Characterisation Studies of Medieval Pottery from Chapel Yard, Sheffield

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Excavations at Chapel Yard, Sheffield, produced a collection of medieval pottery which included overfired or burnt sherds, suggesting that the collection included production waste. Accordingly, a sample of five sherds was submitted for thin section and chemical analysis, to establish the characteristics of the pottery and whether it can be distinguished from other similar vessels.

In the event, it appears that at least some of the samples are not of production waste but were produced elsewhere. However, three of the samples, of Northern Gritty ware, have a distinctive chemical composition which can be distinguished from samples from other medieval production sites (all located considerably to the north of Sheffield).

Methodology

Thin sections were produced by Steve Caldwell, University of Manchester, and a block was removed from each sample and the surfaces removed mechanically. This block was crushed to a fine powder and submitted to Dr J N Walsh, Royal Holloway College, London, for chemical analysis using Inductively-Coupled Plasma Spectroscopy.

A range of major elements was measured and the results expressed as percent oxides (App 1). A range of minor and trace elements was measured and the results expressed as parts per million (App 2).

The ICPS data were normalised to aluminium to take account of the dilution effect of added quartz sand temper and were analysed using Factor Analysis (using the Factor Analysis option in WinSTAT, an add-on for Microsoft Excel).

Northern Gritty ware (V4879, V4881 and V4882)

Northern Gritty ware is a generic name for medieval pottery fabrics in an off-white to light brown clay tempered with angular quartzose gravel, with grains over 1.0mm across. Pottery of this general type was produced at numerous sites and those at Baildon, Winksley and Grantley, all in West Yorkshire, have been sampled and can be compared with the Chapel Yard samples. In addition, a large number of samples of Northern Gritty ware from the occupation site of Ingmanthorpe Manor were also analysed and these too could be compared with the Sheffield samples.

The three samples all have similar characteristics in thin section. The following inclusion types were noted:

- Sandstone. Moderate fragments up to 0.5mm across composed of angular and subangular quartz grains up to 0.3mm across in brown cement.
- Quartz. Moderate subangular grains up to 0.5mm across.
- Opaques. Sparse rounded fragments up to 1.0mm across. Some are vitrified and include abundant vesicules.
- Mudstone. Sparse ovoid fragments with prominent bedding. Some have an opaque core and all are light coloured (light brown or cream in plane-polarized light).

The groundmass consists of light grey to light brown optically isotropic baked clay minerals and sparse ill-sorted angular quartz grains up to 0.1mm across.

The quartzose inclusions are probably derived from a detrital sand derived from the weathering of Carboniferous sandstones, of at least two different textures and lithologies: a coarse-grained rock from which the quartz grains were derived and a finer-grained, red sandstone. Such sandstones mostly occur in the Coal Measures, which is consistent with the location of Chapel Yard. The mudstone, some of which is organic, might be present in the parent clay or may also be detrital. It is almost certainly a Coal Measures shale.

The ICPS data were compared with that from Baildon, Knaresborough, Grantley and Winksley. The Grantley and Winksley samples include several different fabrics, all probably produced of the respective industries, and the Knaresborough samples are from a consumer site in the town, which is, however, known to have had a pottery industry.

Factor analysis was used to analyse the data and five factors were found. A plot of F1 against F2 (Fig 1) indicates that two of the Sheffield samples are clearly distinguished from the comparanda, being closest in composition to the two Knaresborough samples, whilst the third sample is similar to the Winksley and Lumley samples (apart from Winksley Fabric 1, which is a distinctive white sandy fabric).

