Characterisation Studies of Cambridgeshire Anglo-Saxon and Medieval Pottery: Colne Ware

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As part of a programme of scientific analysis of pottery fabrics from Cambridgeshire of Anglo-Saxon and medieval date, a series of samples (App 1) were taken of later medieval pottery production waste from Colne and of visually similar pottery from Caxton (14 miles to the south of Colne) and Huntingdon (10 miles to the west).

The Colne pottery has been studied by Hilary Healey who divided the fabrics into three, A, B and C. The samples from the production site were chosen by P Spoerry to include the actual published examples identified by Healey. In addition, a more sandy version of the fabric was identified by Spoerry and examples of this were sampled from Colne and Huntingdon. Finally, three of the samples from Caxton were identified by Spoerry as Colne-type rather than Colne ware.

The aims of this study are therefore to establish whether or not Colne ware has an distinctive petrological or chemical characteristics which can be used to distinguish it from other visually similar wares (such as Bourne/Baston ware) and secondly to determine whether the samples from Caxton and Huntingdon could be Colne products and thirdly whether the various visually-identified fabric groups have any petrological or chemical validity.

Thin Section Analysis

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

Description

Thin section analysis reveals a similar range of inclusions in each sample. However, the relative frequency of the inclusions varies, as does their size and texture. No correlation could be found between these features and the various fabric groups recognised visually and therefore a single fabric description is given here.

The following inclusion types are present in thin section:

- Quartz. The fabric contains quartz grains of varying size, roundness and sphericity. Three distinctive types can be identified: subangular grains up to 0.3mm across which sometimes show signs of overgrowth; well-rounded, high sphericity grains up to 1.0mm across (and more common in the coarser-textured fabrics); and well-rounded, low sphericity grains, some of which contain iron-stained veins. These types are respectively likely to be of Jurassic sandstone; Triassic and Lower Cretaceous age.

- Sandstone. Two types of sandstone inclusion were present. The first, present in small quantities in all samples, consists of rounded fragments c.0.4mm across containing interlocking grains up to 0.2mm across. Fragments of this sort are a component of cover sands in the East Midlands derived from Triassic sandstones. The other type consists of subangular fragments up to 1.5mm across containing angular grains c.0.1-0.2mm across. This type appears to be a decalcified version of the calcareous sandstone (see below).
- Calcareous sandstone. Sparse to moderate subangular fragments of sandstone consisting of angular quartz grains c.0.1-0.2mm across with a cement of ferroan calcite. It is only present in low-fired samples with an optically anisotropic baked clay groundmass. This sandstone is probably of Jurassic origin.
- Fossiliferous limestone. Sparse to moderate rounded fragments of limestone containing bivalve shell, echinoid shell, echinoid spines and ostracods (sometimes with both valves still in place). These are all composed of non-ferroan calcite and the groundmass consists of ferroan calcite. These fragments are present in both low- and high-fired samples but the ferroan calcite groundmass is only visible in the lower-fired samples.
- Opaques. Moderate well-rounded grains ranging from c.0.2mm to 1.5mm across. Most contain no inclusions and are completely opaque (unlike some iron-rich clay pellets).
- Mudstone. Sparse rounded fragments up to 2.0mm across. Some of these have a similar colour and texture to the groundmass but show bedding. Others are darker in colour than the groundmass and have a darkened halo, suggesting that they are detrital grains.
- Organics. Sparse voids, some containing carbonised organic matter. Some have a clear structure (stem or root) and others are amorphous, sometimes surrounded by a darkened halo.
- Flint. Rare to sparse fragments, mostly angular and unstained up to 1.5mm long. Some rounded, brown-stained grains are present (e.g. V4401).
- Ooliths. A single sample, V4379, contained a single oolith, 0.5mm across

The groundmass consists of optically anisotropic or isotropic baked clay minerals with sparse angular quartz inclusions up to 0.1mm across. The isotropic samples tend to have a redder colour and the calcareous inclusions are usually either partially or completely burnt out. Two exceptional samples are V4380 which contains moderate angular quartz c.0.1mm across and V4390 which contains very little quartz. The Colne A samples tend to me lower-fired than the remainder.

