Characterisation Studies of Medieval Coarseware from Melton, East Yorkshire (OSA04 EX03)

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Excavations on the A63 road-widening at Melton, East Yorkshire, revealed a settlement dating between the mid 12th and the 14th centuries. All of the glazed pottery used there appears to have been produced at Beverley but the unglazed coarsewares have a different fabric to that of the contemporary coarsewares used in Beverley, Beverley Reduced Chalky ware and Beverley Staxton-type ware. Thin section and chemical analyses of these wares indicates that they were probably produced in the Beverley area, perhaps alongside the glazed wares but perhaps in surrounding villages.

The Melton coarseware contains spherical limestone inclusions, probably ooliths, and similar fabrics have been noted on sites in Beverley (greatly outnumbered by the local coarseware types) and at North Newbald, where they may well be waste.

Samples of the Melton coarseware were therefore chosen in order to determine whether or not they all have a similar fabric and how they compare with the Beverley and North Newbald fabrics.

Ten samples were taken, all from Trench 1W (Table 1). All but one came from jars, the exception being from an unglazed jug with a strap handle.

Table 1

TSNO	Context	Action	Trench	Cname	Subfabric	Description	Form	Part
V3934	6232	TS;ICPS	1W	QC	A		JAR	R
V3933	6232	TS;ICPS	1W	QC	A		JAR	R
V3932	6232	TS;ICPS	1W	QC	A		JAR	R;BS
V3931	6232	TS;ICPS	1W	QC	A		JAR	R
V3930	6237	TS;ICPS	1W	QC	B		JAR	BS
V3929	6249	TS;ICPS	1W	QC	A		JAR	R
V3928	6257	TS;ICPS	1W	QC	B	UNGLAZED; STRAP HANDLE JUST BELOW UPRIGHT RIM	JUG	R;H
V3927	6314	TS;ICPS	1W	QC	A		JAR	R
V3926	6327	TS;ICPS	1W	QC	A		JAR	R
V3925	6327	TS;ICPS	1W	QC	A		JAR	R

Thin-Section Analysis

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

Two fabric groups were present in the ten samples and these are denoted as subfabrics A and B.

Subfabric A

The following inclusion types were noted:

- Quartz. Abundant subangular grains up to 0.3mm across. Sparse rounded grains up to 1.0mm across, some with an opaque coating and veins.
- Oolitic limestone. Moderate ooliths, mostly composed of micrite, up to 0.5mm across. Various types were present including examples with a ferroan micrite core and non-ferroan micrite outer crust and examples with a non-ferroan micrite core and ferroan micrite outer crust. Angular fragments of sparry ferroan calcite cement up to 1.0mm long were also present, together with fragments containing echinoid shell fragments, echinoid spine fragments and non-ferroan calcite inoceramid shell fragments up to 1.0mm long. Both the echinoid shell and spines were partially replaced by sparry ferroan calite.
- Calcareous sandstone. Sparse angular fragments of fine-grained sandstone composed of well-sorted angular quartz up to 0.15mm across in a groundmass of sparry ferroan calcite.
- Chalk. Sparse rounded fragments of non-ferroan calcite chalk up to 1.0mm across, containing variable quantities of microfossils.
- Mudstone. Sparse rounded fragments of laminated mudstone up to 1.0mm across. The mudstone is of similar colour and texture to the groundmass.
- Ferruginous sandstone. Sparse angular fragments of fine-grained sandstone composed of well-sorted angular quartz up to 0.15mm across in a groundmass of dark brown or opaque clay/iron. In one case the rock fragment was partially cemented with clay/iron and partly with sparry ferroan calcite.
- Flint. Sparse angular fragments up to 1.0mm across.
- Shell. Sparse fragments of inoceramic shell, probably all from the oolitic limestone, up to 1.0mm long.

The groundmass consists of optically anisotropic baked clay minerals with few visible inclusions except for thin lenses of dark brown grains and sparse individual dark brown grains.

The groundmass and mudstone fragments are probably derived from a Jurassic clay. The chalk fragments are clearly detrital as therefore are the flint fragments. The quartz grains include a small quantity which are probably derived from lower Cretaceous ferruginous sands (or perhaps weathered from the Red Chalk). The oolitic limestone and calcareous and ferruginous sandstones include angular fragments which do not show any signs of water transport. These features indicate the use of a calcareous river sand which drained upper and lower Cretaceous deposits but which at the sampled site was closest to Jurassic limestone and sandstone outcrops. The most likely source of the oolitic limestone is the Cave Oolite (Kent 1980, 51-2) and the ferruginous/calcareous sand might be the Kellaways Rock

(Kent 1980, 63-5). Mudstones which might be the source of the clay itself include the Upper Estuarine beds, Kent 1980, 52, and the Ampthill clay, which outcrops at Melton itself (Kent 1980, 67).

