Characterisation of Roman and Anglo-Saxon coarsewares from Piercebridge, Co Durham

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Excavations at Piercebridge between 1969 and 1981 revealed evidence for Anglo-Saxon settlement on the site of the Roman fort and extramural *vicus*. Although these excavations have never been published, Jerry Evans and Nick Cooper have studied the pottery from the site and a draft typescript by Cooper on the coarsewares and illustrations of selected Anglo-Saxon vessels exists.

One of the problems which Cooper had to confront was the lack of information about the stratigraphy on the site and an assessment of the likelihood of confusion, residuality and intrusion. However, a group of smashed vessels from a well were clearly stratified in association with other 3rd-century pottery and provide a link between the 'Native' wares of Iron Age character which continued to be produced and used in Britain in the early decades of Roman occupation and the 'sub-Roman' and 'Anglo-Saxon vessels found in the later 4th and 5th centuries respectively. The vessels from the well group are low-fired, often contain unburnt carbon in the body, and so have a black colour, contain large angular rock inclusions and have burnished surfaces. Small sherds of these vessels, found without any archaeological context or typological traits, would be extremely difficult to distinguish from Anglo-Saxon vessels. For this reason, Cooper's paper covers all coarsewares, whether or prehistoric, Roman or Anglo-Saxon date.

In 2002, the author re-examined the coarsewares and undertook a x20 binocular microscope survey of the entire collection, which consisted of 336 different groups of sherds totalling 1273 sherds from no more than 930 vessels.

Table 1 shows a breakdown of the collection based on the binocular microscope survey. In very few cases was it possible to be absolutely certain about the date of the sherds. Most of the CALC sherds were clearly of late Roman Calcite-tempered ware (Huntcliffe and Knapton types) but a very similar fabric was used at West Heslerton in the Anglo-Saxon period. Those fabrics with Millstone Grit-type sandstone temper were divided into those with definite evidence for an Anglo-Saxon date (such as stamped decoration) and the remainder, which could not be dated on intrinsic evidence.

Table 1

cname	Description	Nosh	NoV	Further study
CALC	Calcite-tempered vessels (probably in the main Roman-British wares from the Vale of Pickering)	102	40	0
CHARN	Biotite granite temper	199	113	2 TS, 9 TS and ICPS
ECHAF	Chaff temper	1	1	TS and ICPS
ERRA	Basic igneous rock temper, probably most/all prehistoric and Romano-British	79	36	0

HARROLD	Shell-tempered Romano-British from the southeast midlands (includes punctate brachiopod shells)	2	2	0
LIMES	Limestone tempered	2	2	2 TS and ICPS
MISC	Unclassified, includes definite Romano-British vessels	52	18	1 TS
RPOT	Romano-British non-coarse	28	22	0
RPOT/MPOT?	Roman or medieval	4	4	0
SSTMG	Millstone Grit-type sandstone tempered	700	630	1 TS and 16 TS and ICPS
SSTMG1	Millstone Grit-type sandstone tempered, definitely of Anglo-Saxon date	7	4	4 TS and ICPS
Total		1179	873	

The vessels from the 3rd-century well were classified by Cooper as his fabrics 6 and 7. Three slightly different subfabrics were noted by the author but they all contain a mixed ill-sorted gravel (Table 2). The fabrics did not have the appearance of deliberately tempered vessels, although it is often impossible to be certain and demonstrate that the three main inclusion types found in the remainder of the collection could occur in association. One hesitates to guess at the source of these vessels, given the widespread distribution of crude, handmade CALC vessels in the north during the Roman period, but the inclusions would be consistent with a local fluvio-glacial source.

Table 2

ID	Millstone Grit-type sandstone	Fine grained sandstone	Rounded quartz	Basic igneous rock	Acid igneous rock
13	YES			YES	YES
14		YES	YES		
15			YES	YES	YES

Petrological Analysis

The thin sections were examined to establish the range of inclusions present and to record any significant characteristics of these inclusions. In the case of the Piercebridge samples there was a difference in the character and frequency of the inclusions above and below c.0.3mm and the latter is here termed groundmass. It is possible that this is also the division between those inclusions which are naturally present in the parent clay and those which were deliberately added by the potters, as temper.

The sections were grouped into subfabrics on the basis of the presence/absence of inclusion types, with some inclusions, because of their frequency, being treated as mandatory for a sample to be assigned to a subfabric and others not. Differences in the petrological characteristics of the groundmass are assumed to be of greater significance than differences in the larger inclusions. In most cases because of

the size of the inclusions as a proportion of the size of the section a very small number of larger inclusions were present, sometimes less than 10. It would be dangerous, therefore, to place too much significance on the relative frequency of particular inclusion types, or even on the absence of the less common types.

Subfabric 1

This subfabric contains abundant fragments of Millstone Grit-type sandstone in a groundmass of fine quartz sand (up to 0.3mm across). Sparse rounded quartz grains, carboniferous chert, basic igneous rock and organic inclusions are sometimes present.

Subfabric 2

This subfabric contains a mixture of Millstone Grit-type sandstone and biotite granite in a groundmass of fine quartz sand (up to 0.3mm across). Finegrained sandstone, carboniferous chert, organic inclusions (?chaff) and dark brown clay pellets with a concentric structure are sometimes present.