The size-range and texture of the inclusions varies. The majority of the samples contain no inclusions larger than 0.5mm and two contain noticeably fewer inclusions than the remainder. A number of samples have inclusions of which the largest are greater than 0.5mm and less than 1.0mm across and a small number of samples contain inclusions which are in excess of 1.0mm across. There is no obvious correlation between inclusion size and visual fabric group.

Interpretation

The inclusions are probably from a detrital sand containing material of Triassic, Jurassic, Lower Cretaceous and later (rounded flint) date. This mixture of sources suggests that the sand comes from a deposit laid down by a south-flowing water body and the size and angularity of the calcareous sandstone suggests that the source of this sandstone is not that distant from Colne.

Colne itself lies on first to second terrace gravels at the junction of the Ouse and the fens overlying Ampthill Clay. However, a reasonable proportion of the inclusions cannot have been derived from the area drained by the Ouse and must either be re-deposited from glacial deposits or, at the mouth of the Ouse, there is a component of northern origin in the gravels.

Chemical Analysis

Samples of each sherd were prepared for chemical analysis by sawing off a small piece and removing the outer surfaces. The resulting lump was then crushed to a fine powder which was submitted to Royal Holloway College, London, Department of Geology and analysed using Inductively-Coupled Plasma Spectroscopy (ICP-AES) under the supervision of Dr J N Walsh. The results consist of a series of values for a group of major elements, expressed as percent oxides (App 2), and a series of values for minor and trace elements, expressed as parts per million (App 3).

The frequency of silica was not measured but was estimated by subtraction of the total oxides from 100%. The mean values and standard deviations for each of the visual fabric groups is shown in Fig 1. There is a range of silica values from 60.3% to 75.0% but too few samples of most groups to determine whether there is a significant difference between fabrics. The two fabric groups with the most samples, Colne B and C, show no difference in silica content. A difference of 15% in silica content has a diluting effect on the frequency of other elements and therefore the data were normalised to aluminium before investigation using Factor Analysis.

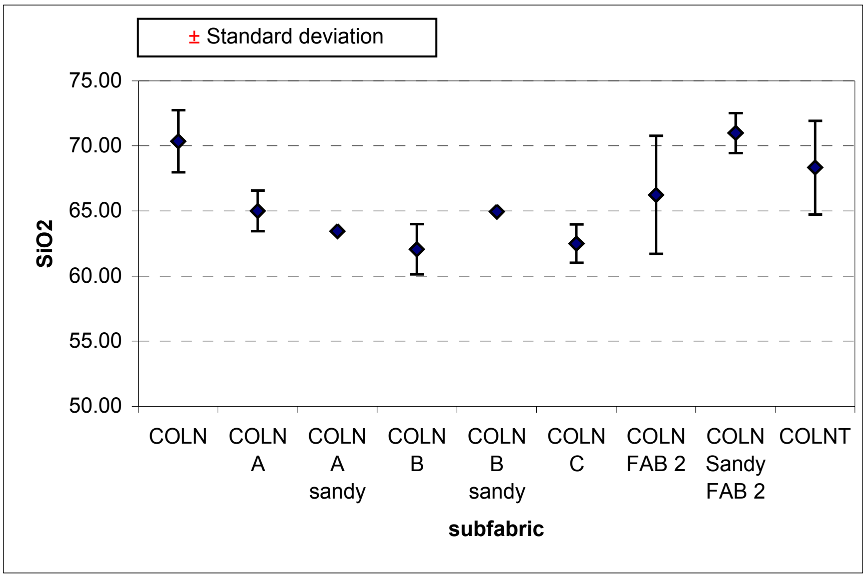

Figure 1

Factor analysis was carried out using all elements except for those affected by burial conditions, i.e. Ca, Ba, P and Sr. This analysis found five factors and a plot of the first against the second factor was carried out, grouping the samples by visual fabric and by findspot. This revealed that the ungrouped Colne samples and the Colne-type samples have higher F2 scores than the remainder. These, it turns out, are all samples from Caxton and Huntingdon (Fig 2). High Factor 2 scores are probably due to high weightings for Zr and Ti, and to a lesser extent Cu and Cr. Fig 3 shows the normalised Zr and Ti values by findspot and indicates that some of the Huntingdon and all of the Caxton samples have higher Zr than Colne. Fig 4 is a scatterplot of normalised Cu against Cr values and also clearly distinguishes the Colne from the Caxton and Huntingdon samples. A difference between this plot and that in Fig 3 is that all of the Huntingdon samples are distinguished from the Colne ones.

