

A graphite-coated early Iron Age pot from Kristineberg, Malmö

Ole Stilborg*¹, v. Attila Rostoványi² & Anders Lindh³

*Corresponding author (skea@stilborg.se)

¹SKEA, Näckrosvägen 142, SE-59054 Sturefors, Sweden

²v. Attila Rostoványi, Malmö Heritage, Box 406, SE-201 24 Malmö, Sweden

³Department of Earth and Ecosystem Sciences, Lund University, Sölvegatan 12, SE-223 62 Lund, Sweden

A sherd found at the Iron Age settlement of Kristineberg in Malmö, Scania, Sweden, carried remnants of an unusual silvery layer on the outer surface. It was suggested that this consisted of graphite, because of its macroscopic appearance and the existence of contemporary parallels on the continent. SEM analysis confirmed that the layer was pure carbon. Although organic carbon cannot be completely excluded, there were no other traces of use on the vessel and nothing to indicate coating or sealing of the vessel with materials such as tar or resin.

Keywords: graphite, Iron Age, vessel, Scania, SEM

Introduction

A more than usually shiny surface on a fine ware sherd from the early Iron Age settlement of Kristineberg South near Malmö in the south-west corner of Scania, Sweden, caught the eye of the excavating archaeologists. While polished surfaces are very common on fine ware pottery from the time around the birth of Christ onwards in southern Scandinavia, the silvery appearance of this black, reduced ware was something different. The personal experience of 14th century AD African graphite-polished wares gained by one of the authors led to the hypothesis that graphite could indeed be what lies behind this special surface. An analysis of the surface layer has subsequently been performed, together with a thin section analysis of the ware; the latter in order to address the question of whether the vessel could have been imported.

The Kristineberg site

Malmö Heritage carried out a salvage excavation in the district of Oxie in the south-eastern part of the town of Malmö, Sweden, during the years 2001–2006. The field campaign uncovered settlement remains ranging from the Neolithic to the Viking Age, with the emphasis on the late Bronze Age and early

Iron Age, 900 BC to 200 AD. The results indicated metalworking craft activities, through finds of both forged objects, e.g. a razor, a spur and a half-moon knife, and crucibles and advanced casting moulds. Traces of a smithy were also present. Thus the site must have harboured high-quality metalworking during both the Bronze Age and the Iron Age. Apart from this, an extensive body of ceramic material was recorded from both periods. The sherd in question was found in the backfilling of a well.

The pot

The sherd (MK 20:203040) encompassed the rim and upper body of a small, fine ware vessel with a restricted orifice (Figs. 1 and 2). The rim diameter was calculated to be 15.5 cm which places it in the group of medium-sized vessels among the settlement pottery of the period (Stilborg 2006a:144f), a group that includes the majority of the standard-sized cooking vessels. There are no visible traces on the sherd to indicate that the pot functioned as a cooking vessel, however. The black colour is thus most likely the result of a successful reduced firing. A couple of centimetres below the thickened, faceted rim, the body is decorated with a narrow, shallow, horizontal groove, and a layer with a metallic shine has been pre-



Figure 1. The sherd with a partly shining surface recovered from a well (A34821) on the Early Iron Age site of Kristineberg, Scania.

served in this groove and in patches on the polished surface around it. The slightly cracked surface of the layer strengthens the impression that it was indeed an added layer. As mentioned above there are no signs of organic deposits resulting from the use of the vessel, but high-gloss polishing cannot be ruled out without analyses. Effective burnishing and polishing draws fine clay particles to the surface, in some cases to the extent of giving the appearance of a separate layer.

The rim shape and the simple ornamentation together point to a date around the birth of Christ for the sherd, which was found in the filling of a well (A34821). The deposition context could be the reason for the metallic layer being preserved as the water-logged environment may have offered a certain protection against erosion.

Methods

An EDS analyser (Inca X-sight from Oxford Instruments) fitted onto a scanning electron microscope (Hitachi S-3400N) was used for the carbon analyses. The samples were uncovered, unpolished and analysed at a low pressure (approx. 100Pa). The acceleration voltages applied were 5 and 10kV. These analytical conditions permit only qualitative analyses. The detection limit is around 0.2 wt% carbon. This choice of method was partially due to availability.

Thin sections imply in this case 0.03 mm samples of the pottery which could be analysed in a polarisation microscope (Shepard 1956:139). The archaeometric analysis entailed a combination of mineral-



Figure 2. Reconstruction drawing of the Kristineberg vessel based on estimation of the rim diameter. 1:3

ogical determinations of the non-plastics and a study of the crafting technology of the ware, including the amount and maximum grain size of any added temper. The possible presence of microfossils was studied at magnifications between x600 and x1000.

