pot, not belonging to these petrographic groups, did not provide

enough petrographic information to determine anything other than an origin in northern Israel.

NOTE

¹ The non-plastic materials within the ceramic body are termed "temper" in cases when the quantities

present could have been added by the potter (i.e., 5% or more).

REFERENCES

- Avissar M. and Stern E.J. 2005. *Pottery of the Crusader, Ayyubid and Mamluk Periods in Israel* (IAA Reports 26). Jerusalem.
- Bentor Y.K. 1966. *The Clays of Israel: Guide-Book to the Excursions*. Jerusalem.
- Dan Y., Raz Z., Yaalon D.H., and Koyumdjisky H. 1975. *Soil Map of Israel 1:500000* (Survey of Israel). Jerusalem.
- Glass J., Goren Y., Bunimovitz S. and Finkelstein I. 1993. Petrographic Analyses of Middle Bronze Age III, Late Bronze Age and Iron Age I Pottery Assemblages. In I. Finkelstein, S. Bunimovitz and Z. Lederman eds. *Shiloh: The Archaeology of a Biblical Site.* Tel Aviv. Pp. 271–286.
- Goren Y. 1995. Shrines and Ceramics in Chalcolithic Israel: The View through the Petrographic Microscope. *Archaeometry* 37:287–305.
- Orton C., Tyers P. and Vince A. 1993. Pottery in Archaeology. Cambridge.
- Rice P.M. 1987. Pottery Analysis: A Sourcebook. Chicago.
- Shapiro A. 2012. Petrographic Analysis of the Crusader-Period Pottery. In E.J. Stern. 'Akko I. The Excavations of 1991–1998: The Crusader-Period Pottery (IAA Reports 51/1). Jerusalem. Pp. 103–126.
- Shapiro A. Forthcoming. The Hospitaller Compound: Tobacco Smoking Pipes and Nargile Heads. In

E.J. Stern and D. Syon. 'Akko II. The Excavations of 1991–1998: The Late Periods. IAA Reports.

- Sneh A. ed. 2008. *Geological Map of Israel 1:50000, Sheet 4-II: Teverya*. Jerusalem.
- Sneh A., Bartov Y. and Rosensaft M. 1998. Geological Map of Israel 1:200000, Sheet 1. Jerusalem.
- Stern E.J. 1995. An Early Islamic Kiln in Tiberias. 'Atiqot 26:57–59.
- Stern E.J. This volume. Crusader, Ayyubid and Mamluk Remains from Tiberias.
- Stern E.J. and Waksman Y. 2003. Pottery from Crusader Acre: A Typological and Analytical Study. VII^e Congrès International sur la Céramique Médiévale en Méditerranée. Pp. 167–180. Athens.
- Waksman S.Y., Segal, I., Porat N., Stern E.J. and Yellin J. 1999. An Analytical Study of Ceramics Found in Crusader Acre: Levantine Production and Imports from the Byzantine World (GSI Report 8/99). Jerusalem (internal report).
- Waksman S.Y., Stern E.J., Segal I., Porat N. and Yellin J. 2008. Some Local and Imported Ceramics from Crusader Acre Investigated by Elemental and Petrographic Analysis. '*Atiqot* 59:157–190.
- Whitbread I.K. 1986. The Characterization of Argillaceous Inclusions in Ceramic Thin Sections. *Archaeometry* 28(1):79–88.