Since neither Zr nor Ti should be mobile post-burial it seems likely that the difference in their frequencies do reflect a difference in composition between the samples from Colne and elsewhere. A second factor analysis, using just the minor and trace elements, found that the Colne samples are distinguished from the remainder by their lower rare earth element scores (e.g. Fig 6, a plot of normalised Yb against Nd scores). The differences, however, are very small.

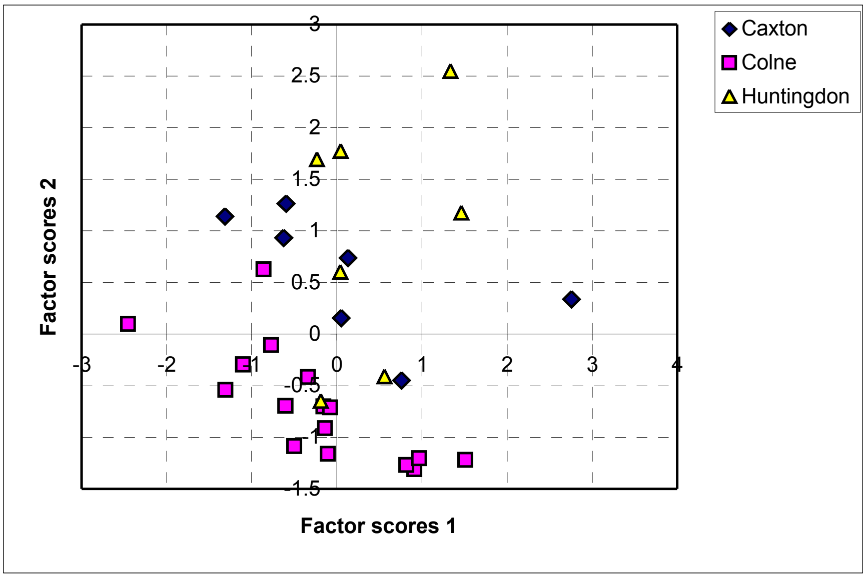

Figure 2

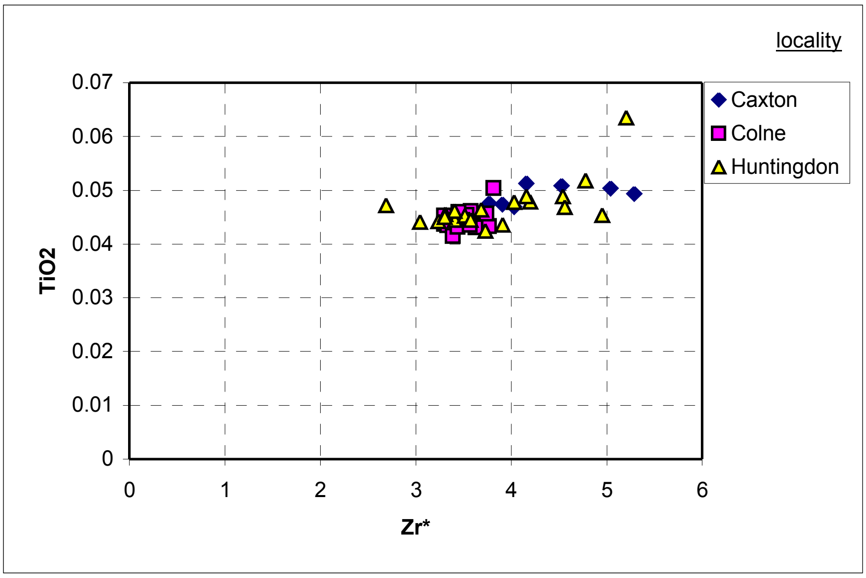

Figure 3

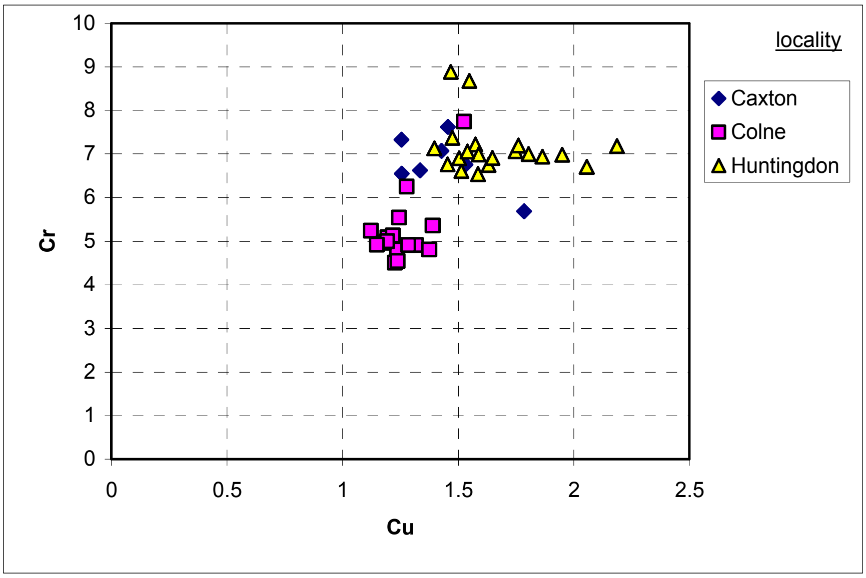

Figure 4

