Characterisation studies of Pottery from Sutton Common, South Yorkshire (SCOM03/04)

Alan Vince

Samples of three Iron Age vessels excavated at Sutton Common, South Yorkshire, were submitted for study by Chris Cumberpatch. The vessels were found with other artefacts in what is interpreted as examples of structured deposition. Elsewhere on the site, as is typical of this part of Yorkshire, pottery was rare or absent.

Methodology

Each sample was thin-sectioned at the Department of Earth Sciences, University of Manchester and stained using Dickson's Method (Dickson 1965).

Petrological analysis

All three samples have a very similar appearance in thin section and were clearly made from the same raw materials. Therefore, a group description of the fabric is given here, with individual sections only being mentioned where the features are not shared by all samples.

The samples show signs of post-depositional alteration:

a) there are moderate large angular voids which originally contained calcite

b) These voids and other pores in the fabric are filled with phosphate, (varying in their colour from almost colourless to a dark red/brown) and unburnt clay minerals (soil matrix).

The amount of phosphate deposited on the sherds may be significant given their suggested structured deposition.

The following inclusion types were noted:

- moderate angular voids ranging from c.0.1mm up to 2.0mm across. These have a roughly euhedral outline with faces at angles suggestive of calcite or dolomite crystals
- Moderate subangular and rounded quartz grains up to 0.3mm across. Most of these grains are monocrystalline and some are well-rounded, suggesting a Permo-Triassic desert sand.
- Moderate angular mudstone fragments up to 2.0mm across. These show signs of stratification and contain abundant angular voids.

- Sparse euhedral quartz grains up to 0.5mm across. These are probably derived from the Lower Carboniferous Millstone Grit.

- Sparse angular flint up 2.0 mm across. These grains are too fine-textured and regular to be Carboniferous chert but might be rhyolite. Single fragments are present, in V2373 and V2371.

- Moderate subangular fragments of basic igneous rock, consisting of laths of plagioclase feldspar and pyroxene in a dark brown cryptocrystalline matrix, up to 2.0mm across (only present in V2373).

The groundmass consists of dark baked clay minerals (probably dark through unburnt carbon), sparse to moderate voids, sparse angular quartz and sparse muscovite laths.

Chemical analysis

Sub-samples of each sample were analysed using Inductively-Coupled Plasma Spectroscopy. The samples were obtained by mechanical removal of the original surfaces of the sherd and any broken edges for a fragment sufficiently large to produce a lump c.1.0mm in weight. This lump was then crushed to a fine powder which was submitted to the Department of Geology at Royal Holloway College, London, where the analysis was carried out under the supervision of Dr J N Walsh.

A range of major, minor and trace elements were measured. The major elements were measured as percent oxides and the remainder as parts per million (Appendix 1 and 2).

Silica is not measured in this procedure, but can be estimated by subtraction of the measured oxides from 100%. This indicates a silica content ranging from 64.4% to 67.6%.

To take account of the dilution effect of variations in silica content, a lot of which could be due to variations in tempering, the data were normalised to Al2O3, which is mainly present in clay minerals (but also feldspars, which in this case form a significant proportion of the rock temper).

The most variable elements were phosphorous, barium, strontium and lead. The first three of these, at least, are probably enhanced through post-depositional concretion of phosphates, as observed in the thin sections.

No samples of local clays of Permian age or clays developed on such strata were available for comparison but there are a few chemical analyses of vessels made from weathered Mercian Mudstone from sites in the Trent valley, plus (to test the possibility of the voids being calcite from the Vale of Pickering) a series of samples from Romano-British and early

Anglo-Saxon calcite-tempered wares and a few vessels tempered with basic igneous rock which may be comparable with V2373).

The Trent valley samples have a very different composition, as do samples from Easington which contain erratic basic igneous rocks, but where those fragments include rounded grains. The Sutton Common samples cannot be clearly distinguished from the remaining basic-igneous rock-tempered samples, nor from the calcite-tempered samples (if those elements which occur in un-leached limestone-temper, CaC03 and Sr, are omitted). Fig 1 is a plot of two factors (F2 and F3) calculated in a factor analysis of this dataset (the Sutton Common samples are labelled “IA”). They show a wide range of compositions for the erratic-tempered samples and a tighter composition for the calcite-tempered wares but in neither case is there a complete separation of the Sutton Common samples.