Subfabric 3

This subfabric contains angular fragments of biotite granite sandstone in a groundmass of fine quartz sand (up to 0.3mm across). Rounded quartz grains, organic inclusions (chaff?), large muscovite sheaves and red clay pellets are sometimes present.

Subfabric 4

This subfabric contains abundant fragments of Millstone Grit-type sandstone in a fine-textured groundmass containing only sparse quartz and muscovite silt. Chaff is sometimes present as are red clay pellets but the subfabric is remarkably mono-mineralic.

Subfabric 5

This subfabric contains a mixture of Millstone Grit-type sandstone and a finer-grained sandstone in a groundmass of fine quartz sand (up to 0.3mm across). Sparse carboniferous chert, basic igneous rock and organic inclusions are sometimes also present.

Subfabric 6

This subfabric contains abundant chaff inclusions in a groundmass of fine quartz sand (up to 0.3mm across).

Subfabric 7

This subfabric contains abundant rounded quartz sand in a groundmass of fine quartz sand (up to 0.3mm across).

Subfabric 8

This subfabric contains a mixture of Millstone Grit-type sandstone and biotite granite in a fine-textured groundmass containing only sparse angular quartz and muscovite silt. Both of the two sections also contain chaff but this is not considered to be essential.

Subfabric 9

This subfabric contains rounded fragments of a fossiliferous dolomitic limestone, containing sparse rounded quartz grains, in a groundmass of abundant well-sorted fine quartz sand up c.0.2mm across. Sparse fragments of biotite granite, fine-grained sandstone and rounded quartz were also present.

Discussion

Table 3 shows the correlation of these subfabric groups, based on thin section analysis and the visually identified fabric groups based on x20 magnification binocular microscope study. This shows that although biotite granite was identified by eye in 9 samples it was present in a further 3 samples. The chaff-tempered, limestone-tempered and rounded quartz sand tempered sampled were successfully identified by eye. The most new information comes from the sandstone tempered samples, where the division into Millstone Grit-type and finer-grained sandstones could not be so reliably carried out by eye.

Table 3

Fab	CHARN	ECHAF	LIMES	MISC	SSTMG	Grand Total
p01					9	9
p02	1				1	2
p03	6				1	7
p04					5	5
p05					3	3
p06		1				1
p07				1		1
p08	2					2
p09			2			2
Grand Total	9	1	2	1	19	32

It is quite clear that p09 is a completely different fabric from the remainder and must have been made from a different parent clay as well as a different tempering material. The limestone inclusions are presumably a Magnesian limestone of Permian date but the source of the parent clay has not yet been established although clays with this texture do occur in the Triassic.

The remaining samples may be divided into those with a fine groundmass and those which have a groundmass containing abundant fine angular quartz sand. It is noticeable that the former contain

much 'cleaner' inclusion suites than the latter. No rounded quartz, carboniferous chert, basic igneous rock or finegrained sandstones were noted.

The overall similarity in the groundmass and the range of minor inclusions suggests that the samples with a fine sandy groundmass were produced from the same parent clay. It is likely that the observed differences are due to the deliberate tempering of these groups with biotite granite and/or Millstone Grit-type sandstone. Whether these inclusions were obtained from a detrital source or were crushed or firecracked by the potters is not determinable from these sections, but there is no evidence for any rounding or weathering of the inclusions. All of the inclusion types are undoubtedly present in the Piercebridge area: The river gravels of rivers which drain the Pennines no doubt contain mainly Millstone Grit whereas the rare rounded quartz grains probably derive from the lower Permian, whilst the area is traversed by basic igneous dykes. Only biotite granite does not outcrop locally but the geological handbook for the area suggests that such erratics occur throughout the region. The identity of the finer grained sandstone inclusions is not known. They do not contain iron cement, nor are there greywackes and siltstones, which would indicate a contribution from the Coal Measures. The lack of Magnesian limestone and of Coal Measure rocks is interesting, since Piercebridge is situated on the former and close to the latter. However, these outcrops could well be masked by a thick overburden of fluvioglacial deposits. Nevertheless, the other possibility is that this group of fabrics was not produced in the Piercebridge area. However, thin section analysis does not allow us to make that conclusion.

Chemical Analysis

Samples were prepared by Peter Hill, who removed the outer surface of an offcut of c.1-2gm and crushed the remaining sample to a fine powder. These powders were sent to Royal Holloway College, London, where they were analysed using Inductively-Coupled Plasma Spectroscopy in the Department of Geology, under the supervision of Dr J N Walsh.

For each sample, the frequency of a range of major and minor elements was calculated. For major elements these are expressed as percent oxides and for minor elements as parts per million. In addition to the standard set of elements, Pb was measured. This element is particularly volatile during firing and for medieval and later samples gives an indication of potential contamination from glaze. However, in the analysis of samples from Catterick , Pb was useful in discriminating between samples.

The dataset was first examined to determine whether any of the values were outliers, defined as lying more than 4 sd from the mean for that element in the dataset. Six samples had such measurements (Table 3). Of these samples, V1472 is a limestone-tempered vessel and the outlying value reflects a true difference in composition. Similarly, V1474 was an ungrouped sample (MISC). The remaining samples are all, visually, of common fabric groups and in these cases perhaps the outlying values are the result of the sample containing a crushed inclusion rich in the elements concerned.