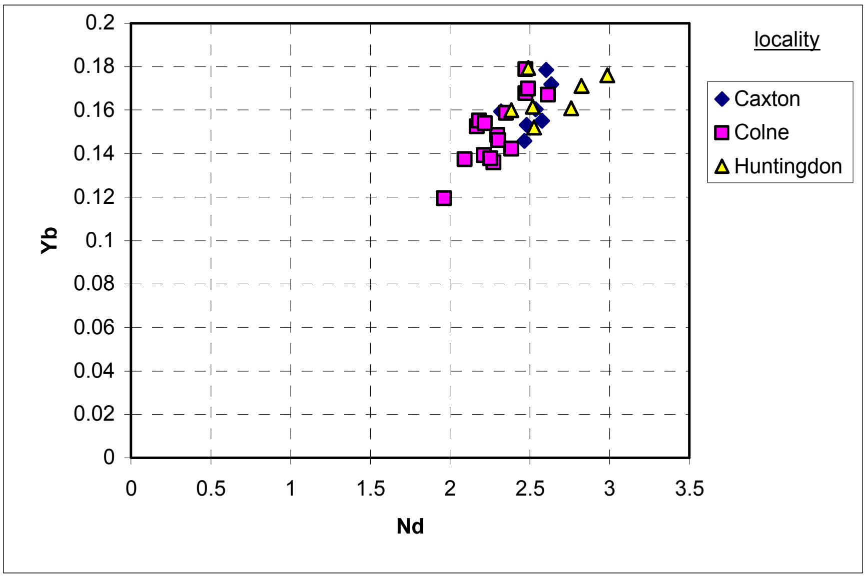

Figure 5

Conclusions

There are no clear differences visible in thin section between the samples from the Colne kiln site and those from Caxton and Huntingdon. However, the fabric is variable, partly as a result of differences in the size and frequency of sand inclusions and partly as a result of firing differences.

Chemical analysis does, however, show differences between the Colne and the remaining samples, and to a lesser extent between the Caxton and Huntingdon samples. Since these include variations in elements with a low mobility it is likely that they do reflect real differences in composition.

