

Petrological analysis of a Middle Bronze Age vessel from the A1, Ferrybridge, West Yorkshire (FHM/D/03)

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Two samples of a Middle Bronze Age vessel from a site on the A1 in West Yorkshire excavated by Oxford Archaeology North were submitted for thin section analysis by Carol Allen.

Thin sections were made at the Department of Earth Sciences, University of Manchester and have been added to the AVAC reference collection under the codes V2337 and V2338 (Table 1).

TSNO	Sitecode	Context	REFNO
V2337	FHM/D/03	2379	
V2338	FHM/D/03	2379	SF12

Petrological Description

Both sections reveal a similar fabric, consistent with the production of the samples as coming from the same vessel.

The following characteristics were noted:

- Abundant angular clay pellets. These clay pellets range from c.0.3mm to c.3.0mm across. They include sparse angular quartz inclusions and angular vesicular glass fragments, up to 0.5mm across. Most of these pellets are black with light brown margins, except close to the sherd surfaces where they are oxidized light brown throughout. The groundmass of the pellets contains no visible inclusions (i.e. large than 0.03mm, the thickness of the thin section).
- Moderate vesicular glass. The fragments range from c.0.2mm up to 2.0mm and contain rounded voids, some of which are tear-shaped. The glass is cloudy with a grey colour in plane polarised light and at x100 magnification can be seen to include abundant opaque inclusions, some of appear to be cubic crystals. These inclusions are not scattered evenly through the glass and are absent where close to the vesicles. Some fragments have few if any vesicles and contain sparse angular quartz(?) inclusions c.0.05mm across.
- Sparse angular quartz. The fragments are well-sorted and mainly c.0.3mm. Some show signs of overgrowth and have euhedral outlines.

- Sparse fine-grained sandstone. A single fragment of sandstone, 0.5mm across, composed of angular grains of quartz c.0.1-0.2mm across. The grains are interlocking with no interstitial cement.
- Sparse angular ferroan calcite. A single fragment of sparry calcite 0.5mm across was present.
- Sparse porphyritic rhyolitic lava containing altered feldspar phenocrysts. A single fragment of glass containing euhedral phenocrysts of feldspar, c.0.5 to 1.0mm across.
- The groundmass contains no visible inclusions and is identical in appearance to that of the clay pellets, although the latter tend to have a higher carbon content.

Interpretation

The clay pellets are relict clay, that is, fragments of the parent clay which have not been mixed during clay preparation. Such clay pellets are common in Beaker and Middle Bronze Age pottery and are often interpreted as grog, i.e. fragments of previously-fired vessels, crushed and added to the clay. In this case, because of the survival of their original organic content, which has caused them to fire black, it is clear that this is the first firing that the pellets have received. It is more likely that they were added to the potting clay as dry crumbs, or that the potters used their clay with little preparation and little liquid present (otherwise the edges of the pellets would become rounded during kneading).

The clastic inclusions, the glass, rhyolite, quartz and sandstone, could either be deliberate temper or were naturally present in the clay. The glass, in the absence of the definite rhyolite, could be interpreted as fuel ash slag. This is a glass formed during the heating of clay (clay minerals and silica) in which plant ash from the fire acts as a flux. It can be formed in domestic fires (or funeral pyres) but is more commonly found associated with industrial processes or conflagrations, where higher temperatures are achieved. However, the presence of the single definite fragment of rhyolite suggests that in fact the glass fragments are also volcanic glass. The presence of these glass fragments within the angular clay pellets strongly suggests that they were present in the potting clay, as dug, and this is probably the explanation for the other clasts too.

The light colour of the oxidized body and the lack of inclusions suggests the use of an estuarine or marine mud. The Coal Measures includes similar clays, as do some beds in the Jurassic of East Yorkshire and Lincolnshire (but not North Yorkshire). However, the local bedrock, of Permian age, does not. The most likely origin for the clay is the Coal Measures, which outcrop a few miles to the west of the site, whilst the clasts are probably from a detrital sand or gravel of mixed origins. Assuming that the glass and rhyolite are also part of this sand, there are two possible sources: firstly, they could come from a river draining the

White Peak, where the Derbyshire Traps outcrop within the Lower Carboniferous limestone. However, these are said to be basaltic rather than rhyolitic and were apparently formed under water, giving rise to dykes and pillow lava. The alternative is that they are glacial erratics and come from either the Lake District or Southern Scotland, where rhyolitic lavas and tuffs occur extensively.

Clearly, further work is required. This might include sending the sections for a second opinion to Dr Rob Ixer, who has specialist knowledge of the Derbyshire volcanics. It is also possible that proposed work on the petrology of the Iron Age and medieval pottery from the A1 project will reveal similar inclusions in later pottery, in which case a fairly local origin would be likely.