Characterisation Studies of Romano-British Shell-Gritted Pottery from Tower Works, Fengate, Peterborough

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Samples of Romano-British shell-gritted pottery from a settlement site at Fengate, Peterborough, were submitted for analysis by Katie Anderson (Table 1). Chemical analyses of each sample were made and three of the samples were thin-sectioned.

The data were compared with samples of a range of shell-gritted wares from Cambridgeshire and elsewhere. In particular, the possibility of the samples being produced at Earith, Haddon, or Harrold was investigated. Earith is c.30 miles southeast of Fengate; Haddon is about 10 miles to the southwest and Harrold is about 39 miles to the southwest.

Table 1

Action	TSNO	DN NO	Context	Cname	Subfabric	Form	Description
TS;ICPS	V4169	0	330	SHELL	FAB 1;BIVALVE;ECHINOID SHELL	SJ	THICK-WALLED
TS;ICPS	V4170	0	408	SHELL	FAB 2: BIVALVE;RED FE;RQ	SJ	THICK-WALLED
ICPS	V4171	0	456	SHELL	FAB 1	JAR	
TS;ICPS	V4172	0	459	SHELL	FAB 3; BIVALVE IN IRONSTONE GROUNDMASS	JAR	
ICPS	V4173	0	459	SHELL	FAB 1	JAR	
ICPS	V4174	0	459	SHELL	FAB 1	JAR	RILLED EXT

Thin Section Analysis

Examination at x20 magnification using a stereomicroscope indicated that the samples could be grouped into three fabrics (Table 1) and a sample of each fabric was thin sectioned by Steve Caldwell, University of Manchester. These sections were stained using Dickson's method (Dickson 1965). This staining distinguishes ferroan from non-ferroan calcite and dolomite.

Fabric 1 (V4169)

- Nacreous bivalve shell.
- Ornamented bivalve shell.
- Echinoid shell.
- Punctate Brachiopod shell.
- Thin-walled shell.

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- Ferruginous limestone.
- Ostracods.
- Clay/ironstone.
- Mudstone.
- Angular quartz.
- Voids. Moderate euhedral voids were present, up to 1.0mm long. However, these are probably either from leached-out sparry calcite or shell fragments rather than selenite crystals, since there are no examples with the distinctive diamond shape found in a transverse section of selenite crystals.

The groundmass consists of brown, optically anisotropic baked clay minerals, dark brown rounded grains up to 0.2mm across and sparse microfossils up to 0.1mm across with ferroan calcite filling of the non-ferroan calcite tests.

Fabric 2 (V4170)

A very similar range of inclusions was noted in the thin section of Fabric 2. Only ostracod shell and microfossils were not noted. However, there is a higher incidence of iron, both as rounded grains in the groundmass and coating and staining the shell fragments.

- Nacreous bivalve shell.
- Ornamented bivalve shell.
- Echinoid shell.
- Punctate Brachiopod shell.
- Thin-walled shell.
- Ferruginous limestone.
- Ostracods.
- Clay/ironstone.
- Mudstone.
- Angular quartz.
- Voids. As in Fabric 1.

The groundmass consists of brown, optically anisotropic baked clay minerals, dark brown rounded grains up to 0.2mm across.

Fabric 3 (V4172)

There is a lower range of shell types present in Fabric 3 and the nacreous bivalve shell is both larger and more frequent than in the other two fabrics. In addition, rounded quartz, absent from the other two fabrics is present and angular quartz is more frequent.

- Nacreous bivalve shell.
- Shelly limestone.
- Ostracods.
- Clay/ironstone.
- Mudstone.
- Angular quartz.
- Rounded quartz.
- Voids. As in Fabric 1

The groundmass consists of brown, optically anisotropic baked clay minerals, dark brown rounded grains up to 0.2mm across and sparse microfossils up to 0.1mm across with ferroan calcite filling of the non-ferroan calcite tests.

Chemical Analysis

Samples of each sherd were taken and all surfaces mechanically removed. The remaining block was then crushed to a fine powder and submitted to Royal Holloway College, London, where inductively-coupled plasma spectroscopy was carried out under the supervision of Dr J N Walsh. A range of major elements was measured and expressed as percent oxides (App 1) and a range of minor and trace elements was measured and expressed in parts per million (App 2). Silica content was not measured but was estimated by subtraction of the total oxides from 100%. After silica estimation the measured values were normalised to aluminium, to take account of the diluting effect of silica.