Whether these differences imply that the Huntingdon and Caxton samples come from another source, or from different batches of clay used at Colne, is not known but they do raise the possibility that the Colne kiln is a minor part of a larger industry and that Colne-type ware may have been produced over a wider area.

Bibliography

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

Appendix 1

TSNO	Sitecode	Context	REFNO	cname	Action	locality	Description	subfabric
V4360	hunol94	57	172	COLN	TS;ICPS	Huntingdon	Buff/l grey bodysherd in hard fabric from prob jug; moderate medium quartz and rare ooliths	COLN FAB 2
V4361	hunol94	57	173	COLN	TS;ICPS	Huntingdon	Grey rim from jug in hard-fired fabric. Common fine quartz and occasional Fine ooliths	COLN FAB 2
V4362	hunol94	174	174	COLN	TS;ICPS	Huntingdon	Jug strap handle in grey fabric; abundant medium quartz	COLN Sandy FAB 2
V4363	hunol94	U/s	175	COLN	TS;ICPS	Huntingdon	Inturned rim of jar with short flange in dark grey/dark brown fabric; abundant medium-coarse quartz and occasional Medium ooliths (voids)	COLN Sandy FAB 2
V4370	hunsr99 stu 96	230	182	COLN	TS;ICPS	Huntingdon	Rim/handle from jug in oolitic, reduced fabric	COLN
V4371	hunsr99 stu 96	202	183	COLN	TS;ICPS	Huntingdon	Rolled rim of jar in slightly oolitic brown/grey fabric	COLN
V4372	hunsr99 stu 96	226	184	COLN	TS;ICPS	Huntingdon	Flanged rim of bowl in grey sandy fabric ;few ooliths	COLN
V4379	COL SA 91	31	191	COLN	TS;ICPS	Colne	Flanged bowl; dark/mid grey with fine quartz and abundant shell and ooliths	COLN A
V4380	COL SA 91	31	192	COLN	TS;ICPS	Colne	Lip/rim from jug in mid-grey fabric with medium quartz and moderate ooliths	COLN A sandy
V4381	COL SA 91	31	193	COLN	TS;ICPS	Colne	‘ginger’ jar rim in mid-grey/orange/light grey fabric ; fine quartz and moderate ooliths	COLN A
V4382	COL SA 91	31	194	COLN	TS;ICPS	Colne	Rim/handle of jug in dark grey/orange-brown fabric with fine quartz and common ooliths	COLN A

V4383	COL SA 91	31	195	COLN	TS;ICPS	Colne	Rim of jar or wide jug in buff/grey fabric with fine quartz and occasional ooliths	COLN B
V4384	COL SA 91	31	196	COLN	TS;ICPS	Colne	Wide jug rim in black and brown/grey fabric with fine quartz and common ooliths	COLN B
V4385	COL SA 91	31	197	COLN	TS;ICPS	Colne	Jar rim in brown/dark grey fabric with medium quartz	COLN B sandy
V4386	COL SA 91	31	198	COLN	TS;ICPS	Colne	Bunghole cistern base in grey fabric with fine quartz	COLN B
V4387	COL SA 91	31	199	COLN	TS;ICPS	Colne	Orange-brown/grey body sherd with buff slip and green glaze from ?jug with fine quartz and occasional. leached ooliths	COLN B
V4388	COL SA 91	31	200	COLN	TS;ICPS	Colne	Buff-brown/grey body sherd with buff slip and green glaze from ?jug with fine quartz and rare ooliths	COLN B
V4389	COL SA 91	31	201	COLN	TS;ICPS	Colne	Flanged bowl rim in orange-brown/grey fabric with fine quartz and occasional leached ooliths	COLN C
V4390	COL SA 91	31	202	COLN	TS;ICPS	Colne	Lid-seated, ext glazed, jar rim in orange fabric with occasional. Medium quartz and common leached ooliths	COLN C
V4391	COL SA 91	31	203	COLN	TS;ICPS	Colne	Upright, cordoned jar rim in grey/orange-brown fabric with fine quartz and rare leached ooliths	COLN C
V4392	COL SA 91	31	204	COLN	TS;ICPS	Colne	Grooved handle from glazed jug in orange/grey fabric with rare fine quartz and occasional ooliths	COLN C
V4393	COL SA 91	31	205	COLN	TS;ICPS	Colne	Bs from jug with applied thumbed pad decoration under thick brown glaze in orange fabric with fine quartz	COLN C
V4394	COL SA 91	31	206	COLN	TS;ICPS	Colne	Bs from jug with applied, thumbed floral design under thick brown glaze in orange fabric with	COLN C