Results

SEM-EDS-analysis

The bottom of the narrow groove where the silvery surface layer appeared to be best preserved was targeted for the analysis.

Spectrum 2 (yellow background), obtained at 5 kV, shows a large peak, which could be either C (a K-peak), K or Ca (in both cases L-peaks) (Fig. 3). At 10 kV (red spectrum) this peak is much smaller, as expected. However, synthesis of a spectrum with K and Ca but no C shows that the C (+K+Ca) peak in the synthesized spectrum is very much smaller than that in the red spectrum. The overlays have been made so that the K-lines for K are of the same height. This proves that the K and Ca content of the sample cannot alone explain the very large C+K+Ca peak found in the low-energy part ($\approx 0.3\text{keV}$) of the spectrum. Consequently, a thin layer of carbon must be present in the sample.

Microscopy of a thin section under a polarizing microscope

The thin section analysis showed a high-quality fine ware made of a sorted, mica-rich, medium coarse clay, rich in fine-sand and tempered with 18% (vol.) crushed granite (max. grain size 1.1 mm). The ware was very well homogenized, adding to the impression of quality workmanship. There were no mineralogical indications of a non-local origin in the clay or temper raw materials, as there are ample parallels for both the type of clay and the temper quality among known ceramics from Scanian Iron Age settlements (Stilborg 2006b:159).

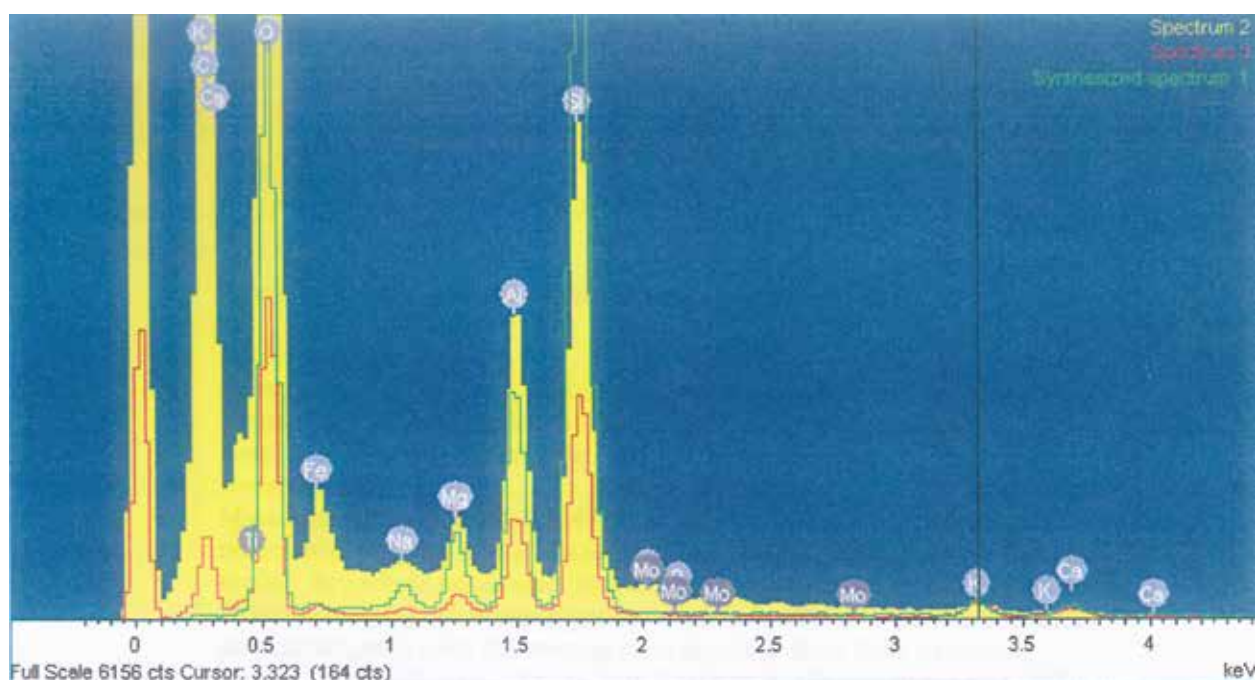


Figure 3. Diagram of the results of the SEM-EDS scanning.

The few cracks and cavities in the sample did not contain any traces of intrusive materials which could have been an indication of coating or sealing of the vessel wall with tar, pitch or resin.