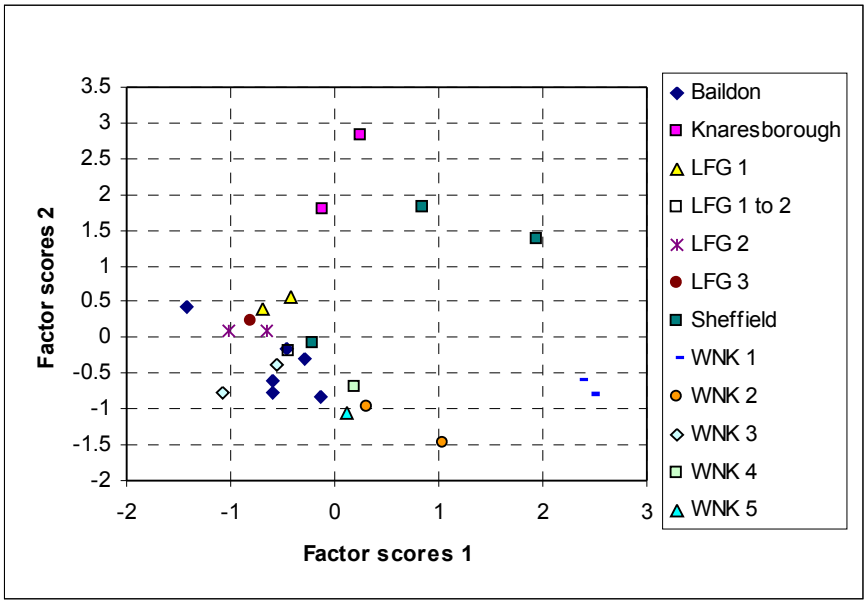

Figure 1

A plot of F3 against F4 scores separates one of the Sheffield samples from the remainder (Fig 2) whilst a plot of F3 against F5 scores distinguishes the Sheffield samples from the others (Fig 3).

The comparative data all come from vessels made with Coal Measures clays and tempered with sands derived from Coal Measures sandstones and therefore the similarity of the Sheffield samples might be expected.

