Characterisation of Medieval Glazed Wares from Partney, Lincolnshire

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Excavations at Partney produced a collection of medieval pottery, much of which dated to the later part of the middle ages, from the later 13th to the 15th centuries, and could be broadly classified as Toynton-type wares.

The pottery industry in the Toynton/Bolingbroke area seems to have begun in the later 13th century and continued into the post-medieval period, by which time it had apparently spread from the village of Toynton All Saints to the nearby villages of Toynton St Peter and Old Bolingbroke.

Several distinct wares can be recognised in the output of this industry and were represented in the finds from Partney. They include Toynton ware (TOY), Toynton 2 ware (TOYII), a variant fabric containing moderate calcareous inclusions (TOY+CA) and a ware which has not been noted in collections of potting waste from Toynton All Saints and is most common at sites in Boston (BOSTT) as well as samples of Toynton-Bolingbroke ware, the late medieval/post-medieval successor to TOY (TB).

Samples of these four groups were selected by Jane Young and submitted for analysis, together with comparanda from kiln sites in Toynton All Saints. The TOY and TOYII samples were identical at x20 magnification to those from consumer sites in Lincoln which have been thin-sectioned and described in print (Vince in {Young & Vince 2006 #44553}. However, neither TOY+CA nor BOSTT was found at Lincoln (or at least neither was recognised there) and samples were therefore thin-sectioned so as to provide a petrological description. The Toynton samples come from Kiln 2, Kiln 3, the Roses kiln and a waster dump at Peasgate Lane, which consisted of Toynton-Bolingbroke ware.

Two samples of fired clay from the Toynton All Saints sites were also analysed.

All the samples were submitted for chemical analysis to Royal Holloway College, London (RHCL), where Inductively-Coupled Plasma Spectroscopy was carried out under the supervision of Dr J N Walsh (App 1).

Thin Section Analysis

The thin sections were prepared by Steve Caldwell, University of Manchester, and stained using Dickson's method ({Dickson 1965 #44803}).

Calcareous Toynton ware (TOY+CA)

The following description is based on a sample of four thin sections. There is little variation in the character of the inclusions present in each section but some variation in firing conditions. The following inclusion types were noted:

- Rounded quartz. Moderate grains up to 1.5mm across. The well-rounded outlines, combined with low sphericity, suggest that these grains are of lower Cretaceous origin. Most are monocrystalline and unstrained.
- Chert. Rounded grains with a coarser texture than flint, up to 0.5mm across.
- Subangular quartz. Abundant grains up to 0.3mm across.
- Microcline feldspar. Sparse subangular grains up to 0.3mm long.
- Clay pellets. Sparse rounded grains of similar texture to the groundmass, some varying in oxidation conditions (e.g. oxidized in a black core).
- Altered Glauconite. Sparse rounded grains of colourless isotropic material, surrounded by a wide shrinkage margin. The colour is unusual and probably due to the combination of reduced firing and high firing temperature.
- Rounded phosphate. A single rounded, brown-stained fragment 1.0mm long.

The groundmass consists of optically isotropic baked clay and moderate angular quartz up to 0.05mm across. The core of three of the samples is black but at the margins it can be seen that the clay includes thin laminae differing in colour and texture. The groundmass also has numerous laminae, some of which are lenticular with a thinner black content. These are probably organic layers.

Boston-type ware (BOSTT)

The following description is based on two thin sections which have a similar range of inclusion types:

- Subangular and rounded quartz. Abundant well-sorted quartz up to 0.3mm across.
- Chert. Sparse rounded grains up to 0.3mm across.
- Altered glauconite. Moderate grains up to 0.3mm across, similar in appearance to those in the calcareous Toynton ware.
- Clay pellets. Rounded fragments, mainly of similar colour and texture to the groundmass, up to 1.0mm across but included some with a light coloured groundmass and dark dendritic staining.

The groundmass consists of optically isotropic baked clay and moderate angular quartz up to 0.05mm across. The core of one sample is black and the other is reduced grey.

Both contain abundant laminae which in the black sample contain carbonised organic matter.

Interpretation of thin section analysis

In both fabrics the groundmass appears to be similar and to consist of an organic clay, probably of Upper Jurassic origin (although possibly redeposited as boulder clay).

