Characterisation Studies of an Anglo-Saxon Pot from Boston Spa, West Yorkshire

Alan Vince

Excavations by West Yorkshire Archaeological Service at Boston Spa, Site Code BYW04, revealed a ditch producing Romano-British pottery whose upper fill included a black, handmade body sherd (context 1087).

The sherd was submitted for assessment to the author, via Ruth Leary, and identified as being an early to mid Anglo-Saxon vessel. The visual parallels to the fabric are with the York area (e.g. Heslington Hill, Heworth, The Mount and Fishergate) whilst the parallels for the overall form and finish of the period are with the earlier part of the period, since the Fishergate vessels are less well-finished and tend to have a more baggy form, being taller than they are wide, in contrast to the earlier, more spherical vessels.

Samples of the Boston Spa vessel were submitted for thin sectioning and chemical analysis.

Description

Thin Section Analysis

The thin section was prepared by Steve Caldwell, University of Manchester, and stained using Dickson's method, in order to distinguish dolomite, ferroan calcite and non-ferroan calcite (Dickson 1965). The section was given the code V2765 and added to the AVAC reference collection.

The following inclusions were noted in thin section:

- Angular quartz. Abundant fragments, mainly of monocrystalline quartz with slight to moderate strain (i.e. subject to slight metamorphism). Some polycrystalline grains with incipient formation of mosaic texture. The grains are up to 1.0mm across and most have one or more straight edges, indicating overgrowth.

- Coarse-grained sandstone. Sparse fragments composed of angular quartz grains similar to those described above, up to 1.0mm across. Strained and unstrained grains occur in the same rock fragment, indicating that the metamorphism took place prior to the formation of the sandstone.

- Medium-grained sandstone. Sparse fragments up to 1.0mm composed of well-sorted quartz grains c.0.2mm across The grains are interlocking and overgrown, but the original rounded grain boundaries are visible due to differences in the quantity of inclusions present in the original and secondary quartz.

The groundmass consists of optically isotropic baked clay minerals and abundant angular quartz (some with very high angularity) and sparse muscovite laths, both c.0.05mm to 0.2mm across.

The groundmass is typical of vessels produced in the Vale of York utilising quaternary clays (which could be boulder clays, glacial/post-glacial lake clays or post-glacial alluvial deposits. The coarse sand might have been present in the parent clay, especially if the source was a boulder clay, and is derived mainly from lower Carboniferous sandstones from the Millstone Grit. The finer-textured sandstones are also possibly from the Millstone Grit. However, the lack of composite sandstone grains and of mudstone fragments suggests perhaps that the coarser grains were water-transported, leading to the mechanical erosion of sandstone fragments and the removal of mudstones.

Chemical analysis

Chemical analysis of a sample of the vessel was carried out under the supervision of J N Walsh, Royal Holloway College, London, using Inductively Coupled Plasma Spectroscopy (ICP-AES). A range of major, minor and trace elements were measured. The major elements were measured as percent oxides (Appendix 1) and the remainder were measured as parts per million (Appendix 2).

Silica was not measured but an estimate of the silica content could be made by subtracting the total measured major element values from 100%. The estimated silica content, 80.72%, is higher than the majority of these sandstone-sand tempered fabrics in northern Britain but comparably high values are recorded from West Heslerton, Catterick, West Lilling and Scorton Quarry (near Catterick).

To take account of the variable quantity of silica (mainly in the form of quartz) present in the fabrics, the data for the Boston Spa sample and comparative vessels were normalised to Aluminium and the resulting dataset then analysed using Factor Analysis. Experience using chemical analysis to characterise vessels from northern Britain has suggested that there was a high degree of post-burial alteration in the frequency of some elements, both as a result of leaching and the invasion of soil into pores and voids and adsorption of elements through circulation of groundwater. Therefore, this factor analysis excluded Magnesium and Calcite, together with Strontium and the Rare Earth Elements, all of which are clearly affected by burial conditions to such an extent that original variations in frequency are masked.

A factor analysis including the following elements was therefore carried out of this restricted dataset and three factors were found (Table 1). A plot of the first two sets of weightings (Fig 1) indicates that Nickel, Manganese, Cobalt and Chromium all contribute to high F1 scores,

whilst Zirconium, Titanium and Vanadium all contribute to high F2 scores, whilst high values of Lithium and Barium contribute to negative F2 scores.

