Characterisation Studies of Anglo-Saxon and Medieval Pottery from Upminster

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A selection of the early to mid Anglo-Saxon pottery from the Upminster sites was submitted to the author for comment and analysis. All of the sherds were examined at x20 magnification and on this basis were assigned to a broad fabric group. Four groups were recognised: Chaff-tempered ware (ECHAF), Sandstone-tempered ware (SST), Granite-tempered ware (CHARN) and Bone-tempered ware (ESBN). From these groups twelve samples were selected for thin section and chemical analysis (ICP-AES). The samples are listed in Table 1 and the ICPS analytical results are given in Appendices 1 and 2.

The thin sections were produced by Steve Caldwell, University of Manchester, and stained using Dickson's method (Dickson 1965). The thin sections have been added to the AVAC reference collection. The chemical analysis was carried out at Royal Holloway College, London, under the supervision of Dr J N Walsh, on a 1-2gm sample of the sherd, prepared from an offcut from which the outer margins had been mechanically removed.

Table 1

TSNO	Action	site name	Sitecode	Context	cname	subfabric
V3565	TS	Manor Farm, North Ockendon	UP-MF83	1+2	ESBN	ESBO
V3566	TS	Manor Farm, North Ockendon	UP-MF83	1(B) WEST OF [6]	ESBN	ESBO
V3567	TS	Manor Farm, North Ockendon	UP-MF83	1(B) OVER [6]	CHARN	ESSTC
V3568	TS	Manor Farm, North Ockendon	UP-MF83	1	SST	ESSTC
V3569	TS	Manor Farm, North Ockendon	UP-MF83	21 (B)	SST	ESSTC
V3570	TS	Manor Farm, North Ockendon	UP-MF83	24 (B)	SST	ESSTD
V3571	ICPS	Hunts Hill Farm	UP-HH89	4567	ECHAF	CHSF
V3572	ICPS	Hunts Hill Farm	UP-HH89	4237	ECHAF	CHSF
V3573	TS;ICPS	Whitehall Wood	UP-WW82	250	ECHAF	CHSFRQ
V3574	ICPS	Whitehall Wood	UP-WW82	349	ECHAF	CHSFRQ
V3575	TS;ICPS	Manor Farm, North Ockendon	UP-MF83	2	ECHAF	CHSF
V3576	ICPS	Manor Farm, North Ockendon	UP-MF83	175	ECHAF	CHAF

The results of these studies suggest that the chaff-tempered wares, which are the main group found, were locally made and can be distinguished by their chemical composition from the visually identical fabric found in central London and other sites in the Thames basin.

The bone-tempered sherds differ in the petrology but in both cases the bone is heavily stained and perhaps of fossil origin. It is very unlikely that the source of the bone is ash from cremations and the bone appears to come from either fish or small amphibians.

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The granite- and sandstone-tempered sherds probably come from the same source and were made from fluvio-glacial deposits. A source in north-east Leicester can be discounted but without chemical analysis it is not possible to chose between a fairly local source in the boulder clays of central or northeast Essex or a non-local origin, either in Jutland or East Anglia.

Bone-tempered ware

Thin-section analysis

The two thin sections have a rather different suite of inclusions.

V3565

The following inclusions were noted.

- Bone. Abundant angular fragments between 0.1mm and 1.5mm long. The fragments are all brown-stained and in addition several have dark brown to opaque dendritic staining. Fine-textured pores are present in some fragments.
- Rounded quartz. Moderate rounded grains, some with brown-stained veins. Most of the grains are monocrystalline and unstrained.
- Subangular quartz. Moderate grains up to 0.3mm across.
- Flint. Sparce angular unstained fragments up to 1.5mm across.
- Chert. Well-rounded grains up to 0.4mm across.
- Opaques. Well-rounded ovoid grains up to 0.3mm across.

The groundmass consists of brown, optically anisotropic baked clay minerals, moderate angular quartz up to 0.1mm across.

V3566

The following inclusions were noted.

- Bone. Abundant angular fragments between 0.1mm and 1.5mm long. The fragments have some brown-staining and in addition several have dark brown to opaque dendritic staining. Fine-textured pores are present in some fragments. The less heavily stained fragments show evidence for pink staining, and in one instance have an outer crust of blue staining.

The groundmass consists of brown, optically anisotropic baked clay minerals, abundant angular quartz and moderate muscovite up to 0.1mm across.