Samples from North Newbald and Wawne below to this subfabric, although the chalk fragments in the Wawne samples are brown-stained, and possibly therefore from the Red Chalk (or due to post-burial alteration).

Subfabric B

The following inclusion types are present in thin section:

- Quartz. Abundant subangular grains up to 0.2mm across. Sparse rounded grains up to 0.5mm across.
- Mudstone. Moderate rounded fragments. Mostly black but where oxidized, these have a similar colour and texture to the groundmass. Sparse ferroan calcite inclusions are present, partly replaced by brown phosphate. These are probably of fossil origin and in one case probably a thin-walled bivalve.
- Limestone/shell. Sparse ferroan calcite fragments, partly replaced by brown phosphate, similar to those found in the mudstone.
- Flint. Sparse angular fragments up to 1.5mm across.

The groundmass consists of optically anisotropic baked clay minerals, no visible quartz and abundant dark brown to opaque grains up to 0.1mm across. Except for the thin margins (c.0.2mm thick) the groundmass is obscured by carbon.

It is likely that the mudstone and limestone/shell were present in the parent clay which was an organic mudstone containing calcareous fossils. The remaining inclusions were probably added as a sand temper and indicate the use of a quartzose sand probably derived from Jurassic, Lower Cretaceous and Upper Cretaceous strata.

Chemical Analysis

Offcuts of each sampled sherd were taken and the outer surfaces removed mechanically. The remaining core was crushed to a fine powder and submitted to Royal Holloway College, London, where the chemical composition was determined using Inductively-Coupled Plasma Spectroscopy.

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 as parts per million (App 2). The silica content was estimated by subtraction of the sum of measured oxides from 100%.

The silica content of the two subfabrics are significantly different (Fig 1). Subfabric A has a mean silica content of 66.54+/- 1.59% whilst the two subfabric B samples have a mean silica content of 72.15+/- 1.76%. These estimates were compared with three samples from Wawne, near Beverley and six samples from North Newbald. The Wawne samples have a similar silica content to subfabric B and the North Newbald and subfabric A samples have a similar silica content.

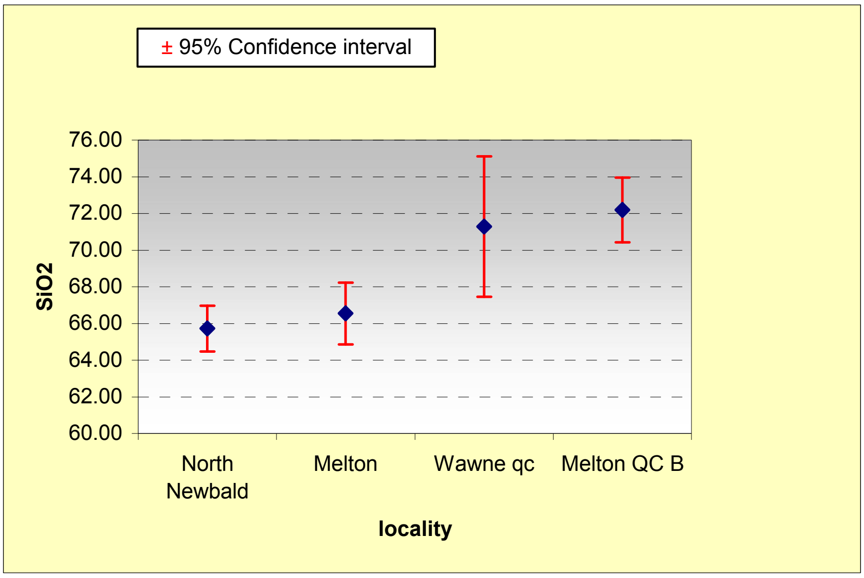

Figure 1

The data were normalised to aluminium to take account of the dilution effect of variations in silica content. They were then analysed using the factor analysis program in WinStat for Excel (). The Melton data were firstly analysed on their own to examine differences in composition between the two subfabrics and then together with the North Newbald and Wawne samples. Calcium, strontium and phosphorous were all omitted because of their mobility.

For the Melton samples on their own, five factors were found and for each factor the scores for the two subfabric B samples were more similar to each other than to the subfabric A samples, However, in only one case, factor 5, were the two subfabrics distinguished. This difference is due mainly to two elements, lithium and vanadium, both of which were slightly higher in subfabric A (Fig 2).