Table 1

Element	Factor 1	Factor 2	Factor 3
K2O	-0.027242127	0.101269745	0.568796002
Zr*	0.03853533	0.66778642	-0.12514646
Cu	0.039637859	-0.254293916	0.328642965
Pb	0.074281709	0.318294123	0.012626475
TiO2	0.099698449	0.615308493	-0.064841663
Li	0.115393554	-0.508529924	-0.170260484
Na2O	0.118336537	-0.151481614	0.523743253
Ba	0.21852426	-0.424458423	0.472700025
V	0.290525216	0.622280215	-0.29733434
MnO	0.499827671	0.108340857	0.431661341
Cr	0.508239389	0.498146696	-0.328701821
Co	0.598368327	0.243986031	0.458333979
Fe2O3	0.630721529	0.261682939	0.211548027
Sc	0.674407224	-0.06705542	-0.220749942
Ni	0.695888654	-0.070971178	0.184356659

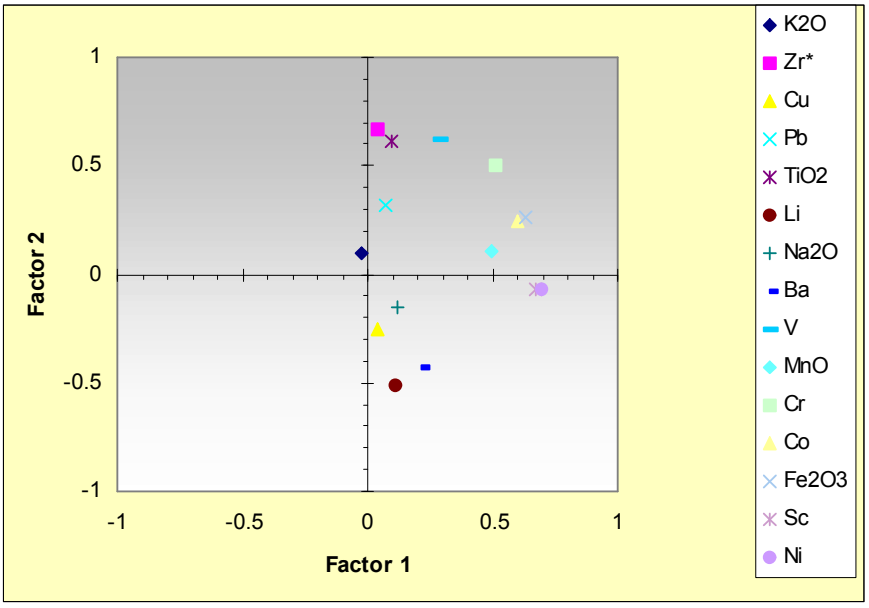


Figure 1

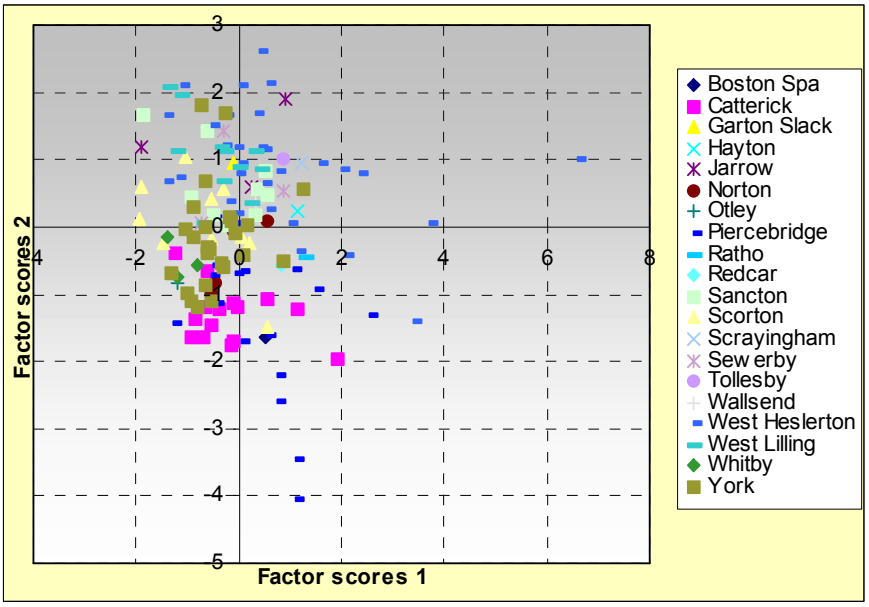
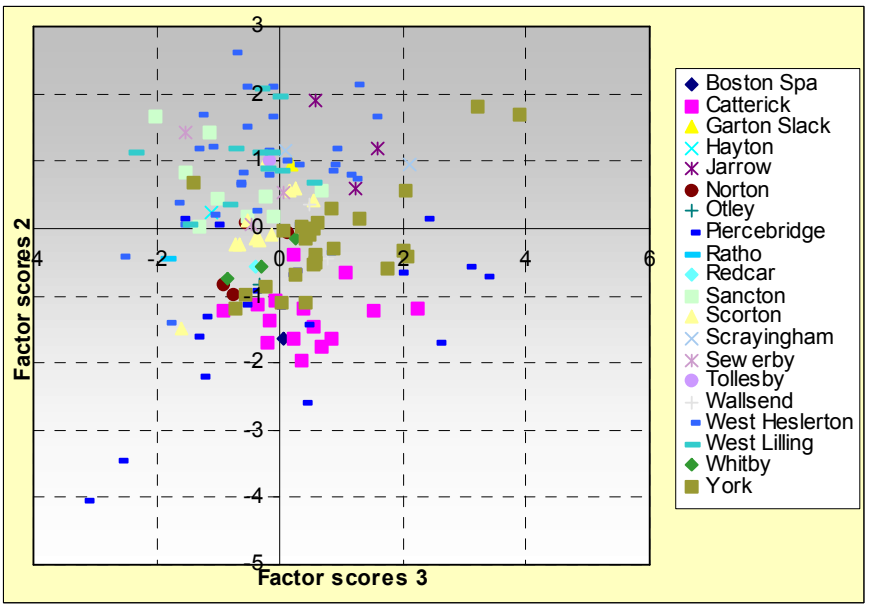


Figure 2

A plot of the F1 and F2 scores for the northern British sandstone-sand tempered comparanda indicates that the Boston Spa sample has a low positive F1 score and a negative F2 score, features which are shared by samples from Piercebridge, Catterick and Scorton Quarry.

A plot of the F2 against F3 scores distinguishes the Scorton Quarry samples from the Boston Spa, Piercebridge and Catterick samples (Fig 3).



Discussion

The thin section confirms that the Boston Spa vessel is identical in fabric to the majority of early to mid Anglo-Saxon vessels in the Vale of York, and neighbouring areas. It suggests that the vessel was made within the Vale of York but since the parent clay was clearly a Quaternary deposit and it is unclear at present how the petrological composition and chemistry of these deposits varies through the Vale it is not yet possible to use the details of the petrology and chemistry to say precisely where the parent clay was obtained.