Discussion

It is clear than in both samples the bone fragments have been heavily stained. Despite being angular, the edges of some of the most sharp angles have been rounded. This suggests that the bone comes from a phosphate sand rather than being, say, crushed cremated bone. In addition, the shape of some fragments suggests that they come from small bones, such as fish or amphibians. Excluding the bone, the two samples are rather different and V3565 includes a mixed sand component derived from Triassic and lower and upper Cretaceous deposits in a coarse silty groundmass whilst V3566 is similar to samples of vessels produced from the upper strata of the London Clay, the Claygate Beds.

Granite-tempered ware

Thin-Section analysis

The following inclusion types were noted:

- Biotite granite. Moderate angular fragments of a biotite granite, up to 1.0mm across. Individual fragments include quartz, altered feldspar, unaltered microcline feldspar and biotite.
- Quartz. Sparse fragments of quartz from a sandstone with quartz overgrowth in optical continuity of the original grain.
- Organics. Sparse irregular voids up to 1.0mm across surrounded by a darkened halo.

The groundmass consists of dark brown optically anisotropic baked clay minerals, sparse angular quartz and muscovite laths up to 0.1mm long.

Discussion

The texture of the groundmass can be matched in Essex in the Claygate Beds of the London Clay, for example, but is not diagnostic and can also be found in central and northern England, and in Jutland. The coarse inclusions are all either derived from a granite or sandstone. The overgrown quartz grains are similar in size and character to those found in the Millstone Grit and there are several potential sources of biotite granite which might be found in clays and gravels in Essex: these include the Mountsorrel granodiorite from central England and erratic fragments from northern England (the Shap granite), Scotland or Scandinavia. The presence of microcline, and the lack of zoning in the feldspars, argues against the Mountsorrel granodiorite. This suggests either a local source employing granite from a fluvio-glacial sand or a boulder clay or that the vessel was produced elsewhere, such as East Anglia, Northern England or Jutland.

There are differences in the chemical composition of the clays used for biotite granite tempered wares in England and Jutland and it is likely that ICPS analysis of the sherd would establish its broad source.

Sandstone-tempered ware

Thin-Section analysis

Three samples could be grouped together because their main inclusion diagnostic type is quartz sandstone.

The following inclusion types were noted:

- Coarse-grained sandstone. Moderate fragments up to 1.5mm long composed of overgrown quartz grains (as in the granite-tempered ware section) with some patches of kaolinite cement.
- Fine-grained sandstone. Moderate fragments up to 1.5mm across composed of well-sorted overgrown quartz grains c.0.15mm across (V3570 only).
- Rounded quartz. Sparse well-rounded grains up to 0.5mm across, including some with a high sphericity probably of Triassic origin and some probably of Lower Cretaceous origin.
- Angular quartz. Moderate fragments up to 1.5mm across. Most probably come from the coarse-grained sandstone but some grains are of metamorphic origin and include strained mosaic quartz. In one case the fragment includes laths of muscovite and is probably a fragment of schist.
- Microcline feldspar. Sparse angular unaltered microcline feldspar fragments ranging from c.0.3mm to 1.5mm across.
- Perthite. Sparse angular fragments up to 1.5mm across. One fragment has kaolinite cement adhering and is probably from a feldspar-rich sandstone.
- Plagioclase feldspar. Sparse angular fragments up to 0.5mm across.
- Biotite. Rare laths up to 0.3mm long.
- Opaques. Sparse subangular fragments up to 0.3mm across.
- Organics. Moderate voids up to 1.5mm long, some with carbonised contents, surrounded by a blackened halo (V3569 only).
- Flint. A single subangular fragment of flint 1.5mm long (V3570).

The groundmass consists of dark brown optically anisotropic baked clay minerals, sparse angular quartz and muscovite laths up to 0.1mm long.

Discussion

There are no differences visible in thin section between the groundmass of these three samples and that of the granite-tempered sample. Furthermore, several of the mineral constituents of the biotite granite occur in these sections, and sparse quartz grains from a similar coarse-grained sandstone to that found in these sandstone-tempered sherds were present in the granite-tempered fabric. It is therefore likely that the four sections all have the same source. The coarse-grained sandstone is probably Millstone Grit, which outcrops in the Pennines and the north-east of England, and was carried south from both areas to midland England and East Anglia. The spherical quartz grains are probably from a Permian or Triassic sandstone, also common in fluvio-glacial deposits in the midlands and East Anglia. Other rounded quartz grains probably came from the Lower Cretaceous and the flint is either of Upper Cretaceous or Tertiary origin. Both are found in association with the previously-mentioned rock and mineral types in certain parts of the midlands and East Anglia. Neither occur in granite-tempered ware from northeast Leicestershire, but do occur alongside fragments of Mountsorrel granodiorite in samples from Cambridgeshire and Norfolk, probably made from boulder clay carried southeast from the Mountsorrel area.