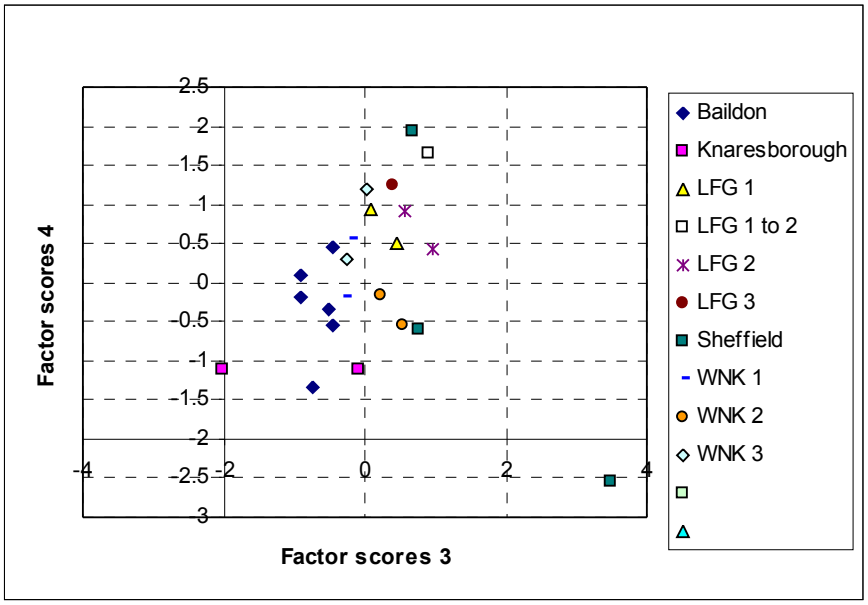

Figure 2

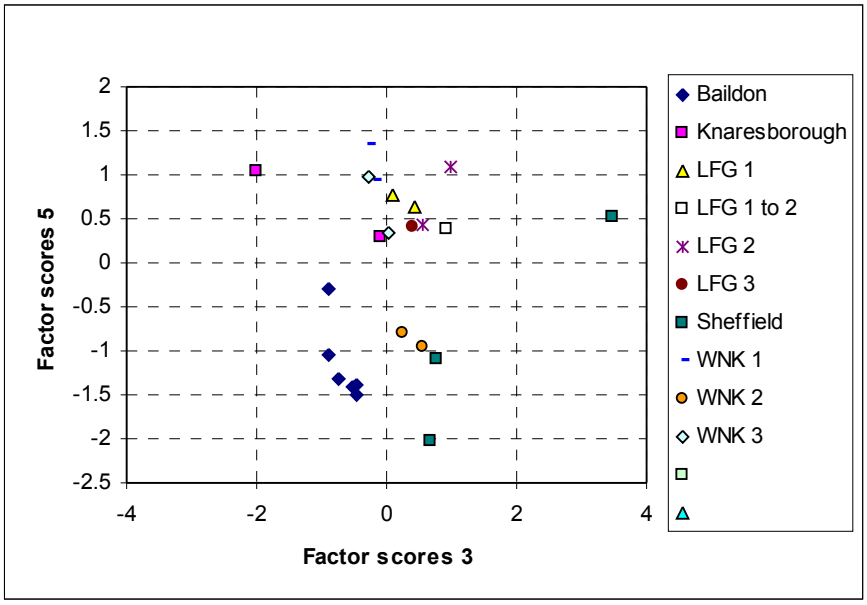

Figure 3

Examination of the data, normalised to aluminium, indicates that the Sheffield samples have higher Potassium and Manganese values but that all other elements occur within the same range as the comparanda (Fig 4).

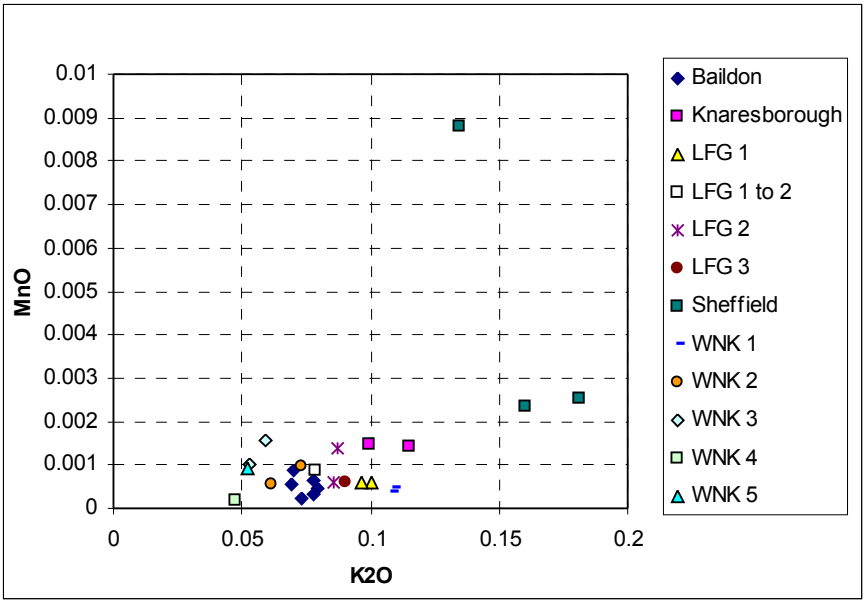

Figure 4

York Gritty ware (V4880)

A single sample from Chapel Yard has the same characteristics as York Gritty ware, which is widely distributed in the Vale of York and less common in surrounding areas (1978; Holdsworth 1995; Mainman 1990). Thin section and chemical analysis has suggested a source for this ware at Potterton but it may well be that it is a generic fabric, produced at

more than one centre but using similar raw materials and production methods (Vince and Young 2007; Vince 2004b). Pottery found at Thorner in levels post-dating a 9th to 11th-century kiln and published as Hallam ware were sampled and shown to be of this fabric (Cumberpatch and Roberts 1998-1999; Vince 2004a).

The thin section has the following inclusion types:

- Quartz/sandstone. Moderate subangular fragments up to 2.0mm across. The quartz grains have one or more flat faces, indicating overgrowth, and in some cases have a dark brown to opaque coating. In some cases kaolinite, lighter in colour than the groundmass and coarser in texture, is seen to adhere to the quartz grains.
- Siltstone. Rare dark brown rounded tabular siltstone fragments up to 1.0mm long.
- Clay pellets. Moderate dark brown rounded clay pellets up to 0.5mm across.