Table 4

Element	TSNO	Value	N*Sigma	P

CaO	V1472	5.55	4.310633627	0.000260427
MnO	V1474	0.41	3.815784013	0.002169736
Cu	V1477	107	4.234026303	0.000367205
Li	V1484	234	2.993314735	0.043222958
Pb	V1454	108	3.958368715	0.001206709
Zn	V1456	513	4.629555454	5.86306E-05

To examine the overall structure of the dataset a cluster analysis was carried out, using Ward's method (Fig 1). This analysis indicated that the data fell into two main groups each of which split into two subgroups and a number of smaller ones. It was determined from this that four major cluster were probably present in the data (Table 4). The samples with outlying values were omitted from the analysis. Each of these four clusters contained a mixture of samples with Millstone Grit-type sandstone inclusions and biotite granite inclusions, demonstrating that the difference in inclusion types does not have an overriding effect on chemical composition.

Table 5

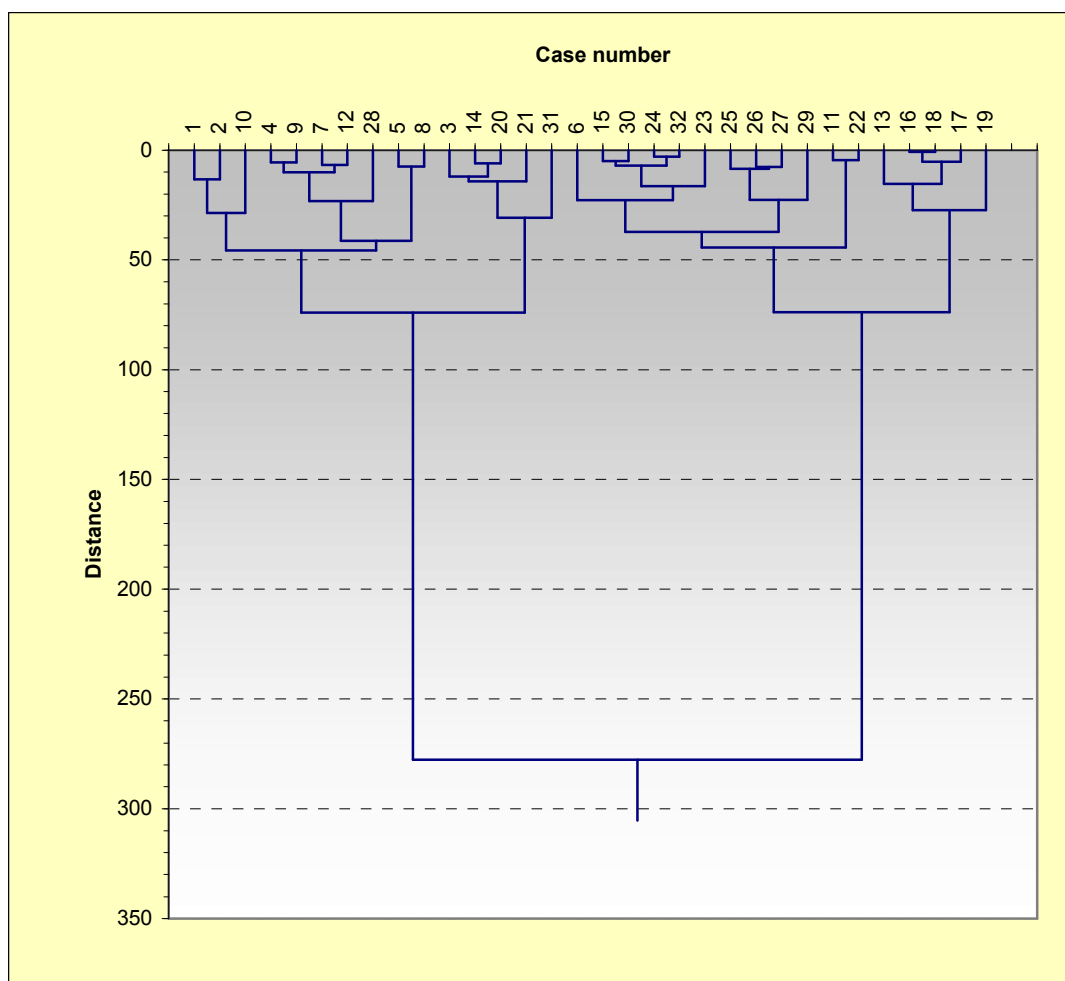| cluster1	cluster2	CHARN	ECHAF	LIMES	MISC	SSTMG	Grand Total
1	1	3				1	4
	2	3				7	10
2	3	1	1	1		5	8
	4	1				3	4
(blank)	(blank)	1		1	1	3	6
Grand Total		9	1	2	1	19	32

Figure 1

Factor analysis was then carried out on the data, again excluding those samples with outlying values. Six factors with eigenvalues over 1 were calculated and Appendix 2 lists the loadings for each element which contribute to these factors. The overall factor loading of course might depend on high values for a single moderately loaded element or moderate values for two or more elements but in practice, the elements with strong positive or negative loadings do appear to determine the factors of any particular sample.

Factor 1 has strong positive loadings for rare earth elements and a moderate negative loading for K_2O.

Factor 2 has strong positive loadings for TiO_2 and Cr and a moderate negative loading for MgO.

Factor 3 has moderately strong positive loadings for Fe_2O_3 and K_2O.

Factor 4 has a strong positive loading for Co and a moderate negative loading for Li.