It is likely that all four samples were produced from boulder clay, the nearest sources of which outcrop in northern Middlesex and northeast and central Essex. As with the granite-tempered ware, a closer idea of the source could probably obtained using chemical analysis to study the clay groundmass.

Chaff-Tempered Ware

The most common Anglo-Saxon pottery fabric found on sites UP-HH89. UP-WW82 and UP-MF83 includes abundant organic material, probably to be interpreted as dung-tempering (Gaimster 1986) although usually termed Chaff-Tempered ware, which is still accurate, as it is likely that animals (probably horses or donkeys) were fed on threshing waste and their dung then used as pottery tempering.

Under x20 magnification and in the hand specimen, few other inclusions are visible and the groundmass contains abundant quartz and muscovite silt, similar to that found in medieval Mill Green ware and South Essex Shelly ware. Similar chaff-tempered wares occur throughout Essex and the lower Thames valley. Previous studies of the fabric of these wares has indicated that those used at Staines and Barking can be distinguished from other samples from sites in the Thames valley: Clapham, Lundenwic, Hammersmith and Harmondsworth, either using thin section or chemical analysis.

Thin Section Analysis

Two samples were taken for thin section analysis, representing the two extremes of visual texture of the groundmass.

V3575 contained moderate organic inclusions in a groundmass of brown optically anisotropic baked clay minerals, abundant angular quartz, moderate muscovite and sparse rounded opaque grains, all up to 0.1mm across. The largest non-organic inclusions were rare subangular quartz grains up to 0.3mm across.

V3573 contained moderate organic inclusions but in addition contained moderate rounded quartz grains, a few well-rounded oval examples but mostly well-rounded with a low sphericity and probably of Lower Cretaceous origin. Sparse angular fragments of flint were also present, most of which were heavily brown-stained.

Chemical Analysis

The chemical data from Upminster was compared with that from other samples of Essex medieval pottery and of chaff-tempered pottery from the lower Thames valley.

This analysis demonstrated that Harlow wares (medieval Harlow ware, Transitional Harlow ware and Metropolitan Slipware) could all be distinguished from the remainder. These were then omitted from further analysis and the process repeated. Because the voids left by the burnt out organic matter were often filled with calcareous and phosphatic deposits after burial, all those elements which were likely to be enhanced as a result were omitted from analysis (calcium, strontium, phosphorus and the rare earth elements). Factor analysis of the resulting dataset revealed four significant factors. A plot of F1 against F2 (Fig 1) revealed no clear separation of any of the different groups although the Mill Green ware (from a single production site at Noak Hill) does form a cluster within the general plot. A further pattern is that the Greater London area samples tend to have a higher F1 score than those from Essex (including Barking). This suggests that the Upminster samples are locally produced, probably from similar parent clays to the Mill Green and South Essex Shelly wares (i.e. the upper beds of the London Clay and later Tertiary clays).

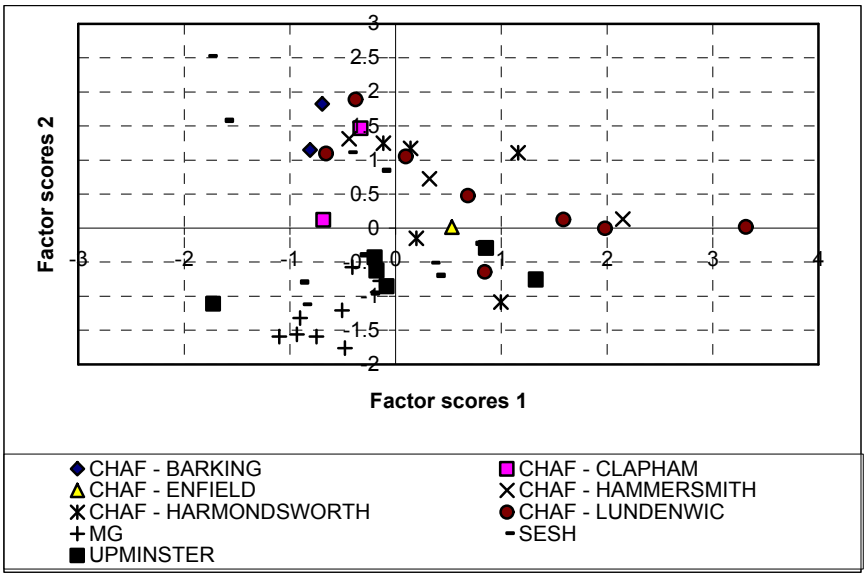

Figure 1

A plot of F3 against F4 shows that the F4 scores for the Upminster samples are higher than for any others except for the two Clapham samples and one of the Barking samples (a sample of the noticeably more micaceous fabric, rather than one containing sparse polished, rounded quartz sand). Examination of the factor weightings shows that the main discriminatory element in F4, as far as the Upminster samples is concerned, is vanadium, which occurs with a frequency only matched by the Barking sample (the Clapham samples have moderately high vanadium but still have a high F4 score because of a higher iron content).

