Characterisation of Scarborough and Hambleton wares from Wetherby, West Yorkshire

Samples of two wares produced on the fringes of the North Yorkshire Moors, a Hambleton ware lobed cup and a Scarborough ware jug, were analysed (Table 1). The reasons for the analysis were firstly to confirm the visual identification of these vessels and secondly to see if fabric analysis would give further precision in determining the precise source of the vessels, and thus possibly narrow down the date of the vessels and the trading networks whereby they were distributed.

Table 1

TSNO	Sitecode	Context	REFNO	cname	Form	Action	Description
V2445	WW/16A/03	471	SF2121	HAMB	LCUP	TS;ICPS	CUGL INT AND EXT
V2443	WW/16A/03	471	SF2121	SCAR	JUG	TS;ICPS	CUGL EXT;ROD HANDLE

Thin sections and chemical analyses were taken from each sample. The thin sections were prepared by Steve Caldwell at the University of Manchester and stained using Dickson's method (Dickson 1965). An offcut from each sample was taken by Peter Hill and the potentially contaminated outer margins and surfaces were removed mechanically. The remainder of the sample was crushed to a fine powder and submitted to the Department of Geology at Royal Holloway College, London, where it was analysed using Inductively-Coupled Plasma Spectroscopy (ICP-AES).

Petrological Analysis

Scarborough ware

Description

The following inclusion types were noted in thin section:

- Medium-grained Sandstone. Sparse fragments up to 1.0mm across. The sandstone is composed of grains of subangular quartz with overgrowth and inclusion trails marking the original grain boundaries

- Subangular quartz. Abundant well-sorted grains, similar to those found in the sandstone above. Some have an opaque or dark brown coating indicating that the sandstone from which they are derived had a clay/iron cement.

- Rounded opaques. Sparse fragments up to 0.3mm across.

- White-firing mudstone. Sparse fragments up to 1.0mm across. These contain sparse angular quartz inclusions.

- Concretionary ironstone. A single fragment 1.5mm across consisting of an irregular dark brown concretion with a void at the centre.
- Rounded brown mudstone. Sparse fragments up to 0.5mm across
- Muscovite. Moderate laths up to 0.3mm long.
- Plagioclase feldspar. Sparse fragments up to 0.3mm across.

The groundmass consists of optically anisotropic baked clay minerals, abundant angular quartz up to 0.1mm across, moderate muscovite laths up to 0.3mm across and rounded opaque and dark brown grains up to 0.05mm across.

Interpretation

Although the muscovite laths are similar in size to the other inclusions, it is likely that they were present in the parent clay. The white-firing and brown mudstones are also likely to be relicts from the weathered parent clays, suggesting that the clay was formed by mixing together clays with different iron contents and compositions. Mudstones which on weathering fire to brown and white colours occur in the Middle Jurassic in the Scarborough area.

The remaining inclusions form a quartzose sand, probably derived in the main from the weathering of an Upper Jurassic sandstone (including beds with an iron-rich cement and beds with no cement apart from the quartz overgrowth).

Hambleton ware

Description

The following inclusions were noted in thin section:

- Angular quartz. Abundant fragments up to 0.2mm across.
- Muscovite. Moderate laths up to 0.3mm long.
- Subangular limestone. A single fragment of non-ferroan calcite partially replaced by a brown material, which has stained the surrounding clay in a dendritic manner, suggesting it might be rich in manganese.
- Subangular opaques. Sparse fragments, up to 0.5mm across. Some, with a dark brown colour around the edges are composed of aggregates of spherical grains whilst others, totally opaque are not.
- Rounded white-firing mudstone. Sparse dense fragments up to 1.0mm long,

- Subangular voids. Several irregular shaped voids are present, up to 1.0mm across. They do not appear to have contained limestone (which in at least one case has survived in this section) and might be pockets of air folded into the clay. They are surrounded by a slight but noticeable reaction rim, at least 0.5mm wide. It is unclear what chemical reactions were involved but interesting, when considering the results of the chemical analysis, to realise that such reactions reached deep into the body of the pot.

Interpretation

The quartz grains show no signs of rounding at all and might have come from a silt/fine sand band within the parent clay. The white-firing mudstone is probably a relict from the parent clay, but contains no quartz silt which again suggests that the parent clay is a composite material, including silt-free clays mixed with silty and fine sandy beds. The limestone fragment might be a concretion or a fossil, also naturally present in the parent clay.

Chemical analysis

A range of major elements were measured as percent oxides (Appendix 1) and a range of minor and trace elements were measured as parts per million (Appendix 2). Silica was not measured directly but was estimated by subtracting the total measured oxides from 100%. The two estimates are 75.2% (Scarborough ware) and 67.9% (Hambleton ware). These compare well with other analysed samples of the two wares (Fig 1).

