Petrological Analysis of Prehistoric Pottery from Ratcliffe on the Wreake, Leicestershire

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A series of samples of prehistoric pottery, ranging in date from the early Bronze Age to the Middle Iron Age, from two sites (Sites 10 and 11) discovered on the Ashby Folville to Thurcaston pipeline in Ratcliffe on the Wreake were submitted for thin section analysis (Table 1).

Table 1

REFNO	Action	TSNO	class	Cname	Subfabric	Location
48171	TS	V4231	POTTERY	EBAFLINT	1	Site 10
48337	TS	V4232	POTTERY	EBAFLINT	1	Site 10
48338	TS	V4233	POTTERY	EBASAND	2	Site 10
48383	TS	V4234	POTTERY	EBAGROG	2	Site 10
48383	TS	V4235	POTTERY	EBAGROG	2	Site 10
48383	TS	V4236	POTTERY	EBAGROG	2	Site 10
48337	TS	V4237	POTTERY	EBAVESICULAR	2	Site 10
48283	TS	V4238	POTTERY	MBACHARN	3	Site 10
48007	TS	V4239	POTTERY	LBACHARN	4	Site 10
48022	TS	V4240	POTTERY	LBACHARN	4	Site 10
54029	TS	V4241	POTTERY	IACHARN	5	Site 11
54033	TS	V4242	POTTERY	IACHARN	5	Site 11
095	TS	V4243	POTTERY	IACHARN	5	Site 11
54054	TS	V4244	POTTERY	IACHARN	6	Site 11
54096	TS	V4245	POTTERY	IACHARN	6	Site 11
54019	TS	V4246	POTTERY	IASANDY	7	Site 11
54022	TS	V4247	POTTERY	IASANDY	7	Site 11
65013	TS	V4248	POTTERY	IAFE	8	Site 11
54019	TS	V4249	POTTERY	IAFE	8	Site 11
54096	TS	V4250	POTTERY	IASH	9	Site 11
54096	TS	V4251	POTTERY	IASH	10	Site 11

Thin sections were made by Steve Caldwell, University of Manchester, and stained using Dickson's method (Dickson 1965).

It should be noted that in this report the term "granitic" is used in a broad sense to denote a coarse crystalline rock containing quartz, feldspar and ferromagnesian minerals. Strictly speaking, since the rock contains some plagioclase feldspar it should be classed as a quartz granodiorite or an intermediate igneous rock whilst the term "igneous rock" is too broad.

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Early Bronze Age

Six samples of early Bronze Age date were submitted. They could be grouped into two main fabrics: flint-tempered and quartz-tempered. Within these groups there are some slight variations in either the range of inclusions or the texture but these are minor compared with the differences between the two groups.

Fabric 1: Flint-tempered fabric

Two samples with very similar ranges of inclusions and textures were examined, V4231 and V4232. A single large subrounded, stained flint fragment was present in one other section, V4237, but that sample is classed here as a sand-tempered fabric and a single fragment of fresh angular flint was present in a fourth section, but is nevertheless classed here as a sand-tempered fabric.

The following inclusion types were noted:

- Flint. Moderate angular unstained flint, often with sharp acute angles
- Quartz. Moderate rounded grains up to 2.5mm across but mainly less than 0.5mm. Also moderate subangular and angular grains up to 0.5mm across.
- Chert. Sparse rounded fragments up to 0.5mm across. Includes one fragment with radial chalcedony.
- Opaques. Sparse rounded fragments up to 0.5mm across.
- Sandstone. Sparse subangular fragments up to 0.5mm across containing well-sorted subangular quartz grains c.0.15mm across with a small quantity of amorphous brown cement.
- Organics. Sparse burnt-out organics, represented by voids surrounded by a darkened halo. Some appear to be oblique sections of circular stems or roots.

The groundmass consists of optically anisotropic baked clay minerals, moderate angular quartz up to 0.1mm across, sparse muscovite laths up to 0.1mm long, and brown phosphate-filled laminae.