The groundmass is optically anisotropic light brown baked clay minerals with no inclusions. Thin lenses of darker brown clay occur.

The ICPS data was compared with that from consumer sites at Doncaster, Knaresborough, Swillington, Thorner, Wetherby (Ingmanthorpe Manor) and York.

Factor analysis found three factors. A plot of F1 against F2 (Fig 5) found that the F1 score of the Sheffield sample was within the range of the comparanda (as were those of the Sheffield Northern Gritty ware sherds). However, the F2 scores of both the Sheffield group were higher than those of the majority of the comparanda, the exception being one of the Doncaster samples.

A plot of the F2 against F3 scores for this dataset shows that the Sheffield sample has a lower F3 score than any of the comparanda (also lower than the Sheffield Northern Gritty ware).

Examination of the normalised data indicates that the Sheffield YG sample has a lower Calcium value than any of the comparanda, followed by the Sheffield NGR samples. The Scandium value separates the two Sheffield groups, although both lie within the range found in the comparanda. The Vanadium value is higher than in the comparanda, followed closely by the Sheffield NGR samples (Fig 7). The ICPS data therefore suggest that the two Sheffield groups are more similar to each other than to other York Gritty ware samples, but that with the exceptions noted above, the range of values found is similar for both the Sheffield samples and the comparanda. The high Vanadium values are probably present in the dark brown to opaque coatings seen on the quartz grains, and in the siltstone.