							medium quartz	
V4395	CAX GR 99	21	207	COLN	TS;ICPS	Caxton	Bs from almost complete jug in buff fabric, fine quartz, no calc.	COLN
V4396	CAX GR 99	104	208	COLN	TS;ICPS	Caxton	Rim/handle from jug in grey/brown fabric with slashing. Medium quartz and rare. calc	COLN
V4397	CAX GR 99	104	209	COLN	TS;ICPS	Caxton	Slashed jug handle base in grey fabric with medium quartz and occasional calc.	COLN
V4398	CAX GR 99	194	210	COLN	TS;ICPS	Caxton	Handle from jug in buff/orange fabric with slashing. Medium quartz and rare calc.	COLN
V4399	CAX GR 99	197	211	COLN	TS;ICPS	Caxton	Bs from ?jug in mid-grey fabric with coarse quartz and common calc externally. Incised geometric lines.	COLNT
V4400	CAX GR 99	27	212	COLN	TS;ICPS	Caxton	Bs in dark grey/grey fabric with medium quartz and rare calc. LMR-type appearance to fabric.	COLNT
V4401	CAX GR 99	106	213	COLN	TS;ICPS	Caxton	Bs (sooted) in orange fabric with medium quartz and common leached calc. OSW type fabric	COLNT

Appendix 2

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V4360	13.76	5.41	1.06	12.75	0.26	2.68	0.65	0.33	0.059
V4361	15.78	6.57	1.19	2.92	0.23	2.72	0.74	0.39	0.028
V4362	12.27	6.12	0.97	4.64	0.13	2.31	0.60	0.86	0.044
V4363	14.86	8.05	1.15	1.92	0.17	2.60	0.77	0.54	0.042
V4370	14.31	6.75	1.34	4.05	0.28	2.50	0.70	0.24	0.049
V4371	15.14	6.64	1.33	1.22	0.46	2.81	0.67	0.41	0.066

V4372	13.07	6.30	1.29	1.16	0.21	1.95	0.83	0.11	0.044
V4379	15.65	6.88	1.11	5.32	0.25	2.74	0.65	0.57	0.057
V4380	18.27	7.82	1.35	4.56	0.34	3.12	0.84	0.19	0.061
V4381	17.66	7.44	1.26	5.08	0.21	3.13	0.77	0.64	0.057
V4382	18.69	7.56	1.17	3.40	0.27	3.22	0.85	0.26	0.040
V4383	21.83	7.14	1.45	3.74	0.19	3.74	0.99	0.20	0.035
V4384	16.68	6.91	1.12	6.59	0.23	2.91	0.73	0.28	0.055
V4385	17.04	7.98	1.21	4.40	0.17	2.93	0.86	0.40	0.051
V4386	22.57	7.74	1.56	1.81	0.22	3.90	1.00	0.15	0.037
V4387	22.98	7.60	1.60	2.08	0.20	3.97	1.05	0.17	0.029
V4388	20.13	7.25	1.40	2.62	0.19	3.46	0.93	0.19	0.032
V4389	20.35	7.78	1.47	4.59	0.23	3.34	0.88	0.14	0.051
V4390	22.82	7.74	1.37	1.30	0.23	3.70	0.99	0.25	0.026
V4391	19.52	7.23	1.33	2.24	0.25	3.17	0.85	0.21	0.043
V4392	22.59	7.76	1.41	1.56	0.25	3.62	0.99	0.16	0.021
V4393	21.79	7.48	1.46	1.15	0.24	3.50	0.97	0.14	0.030
V4394	21.78	7.78	1.49	1.78	0.26	3.51	0.94	0.20	0.032
V4395	16.12	7.60	1.34	2.56	0.18	3.14	0.82	0.43	0.046
V4396	15.13	6.71	1.25	4.69	0.14	2.74	0.71	0.25	0.052
V4397	14.34	7.40	1.16	3.22	0.13	2.61	0.68	0.19	0.038
V4398	14.43	7.29	0.95	3.47	0.19	2.27	0.74	0.59	0.035
V4399	15.13	5.84	1.01	2.55	0.26	2.16	0.72	0.24	0.033
V4400	14.37	6.81	1.11	5.52	0.20	2.70	0.71	0.46	0.043