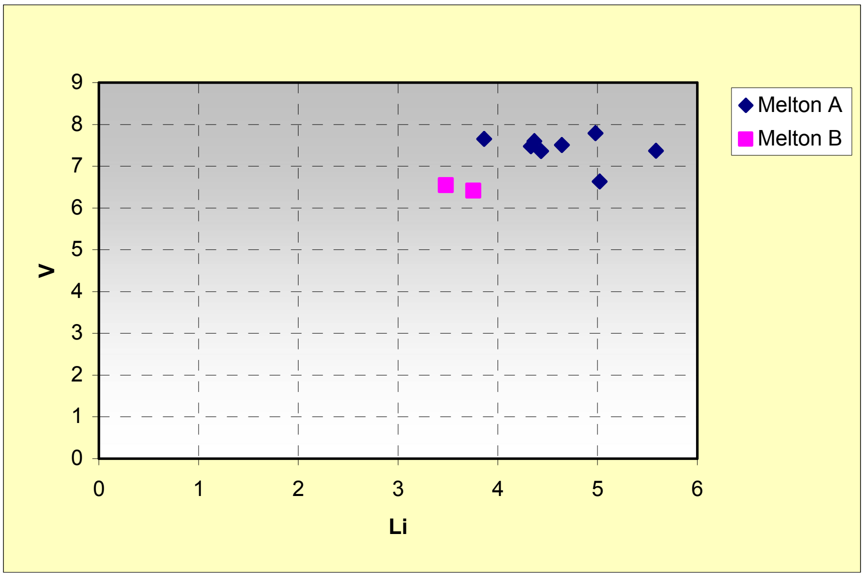

Figure 2

When compared with the North Newbald and Wawne samples, again five factors were found. A combination of Factor 1 and Factor 2 distinguished the North Newbald samples from the remainder (Fig 1). This is apparently due to higher values for three rare earth elements in the North Newbald samples: lanthanum, cerium and neodymium together with higher values for scandium and vanadium and to low values for lithium.

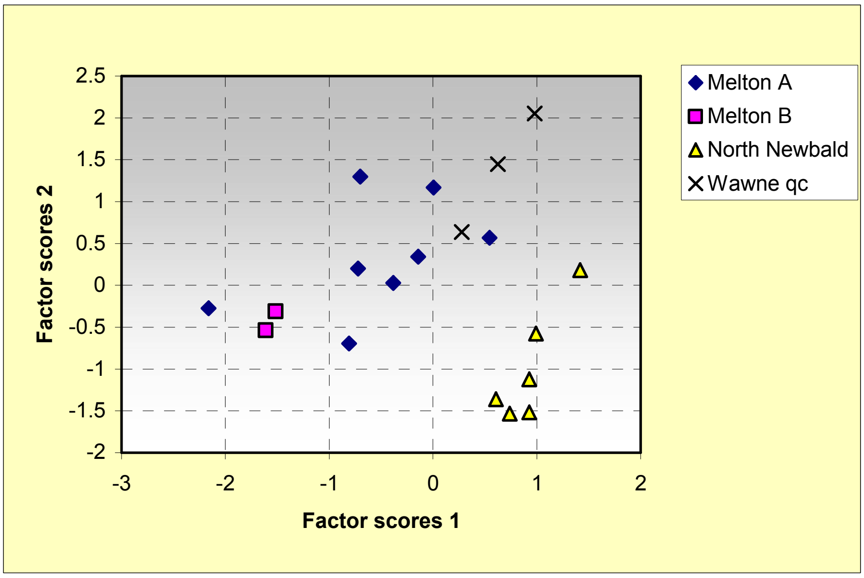

Figure 3

Factors 3 and 4 distinguish the Wawne samples from the remainder. One of these samples has abnormally high cobalt and nickel values, giving a high F4 score, whilst all three have negative F3 scores. These are due to lower magnesium and higher sodium values.