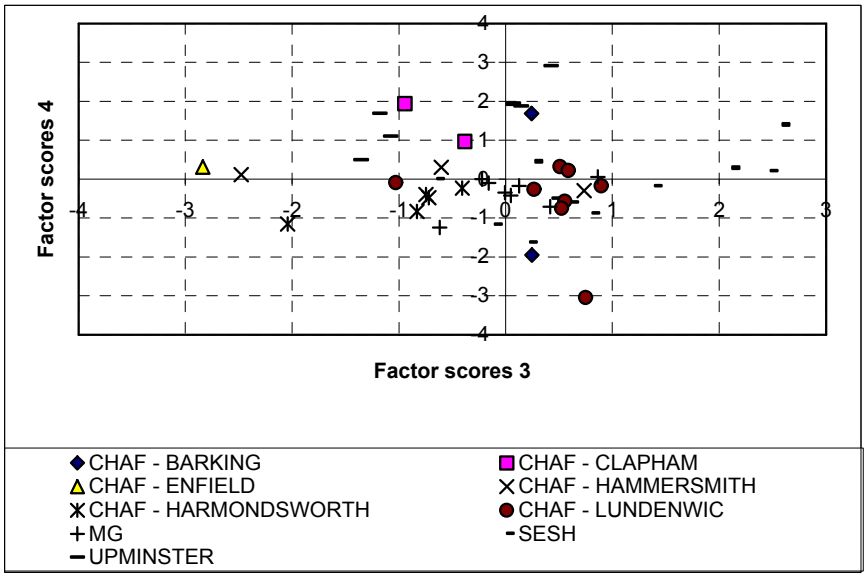

Figure 2

Vanadium tends to concentrate in sediments deposited in reducing conditions, as well as those rich in iron oxides, hydrous oxides of iron or manganese and organic matter (1996). In

this dataset, there is a correlation with iron but not one with manganese (which, incidentally, is much higher in the two Barking chaff-tempered samples than in the remainder, thus distinguishing them from the Upminster samples). This suggests that the Vanadium is present either in the clay groundmass or in iron compound inclusions deposited in reducing conditions. The presence of iron pyrites, which is deposited in reducing conditions, is a feature of the London Clay and common trace elements in pyrites include vanadium as well as nickel, cobalt and zinc. Of these, nickel shows a correlation with vanadium whilst the other two elements do not.

Discussion

The chemical data therefore suggest that the Upminster chaff-tempered pottery was made in south Essex, and has high frequencies of vanadium and nickel which are also found in South Essex Shelly ware, but not in chaff-tempered wares from sites closer to Lundenwic. Therefore, not only was the Upminster pottery locally produced it was also not traded to Lundenwic. The thin section evidence is consistent with a local, south Essex, origin but would also be consistent with a wider, Thames Basin, origin.

Bibliography

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Appendices

Appendix 1 ICPS Analysis. Major elements measured as percent oxides

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V3571	15.74	10.85	2.02	1.13	0.38	2.5	0.85	0.68	0.023
V3572	16.17	8.29	1.11	0.95	0.14	2.44	0.88	0.14	0.04
V3573	15.8	8.65	1.78	1.04	0.19	2.11	0.81	0.1	0.03
V3574	14.24	7.18	1.71	1.07	0.24	2.13	0.79	0.17	0.038
V3575	16.05	8.5	1.05	0.76	0.43	2.42	0.88	0.11	0.058
V3576	15.76	7.9	1.52	1.19	0.28	2.56	0.9	0.17	0.05

Appendix 2 ICPS Analysis. Minor elements measured as parts per million

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V3571	399	145	35	55	84	18	87	177	33	108	44	119	47	11	2	6	4	34	123	26
V3572	354	128	36	38	61	19	70	189	28	103	44	76	46	8	2	5	3	31	91	18
V3573	394	120	28	59	71	18	71	179	28	99	38	70	40	8	1	4	3	24	84	21
V3574	432	112	30	56	71	16	72	155	33	105	40	83	42	9	2	5	3	29	85	22
V3575	461	151	25	41	42	17	64	174	15	96	23	47	25	4	1	3	2	26	70	16
V3576	430	128	41	40	60	18	73	167	29	115	41	73	43	7	2	4	3	26	93	16