It is interesting that the chemical composition of the Boston Spa vessel does not match that of the closest comparanda, from the York area which is only 16 miles to the east, but does match samples from Piercebridge and Catterick, over 40 miles to the north. There are two main potential interpretations: the first is that the Catterick and Boston Spa vessels were indeed made in the same area and that they reflect the use of the predecessor of the Great North Road and the A1, running along the western side of the Vale. The second possibility is that the composition of the Quaternary deposits in the Vale of York varies more in an east-west than a north-south direction, since, unlike riverine deposits, there is no opportunity for lateral mixing of deposits laid down by ice or subglacial water channels. A third factor is that the comparative samples are not all of the same date. Those from Piercebridge and Catterick include stamped and bossed vessels which are clearly of 6th century, whereas those from the York area are all potentially of later 7th to 9th-century date, as is the Otley sample and those from Whitby Abbey, all of which have similar scores in the factor analysis.

Appendix 1

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V2765	12.42	2.35	0.71	1.22	0.5	1.05	0.46	0.55	0.016

Appendix 2

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V2765	1335	69	27	100	37	11	77	69	33	43	39	70	42	10	2	6	2	71	118	16

Bibliography

Dickson, J. A. D. (1965) "A modified staining technique for carbonates in thin section." *Nature*, 205, 587.