There are no flint fragments less than c.0.5mm across and the fresh appearance suggests that either flint debitage or fire-cracked flint has been used to temper a sandy clay. Without the flint, the range of inclusions is typical of clays in the east midlands derived from Triassic sandstones and sands. Such sands and sandstones outcrop extensively in Leicestershire and form a major constituent of Quaternary sands and boulder clays in the area. It is therefore most likely that the flint is not naturally present in the area, nor necessarily collected from local gravels.

Fabric 2: Sand-tempered fabric

Five samples were present in this group. One contained a single fragment of fresh flint, similar to those in the flint-tempered fabric and one contained a sub-rounded fragment of stained flint. One of the samples contained sparse angular quartz grains which were larger than in the remainder but in all other respects the sections contained a similar range of inclusions and had a similar groundmass.

The following inclusion types were noted in thin section:

- Quartz. Moderate rounded grains up to 0.5mm across, occasionally larger (up to 2.0mm) were present. Sparse angular fragments up to 1.0mm across were present in V4237.
- Clay pellets. Moderate angular fragments with a similar texture to the groundmass, containing a similar range of larger inclusions (quartz, chert, sandstone etc). Most of these pellets have a darker colour than the groundmass indicating the presence of finely-divided organic matter. There is no sign of bedding, confirming that they are not mudstone fragments.
- Chert. Sparse rounded grains, as in the flint-tempered fabric.
- Sandstone. Sparse rounded fragments up to 0.5mm across, similar in grain size and cement to those in the flint-tempered fabric.
- Opaques. Sparse rounded fragments up to 0.3mm. These inclusions were present in all sections but could only be clearly seen in V4235, where the majority of the sample was oxidized.
- Organics. Sparse thin voids or laminae with dark halos.
- Flint. A single angular fragment, similar to those in the flint-tempered fabric, was present in V4234 and a large sub-rounded, stained fragment, 1.5mm long, was present in V4237.
- Muscovite. Sparse laths up to 0.2mm long.

The groundmass consists of optically anisotropic baked clay minerals, mostly dark brown or black as a result of carbon. Moderate angular fragments of quartz up to 0.2mm across and muscovite laths up to 0.1mm long were present.

Most of the inclusions present in these samples derive from Triassic sands and sandstones. The exceptions are the flint and probably the coarse quartz grains in V4237. However, glacial deposits in Leicestershire might well contain erratics of coarse-grained sandstones, such as the Millstone Grit, and flint from the Yorkshire Wolds. The fresh fragment, however, probably has the same origin as those in the flint-tempered ware, being deliberate additions of flint debitage or fire-cracked flint.

The range of inclusions in this fabric is very similar to that of the flint-tempered ware except, obviously, for the flint. However the texture of the two fabrics also differs, in that neither of the flint-tempered sections contained clay pellets whilst these are perhaps the most obvious characteristic of the sand-tempered ware. The angular outlines of several of these pellets suggests that they differ from the clay relicts found in several fabrics, which are probably a result of poor mixing of an indurated clay. One possible reason for this difference is that the pellets were already fired before inclusion in the pottery, i.e. grog. However, the dark colour of many of the pellets suggests that they were rich in organic matter, which would be burnt out in an oxidized firing. Similar blocky clay inclusions are a feature of the fabrics of many earlier prehistoric pottery fabrics and probably reflect a shared manufacturing technique, probably one in which the clay was used in a relatively dry state. Another interpretation could be that the organic matter was not present in the parent clay but that grog fragments were soaked in an organic liquid before being used.

Middle Bronze Age

Only one sample of Middle Bronze Age date was examined. It has a granite-tempered fabric which is quite distinct from the preceding Early Bronze Age fabrics.