In fact, only two elements in the Sutton Common analyses are distinctly different: Li and Sm, both of which are lower in the Sutton Common samples than in the comparanda. A plot of the values for these elements (Fig 2) shows that these two elements distinguish both the Calcite-tempered from the erratic-tempered samples, and both of these from the Sutton Common pieces.

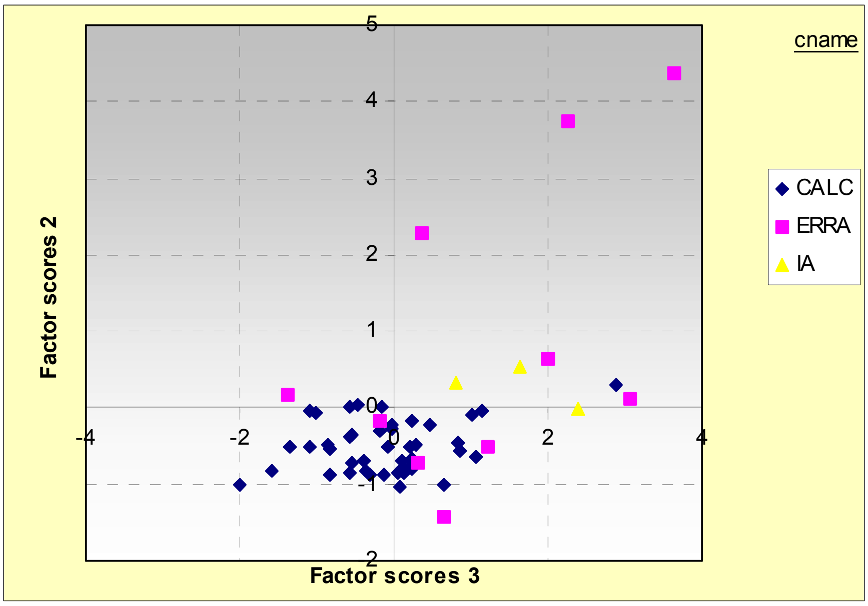

Figure 1

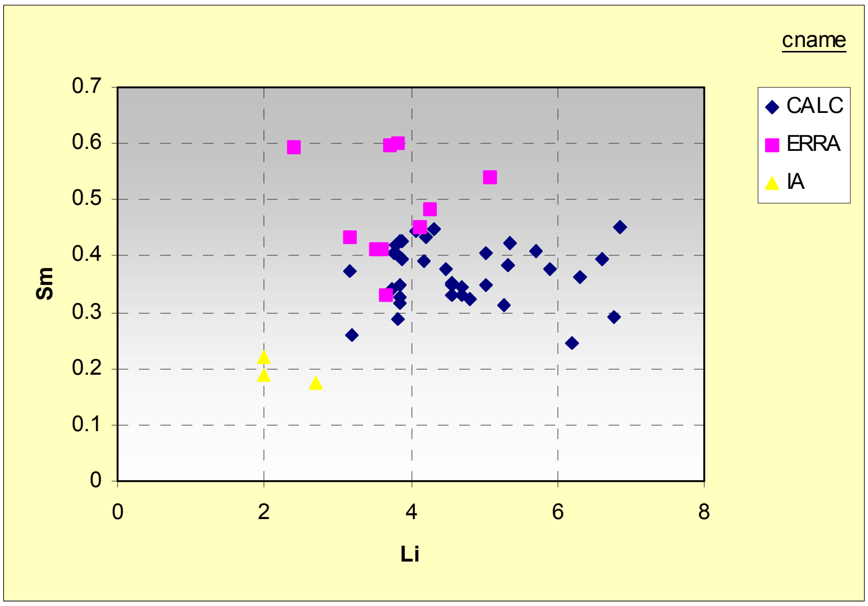

Figure 2

Discussion

The site lies close to the junction of the Permian Upper Magnesian Limestone and the Triassic Sherwood Sandstone but these deposits are probably masked to a great extent by boulder clay, fluvioglacial sands and gravels and post-glacial riverine and lacustrine sediments.

