Petrological analysis of Ceramic Building Material from St Peter's Church, Barton-upon-Humber

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Introduction

Samples of floor tile, roof tile and the brick and tile fabric series (excluding Fabric 6) were submitted for chemical and petrological analysis. The chemical analysis demonstrated that there were three main chemical composition groups: Cluster A consists of definite Flemish pottery samples and some tiles from Hull and York, but none from Barton. Cluster B consists of 'Flemish' tiles from Launceston in Cornwall, and from Barton. Cluster C consists of samples from the Beverley tilery and some from Barton. The latter cluster also includes pegtile, nibtile and brick fabrics.

The main aims of the petrological analysis were firstly to test whether or not any of the ceramic building materials used in the church were imported from Flanders and, secondly, to establish whether any ceramic building materials were produced in the Beverley tileworks. A third aim was to try and identify visual differences which would allow tiles to be assigned to their chemical composition groups. Sample selection was carried out by Jennie Stopford (Floor tiles) and John Tibbles (brick and roof tiles).

Table 1

TS Nos	Description	Comments
V997-V1056	Plain floor tiles	
V1057-V1062	Decorated floor tiles	
V1063	Brick/Tile Fabric 1	
V1064	Brick/Tile Fabric 2	
V1065	Brick/Tile Fabric 3	
V1066	Brick/Tile Fabric 4	
V1067	Brick/Tile Fabric 5	
V1069	Brick/Tile Fabric 7	
V1070	Brick/Tile Fabric 8	
V1071	Brick/Tile Fabric 9	
V1072	Brick/Tile Fabric 10	

Methodology

Thin-sections of the samples were prepared by Paul Hands at the Department of Earth Sciences, University of Birmingham. The sections were polished and stained using Dickson's Method. This staining allows ferroan and non-ferroan calcite to be distinguished from each other and from dolomite.

Cluster B (FLEMISH)

Chemical analysis allowed the 'Flemish' tiles from Barton to be subdivided into two groups, B1 and B2. One of the distinguishing elements is CaO and it is therefore important to examine the thin-sections to see if this element is occurring as clasts (such as limestone or shell), in the original groundmass or through post-burial contamination.

Nine thin-sections of 'Flemish' tiles from Barton were made. Of these, all but one (V1011) belong to chemical subgroup B2 (V1002, V1003, V1005, V1022, V1028, V1029, V1031 and V1043). Most of these samples have a similar visual appearance. The exceptions are V1043 which was reduced whereas the remainder were oxidized, and V1031, which has a coarser quartzose sand than the remainder.

The tiles all have a variegated texture, with lenses of lighter-coloured, sandier clay mixed with redder, less sandy clay. They contain abundant subangular quartzose sand which includes small quantities of plagioclase feldspar and chert (or perhaps altered lava). Most of the samples contain sparse altered biotite and sparse muscovite both up to 0.2mm long. The proportion of clasts other than quartz is higher in the coarser-textured V1031 and these include bone, sandstone, orthoclase feldspar and altered lava.

Most of the samples have calcareous matrices, the exception again being V1031. It seems that there is a difference in carbonate content between the lighter, sandier areas of the groundmass and the remainder and it may be that fluctuations in the relative proportions of these two elements affect the chemical composition. Carbonate is particularly common, or at least visible, in the sample of B1, V1011

Cluster C (BEVO and BEVO/LOCAL)

The samples which fell into the chemical composition group, Cluster C, are visually quite varied. They include plain and decorated floor tiles and nine of the ten ceramic building material fabrics (the tenth, Fabric 6, was not sampled).

Floor tiles

Eight samples of Cluster C floor tiles were thin-sectioned. All have similar characteristics although one, V1060, contains abundant quartzose sand, with grains up to 1.5mm across, which is rare in the remaining samples. Like the 'Flemish' tiles of Cluster B these samples are calcareous, but the carbonate seems to have been present as discrete nodules rather than scattered through the body of the clay. These nodules, however, are consistently heat-altered and therefore impossible to study in any detail. There is a difference in texture between these samples and those of Cluster B. The quartz grains are mainly smaller and better sorted. However, there is a considerable variation in their quantity both within samples and between them. There is also a difference in the average grain size between sections, ranging from less than 0.1mm to closer to 0.2mm. The quartzose sand grains in V1060 include rounded and subangular quartz, sandstone and chert.

There is no clear difference between the fabrics of the decorated tiles (V1058-V1061) and those of the plain ones (V1008, V1032, V1036, V1051). One sample, V1036, is more similar to those of Cluster B samples although the differences between the two groups are slight.