The inclusions in the Boston-type ware appear to be a mixture of Triassic, Jurassic and Lower Cretaceous grains and the similarity in size and the sorting, together with the mixed origin, suggest either a Quaternary riverine or aeolian origin.

The inclusions in the calcareous Toynton ware are similar in origin, but include grains probably derived from the Spilsby sandstone which are absent in the Boston-type ware. However, they probably have a similar origin. It should be noted that there is little sign in the thin section for either the calcareous inclusions which give this fabric its visual distinctiveness nor for voids which might once have contained these inclusions.

Chemical Analysis

The samples were prepared by Peter Hill and submitted to RHCL where a range of major elements and minor elements were measured, the former as percent oxides (App 2) and the latter in parts per million (App 3).

Silica was not measured but can be estimated since it is by far the most common element likely to have been present in the sample which was not included (followed by organic matter). The estimated silica content was therefore determined by subtracting the total measured oxides from 100% (Table 1). These estimates show that all the Toynton ware samples have a very similar silica content and that the Toynton-Bolingbroke ware samples have a similar silica content, but with a slightly higher mean. The two fired clay samples both have higher silica contents than the pottery from the same sites.

Table 1

Group	N	Mean	Conf. (±)	Std.Error	Std.Dev.
BOSTTT	2	65.46	3.97	0.397	0.561442784
TOY Kiln 3	6	65.68	1.48	0.577549502	1.414701582
TOY Kiln 2	6	66.38	1.14	0.442243554	1.083271049
TOY	6	67.45	0.91	0.352994964	0.864657543
TOY The Roses	5	67.64	1.79	0.645927117	1.444336941
TB	6	68.37	1.51	0.586053548	1.435532155
TOY+CA	4	68.92	3.96	1.243651303	2.487302605
TOYII	5	69.01	4.83	1.740960729	3.892906536
TB Peasgate Lane	6	71.11	2.75	1.068165707	2.616460943
FCLAY The Roses	1	73.73	----	----	----

FCLAY Kiln 3	1	76.41	----	----	----

Post-burial alteration

The ICPS data was normalised to aluminium, to take account of the dilution effect of variations in silica content, and analysed using a statistical package (Winstat for Excel, {Fitch 2001 #44933}). Calcium was noted to have a high variability, higher than that between groups, and this is interpreted as being due to leaching. Correlation analysis indicated that calcium was strongly correlated with strontium whilst an apparent correlation with magnesium and lithium is probably due to the fact that all three elements are high in the sample of fired clay from Kiln 3.

Phosphorus was similarly high, with a high variability, in samples of TOY and TOYII from Partney. This is probably due to the presence of post-depositional phosphate concretions in the pores of the samples. No other elements were found to be correlated with phosphorus.

Lead and copper both showed evidence for high variability and in both cases this is probably due to contamination of the sample with glaze. Since the outer layers of the samples were removed before sampling this is probably due to glaze being drawn into the pores of the vessel by capillary action prior to or during firing. Sodium, manganese, barium and zinc also showed apparent correlation with lead, but in each case this appears to be due to the fired clay sample from Kiln 3. The fired clay samples were then removed from the dataset and no correlation was found.

Those elements potentially either enhanced or depleted during burial were then omitted from the dataset and factor analysis carried out. This found four factors but in the first three of these factors there is a systematic difference in mean scores between the Partney and Toynton samples. This is not sufficient to make one doubt that all the samples were actually the products of the Toynton area, since when samples of medieval roof tiles from Partney are included in the analysis they have the effect of reducing the difference in scores between the various Toynton ware samples.

The normalised data was re-examined to see if these differences affected specific elements and it was found that subtle differences were present in a large number of elements, most notably magnesium, potassium, barium, lithium, scandium, lanthanum, neodymium, dysprosium, cobalt and zirconium. The least affected elements are iron, sodium, manganese, titanium, chromium, yttrium, vanadium, samarium, europium, and zinc. Factor analysis was carried out using just these elements and the following conclusions were then drawn from that analysis: (Fig 1)

- There is very little difference indeed in the compositions of any of these groups.
- Kiln 3, the Roses kiln and TOYII have very similar compositions.