Estimated silica content for the four fabric 1 samples was 59.89% with an SD of 1.60. The Fabric 2 and 3 samples have higher estimated silica: 62.88% and 64.13% respectively. Thus Fabrics 2 and 3 have silica values greater than 1 SD from the mean for Fabric 1. the higher value for Fabric 3 is consistent with the thin section.

The normalised data were examined using Winstat for Excel (). All of the measured elements were examined to look for outlying values (greater than 4 SD than the mean) and no such values were noted. In fact, only one value, phosphorus in sample V4169, lay more than 2 SD from the mean, indicating a high degree of similarity in chemical composition.

Factor analysis was undertaken of the least mobile elements (i.e. omitting calcium, phosphorous, strontium and the Rare Earths) and zirconium, which is only partially measured

using the RCHL set-up. This analysis found four factors and a plot of the first two factors indicates that the Fabric 2 sample is distinguished by negative F1 and F2 values whilst the Fabric 3 sample is distinguished by high F2 and negative F1 values (Fig 1).

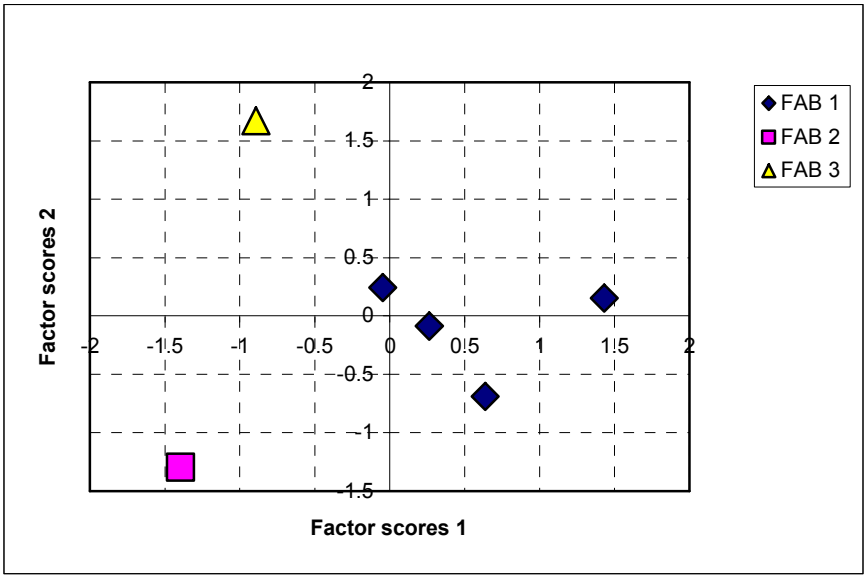

Figure 1

High F2 scores are due mainly to high manganese, lithium and copper values whilst high F1 scores are due to high potassium, barium and magnesium values and to low lead and titanium values. Examination of the normalised data confirms that Fabric 3 is distinguished by high copper, titanium, lithium and manganese values whilst Fabric 2 is distinguished by high lead and low lithium. Fabric 1 is distinguished by high magnesium and potassium.

The ICPS data were then compared with that from a range of sites in Cambridgeshire and that of a group of waste (of medieval date) from Harrold, Bedfordshire. Factor analysis of this data indicated that the Harrold and Earith samples could be readily distinguished from the Fengate samples and therefore the analysis was repeated omitting these samples.

Factor analysis of this reduced dataset indicates that the Fengate Fabrics 2 and 3 samples do not match any of the comparanda whilst the Fabric 1 samples are similar to a range of Peterborough-area shell-gritted wares:

- Ten samples from the Haddon kiln
- Three samples of Developed St Neots-type ware (DEV NEOT)
- Five samples of St Neots-type ware (NEOT)
- Five samples of Peterborough shell-tempered ware (PSHW)
- Nine samples of Lyveden/Stanley-type shell-tempered ware (STANLY)

The Fengate 1 samples and the remaining comparanda were then examined again, using both factor analysis and a series of plots of pairs of elements and little patterning

was evident (Fig 2). This suggests that that the Fengate 1 samples were probably produced to the west of Peterborough and that the Haddon kiln is indeed a possible source.