Discussion

Given that graphite is pure carbon, it is not possible to ascertain with certainty that the layer on the Kristineberg sherd is in fact graphite. A coating with tar or pitch to seal the vessel and perhaps in order to attain a shiny surface cannot be ruled out, but this would be equally unique in the prehistory of southern Sweden as the graphite coating suggested here. Only one lipid analysis has established the presence of birch tar/resin in a polished fine ware vessel, one from the Late Bronze Age settlement of Ryssgårdet (Eriksson 2009:167; Karlsson 2009:30).

The layer on the surface of the Kristineberg sherd is too thin to allow a lipid analysis of the layer per se, and analyses of the ware are just as likely to show lipids introduced through use of the vessel. Thus we are left with the macroscopic appearance of the layer (see above), which points to graphite as the most reasonable explanation. According to the literature, the closest finds of graphite-coated pottery from roughly the same period have been recorded in the Sachsen-Anhalt region of eastern Germany. An internet article “Sachsen Anhalt Graffiti-tes” by H. Wunderlich, M. Schulz, H. Jarecki and A. Reichenberger (2004) dealing with the find concludes:

“Sicherlich wurden schon in der Vorzeit die Graphitlagerstätten in der Gegend von Passau genutzt. Mit zunehmender Entfernung von den Vorkommen im Bayerischen Wald und im Böhmerwald tritt aber der Anteil von graphithaltiger oder graphitbemalter Keramik zurück. Besonders gut untersucht ist dies für die Latènezeit, in der ein Zusammenhang zwischen den spätkeltischen Oppida in Böhmen und Süddeutschland und dem gehäuftem Auftreten von Graphittonkeramik zu konstatieren ist. Sowohl in der frühen als auch in der späten vorrömischen Eisenzeit gelangt mit Graphit bemalte Keramik im Norden nicht über das südliche Sachsen-Anhalt hinaus. Räumlich gesehen stammen die nächsten Vergleichsstücke aus Crauschwitz im Burgenlandkreis. Es ist als sicher anzunehmen, dass diese Keramik im Lande hergestellt wurde und somit der Graphit als Rohstoff zur Weiterverwendung eingehandelt worden ist”.

As the quotation indicates, the graphite-coated pottery found in the southern part of Sachsen-Anhalt is most likely the result of a local production using graphite imported from the south (Passau, Bayern). The design of the preserved part of the Scanian pot and the results of the analysis of the ware both speak in favour of local production in this case, too. The shape of the pot, and especially of the faceted, thickened rim profile, has parallels in several other contexts at Kristineberg, but none of these show any traces of graphite coating.

The identification of organic inclusions in graphite material may make it possible to point to a source for the graphite. The present layer, however, is so thin and so limited in extent that it is highly unlikely that an analysis would reveal any distinctive organic inclusions.

The most notable source of graphite in southern Sweden is located at Taberg, south of Jönköping, but smaller outcrops may also exist in Scania. It is less likely, however, that the Scanian Iron Age potter would have been able to locate one of these outcrops than that the graphite itself was imported. The effort required to locate such a local source makes it more reasonable to think that the raw material came from the south along the same contact routes as the technological know-how for using it.

Thus the vessel from Kristineberg seems to combine local, contemporary design in its shape and high-quality ware with an imported surface coating technology that enhances the lustre of the polished surface.

English language revision by Malcolm Hicks.

References

- Eriksson, T. 2009. *Kärl och social gestik. Keramik i Mälardalen 1500 BC– 400 AD*. AUN 41. Riksantikvarieämbetet arkeologiska undersökningar Skrifter no 76.
- Karlsson, C. 2009. Food Culture in Ritual and Profane Contexts—organic residue analyses of vessels from two Bronze Age sites in Uppland, Sweden. *Master thesis in scientific archaeology*, Stockholm University.
- Shepard, A.O. 1956. *Ceramics for the archaeologist*. Publ. 609. Carnegie Institution of Washington.
- Stilborg, O. 2006a. Pottery and Space. In A. Carlie red. *Järnålder vid Öresund. Band II. Skånska spår – arkeologi längs Västkustbanan*. Riksantikvarieämbetet
- Stilborg, O. 2006b. Pottery and Time. In A. Carlie red. *Järnålder vid Öresund. Band II. Skånska spår – arkeologi längs Västkustbanan*. Riksantikvarieämbetet
- Wunderlich, H., Schulz, M., Jarecki, H. & Reichenberger, A. 2004. Sachsen Anhalt Graffitties. [http://www.lda-lsa.de/landesmuseum_fuer_vorgeschichte/fund_des_monats/2004/sepember/\[20120813\]](http://www.lda-lsa.de/landesmuseum_fuer_vorgeschichte/fund_des_monats/2004/sepember/[20120813])