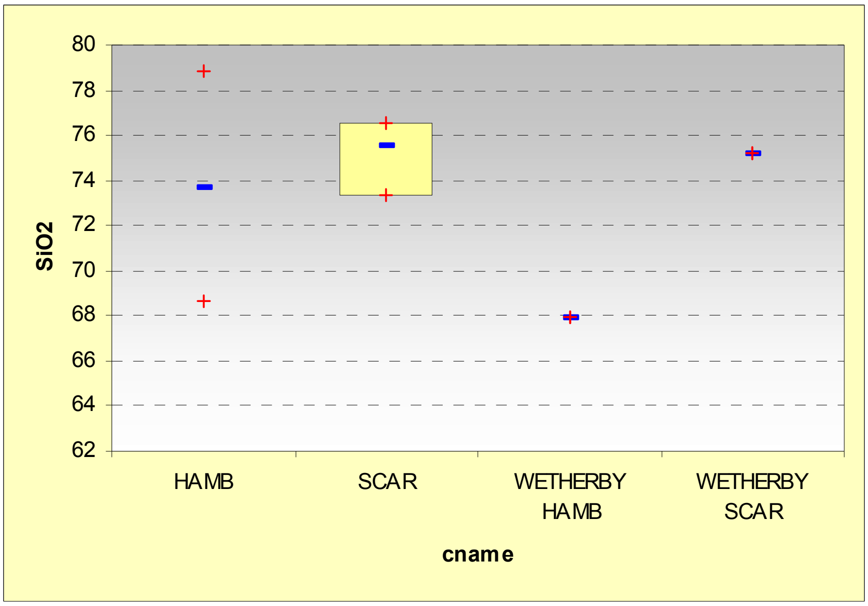

Figure 1

The data for these samples, and for other vessels made on the fringes of the North Yorkshire Moors, were then normalised to aluminium, to try and counteract the dilution effect of differing quantities of silica in the samples, and analysed using factor analysis.

The factor analysis found five significant factors in the dataset. A plot of F1 against F2 indicates a single large cluster with two outliers with high F1 scores, both fine North Yorkshire whitewares from occupation sites in Hartlepool, and two outliers with high F2 scores, both of which come from consumer sites in York. Within the main cluster there is a trend for samples made or found to the north of the moors (Whitby and Hartlepool) to have higher F2 scores than the remainder.

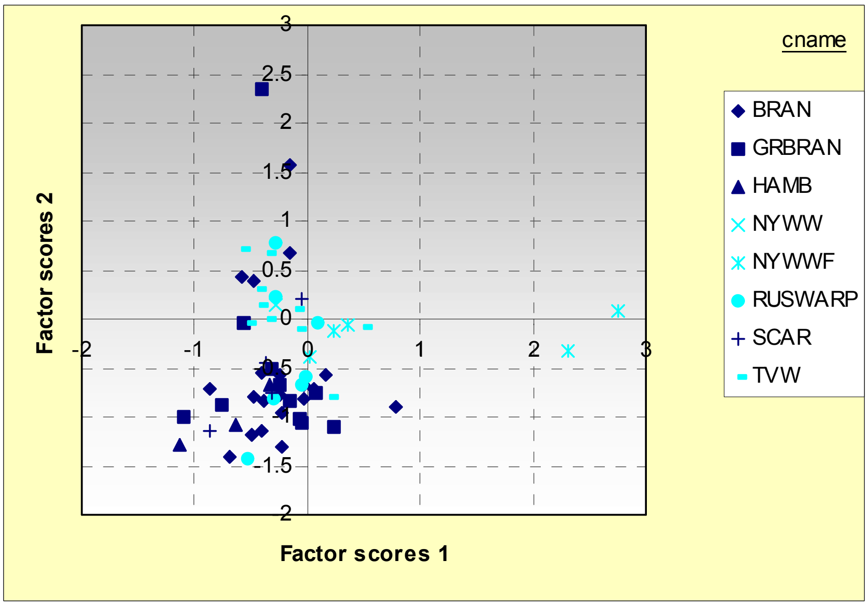

Figure 2

Both of these factors, however, include high weightings for elements which are potentially or definitely affected by burial. These can include the rare earth elements, which are often present in secondary phosphate concretions, along with barium and strontium; and calcium. Furthermore, analysis of a Lincolnshire shell-tempered ware from Wetherby suggests that on that site groundwater caused the leaching of calcium, magnesium and lithium and the enrichment of chromium.

Consequently, the factor analysis was re-run omitting all of these elements. This found three significant factors. High F1 scores are brought about mainly through high scandium and zirconium weightings, Negative F1 scores are the result of high iron weightings. High F2 scores are brought about by high potassium, manganese and sodium weightings. Finally, high F3 scores are caused by high zinc, nickel and copper weightings. Fig 3 shows a plot of F1 against F2 scores for this analysis. The outliers in the original analysis are now placed back in the main cluster, but there is no separation of different kilns, nor even of different areas within the region. However, the Wetherby samples do fall well within the main cluster, indicating that they are indeed of North Yorkshire origin. The F2 scores show a trend, with vessels found or made to the north of the moors having negative scores and those made in the south having positive scores.