Factor 5 has moderately strong positive loadings for Na_2O and Pb and moderately strong negative loadings for Zr.

Factor 6 has a strong positive loading for P_2O_5 and a moderately strong negative loading for Na_2O.

Plotting scattergraphs of one factor against another is a quick and visually direct means of studying the composition of the dataset.

A plot of F1/F2 grouped by Sitecode was prepared to determine whether there was any strong correlation between burial and composition, such as might occur if the samples were subjected to post-burial alteration (Fig 2).
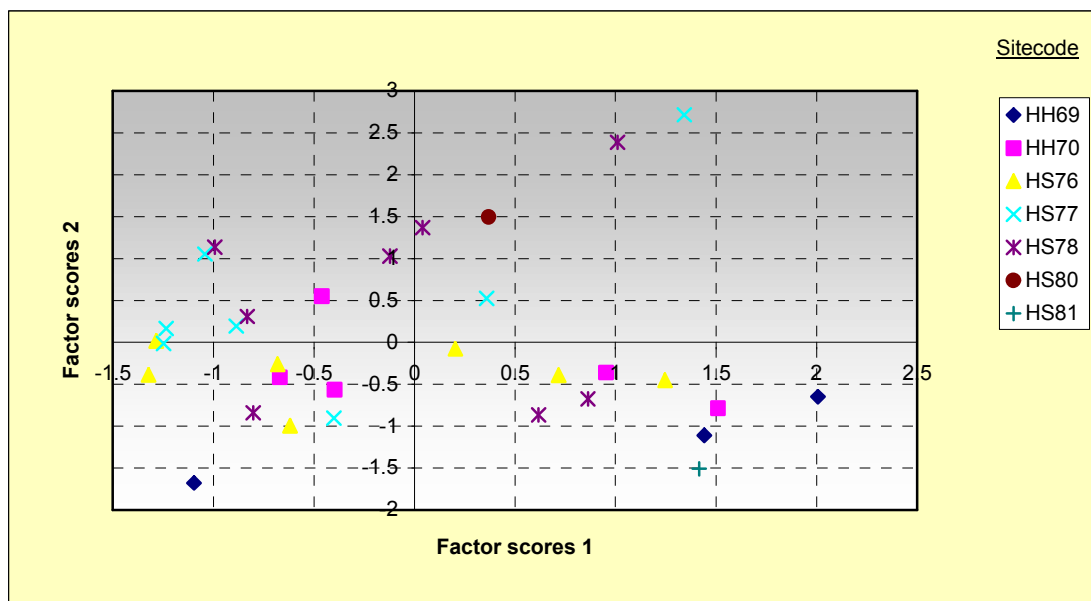
Figure 2

The same data was then plotted, grouped by visual fabric code (Fig 3). This shows that the two limestone tempered samples plot close together and are separated from the remainder of the dataset. Otherwise, there is a tendency for the SSTMG samples to have negative values for both factors and for the CHARN samples to have positive values for Factor 1 and negative values for Factor 2. The ECHAF and MISC samples are not separated from the remainder.
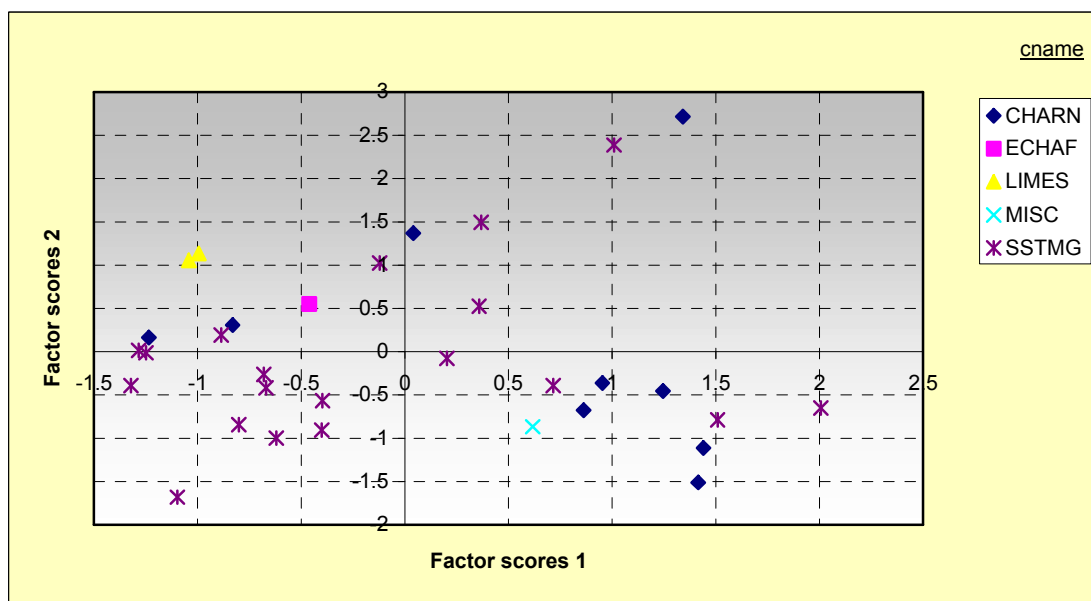