- Kiln 2, BOSTT and TOY have very similar compositions, but with greater variability within each group.
- TOY+CA has a composition midway between the first and second groups.
- The TB samples from Partney and Toynton are indistinguishable, but their variability encompasses that of the other groups (and so they are left out of Fig 1).

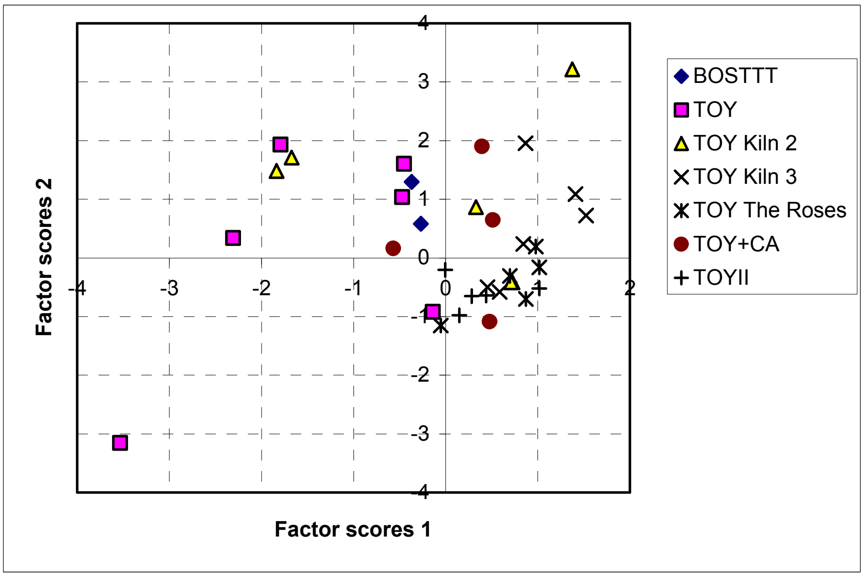

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Figure 1

Conclusions

The thin section and chemical analyses make it clear that the BOSTT and TOY+CA samples are made from the same raw materials as the various groups of medieval and post-medieval pottery waste sampled from Toynton. The most likely explanation is that they are products of the Toynton potteries which have visual characteristics not matched at any of the known kiln sites. However, it is also possible that clay from Toynton was transported elsewhere, although if that was the case it seems that the sand temper was also transported.

The chemical analyses confirm the similarity of the BOSTT and TOY+CA samples to those of Toynton area origin, both from production sites at Toynton All Saints and from consumer sites in Partney.

The presence of samples from consumer sites and production sites situated only 4 miles apart and on similar bedrock makes it possible to study the differences in chemical composition brought about by burial in a way that is rarely possible elsewhere. These differences did not affect all the elements, however and specifically were not present in the aluminium determinations, which were used to normalise the data. It is inevitable with porous earthenware that some contamination of the sample from groundwater and soil matrix will be present and the techniques employed to study this data are designed to find differences, however, small. The lack of major patterning suggests that the parent clay used at Toynton, from the later 13th century into the late or post-medieval period (TB) remains the same.

Finally, the difference in chemical composition between the flat roof tiles from Partney Site 4 and these Toynton wares make it certain that the tiles were not produced alongside pottery at Toynton, although they have a similar petrology and probably come from a geologically similar area, perhaps Partney itself.