Fabric 3: Granite-tempered fabric

A single example of a granite-tempered fabric of Middle Bronze Age date was sampled. The following inclusion types were noted:

- Igneous rock fragments and constituent minerals. The rock is medium-grained, with crystals ranging from c.0.2mm to 1.0mm. These consist of quartz, feldspar, biotite and opaques. The feldspars are often twinned plagioclases and usually zoned, with the central zones being heavily altered to sericite.
- Quartz. Sparse rounded grains up to 0.5mm across.
- Sandstone. Rare rounded grains up to 0.5mm across similar to those in the Early Bronze Age fabrics.
- Chert. Sparse rounded grains up to 0.5mm across.

The groundmass consists of optically anisotropic baked clay minerals, rare angular quartz and dark brown amorphous inclusions.

Several igneous intrusions outcrop in the Leicestershire area but the igneous rock is almost certainly Mountsorrel Granodiorite (1969, 27). The lack of rounding on any of the igneous rock fragments and the lack of staining around the fragments leaves the immediate source of the material in doubt. The fragments range from c.0.2mm to over 3.0mm and could be from a talus (i.e. collected directly from an exposure), or a glacial deposit. Fire cracking is less likely, because of the lack of acute-angled corners and the generally blocky sections of the

fragments. There is a background scatter of Triassic material, but considerably less than in the two Early Bronze Age fabrics.

Late Bronze Age

Two samples of Late Bronze Age date were submitted. Both have a similar appearance in thin section and are classed as Granite-tempered fabrics. However, there are minor differences between this fabric and the Middle Bronze Age example. These differences could, however, simply reflect the small number of samples of a single, but variable, fabric group.

Fabric 4: Granite-tempered Fabric

The following inclusion types were noted in thin section:

- Igneous rock fragments and constituent minerals. Ill-sorted, moderate fragments up to 3.0mm across. Identical in composition to those in the Middle Bronze Age sample.
- Quartz. Sparse rounded grains up to 0.5mm across.
- Sandstone. Moderate angular fragments up to 2.0mm across. These come from a coarse-grained sandstone with overgrown grains, with some kaolinite filling of pores.
- Chert. Sparse rounded grains up to 0.5mm across.

The groundmass consists of optically anisotropic baked clay minerals and has in places a variegated texture (lighter and darker brown lenses and laminae) moderate angular quartz and moderate dark brown amorphous inclusions.

In comparison with the Middle Bronze Age sample, these sections differ in several ways: they both contain coarse-grained sandstone fragments, which are identical to those found in the Millstone Grit; the groundmass is variegated; the groundmass contains a higher quantity of angular quartz and it also contains a higher quantity of dark brown amorphous inclusions.

A small outcrop of Millstone Grit occurs to the northwest of the Mountsorrel granodiorite and it is possible that sandstone and quartz from that source were present along with the Mountsorrel granodiorite in a local boulder clay to the south or southeast of the granodiorite outcrop. Similar material, but derived from the Pennines, Southwest Scotland and the Lake District, occurs in fluvioglacial deposits in the Vale of York and presumably further south. However, given the proximity of the pipeline to Mountsorrel the more local source is much more likely.

Middle Iron Age

Eleven samples of Iron Age pottery were thin-sectioned. These could be grouped into five fabric groups.

Fabric 5: Sand and Granite-tempered

Three sections contain mainly a rounded quartzose sand but with sparse granitic inclusions. The following inclusion types were noted:

- Igneous rock fragments and their constituent minerals. Sparse angular fragments up to 1.0mm across. The rock is similar to that in Fabric 3 in composition and texture.
- Quartz. Moderate rounded grains up to 0.5mm across.
- Opaques. Sparse rounded grains up to 0.3mm across.
- Clay pellets. Moderate rounded pellets up to 1.5mm across. Similar in colour, texture and inclusions to the groundmass.
- Organics. Several of the thin laminae have darkened haloes and may therefore have originally contained organic matter.

The groundmass consists of optically anisotropic baked clay minerals, moderate angular quartz up to 0.2mm across, and dark brown clay pellets up to 0.2mm across.