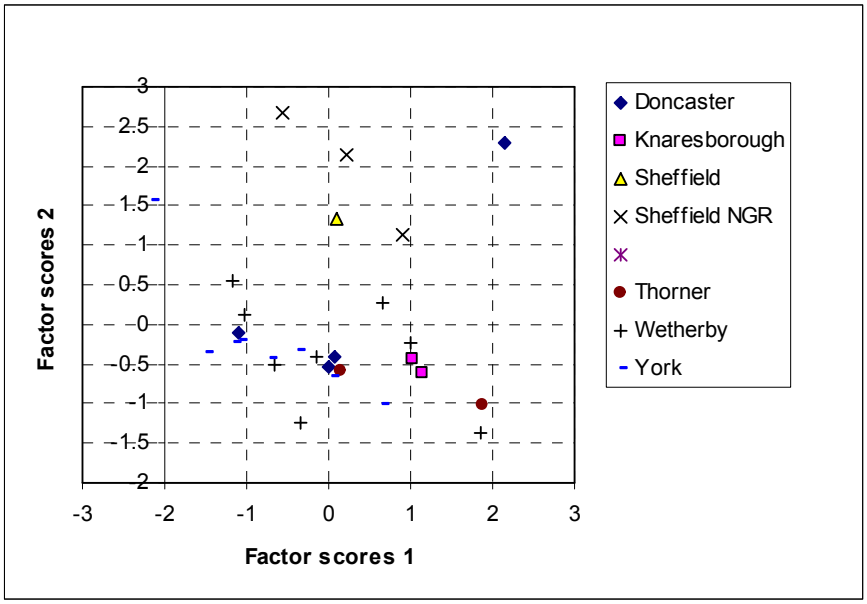

Figure 5

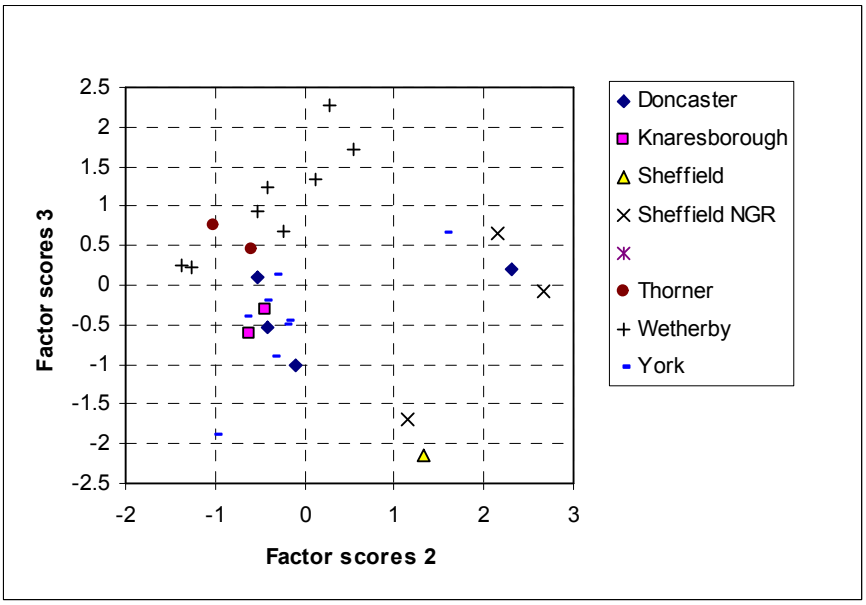

Figure 6

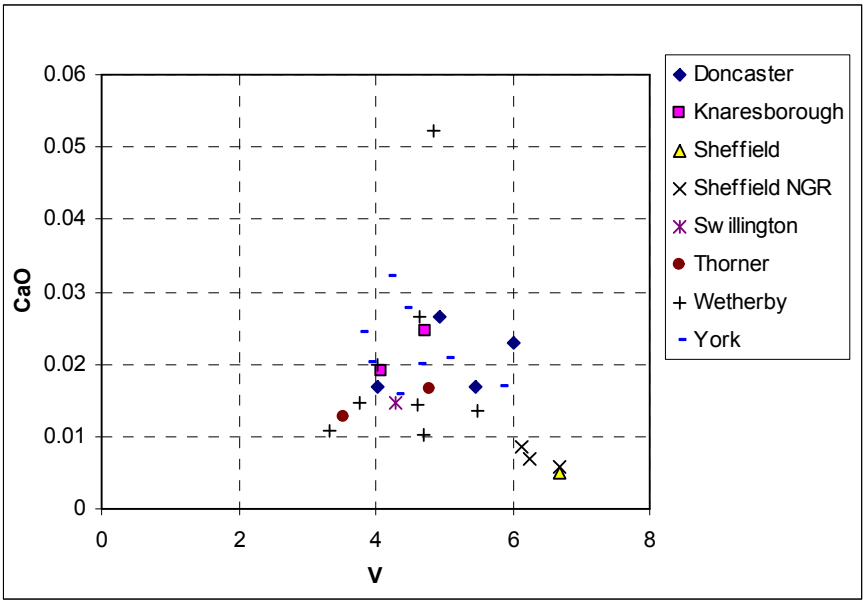

Figure 7

Miscellaneous Glazed Red Earthenware (V4878)

One sample could be distinguished by its higher iron content and the character of the sand inclusions. The following inclusions were noted in thin section:

- Quartz. Sparse subangular grains up to 0.5mm across and moderate rounded grains up to 0.3mm across.
- Chert. Sparse rounded grains up to 0.3mm across.
- Basic igneous rock. A single rounded fragment 0.5mm long containing plagioclase laths in a fine-grained groundmass.
- Siltstone. Sparse rounded fragments up to 0.3mm across.
- Sandstone. Sparse rounded fragments up to 0.3mm across, some with a dark brown cement and composed of subangular quartz grains up to 0.2mm across.
- Concretionary clay pellets. Sparse pellets up to 1.5mm across of similar colour and texture to the groundmass but with an oolitic dark brown staining.

The groundmass consists of optically anisotropic baked clay minerals, moderate muscovite laths up to 0.05mm across and moderate angular quartz grains up to 0.1mm across.

The sand inclusions in this sample are probably derived from a Permo-Triassic sand (the rounded quartz, chert, siltstone and fine sandstone), together with some Carboniferous sandstone. Such a sand deposit should not occur in the Sheffield area and the closest source would be to the east of Sheffield, such as the Don Valley, or to the south, in the Nottingham area.

