Journal of Archaeological Science: Reports xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Journal of Archaeological Science: Reports

journal homepage: www.elsevier.com/locate/jasrep

Glazed ware from here and there: Petrographic analysis of the technological transfer of glazing knowledge

Mary F. Ownby [a,*], Evan Giomi [b], Gregory Williams [c]

[a] Desert Archaeology, Inc., 3975 N. Tucson Blvd., Tucson, AZ 85716, USA
[b] School of Anthropology, University of Arizona, Tucson, AZ 85716, USA
[c] Swiss Institute for Architectural and Archaeological Research on Ancient Egypt, 13, Sh. el-Shaer Aziz Abaza, Cairo 11211, Zamalek, Egypt

ARTICLE INFO

Article history:
Received 9 April 2015
Received in revised form 29 March 2016
Accepted 29 April 2016
Available online xxxx

Keywords:
Petrography
Rio Grande Glaze Ware
New Mexico
Piro Pueblos
Medieval glaze ware
Stonepaste ware
Aswan
Egypt

ABSTRACT

The typical method employed to analyze glaze surfaces has been chemical analysis often by means of scanning electron microscopy, which provides visual information as well. However, glazes can also be examined petrographically and their features related directly to the paste of the ceramic body. The link between raw materials used for producing the pottery and glaze features can inform on the technological transfer of glazing knowledge. Two case studies, one from Medieval Egypt and the other from pre-Hispanic and early Colonial New Mexico, provided an opportunity to explore the adoption and adaptation of glaze technology by potters working in different areas. In the case of Medieval Egypt, the industrial setting of pottery production and the extensive exchange networks resulted in the accurate reproduction of various types of glazes on locally made pottery. On the other hand, glaze ware production at the household level in New Mexico shows a change in glaze paint appearance that probably relates to the use of different glazing raw materials and/or a lack of knowledge of the recipe by potters located outside the original area of manufacture. Thus, petrography can provide valuable information on the ways technological knowledge of glazing was acquired and modified as the idea spread.

1. Introduction

Petrographic analysis of pottery has a long tradition in archaeological research starting with Linné and Hodges in Europe and Shepard in the United States (Hodges, 1962; Linné, 1925, 1957; Shepard, 1936). These works demonstrated the utility of the method for identifying the provenance of pottery to inform on ceramic production and consumption. Since then petrographic analysis has been applied to pottery from almost all areas of the globe and time periods ranging from prehistoric to near modern. The technique has also been utilized to examine the technology of ceramic production including aspects of *chaîne opératoire* and technological traditions (Gosselain, 1995; Lemonnier, 1976; Sillar and Tite, 2000; Velde and Druc, 1999). However, petrographic analysis has seen less application when it comes to pottery surfaces, though they are readily visible in thin sections (Reedy, 2008:194–206).

The current study selected petrographic analysis for examining glaze-ware traditions from two different parts of the world in order to better understand the technological transfer of glazing knowledge. Although SEM is the usual choice for analysis of this type, the selection of petrographic analysis here was necessitated by the fact that the Egyptian material studied cannot be exported for scientific analyses.[1] Further, the ability to examine provenance and technology with one sample concurrently provides a robust and economical approach to pottery with glaze surfaces.[2]

This method was applied to two case studies. The first examined glazes and paste recipes of medieval pottery from the site of Elephantine in the Aswan area of Egypt. The samples date from the 9th to 15th centuries CE covering a wide range of glaze ware types and several different paste recipes. The second assemblage was made up of Rio Grande Glaze Ware from the sites of Qualacu and Pargas Pueblos in New Mexico. The samples covered four different types of glaze ware that span the period from 1300 to 1700 CE. While these ceramic traditions appear largely dissimilar, they share a commonality involving the technological

[1] There is an extensive literature on SEM analysis of glazes with several also using X-ray diffraction, a few examples being Charalambous et al. (2010), De Benedetto et al. (2004), Freestone (1982) (microprobe), Fortina et al. (2008), Mason et al. (2001), Pace et al. (2008), Ricci et al. (2005), and Wood et al. (2007); in the American Southwest lead isotope analysis through ICP-MS has been used, see Huntley et al. (2007) and Thibodeau et al. (2013).

[2] Previous studies of thin sections with glazes include Jiazhi (1984), Sakarya et al. (1990), and Vendrall-Saz et al. (2006); examples of those using other methods for the glaze analysis plus petrography for paste characterization are Fortina et al. (2008), Hill et al. (2004), and Polvorinos del Rio and Castaing (2010).