Figure 3

A plot of F3/F3 shows that the MISC sample has a strong positive value for Factor 4 but that the remaining samples cannot readily be differentiated (Fig 4).
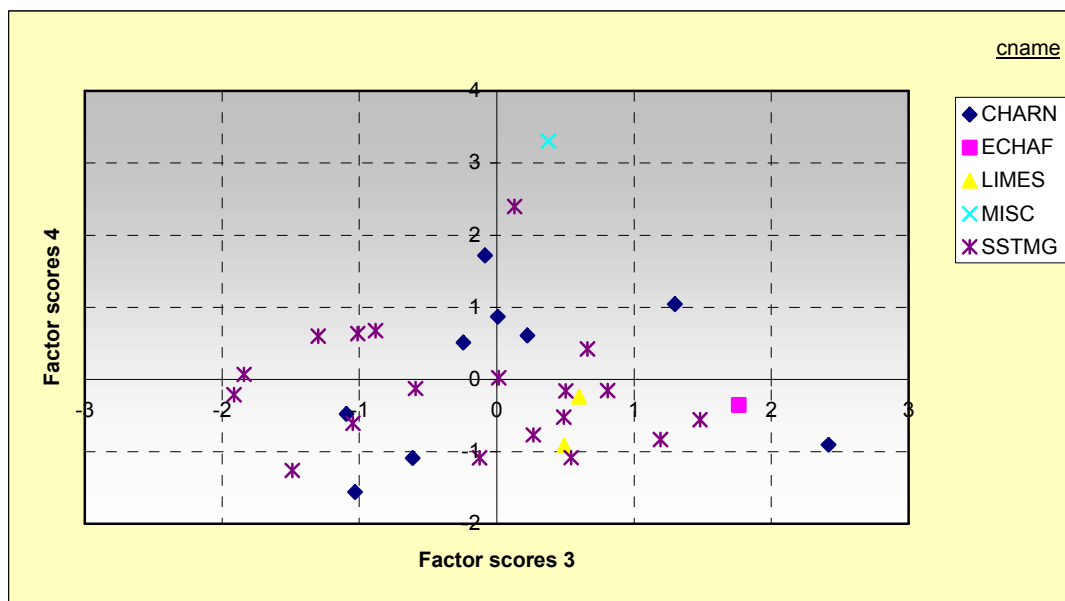
Figure 4

Finally, a plot of F5/F6 (Fig 5) shows no clear evidence for patterning. The ECHAF sample has a strong negative value for Factor 5, but only marginally more so than two other samples, of CHARN and SSTMG visual fabrics.

The chemical analysis therefore distinguishes the LIMES, MISC and, arguably, the ECHAF samples but shows no clear separation of the two main groups. This evidence would be consistent with these two groups being produced by selecting different tempering materials and adding them to the same parent clay, whilst the LIMES, MISC and possibly the ECHAF samples might have been made from different raw materials.

Combining this evidence with that from the thin section study it would seem that the two LIMES samples do come from a distinctly different source from the remainder. However, the division between the fabrics with a fine groundmass and those with a coarse one is less clearly reflected in the chemical composition.

Fig 00 shows F1/F2 grouped by groundmass type. The two LIMES samples stand out (as = abundant silt) but of the 7 samples with a fine groundmass three are separated from the remainder but four are not. There is certainly no evidence from this analysis to support the idea that all 7 have the same, different parent clay.
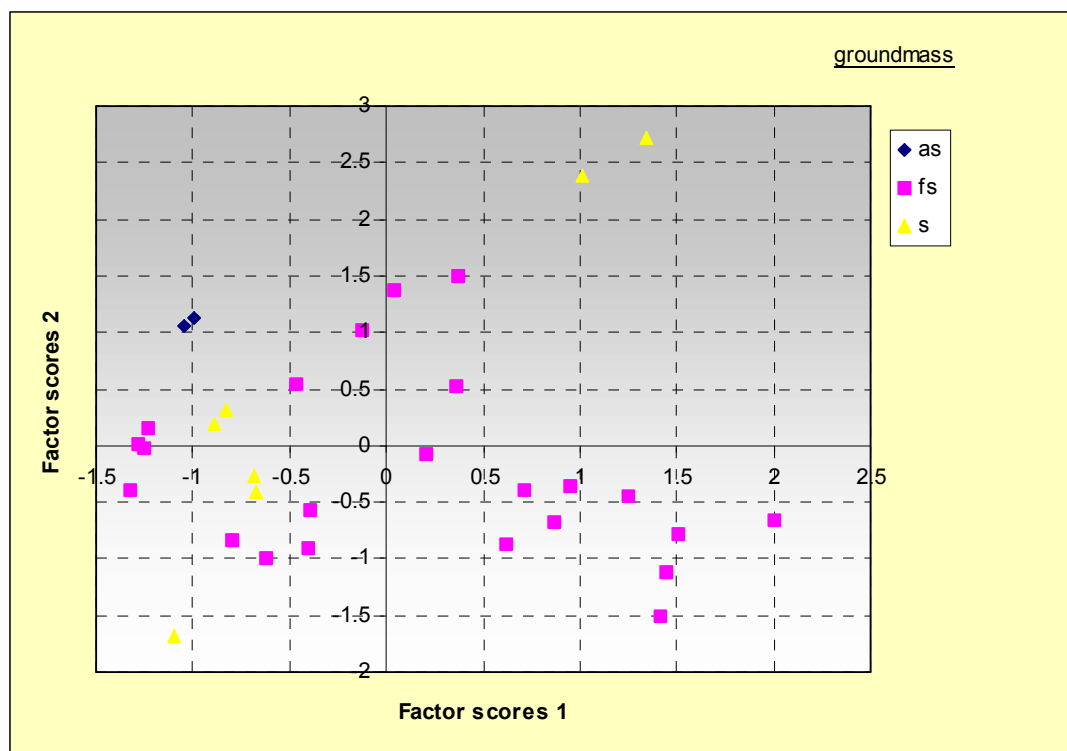
Finally, we can ask whether there is any evidence in this study for a difference in composition between Anglo-Saxon and Roman handmade coarsewares. An attempt to assign sherds to a period was made by the author (Table 6). Within the 32 samples two were thought possibly to be of Bronze Age date. One of these is subfabric 1 and the other subfabric 4. Nine samples were thought to be Romano-British 'native' wares. These were assigned to subfabrics 1, 3, 4, 5, 6, and 7. This includes the only examples of subfabrics 6 (chaff) and 7 (rounded quartz sand). Three samples were not assigned a date and the remainder were thought to be Anglo-Saxon. Of the latter, some are undoubtedly Anglo-Saxon and have features such as stamping, a footring base and long boss decoration. Another comes from a globular jar, a form not seen in Romano-British coarsewares. Four of these definite Anglo-Saxon sherds are assigned to subfabrics not present in earlier periods (8 and 9). However, two of these are the Magnesian limestone-tempered fabric and thus of no use in distinguishing the majority of the Roman and Anglo-Saxon coarsewares. A third subfabric was only classed as Anglo-Saxon or unclassed (subfabric 2). Thus, even detailed petrological examination has failed to find a clear distinction between the Anglo-Saxon and earlier ceramics (assuming that the subjective classification by date attempted here has some validity).