The normalised ICPS data indicates a higher iron content for this sample as well as a higher Calcium, Titanium, Phosphorus, Chromium, Copper, Vanadium, Zirconium, Lanthanum, Cerium and Lead content and a lower Potassium, Manganese, Lithium, and Strontium content. Some of these elements are easily affected by burial conditions, but in this case these are likely to be comparable for all five samples. Furthermore, the copper and lead values might be enhanced through contamination by the glaze. Even excluding these elements there are sufficient differences between this sample and the others to suggest a different source.

The normalised ICPS data were then compared with those from a series of samples of Nottingham glazed wares (NOTG), a sherd of possible late Saxon Nottingham ware from a site in Doncaster (NOTTS) and Doncaster glazed red earthenware (Doncaster A ware). Factor analysis revealed five factors and a plot of F1 against F2 (Fig 8) indicates that the Sheffield sample is closest to the Nottingham glazed ware (and that the supposed Nottingham late Saxon sample is closer to the Doncaster glazed ware). However, examination of the normalised data indicates that the sample can be distinguished from the comparanda by higher Titanium and Chromium values (Fig 9) and lower Lithium and Strontium values (Fig 10).

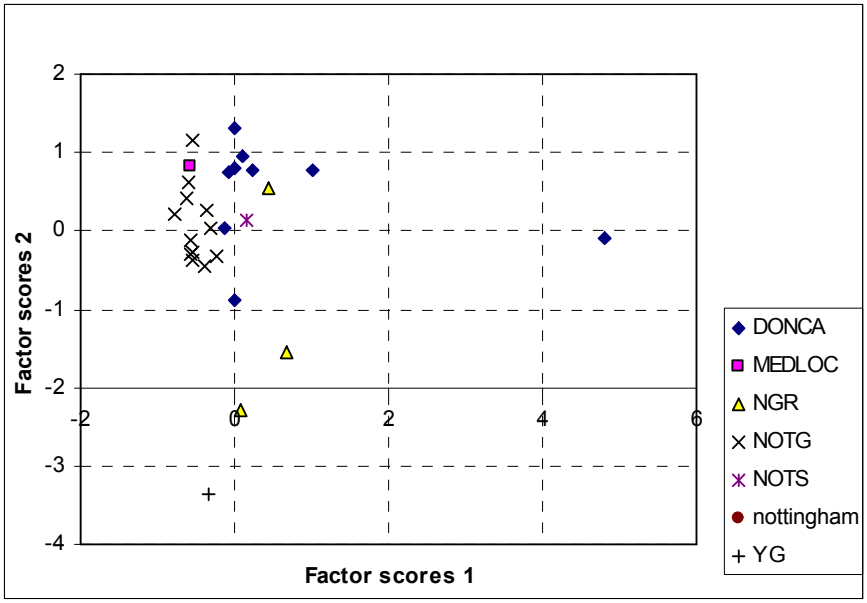

Figure 8

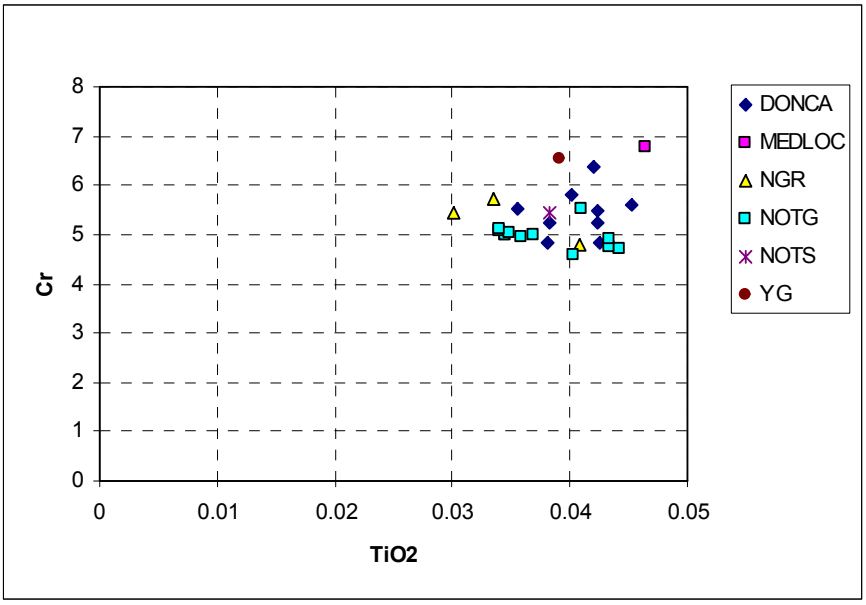

Figure 9

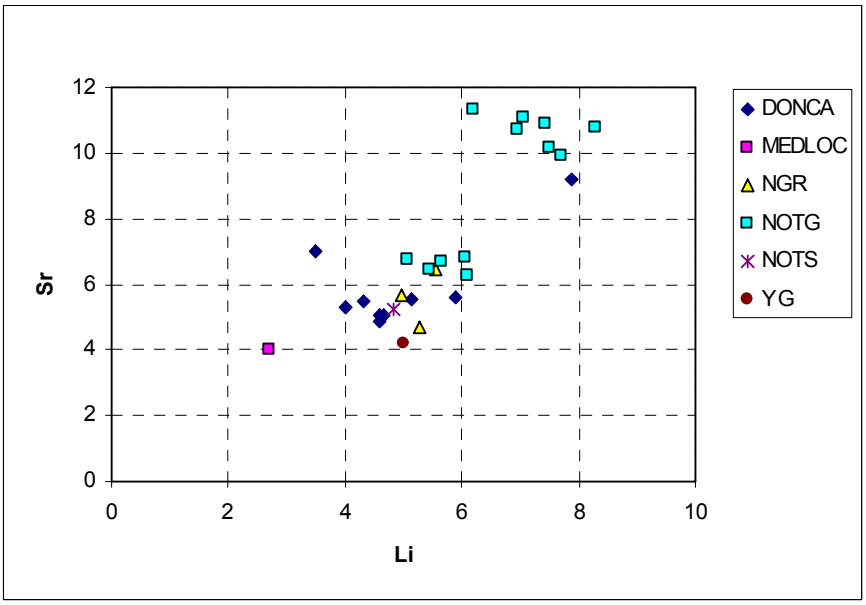

Figure 10

Conclusions