Fabric 6: Granite-tempered

Two sections contain large angular granitic inclusions with little quartz sand. This fabric is very similar to Fabric 3 but may contain more iron-rich clay pellets. The following inclusion types were noted:

- Igneous rock fragments and their constituent minerals. In one of the sections hornblende, with opaque euhedral crystals up to 0.2mm across is common in addition to biotite. Some of the grains are rounded.
- Clay/iron. Rounded dark brown pellets up to 1.0mm across.
- Quartz. Rare rounded grains up 0.5mm across.

The groundmass consists of optically anisotropic baked clay minerals, rounded dark brown clay/iron grains up to 0.2mm across and sparse angular quartz up to 0.1mm across.

Fabric 7: Sand-tempered

Two sections contain rounded quartzose sand similar to that in Fabric 2. The following inclusion types were noted:

- Quartz. As Fabric 2 together with sparse larger angular fragments up to 1.5mm across.
- Clay pellets. As Fabric 2.
- Chert. As Fabric 2.

- Sandstone. As Fabric 2.
- Opaques. As Fabric 2,
- Organics. As Fabric 2.

The groundmass is similar to that of Fabric 2.

Fabric 8: Sand-tempered with clay pellets

Two sections contain a similar quartz sand to that in Fabric 2 together with dark brown clay pellets. The groundmass contains more angular quartz than Fabric 7. The following inclusion types were noted:

- Quartz. As Fabric 2.
- Clay pellets. As Fabric 2 but more common and usually darker in colour.
- Chert. As Fabric 2.
- Sandstone. As Fabric 2.
- Opaques. As Fabric 2.
- Organics. As Fabric 2.

The groundmass is similar to that of Fabric 2 but has a higher quantity of angular quartz up to 0.1mm across.

Fabric 9: Sand and Fossiliferous limestone tempered

One section contains a mixture of quartzose sand and rounded fragments of a fossiliferous limestone, probably of lower Jurassic date. The following inclusion types were noted:

- Fossiliferous Limestone. Moderate rounded fragments consisting of nacreous, non-ferroan calcite bivalve shell up to 1.0mm long, often coated in prismatic ferroan calcite; echinoid shell fragments in a matrix of light brown calcite mudstone and variable quantities of angular quartz and muscovite laths.
- Quartz. As Fabric 2.
- Opaques. As Fabric 2.
- Chert. As Fabric 2.
- Organics. As Fabric 2.

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

The fossiliferous limestone is similar to those seen in ceramics made in North Lincolnshire and East Yorkshire from lower Jurassic clays. The rounded quartzose sand inclusions could probably also be paralleled in that area. However, Lower Jurassic

gryphaea have been observed in samples of boulder clay from the Charnwood forest area and a local source is therefore possible, and probably more likely.

Fabric 10: Shell-tempered

One section contains abundant shell sand and limestone fragments, in which punctate brachiopod shell is prominent. The following inclusion types were noted:

- Bivalve shell. Moderate rounded fragments of nacreous bivalve shell, including thick hinge fragments up to 2.0mm across and 0.5mm thick.
- Punctate Brachiopod. Moderate rounded fragments of punctate brachiopod composed of non-ferroan calcite with brown clay infilling of the holes in the shell.
- Oolitic limestone. Sparse rounded fragments of mudstone containing sparse ooliths, each with a fragment of punctate brachiopod, echinoid shell or bivalve shell at its core. The oolitic coating is usually composed of micrite. The groundmass is dolomitic micrite.

The groundmass consists of optically anisotropic baked clay minerals, moderate shell fragments, c.0.05mm thick and up to 0.2mm long, sparse angular quartz and sparse dark brown clay pellets up to 0.1mm across.

It is likely that the parent clay was shelly marl containing the shell fragments as a shell sand whilst the oolitic limestone is rounded and presumably detrital rather than dolomitic concretions within the marl (no echinoid shell fragments are present, for example, and none of the loose punctate brachiopod shell fragments have dolomitic infilling of their pores). However, the limestone fragments could have been present as detrital grains in the original shell sand. Similar shell is present in shelly wares of various dates in the south-east midlands but the limestone fragments are unusual in having a very low clast:matrix ratio. The dolomitic groundmass suggests a very shallow marine environment and this in turn points probably to a Rhaetic or Middle or Upper Jurassic source. A Rhaetic source is probably excludable since no oolitic limestones are reported in the midlands in these strata (1969).