* Corresponding author.
E-mail addresses: mownby@desert.com (M.F. Ownby), egiomi@email.arizona.edu (E. Giomi), g.williams@aucegypt.edu (G. Williams).

http://dx.doi.org/10.1016/j.jasrep.2016.04.019
2352-409X/

Fig. 1. Map of Egypt showing the sites of Elephantine and al-Fustat.

transfer of glazing. Typically, technological transfer refers to the skills involved in learning technologies (e.g. Loney, 2007), however, in this case it applies to the adoption of glazing technology in specific locations (for an early example on Islamic glaze ware see Mason and Tite, 1997). Through the characterization of the appearance of the glaze in thin section and the relationship of the paste to geological sources, connections between location of manufacture and glaze-ware technology can be clarified. In the context of the two case studies, this should allow for an examination of how these technologies and their transfer differed between a highly structured state-level society (medieval Egypt) and autonomous cultural-based groups (early contact New Mexico). Each area possesses its own unique history of and methods for glazing ceramics, with specific materials available for producing pottery and glazes. But similarities nonetheless exist in the approaches to raw materials and the acquisition of specific glazing components. How this changed according to location of production and the dispersal of technological knowledge is of prime interest in this study, as is any effect these had on the resulting glaze ware ceramics.

2. Sites and samples

2.1. Egyptian glaze ware from Elephantine

The tell of Elephantine island, adjacent to the modern city of Aswan in southern Egypt (Fig. 1), has been excavated for over forty years under a joint project between the German Archaeological Institute and the Swiss Institute for Architectural and Archaeological Research on Ancient Egypt in Cairo. Swiss Institute excavations of Late Antique tower houses built in the precinct of the former Khnum temple produced some glazed ceramics comparable to finds from 'Abbasid-period' (750–868 CE) and later occupation at al-Fustat (Cairo) (Arnold, 2003, 2014; Gayraud et al., 2009). Surface finds and material from layers disturbed by digging for agricultural fertilizer collected during the course of excavations on the tell have also contributed to the corpus of glazed material from Elephantine. Despite the traditional interpretation that the island was unoccupied by the 10th–11th century CE, some sherds exhibit decorative glazing styles and clay fabrics that suggest they were produced as late as the Ayyubid (1171–1260 CE) or Mamluk (1260–1517 CE) periods in Egypt.

A group of ceramics generally thought to be the earliest glazed wares in Egypt have sometimes been referred to as "Coptic-glazed" wares, a term employed to describe the combination of slip-painting techniques with lead glazing, a style quite different from contemporary traditions in Sasanian or early Islamic Syria and Mesopotamia that utilized alkali glaze (Whitcomb, 1989:180–182; Féhérvari et al., 2006). As they are thought to come from the Aswan region, these glazed ceramics are currently termed Aswan glaze wares, although no kiln site has ever been identified (Adams, 1986:525).[3] The most common forms are shallow, flat-bottomed bowls, and a variety of glazing techniques are reported (Gayraud et al., 2009; Mason, 1997; Scanlon, 1998:21–54; Whitcomb, 1989:Fig. 3). Only one of the samples analyzed here (No. 5931) seems to display the slip-painting and glaze combination, but four other samples (Nos. 195, 38, 140, and 141) also exhibit the same Aswan fabric. The majority have a green glaze but several (Nos. 141 and 5931) were glazed in yellow and brown colours (Table 1). Sample No. 38 is an outlier in that it features exterior cutting and incising under a green glaze. Both glazed and unglazed variations of cut-wares or *kerbschnitt* are known from a number of sites throughout the Middle East and date from the 9th to 11th centuries CE (Féhérvari et al., 2006:58, 247; Frend, 1974; Philon, 1980:643, 644; Pierrat, 1990:31).

The second group comprises thirteen samples mostly from small bowls with slightly out-curving rims and exhibiting a simple splash decoration in blue or green on a white background, often with black (Table

[3] Currently a team lead by Lisa Peloscheck from the Austrian Archaeological Institute, Cairo is sampling clays in the Aswan region to identify the source of this particular fabric.

Please cite this article as: Ownby, M.F., et al., Glazed ware from here and there: Petrographic analysis of the technological transfer of glazing knowledge, Journal of Archaeological Science: Reports (2016), http://dx.doi.org/10.1016/j.jasrep.2016.04.019