Fabric 1

The sample of Fabric 1 (V1063) contains few large inclusions. These consist of sparse light-coloured, calcareous pellets or dark red pellets or, in one case, a pellet with a dark red core and light-coloured crust. All are less than 0.5mm across. A single rounded inclusionless red clay pellet 1.0mm across was the only other inclusion larger than silt size. The groundmass consists of a heat-altered moderately calcareous body with abundant silt-sized grains of quartz, muscovite and biotite.

Fabric 2

The sample of Fabric 2 (V1064) was very similar in composition to that Fabric 1 except that it was less homogenous.

Fabric 3

The sample of Fabric 3 (V1065) contains sparse angular quartz grains up to 0.2mm across in a variegated, heat-altered calcareous matrix.

Fabric 4

The sample of Fabric 4 (V1066) is very similar in thin-section to Fabric 2

Fabric 5

The sample of Fabric 5 (V1067) is similar to Fabric 2 but with sparse subangular quartz silt grains up to 0.2mm across.

Fabric 6

Fabric 6 was not thin-sectioned

Fabric 7

The sample of Fabric 7 (V1069) has a groundmass like that of Fabric 2 but with a quartzose sand up to 1.5mm across. The grains in this sand consist of quartz, chert and a sandstone with a red cement.

Fabric 8

The sample of Fabric 8 (V1070) is similar to Fabric 7

Fabric 9

The sample of Fabric 9 (V1071) is similar to Fabric 5

Fabric 10

The sample of Fabric 10 (V1071) is similar to fabric 2

Conclusions

A characteristic of all of the samples is that they are heterogeneous, formed either by mixing two or more clays together or by utilising clays which are naturally heterogeneous. Estuarine clays are the most likely source for all of the samples. However, it is not clear from the petrological evidence whether we should be looking for one estuary (the Humber), two (the Humber and one in the Low Countries) or a number. The character of the coarse sand, found in both the 'Flemish' and local samples, is ambivalent: there are strong similarities between the coarser elements in both of the two groups, which would suggest a similar source. Both groups contain an igneous element which is consistent with North Sea littoral deposits, which contain igneous rocks and minerals derived from the weathering of coastal till deposits.

A final factor to consider is that there is no petrological difference between the 'Flemish' tiles of Cluster B from Barton and those from Launceston in Cornwall, which have always been assumed to be Flemish, on the basis of documentary evidence.

Appendices

App 1. List of Samples

TSNO	REFNO	cname	Form	Action	Description
V1002	88099158	FLEMISH	FLOOR	PTS;ICPS	
V1003	88099367.1	FLEMISH	FLOOR	PTS;ICPS	
V1005	88099433	FLEMISH	FLOOR	PTS;ICPS	
V1008	88099462	BEVO/LOC	FLOOR	PTS;ICPS	
V1011	88099543	FLEMISH	FLOOR	PTS;ICPS	
V1022	88099718	FLEMISH	FLOOR	PTS;ICPS	
V1028	88099725	FLEMISH	FLOOR	PTS;ICPS	
V1029	88099726	FLEMISH	FLOOR	PTS;ICPS	
V1031	88099815	FLEMISH	FLOOR	PTS;ICPS	
V1032	88099817	BEVO/LOC	FLOOR	PTS;ICPS	
V1036	88099820	BEVO/LOC	FLOOR	PTS;ICPS	
V1043	88099838.2	Flemish	FLOOR	PTS;ICPS	
V1061	89000572	BEVO/LOC	FLOOR	PTS;ICPS	DEC
V1058	89000567	BEVO/LOC	FLOOR	PTS;ICPS	DEC
V1059	89000568	BEVO/LOC	FLOOR	PTS;ICPS	DEC
V1060	89000569	BEVO/LOC	FLOOR	PTS;ICPS	DEC
V1051	88099932	BEVO/LOC	FLOOR	PTS;ICPS	
V1063	F1	BEVO/LOC	CBM	PTS;ICPS	UNTEMPERED SILTY SALT-SURFACED
V1064	F2	BEVO/LOC	CBM	PTS;ICPS	UNTEMPERED SILTY SALT-SURFACED

V1065	F3	BEVO/LOC	CBM	PTS;ICPS	CALCAREOUS SALT-SURFACED
V1066	F4	BEVO/LOC	CBM	PTS;ICPS	CALCAREOUS SALT-SURFACED;OVERFIRED
V1067	F5	BEVO/LOC	CBM	PTS;ICPS	UNTEMPERED SILTY
V1069	F7	BEVO/LOC	CBM	PTS;ICPS	SAND-TEMPERED
V1070	F8	BEVO/LOC	CBM	PTS;ICPS	SAND-TEMPERED
V1071	F9	BEVO/LOC	CBM	PTS;ICPS	UNTEMPERED;SANDED BASE
V1072	F10	BEVO/LOC	CBM	PTS;ICPS	UNTEMPERED;FINE SANDED BASE