Appendix 1

TSNO	Sitecode	Context	cname	Form	Action	locality	Description
V3502	Peasgate Lane	US	TB	PANC	TS;ICPS	Toynton All Saints	
V3503	Peasgate Lane	US	TB	JUG	ICPS	Toynton All Saints	
V3504	Peasgate Lane	US	TB	JUG	ICPS	Toynton All Saints	
V3505	Peasgate Lane	US	TB	JUG	ICPS	Toynton All Saints	WIDE MOUTHED VESSEL WITH STRAP HANDLE
V3506	Peasgate Lane	US	TB	PANC	ICPS	Toynton All Saints	
V3507	Peasgate Lane	US	TB	CIST	ICPS	Toynton All Saints	BUNG HOLE
V3508	The Roses	US	FCLAY	KILN	ICPS	Toynton All Saints	
V3509	The Roses	US	TOY	JUG	ICPS	Toynton All Saints	
V3510	The Roses	US	TOY	JUG	TS;ICPS	Toynton All Saints	
V3511	The Roses	US	TOY	JUG	ICPS	Toynton All Saints	
V3512	The Roses	US	TOY	JUG	ICPS	Toynton All Saints	
V3513	The Roses	US	TOY	JUG	ICPS	Toynton All Saints	
V3514	The Roses	US	TOY	JUG	ICPS	Toynton All Saints	
V3515	Kiln 3	US	TOY		ICPS	Toynton All Saints	
V3516	Kiln 3	US	TOY		ICPS	Toynton All Saints	
V3517	Kiln 3	US	TOY		ICPS	Toynton All Saints	
V3518	Kiln 3	US	TOY		ICPS	Toynton All Saints	
V3519	Kiln 3	US	FCLAY	KILN	ICPS	Toynton All Saints	
V3520	Kiln 3	US	TOY	JUG	ICPS	Toynton All Saints	
V3522	Kiln 2	US	TOY		ICPS	Toynton All Saints	
V3523	Kiln 2	US	TOY		ICPS	Toynton All Saints	
V3524	Kiln 2	US	TOY		ICPS	Toynton All Saints	

TSNO	Sitecode	Context	cname	Form	Action	locality	Description
V3525	Kiln 2	US	TOY		ICPS	Toynton All Saints	
V3526	Kiln 2	US	TOY		ICPS	Toynton All Saints	
V3527	Kiln 2	US	TOY		ICPS	Toynton All Saints	
V3589	PTN804	1100	TOY+CA	JUG	TS;ICPS	Partney	
V3590	PTN804	650	TOY+CA	JUG	TS;ICPS	Partney	
V3591	PTN804	1250	TOY+CA	JUG	TS;ICPS	Partney	
V3592	PTN804	1750	TOY+CA	JUG	TS;ICPS	Partney	EXT WHITE SLIP;PLAIN EXT SPLASH GL
V3593	PTN804	750	TOYII	JUG	ICPS	Partney	
V3594	PTN804	750	TOYII	JUG	ICPS	Partney	
V3595	PTN804	600	TOYII	JUG	ICPS	Partney	
V3596	PTN804	1250	TOYII	JUG	ICPS	Partney	
V3597	ptn 4	452	TOYII	JUG	ICPS	Partney	
V3598	ptn 4	504	TB	JUG	ICPS	Partney	
V3599	PTN804	1500	TB	JUG/JAR	ICPS	Partney	
V3600	PTN804	1250	TB	BOWL	ICPS	Partney	
V3601	PTN804	750	TB	JAR/JUG	ICPS	Partney	
V3602	PTN804	1550	TB	PANC	ICPS	Partney	
V3603	PTN804	1300	TB	PANC	ICPS	Partney	
V3604	ptn 4	159	TOY	JUG	ICPS	Partney	WHSL
V3605	ptn 4	361	TOY	JUG	ICPS	Partney	WHSL
V3606	ptn 4	225	TOY	JUG	ICPS	Partney	WHSL
V3607	ptn 4	389	TOY	JUG	ICPS	Partney	
V3608	ptn 4	384	TOY	PANC	ICPS	Partney	WHSL
V3609	ptn 4	384	TOY	JUG	ICPS	Partney	WHSL