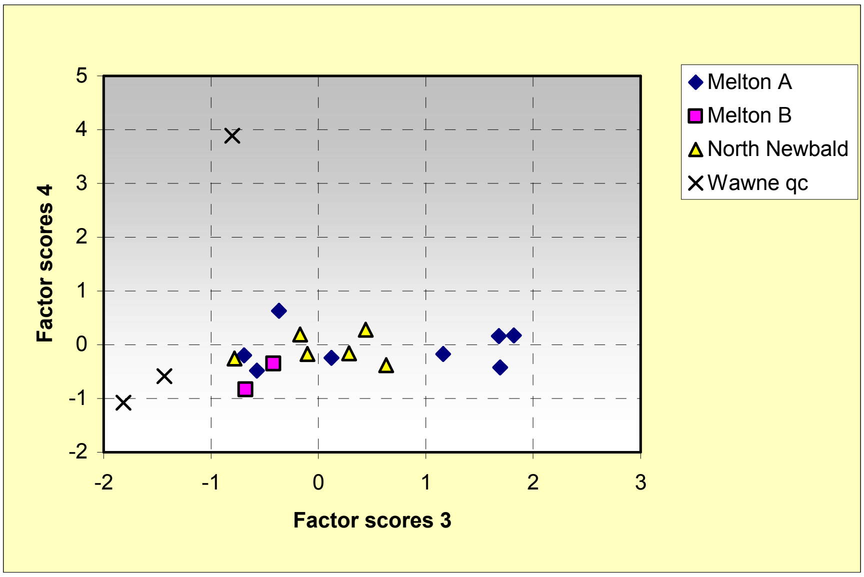

Figure 4

Finally, the QC samples were compared with samples made from Triassic to Jurassic clays in Lincolnshire, comparing only elements which are mainly present in the clay fraction. This analysis indicates that the QC samples were made from a clay with similar chemical composition to Upper Jurassic clay from Market Rasen and could be distinguished from Triassic to Lower Jurassic clays from various sites in the Trent Valley (Lincoln, North Hykeham and Torksey). Samples from Roxby, which is located to the east of the Middle Jurassic scarp, have a similar composition to those made from Lower Jurassic clays, confirming that the valley in which Roxby lies cuts through the Middle Jurassic limestone exposing Lower Jurassic clays in its base. No examples of Middle Jurassic clays were included and it cannot therefore be proven that Upper Estuarine Beds were not the source of the clay. Nevertheless, this data does favour the Ampthill Clay as the parent clay.

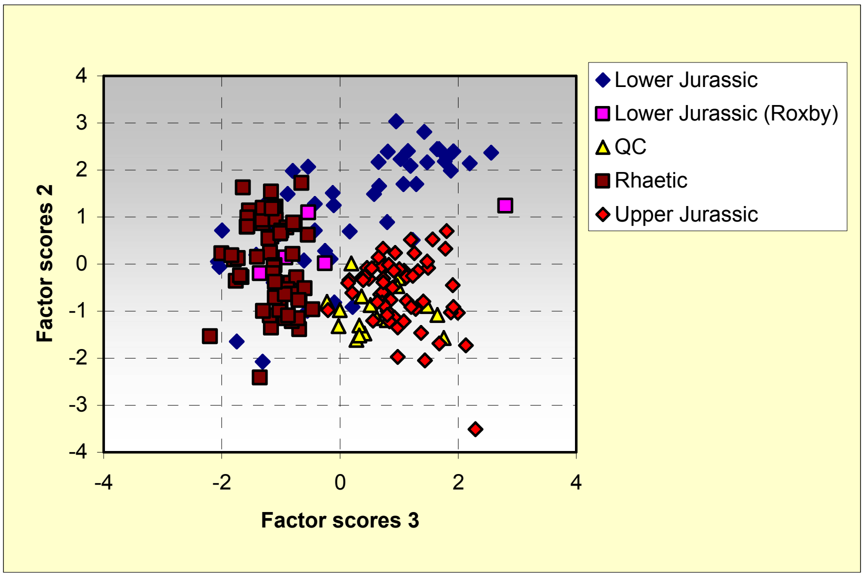

Figure 5

Conclusions

The thin section evidence indicates clearly that there are two separate fabrics present in the Melton samples, and these differences indicate that whilst both parent clays were likely to have been Upper Jurassic clays (perhaps the Ampthill Clay) with distinctive iron-rich inclusions, that clay used for subfabric B was organic and fossiliferous whereas that used for subfabric A was perhaps less organic and certainly does not have any evidence for being fossiliferous. There are also differences in the sand tempers used for the two subfabrics. Subfabric A is tempered with a calcareous sand whilst Subfabric B is tempered with a non-calcareous sand. That in subfabric B cannot simply be the same sand as subfabric A but subjected to acid groundwater since there are no fragments of the iron-cemented sandstone which should have survived those conditions. Nevertheless, both subfabrics clearly originated in an area or areas with similar geological characteristics: a Jurassic clay, tempered with sands containing Upper Jurassic, Lower Cretaceous and Upper Cretaceous material.