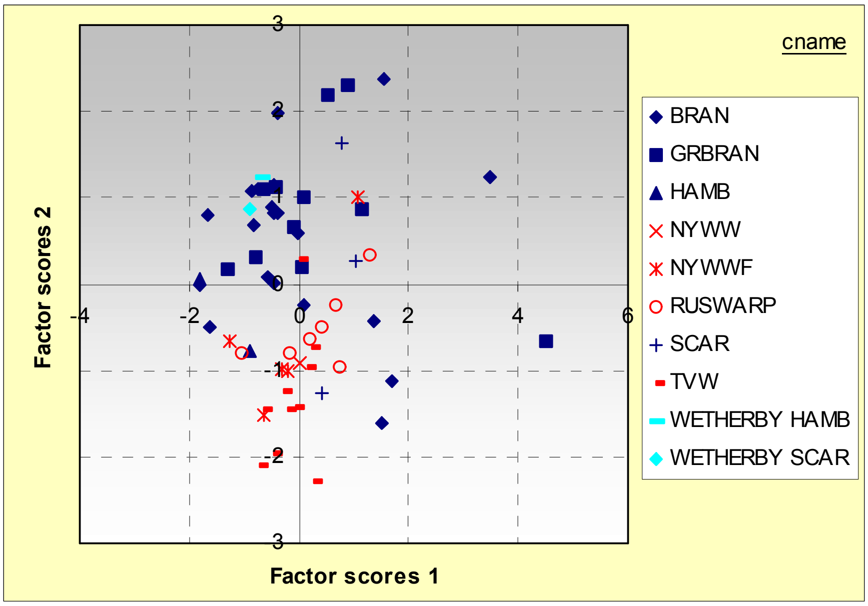

Figure 3

Fig 4 shows a plot of F2 against F3 for this analysis but indicates little sign of any patterning in the F3 scores.

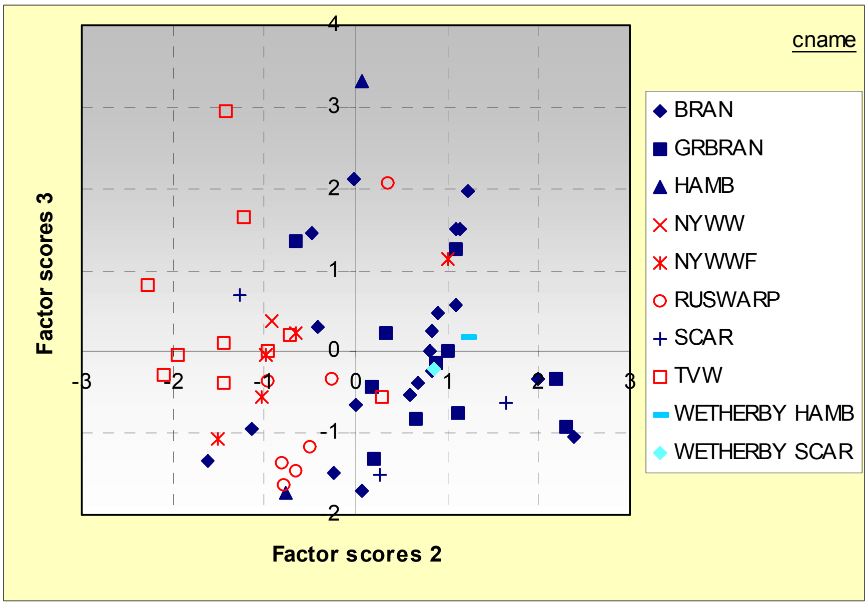

Figure 4

Conclusions

The pottery made in and around the North Yorkshire Moors used weathered Middle Jurassic mudstones for the parent clay, sometimes with the addition of quartz sands of various kinds. Because these mudstones are very variable in their texture and, therefore, composition, a wide range of compositions is found even in samples from the same kiln site (as at Ruswarp Bank). Therefore, the analyses of the Wetherby samples confirm that they are indeed products of this production region but do not provide any further knowledge about the source of the vessels.

Appendices

Appendix 1

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V2443	17.65	3.1	0.65	0.57	0.11	1.57	1.07	0.1	0.011
V2445	23.38	3.14	0.89	0.83	0.17	1.92	1.41	0.31	0.024

Appendix 2

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V2443	289	100	25	49	36	17	59	160	15	75	33	68	33	2	1	2	2	658	40	13
V2445	385	123	92	103	49	24	95	182	20	113	50	110	51	5	1	4	2	5483	81	14