Discussion

Although there is a great variety in inclusion types and textures within the ten fabric groups all but one are likely to be of local origin. Here, local is defined as within 10 miles of the findspot. The exception is Fabric 10 which appears to have been produced from clay quarried from a Middle or Upper Jurassic shelly marl or limestone. Such clays were extensively used in the south east midlands in the Roman, Anglo-Saxon and medieval periods. Production sites where similar fabrics were used include Harrold in Bedfordshire, and Haddon and Earith in Huntingdonshire. The Jurassic outcrops of central and north Lincolnshire and East Yorkshire are not known to include similar shell fauna. The closest of

these sites to the Ashby Folville pipeline is Haddon and it is likely that Fabric 10 has a lower Nene Valley source. No geological processes (i.e. in this case glacial action) could have transported clay of this type closer to the findspot and thus the Fabric 10 vessel was probably carried at least 35-40 miles.

The remaining fabrics can be divided into those which contain at least some granitic rock fragments and those which do not (Table 1). The granitic fabrics all contain what is most likely to be Mountsorrel granodiorite and most of these have a relatively clean groundmass containing clay/iron pellets. However, they can be classified clearly into three groups: fabrics containing solely granitic rock fragments (Fabrics 3 and 6); fabrics containing granitic rock and coarse-grained sandstone (Fabric 4) and fabrics containing granitic rock and quartzose sand (fabric 5). In each case, however, if the rock is Mountsorrel granodiorite and if it is naturally present in a sand or gravel used as temper or was present in the clay as dug then the vessels must have been produced somewhere to the south or southeast of the outcrop, since that is the direction of transport of the ice in this area. Examination of river terrace gravels from the Soar valley collected by Greg Phillips indicates that they do not contain angular granitic rock fragments but it is likely that terrace sands south and southeast of the outcrop do. The Wreake flows southwards and probably contains no granitic rock fragments in its terrace or recent alluvial sands at Ratcliffe itself. Certainly, fired clay artefacts from these sites do not contain granitic fragments (see Vince, this volume, 00). However, it is quite likely that sands and gravels in the Wanlip/Thurmaston area are granitic. These four fabrics therefore probably all originated at least a few miles to the south or west of the site. The similarity of fabrics 3 and 6 is of interest, considering the difference in date and the fact that the samples come from different sites and may imply the use of traditional methods and clay sources stretching over a period of several centuries.

The non-granitic group could be produced much closer to the sites, perhaps even using material available on site. However, without chemical analysis of the clays and fired clay we cannot be that precise. All the fabrics contain quartzose sand derived from the Triassic which has a very wide distribution in Quaternary sands and clays. The fossiliferous limestone is probably of Lower Jurassic origin and fossils of this age were noted in boulder clay samples collected by Greg Phillips in the Mountsorrel area. Fabric 9, therefore, was probably produced using a local boulder clay and it is quite likely that the remaining fabrics in this group were also produced from boulder clays.

The flint tempering found in Fabric 1 is almost certainly deliberately added, probably using non-local flint waste. However, the boulder clays north of Melton Mowbray are noted as being chalky (presumably derived from the Yorkshire Wolds) and it is just possible that decalcified boulder clays in that area naturally contain angular flint. Against this, though, is the fact that the groundmass of Fabric 1 is so similar to the remaining non-granitic fabrics.

Table 2

Period	Granitic	Non-granitic
Early Bronze Age	None	Fabrics 1 and 2
Middle Bronze Age	Fabric 3	None
Late Bronze Age	Fabric 4	None
Middle Iron Age	Fabrics 5 and 6	Fabrics 7, 8 and 9

Bibliography

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