Table 6

Fab	B	R	R/AS	AS	Grand Total
p04	1	1		3	5
p01	1	1	1	6	9
p03		4		3	7
p06		1			1
p07		1			1
p05		1	1	1	3
p02			1	1	2
p08				2	2
p09				2	2
Grand Total	2	9	3	18	32

However, when the same classification was used to group the chemical data, a clearer pattern emerged (Fig 5). Most of the Anglo-Saxon sherds have higher positive Factor 1 scores than the earlier vessels. By contrast, there is no evidence for any correlation of period and factors 3 or 4. Since the loadings for Factor 1 emphasis elements which are likely to occur mainly in the clay fraction it may be that this result is actually reflecting the amount of clay in the sample. In other words, Romano-British and earlier wares have a higher percentage of silica.

Silica is not measured directly in ICPS but can be approximated by subtracting the frequencies of the major oxides from 100%. However, this figure is not simply silica but also will include carbon and other organic matter and chemically-combined water. Thus, another interpretation of this data would be that the Romano-British and earlier wares were less high fired or contained a higher organic content than the Anglo-Saxon ones.
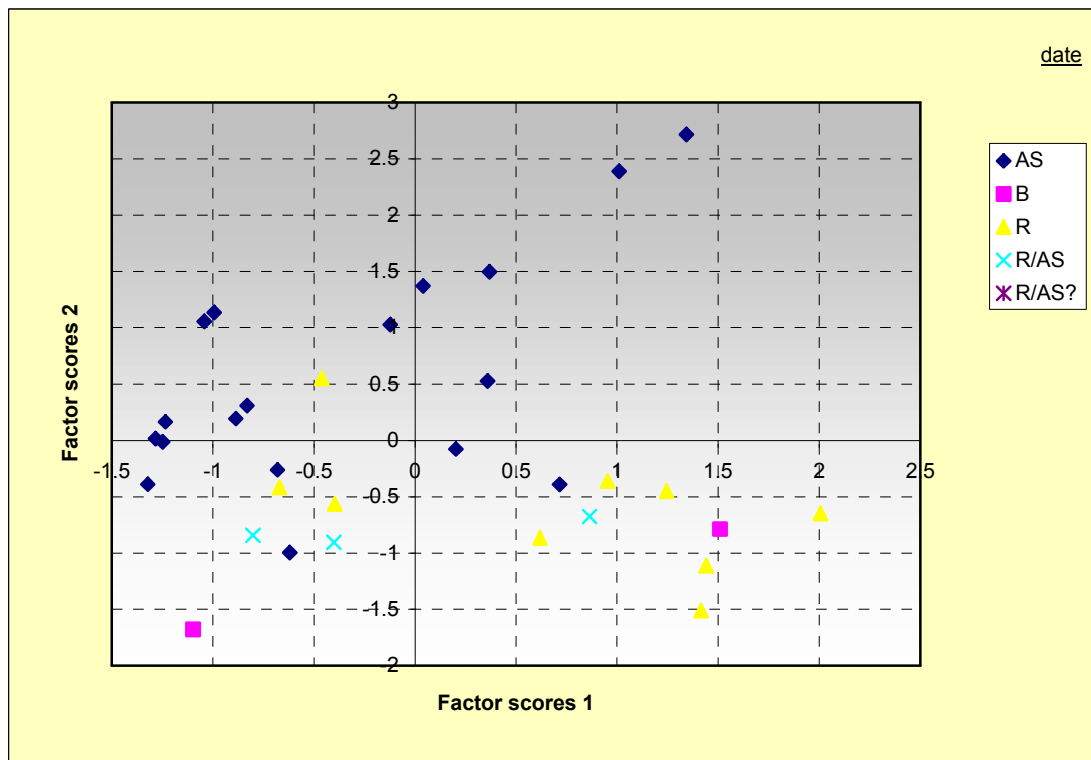