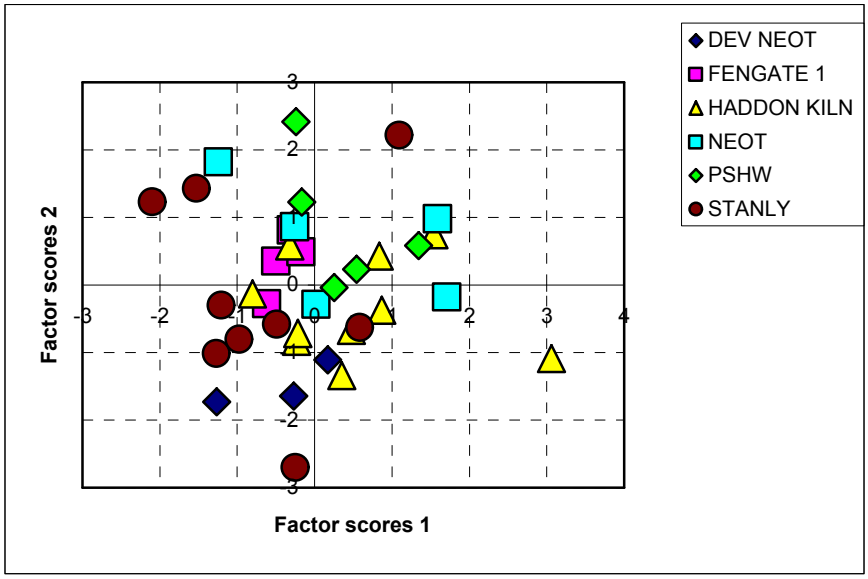

Figure 2

Discussion

The Fengate samples can be divided into three separate fabric groups. Fabrics 1 and 2 contain a similar range of inclusions and might be thought of as variations within a single source. However, the chemical composition separates the two fabrics quite sharply and instead indicates a similarity between Fabrics 2 and 3. However, these two fabrics have quite different shell inclusions, although in both fabrics there is a high degree of iron both in the body and adhering to the shell fragments.

None of the comparanda match either Fabrics 2 or 3 and this is in agreement with their petrology, since none of the comparative fabrics have such high frequency of iron-rich inclusions. Fabric 1 samples, however, match well with a range of shelly wares found in Peterborough, including material probably produced in the Lyveden/Stanion area and that produced at Haddon. Given the similarity of all of these wares it is impossible to say that Haddon was the source of the Fengate 1 samples, only that there is no petrological or chemical grounds for discounting this source. It may well be that other kilns in the Peterborough area which have yet to be discovered were producing similar wares.

Nevertheless, we can be fairly certain that the Fengate 1 samples have a fairly local source and that neither Earith nor Harrold could have produced this ware.

Bibliography

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

Winstat for Microsoft (r) Excel. Fitch, Robert K. 2001

Appendix 1

Fabric	**TSNO**	**Al2O3**	**Fe2O3**	**MgO**	**CaO**	**Na2O**	**K2O**	**TiO2**	**P2O5**	**MnO**
FAB1	V4169	13.48	6.05	0.92	12.82	0.28	1.99	0.55	2.25	0.09
FAB1	V4171	16.70	6.38	1.15	13.92	0.30	2.43	0.73	0.59	0.08
FAB1	V4173	13.14	5.77	1.01	16.94	0.39	1.77	0.57	0.35	0.11
FAB1	V4174	12.62	5.59	0.80	17.70	0.25	1.62	0.53	0.49	0.07
	Mean	13.99	5.95	0.97	15.35	0.31	1.95	0.60	0.92	0.09
	SD	1.84	0.34	0.15	2.34	0.06	0.35	0.09	0.89	0.02
FAB2	V4170	15.63	6.23	0.57	11.47	0.17	1.36	0.74	0.90	0.05
FAB3	V4172	13.04	5.07	0.56	14.62	0.30	0.88	0.85	0.43	0.12

Appendix 2

Fabric	TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
FAB1	V4169	576	85	21	49	38	13	356	95	22	83	34	61	35	6	1	4	2	10	78	15
FAB1	V4171	514	113	22	62	47	15	404	104	26	60	40	76	41	8	2	4	2	10	101	14
FAB1	V4173	386	88	22	48	49	13	331	84	23	55	31	57	33	6	1	4	2	7	87	15
FAB1	V4174	334	74	22	41	42	11	359	94	23	74	32	59	33	6	1	3	2	8	67	17
Mean		452.5	90.0	21.8	50.0	44.0	13.0	362.5	94.3	23.5	68.0	34.3	63.3	35.4	6.4	1.3	3.5	2.3	8.7	83.3	15.3
SD		111.8	16.5	0.5	8.8	5.0	1.6	30.4	8.2	1.7	12.8	4.0	8.7	3.8	0.9	0.2	0.3	0.1	1.1	14.4	1.3
FAB2	V4170	341	76	23	25	47	14	245	111	33	69	39	71	41	9	2	5	3	24	84	18
FAB3	V4172	317	85	30	77	33	12	260	91	21	71	35	67	36	6	1	4	2	14	71	13