Locally, the only area with these characteristics is a narrow band around the edge of the Wolds running from the Melton area around to North Newbald. By Market Weighton, the Jurassic and Lower Cretaceous strata are absent and Upper Cretaceous chalk rests directly on the Rhaetic (Penarth Group) strata. North of the Humber, the main middle Jurassic ironstone deposits do not occur and the most obvious candidate for the iron-cemented sandstone fragments is the Marlstone rock, which is the local equivalent of the Frodingham ironstone of the Scunthorpe area (1992, 40-41). If this is the case, then it is unlikely that the sand was deposited higher than the outcrop of this rock and this would bar North Newbald as a possible source. If Marlstone rock is present in the sand fraction, this also ought to disbar mudstones of later age as the source of the parent clay, which would therefore be the Redcar

Mudstone formation, which forms a narrow outcrop at the base of the chalk scarp from Market Weighton to the Humber.

It is unclear whether all the samples come from a single production site or whether production was more dispersed, as appears to have been the case in parts of West Yorkshire and the Hambleton Hills. The chemical differences between the three groups of samples: subfabric A from North Newbald, Wawne and Melton subfabrics A and B, favours the dispersed model whereas the identical range of inclusions in the North Newbald, Wawne and Melton samples favours a single source for subfabric A with the possibility of a separate but nearby source for subfabric B.

Appendix 1

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V3925	12.35	4.54	1.43	10.61	0.22	2.4	0.51	0.69	0.086
V3926	16.13	6.45	1.42	6.19	0.33	2.77	0.71	0.68	0.103
V3927	11.95	4.32	1.23	11.9	0.2	2	0.44	2.79	0.072
V3928	14.36	5.27	1.32	2.97	0.22	2.56	0.61	0.62	0.054
V3929	13.46	4.57	1.13	9.27	0.21	2.17	0.56	0.53	0.054
V3930	14.64	5.25	1.44	2.43	0.22	2.56	0.6	0.45	0.042
V3931	12.92	4.8	1.09	10.54	0.22	2.15	0.53	0.48	0.042
V3932	11.77	4.33	1.33	9.84	0.19	2.15	0.45	1.44	0.044
V3933	11.45	4.29	1.39	10.64	0.19	2.08	0.45	1.07	0.038
V3934	13.86	4.34	1.33	13.98	0.2	2.39	0.54	0.58	0.047

Appendix 2

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V2091	476	84	15	69	36	11	154	101	18	51	35	66	36	6	1	3	2	43	52	9
V2092	633	97	23	64	121	12	171	107	19	54	36	74	37	6	1	3	2	42	57	105
V2097	707	90	20	72	43	12	169	102	21	51	39	79	40	7	1	4	2	50	63	14
V3031	312	83	18	35	37	12	260	96	17	58	35	62	36	5	1	3	2	25	66	10
V3032	379	83	18	39	40	12	282	100	19	63	38	63	39	6	1	3	2	25	56	11
V3033	309	77	18	33	35	11	277	90	17	61	33	56	34	5	1	3	2	24	81	10
V3034	293	86	18	41	39	12	193	94	18	58	37	79	38	5	1	3	2	39	73	15
V3035	287	84	19	45	39	12	243	99	17	53	37	64	38	5	1	3	2	40	68	14
V3036	290	81	17	31	35	11	254	89	17	56	35	62	36	5	1	3	2	36	77	11
V3925	417	73	20	69	42	11	222	91	19	62	32	55	33	5	1	4	2	11	64	13
V3926	459	87	29	81	55	15	144	107	20	70	36	62	38	6	1	4	3	19	86	18
V3927	316	67	30	53	43	11	387	88	19	63	31	51	32	6	1	3	2	12	58	13
V3928	465	95	22	50	37	12	109	94	19	57	34	60	35	5	1	4	2	17	58	13
V3929	390	95	19	52	37	11	216	103	18	58	33	57	34	6	1	4	2	11	57	13
V3930	437	92	18	55	36	13	102	94	19	52	34	61	36	6	1	4	2	16	77	12
V3931	384	96	76	60	38	11	249	97	19	55	34	59	36	6	1	4	2	14	96	12
V3932	474	91	25	51	38	10	265	88	18	57	33	56	34	5	1	3	2	13	68	10

V3933	391	88	22	50	37	10	255	87	18	54	29	47	30	5	1	3	2	13	62	11
V3934	333	103	19	69	37	12	339	108	19	57	34	61	35	5	1	3	2	12	65	11

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