Appendix 2

TSNO	**Al2O3**	**Fe2O3**	**MgO**	**CaO**	**Na2O**	**K2O**	**TiO2**	**P2O5**	**MnO**
V3502	15.48	5.53	1.1	2.61	0.26	2.64	0.72	0.36	0.024
V3503	13.91	5.07	0.98	1.74	0.26	2.34	0.58	0.38	0.042
V3504	15.48	5.6	1.1	2.98	0.26	2.83	0.67	0.37	0.037
V3505	17.12	5.98	1.18	3	0.27	2.93	0.76	0.38	0.032
V3506	14.46	4.97	1.02	2.49	0.22	2.45	0.65	0.31	0.029
V3507	16.99	6.01	1.17	3.24	0.28	2.91	0.75	0.38	0.034
V3508	10.57	4.83	0.92	3.63	0.61	2.21	0.51	0.25	0.059
V3509	18.33	6.28	1.27	3.46	0.29	2.89	0.83	0.29	0.033
V3510	16.06	5.48	1.23	6.98	0.28	2.84	0.71	0.27	0.028
V3511	17.31	5.59	1.27	7.97	0.31	2.9	0.76	0.34	0.033
V3512	18.2	6.19	1.22	3.9	0.28	2.83	0.8	0.31	0.039
V3513	17.1	5.76	1.31	7.08	0.32	2.89	0.76	0.28	0.028
V3514	17.26	5.48	1.18	4.63	0.32	2.7	0.73	0.27	0.032
V3515	16.87	6.1	1.18	3.09	0.28	2.78	0.72	0.35	0.037
V3516	15.86	5.36	1.12	5.18	0.27	2.58	0.68	0.35	0.027

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V3517	15.63	5.24	1.12	5.33	0.28	2.7	0.67	0.33	0.031
V3518	15	4.98	1.25	9.48	0.33	2.54	0.64	0.36	0.029
V3519	13.9	4.83	0.74	3.39	0.21	2.17	0.6	0.39	0.042
V3520	17.25	5.52	1.18	5.04	0.42	2.6	0.7	0.29	0.03
V3522	16.78	5.47	1.12	4.39	0.28	2.69	0.75	0.36	0.032
V3523	17.6	6.62	1.38	4.31	0.3	3.08	0.77	0.46	0.06
V3524	17.44	6.54	1.32	3.55	0.3	3.15	0.74	0.49	0.038
V3525	18.32	6.06	1.22	2.8	0.29	3.02	0.8	0.31	0.032
V3526	17.73	6.81	1.34	3.76	0.3	3.16	0.75	0.39	0.064
V3527	19.02	6.79	1.35	2.58	0.25	3.33	0.82	0.35	0.041
V3587	17.19	5.78	1.22	6.27	0.32	2.92	0.76	0.45	0.03
V3588	17.41	5.7	1.25	5.59	0.29	2.76	0.72	0.39	0.036
V3589	16.81	5.59	1.11	4.05	0.28	2.61	0.73	0.38	0.033
V3590	18.45	6.01	1.15	3.53	0.29	2.84	0.8	0.36	0.034
V3591	15.38	5.49	1.02	1.89	0.18	2.47	0.67	0.45	0.029
V3592	17.29	5.59	1.11	3.66	0.24	2.7	0.73	0.33	0.027
V3593	13.29	4.42	0.99	5.41	0.23	2.3	0.57	0.37	0.021
V3594	18.93	6.2	1.17	3.29	0.28	2.94	0.84	0.32	0.036
V3595	14.09	5.6	1.02	1.48	0.2	2.6	0.61	0.4	0.032
V3596	17.81	6.33	1.2	3.18	0.26	2.87	0.79	0.34	0.039
V3597	15.67	6.59	1.1	6.59	0.27	2.58	0.67	0.96	0.04
V3604	16.84	5.38	1.1	5.99	0.26	2.81	0.69	0.55	0.027
V3605	16.59	5.65	0.98	3.47	0.26	2.53	0.73	1.09	0.038
V3606	16.34	5.81	1.16	4.54	0.31	2.8	0.67	0.42	0.029
V3607	16.67	5.73	1.14	3.8	0.28	2.7	0.72	1.09	0.033
V3608	16.6	5.58	1.18	5.54	0.26	2.83	0.7	0.64	0.032
V3609	16.23	5.61	1.07	5.72	0.25	2.51	0.7	0.62	0.027