Figure 5

To test whether this chemical pattern was indeed related to chronology the analysis was repeated with the addition of the data from Catterick Bridge (Fig 6 CB AS) and Catterick Triangle (CT AS). The F1/F2 plot still shows a separation between Anglo-Saxon and earlier wares, although there are one Bronze Age and two Roman samples which plot with the main, Anglo-Saxon cluster.
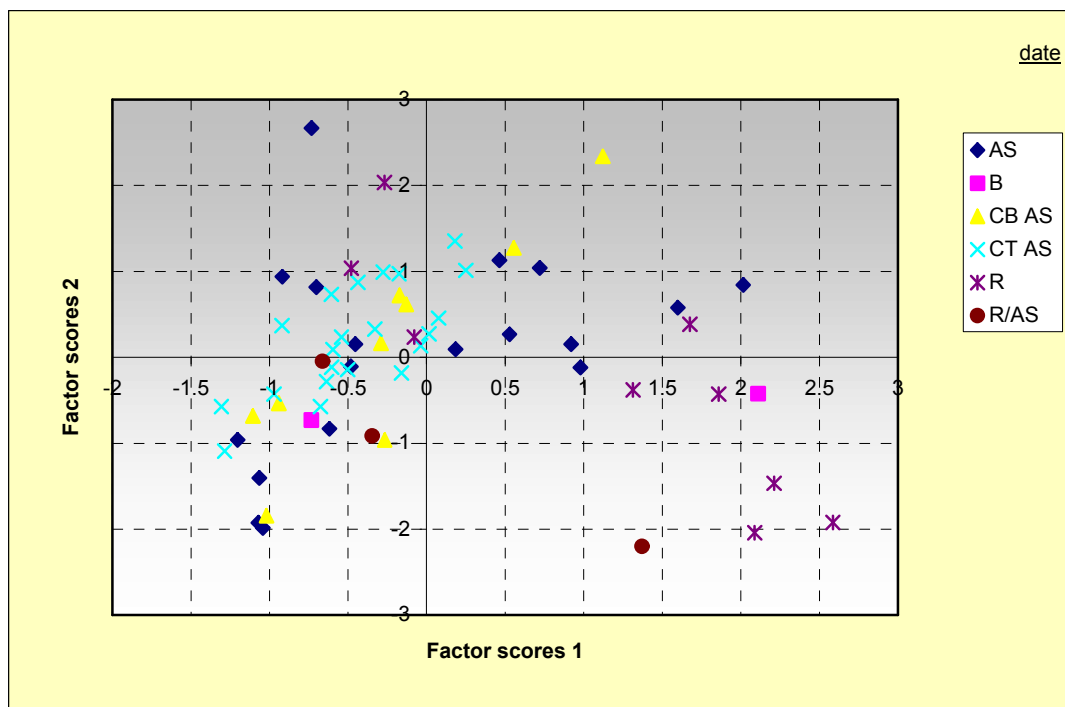
Figure 6

If this analysis is repeated, omitting the Bronze Age and Romano-British samples it then shows a strong degree of similarity between the Anglo-Saxon pottery from these three sites (Fig 7), as well as suggesting that one of the ungrouped Piercebridge samples is indeed Romano-British and the other two are Anglo-Saxon. There is thus no support from the chemical data for the three sites obtaining their pottery from different sources. This could simply mean that there is little chemical difference between the clays used.
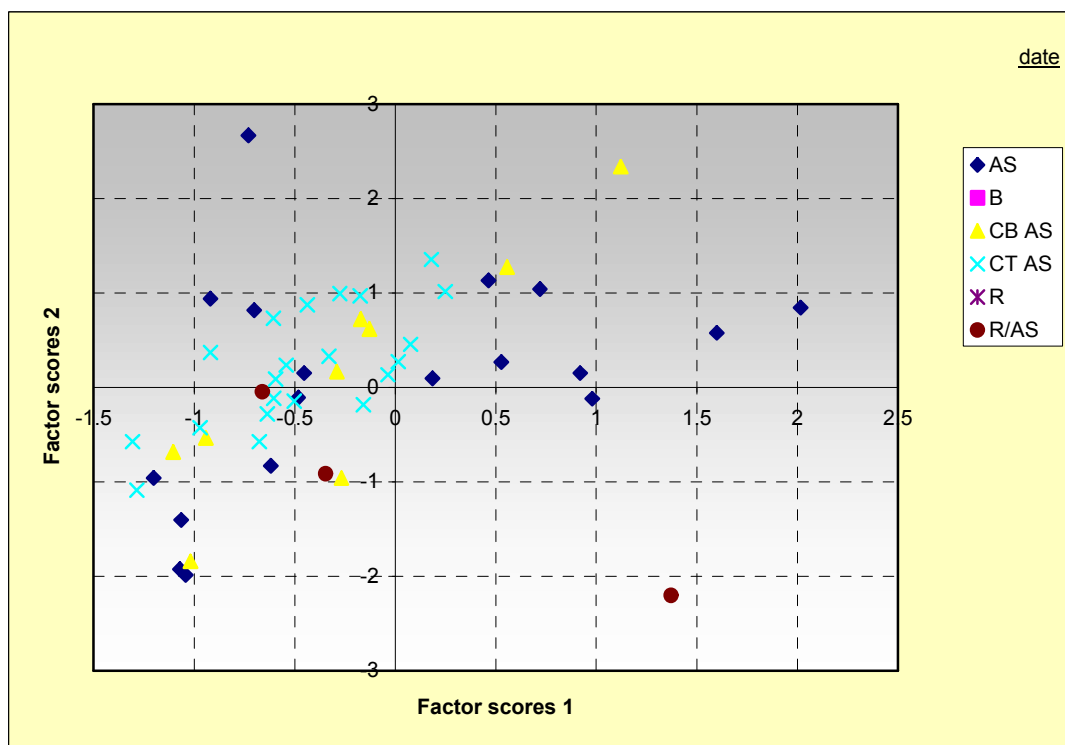
To summarise, the chemical data from Piercebridge seems to indicate differences between the Romano-British 'native' coarsewares and the Anglo-Saxon wares used on the site and this chemical