One of the five submitted samples is definitely not a local Sheffield product and can be distinguished both in thin section and by its chemical composition. The remainder include one sample which is distinct in thin section and, to a lesser extent, in its chemical composition. However, the raw materials to produce this fabric should be available in the Sheffield area and it is possible (though unlikely) that the “York Gritty” ware sample is a Sheffield product made using similar raw materials and preparation techniques to the York Gritty ware found in the Vale of York and more rarely neighbouring areas.

Three of the samples, however, were produced from similar raw materials and could well have been made in the Sheffield area. They are similar in thin section and chemical composition to Northern Gritty wares produced at sites in West Yorkshire, but since these exploited the same Coal Measures outcrops this is unsurprising.

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Appendix 1

cname	TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
MEDLOC	V4878	20.02	7.71	1.28	0.22	0.29	2.52	0.93	0.38	0.045
NGR	V4879	19.88	6.73	1.12	0.17	0.49	2.68	0.81	0.10	0.175
YG	V4880	21.96	6.35	1.41	0.11	0.28	3.79	0.86	0.20	0.052
NGR	V4881	22.90	5.73	1.50	0.16	0.36	4.15	0.69	0.08	0.058
NGR	V4882	22.12	6.44	1.59	0.13	0.32	3.54	0.74	0.26	0.052

Appendix 2

cname	TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
MEDLOC	V4878	507	136	33	54	52	19	81	135	17	78	51	92	51	9	1	3	2	1,466	109	17
NGR	V4879	570	95	20	105	44	17	93	122	12	43	33	63	35	7	1	4	2	364	153	25
YG	V4880	524	144	25	110	62	15	92	147	13	46	26	43	27	9	1	3	2	517	115	19
NGR	V4881	632	125	33	127	55	20	148	143	21	40	42	78	43	12	2	4	2	211	104	16
NGR	V4882	537	127	33	110	53	22	125	148	27	70	56	97	56	12	2	4	3	490	106	15