Appendix 3

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V3502	303	116	21	73	50	13	119	111	24	55	44	72	45	8	1	3	2	183	77	18
V3503	293	97	18	62	42	12	94	99	25	59	42	70	43	7	1	4	2	474	61	20
V3504	328	111	22	77	48	13	117	104	26	68	46	78	47	7	1	4	2	382	71	19
V3505	322	120	23	69	48	15	127	117	29	72	50	87	51	8	2	4	3	222	79	22
V3506	290	110	24	48	47	12	104	104	23	50	41	68	42	6	1	3	2	104	68	18
V3507	341	117	24	82	51	14	139	115	30	64	49	79	50	8	1	4	2	111	75	19
V3508	337	68	18	68	32	8	134	88	16	46	30	53	31	5	1	3	2	11,293	66	18
V3509	337	129	27	80	62	15	126	125	29	68	47	75	48	8	2	4	3	641	81	20
V3510	301	114	27	81	53	13	164	103	25	68	42	71	43	7	1	4	2	727	79	16
V3511	323	120	28	77	56	15	184	116	28	78	44	76	45	7	1	4	3	672	82	16
V3512	341	127	27	73	60	15	136	123	31	73	49	77	50	8	2	4	3	221	81	21
V3513	322	121	29	72	56	14	176	120	27	75	43	72	44	6	1	4	3	383	81	16
V3514	304	118	30	88	57	14	133	114	28	83	44	74	45	6	1	4	2	118	76	21
V3515	324	113	27	80	50	14	129	110	32	84	48	79	49	8	2	4	3	110	77	20

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V3516	302	114	27	69	56	13	142	110	27	59	43	76	44	7	2	4	2	518	77	17
V3517	308	109	30	81	53	13	153	101	25	56	42	71	43	7	1	4	2	430	73	18
V3518	296	105	26	71	50	12	203	89	27	61	41	70	42	6	1	3	2	861	71	15
V3519	387	85	23	58	52	11	158	74	28	66	41	71	42	7	1	4	2	165	67	15
V3520	305	115	24	74	56	14	145	110	27	70	45	76	46	7	2	4	2	243	74	21
V3522	334	121	27	77	54	14	142	114	28	64	48	77	49	8	2	4	2	132	72	19
V3523	370	122	26	55	58	15	150	120	33	86	50	88	52	8	1	5	3	943	79	22
V3524	420	122	25	53	54	15	153	111	34	89	52	83	53	8	2	5	3	734	81	16
V3525	345	130	25	77	54	15	130	122	30	89	49	85	50	8	1	4	3	107	78	19
V3526	357	123	25	53	60	15	144	121	29	71	50	89	52	7	2	5	3	246	81	25
V3527	420	137	27	71	60	16	121	129	30	80	51	81	52	9	2	5	3	1,370	87	18
V3587	368	119	28	69	49	14	185	118	26	49	46	82	47	7	2	4	2	72	93	17
V3588	348	122	29	84	60	15	166	118	27	50	47	82	48	7	2	4	2	167	83	18
V3589	308	120	30	70	55	15	127	118	28	54	46	78	47	7	2	4	2	59	75	18
V3590	335	128	30	82	62	16	130	124	29	60	48	88	49	8	2	4	2	72	77	19
V3591	302	110	21	58	47	14	96	106	27	56	46	79	46	7	2	3	2	108	68	18
V3592	310	125	31	73	52	15	128	122	28	63	45	80	46	8	2	4	2	106	74	17
V3593	261	97	23	65	43	12	135	95	26	50	40	70	41	7	1	3	2	48	63	15
V3594	329	132	32	89	60	16	126	130	27	53	49	85	50	8	2	4	2	79	85	21
V3595	280	101	22	66	48	13	95	99	28	40	46	79	47	8	2	4	2	94	69	20
V3596	323	126	29	74	55	16	122	126	28	58	49	86	50	8	2	4	2	60	77	19
V3597	298	110	42	66	50	14	159	114	25	48	42	74	42	6	1	3	2	1,356	84	18
V3604	316	117	30	81	56	15	163	111	26	54	45	78	46	7	2	3	2	98	73	18
V3605	341	117	26	55	48	14	139	118	27	46	46	77	47	7	2	4	2	91	69	17
V3606	332	112	25	72	50	14	152	108	28	49	46	82	47	7	2	4	2	82	72	18
V3607	322	120	26	75	55	15	149	107	28	54	49	85	50	8	2	4	2	184	75	19
V3608	325	121	27	68	52	15	162	121	27	51	46	84	47	7	2	4	2	171	76	19
V3609	304	116	27	60	51	14	157	114	27	49	45	77	46	7	2	4	2	671	73	16