difference is also seen if we compare Piercebridge and Catterick. The explanation for the difference is not entirely clear, but might be related to the amount of silica found in the earlier fabrics or perhaps to differences in firing or organic content. It is also possible that the difference in age of the samples has allowed the earlier ones longer to react with groundwater although if this were the case then the Bronze Age samples should certainly be separated more strongly from the Anglo-Saxon and Roman samples.

Appendices

Appendix 2. Factor Analysis loadings

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Communality
Dy	0.985766308	-0.101351499	0.0336286	0.04020489	-0.022010912	-0.102297666	0.995703949
Sm	0.981879062	0.002472679	-0.079873549	-0.009897861	0.040492184	-0.048388782	0.97455145
Eu	0.946659485	0.006595334	-0.241570863	-0.088149266	0.109744383	-0.030550024	0.975311587
Y	0.946109191	-0.178742096	0.13526687	0.000916866	-0.072092481	-0.10114476	0.960796893
Nd	0.924862243	0.276485848	-0.16270438	0.025164608	0.087075959	0.077177879	0.972459213
Sc	0.888199546	0.348840169	0.1515357	-0.027709932	-0.140136984	-0.008266683	0.954025518
Yb	0.879111096	-0.015033728	0.30305623	0.154523178	-0.258891865	-0.122768846	0.970880011
La	0.876728817	0.349161895	-0.199904771	0.017877188	0.112715049	0.118906695	0.957692443
Ce	0.82334565	0.341162061	-0.226147892	0.20094717	0.122779681	0.185275482	0.935214099
Zn	0.797877222	-0.11547878	0.298421617	0.128264247	0.001546035	0.233994777	0.810206535
Ni	0.76769976	-0.051763147	0.320647537	0.340839998	-0.147776847	0.026683423	0.833579094
Li	0.739399647	0.02114301	-0.043982926	-0.419802451	0.292734092	-0.052336767	0.813759846
TiO2	0.179866707	0.908155311	-0.109005448	-0.124419886	0.030158044	-0.106328695	0.896675896
Cr	0.463951692	0.815256304	0.18887527	0.019314061	-0.178604442	0.057833761	0.951185205
Al2O3	0.609448683	0.696594557	0.11294551	0.024711804	0.197026618	0.041385464	0.910571281
Fe2O3	0.216125446	0.03342201	0.720126875	0.286830276	-0.301594501	-0.049673115	0.742108224
K2O	-0.3867695	0.009563172	0.711192572	0.270558979	0.26046771	-0.214711354	0.842623529
Cu	0.349483922	-0.084209776	0.614672619	0.230327542	0.090299793	0.175999092	0.599233236
V	0.366651813	0.436367504	0.492593857	0.27666297	-0.466686293	-0.148251293	0.883815801
CaO	0.027328438	0.042228213	0.353355668	-0.056029277	-0.048433817	0.076130668	0.138671287
Co	0.436620049	0.045894486	0.207907932	0.845085307	0.077586437	-0.081019837	0.962722125
MnO	0.473034418	-0.018372297	0.238240701	0.671630742	0.018891353	-0.042755147	0.734130473
MgO	-0.197556782	-0.328909106	0.405367386	0.449300326	-0.112556359	-0.092228882	0.534578483
Na2O	0.134533497	-0.163233166	0.182720442	0.185571862	0.54361238	-0.308183664	0.503059595
Pb	0.075420353	0.135374406	-0.148639783	0.012379356	0.540309664	0.052039127	0.340904097
Zr*	0.326093829	0.385465538	0.136825054	0.338911172	-0.531324655	0.002356237	0.670814186
P2O5	-0.011897497	-0.013517923	0.040135731	-0.118295902	-0.091252945	0.85876976	0.761741682
Sr	0.218881147	0.055713571	0.485548328	-0.037706294	0.435023531	0.498193525	0.725634163
Ba	0.32774822	-0.141373352	0.213071028	0.381454745	0.080126948	0.473226022	0.548675502
Sum of Squares	11.17512026	2.99798342	2.96165044	2.36649353	1.800444426	1.599633323	22.9013254
Percent of Variance	38.53489746	10.33787386	10.21258772	8.160322516	6.208429057	5.515976977	78.97008759