The angular voids might have been filled with sparry calcite, but lack the clearcut euhedral outlines of the calcite found in late Roman and early Anglo-Saxon calcite-tempered wares from the Vale of Pickering. Furthermore, glauconite is common in that ware and is completely absent from the Sutton Common sherds. Perhaps the obvious identity of the voids is the Magnesian limestone, which remains a strong possibility. However, the mudstone fragments, which are probably relict clay, are reminiscent of the marly facies of the Mercian Mudstone, in which case the voids might have been marl lumps. The Mercian Mudstone marls outcrop in the Trent valley and on the eastern side of the Vale of York, but are mainly masked by Quaternary deposits and the Trent valley option can probably be discounted through the difference in chemical composition and because the quartz sand grains do not include the fine-grained siltstone and rounded cherts which characterise the Trent valley sands. A potentially much closer source is the Upper Permian Marl which outcrops above the Upper Magnesian Limestone and is therefore likely to occur close to Sutton Common (Edwards and Trotter 1954, 61).

The remaining inclusions can be considered in two groups. Firstly, the rounded quartz, flint/rhyolite and the Millstone Grit sandstone may have been deliberately added, probably as detrital gravel. All the inclusions occur in fluvio-glacial sands in the Vale of York, south Yorkshire and Nottinghamshire and these deposits are too variable to narrow down the source. The basic igneous rock is likely to have been added as a crushed rock, as suggested by Ian Freestone and Andrew Middleton for examples in East Yorkshire and the Vale of Pickering, or it may indicate the use of a boulder clay in which local and exotic materials were mixed. Numerous dolerite sills outcrop to the north of the Vale of York and one might expect boulder clays in the valley to include fragments of them. However, most of the documented basic igneous erratics in Yorkshire boulder clays occur to the east of the Wolds and in the eastern part of the Vale of Pickering whereas erratics in the Vale of York consist mainly of Shap Granite and, possibly, rhyolite from the Lake District volcanics.

The thin section evidence therefore suggests that the pots may have been made from weathered Upper Permian Marl, or Mercian mudstone, either directly or redeposited in boulder clay. Without local fieldwork and the consequent identification and sampling of potential clay sources no clearer idea of the potential source can be determined although it should be relatively simple to test the suggestion.

Tables

Table 1

TSNO	Trench	REFNO	Action	Context	Cname	Subfabric	Form
V2371	T3	G13	TS;ICPS	3150	IA	LIMESTONE VOIDS	JAR
V2372	T4	G12;SF5	TS;ICPS		IA	LIMESTONE VOIDS	JAR?
V2373	T4	G12;SF2	TS;ICPS		IA	LIMESTONE VOIDS	JAR?

Appendix 1

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V2371	17.03	7.22	0.78	1.86	0.171	1.53	0.76	3.01	0.052
V2372	18.82	10.47	1.01	1.52	0.1995	2.11	0.84	0.45	0.16
V2373	19.64	7.89	0.86	1.79	0.2185	1.96	0.93	0.46	0.045
Mean	18.50	8.53	0.88	1.72	0.20	1.87	0.84	1.31	0.09
StDev	1.33	1.72	0.12	0.18	0.02	0.30	0.09	1.48	0.06

Appendix 2

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V2371	622	109	31	34	38	17	299	101	25	75	37	92.00	49.00	3.73	1.38	5.10	2.60	513.43	73.00	13.00
V2372	787	125	129	51	61	16	116	177	18	94	32	81.00	34.00	3.26	1.35	4.50	2.40	157.95	89.00	18.00
V2373	549	130	79	39	55	19	152	181	20	89	40	95.00	48.00	3.73	1.41	4.60	2.30	140.90	94.00	16.00
Mean	652.67	121.33	79.67	41.33	51.33	17.33	189.00	153.00	21.00	86.00	36.33	89.33	43.67	3.58	1.38	4.73	2.43	270.76	85.33	15.67
StDev	121.93	10.97	49.00	8.74	11.93	1.53	96.95	45.08	3.61	9.85	4.04	7.37	8.39	0.27	0.03	0.32	0.15	210.33	10.97	2.52

Bibliography

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

Edwards, W and Trotter, FM (1954) *The Pennines and adjacent areas*. British Regional Geology London, HMSO.