V4401	16.47	8.14	1.24	4.85	0.21	3.00	0.83	0.32	0.051

Appendix 3

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V4360	285	93	20	69	47	12	216	123	19	37	32	62	33	5	1	3	2	114	106	13
V4361	299	109	26	57	42	15	132	144	23	72	44	93	45	7	2	3	3	28	116	14
V4362	354	109	18	44	46	12	194	139	17	51	30	66	31	4	1	3	2	18	80	14
V4363	350	129	23	56	53	15	143	169	21	71	37	85	37	5	1	3	2	19	98	19
V4370	324	101	25	75	44	14	155	131	19	65	39	81	39	6	1	3	2	24	98	16
V4371	519	99	24	63	48	13	114	123	23	49	37	69	38	7	1	4	2	26	92	15
V4372	315	94	23	97	83	14	76	126	23	68	38	99	39	7	1	4	2	18	84	21
V4379	410	98	20	71	54	15	170	154	24	53	38	82	39	7	1	3	3	23	93	17
V4380	394	90	21	107	56	17	190	179	27	63	42	88	43	8	1	4	3	23	99	19
V4381	431	98	22	76	63	17	185	178	28	63	43	97	44	8	2	4	3	23	107	21
V4382	439	98	21	85	60	17	137	165	27	66	40	85	41	8	1	3	3	21	101	19
V4383	535	105	27	106	63	20	181	193	26	72	45	95	46	9	2	4	3	30	125	22
V4384	392	82	22	68	54	16	192	163	24	55	40	83	41	8	1	4	3	15	97	18
V4385	404	132	26	57	53	16	207	176	21	65	36	84	37	7	1	3	3	20	95	18
V4386	411	111	29	121	80	21	151	220	28	78	51	110	52	10	2	4	3	22	122	26
V4387	404	118	28	126	65	22	170	213	28	86	50	105	51	10	2	4	3	41	126	23
V4388	391	108	28	111	63	19	149	191	23	72	44	96	45	9	1	4	3	794	124	21

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V4389	434	98	28	115	86	20	183	204	34	70	52	110	53	11	2	5	3	30	125	26
V4390	444	103	28	85	67	21	143	166	31	86	51	112	52	11	2	4	3	36	128	22
V4391	400	97	23	97	59	19	154	192	25	65	44	93	45	9	2	4	3	29	110	19
V4392	413	115	27	114	48	21	143	212	21	81	44	87	44	8	1	3	3	41	113	17
V4393	423	109	26	117	69	21	138	218	31	76	51	110	52	10	2	4	3	80	120	22
V4394	424	99	27	102	65	20	146	189	34	79	48	111	49	10	2	4	3	524	124	22
V4395	740	114	23	71	48	15	139	159	23	73	41	99	42	8	1	3	3	23	101	18
V4396	351	99	19	86	48	14	155	173	21	61	39	88	40	7	1	3	3	21	95	16
V4397	315	105	18	61	49	14	122	166	19	56	36	77	36	6	1	3	2	24	94	16
V4398	507	110	21	47	46	12	183	153	17	60	33	75	33	6	1	3	2	13	87	15
V4399	350	86	27	62	46	15	107	146	25	57	38	80	39	8	1	4	3	69	134	12
V4400	416	97	22	43	49	14	200	158	18	76	35	63	36	6	1	3	2	25	86	15
V4401	370	109	22	62	52	15	195	169	19	83	40	78	41	6	1	3	2	27	93	20