Ancient Monuments Laboratory
Report 16/90

EXAMINATION AND ANALYSIS OF GLASS FRAGMENT FROM TROWBRIDGE CASTLE, TROWBRIDGE, WILTSHIRE.

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Summary

A small sherd of translucent blue vessel glass decorated with a translucent blue reticella rod with alternate opaque white and opaque yellow glass spirals was examined and analysed. X-ray analysis showed that the vessel was a soda-lime-silica glass coloured by copper and possibly iron. The reticella rod was of similar composition to the vessel on which it was applied. The opacity in both the spirals is due to the presence of tin which is present in the form of tin oxide (white) and lead-tin oxide (yellow) respectively. The sherd is likely to be from a Saxon vessel and date to between the eighth and tenth centuries AD.

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A small fragment of glass recovered from late Saxon levels during excavations at Trowbridge Castle in Wiltshire was examined (AML No. 900001). The fragment is from the wall of a vessel and is approximately 21 mm x 14 mm in size and 2 mm thick. It is a translucent blue colour, containing some small elongated bubbles, with a highly iridescent surface, and was decorated with a so-called reticella rod applied to the outer surface. The rod is 3 mm in diameter and is also of translucent blue glass with alternate opaque yellow and opaque white threads of glass wound around the rod surface in a spiral pattern. The rod was formed by laying the opaque coloured rods along the length of the blue base rod, heating to soften and fuse the glasses together and then pulling it out while twisting it to create the spiral pattern. The rod was then applied onto the surface of the vessel and gently heated to fuse the rod to the surface of the vessel. The opaque yellow trail has spread out slightly more than the opaque white trail onto the surface of the vessel glass which must have occurred when the rod and vessel were reheated together. Unfortunately the glass vessel fragment is to small to identify the vessel form, however it is likely to be either a beaker or bowl form as these are the most common vessels in the late Saxon period.

The term reticella rod has been applied to this type of decorated rod even though it is not strictly correct. The term comes from the Italian *'vetro a reticello'* which is a glass decorated with threads of glass in the form of a criss-cross diagonal network. It is more appropriate to use the phrase *'vetro a fili'* which relates to glass decorated by threads of glass in a helix or spiral pattern without any crossing of the threads (though this does occur on some archaeological examples). However there is no real English equivalent to the term *'vetro a fili'*, other than the generic term of filigree glasses (coming from the Italian *'filigrana'*) which covers all the different glasses decorated with threads of glass. In the absence of a more appropriate English term in common usage the phrase reticella rod will be adopted here.

Reticella rods appear on pre-Roman glass vessels and were also used in the early Roman glass workshops, however none are known from the later Roman workshops (Nasman 1986). Similar rods are used to decorate glass beads found in pagan Saxon graves and they are also commonly found on glass vessels throughout Europe dating from the eighth century to the tenth century AD (Evison 1983). Fragments have been recorded from several British sites including the Brough of Birsay, Ipswich, Mote of Mark, Portchester, Repton, Southampton, Whitby, Wicken Bonhunt and York (Evison 1983; Nasman 1986). Similar vessels have been found in Scandinavia and continental Europe (Evison 1983, 1989; Nasman 1986). The colours of the glass spirals on the reticella rods are commonly opaque white or opaque yellow, though other colours such as red are known. The occurrence of threads of more than one colour on the same rod is relatively common from sites such as Southampton (Hunter & Heyworth forthcoming).

It seems that the technique for producing reticella rods was relatively well known in the second half of the first millennium AD. Nasman has postulated, on the basis of the limited number of known find spots for reticella rods on vessel glass, that they are probably being produced in England and exported to Scandinavia and the continent (Nasman 1986). Unfortunately there is no physical evidence for the production of reticella rods in England at this time so it is not possible to be more specific about possible manufacturing centres. There is however evidence for the working of opaque white and opaque yellow glass in the sixth century AD at Buckden in eastern England (Biek & Bayley 1979). This at least proves that the knowledge for working with opaque coloured glasses was available in post-Roman England.

To investigate the composition of the glass sherd from Trowbridge a small sample, including an area of the reticella rod, was cut off for analysis using a low speed diamond saw. The sample was mounted in resin and polished before being analysed using a Link Systems energy dispersive X-ray analyser attached to a scanning electron microscope (SEM). Quantitative analytical results were obtained for the blue vessel glass as well as for the blue glass forming the rod (see Table 1) and qualitative results were obtained for the opaque white and opaque yellow glass wound round the surface of the rod.

The basic blue glass of the vessel and the rod were of similar composition. Both were soda-lime-silica glasses which is the standard glass type in the first millennium AD in north-west Europe. The blue colour was mainly due to the presence of copper, which was probably added deliberately to the glass as a colourant, though the iron oxide may also have contributed to the colour.

The analyses of the opaque white and opaque yellow glasses indicate that both were opacified by tin. Tin is the usual opacifier in post Roman glass and antimony, which was the predominant pre-Roman and Roman opacifer and which has been found as an opacifier in some post-Roman glasses (Henderson 1985), was not detected in either of the glasses. The opacity and colour in the opaque white glass is probably due to crystalline tin oxide (SnO_2). In the case of the opaque yellow glass the opacifier is probably in the form of lead-tin oxide as identified by Rooksby (1964). The production of an opaque yellow glass of this composition required good control as the colour only develops when the glass is heated to over 900°C and the lead-tin oxide is transformed to the cubic form in the presence of silica, however overheating to 1100°C destroys this structure and leaves an opaque white colour.

The high lead content of the opaque yellow glass explains the fact that this trail has spread onto the surface of the glass vessel. The presence of lead would lower the working temperature of the glass and allow it to flow at a lower temperature than the opaque white or the soda-lime-silica glasses.

The composition of the reticella glass from Trowbridge can be compared with analyses of similar reticella rods from Saxon levels at Southampton (Henderson forthcoming). Quantitative analyses using an electron microprobe of two opaque yellow trails

and one opaque white glass trail from reticella rods attached to vessel glass fragments showed that they were both coloured and opacified by the same oxides as the example from Trowbridge. The opaque yellow glasses from Southampton contained 7% tin oxide and 45-48% lead oxide whilst the opaque white glass contained 5% tin oxide and 9% lead oxide.

The composition, typology and decorative form of the glass sherd from Trowbridge are therefore consistent with a late Saxon date and comparable examples are known from several British sites. There is some evidence to suggest that these glasses were produced in England, however as no production site has yet been identified it is not possible to identify the precise place of manufacture.

Acknowledgements

I would like to thank Dr J.G.McDonnell for assisting with the analytical equipment. I would also like to thank Dr J.Henderson for permission to quote his unpublished report.

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Table 1

Results of SEM analyses

	Vessel body blue glass	Rod body blue glass
Na_2O	19.1 %	19.5 %
MgO	0.8 %	0.7 %
Al_2O_3	1.9 %	2.0 %
SiO_2	69.8 %	68.6 %
P_2O_5	0.0 %	0.0 %
S	0.1 %	0.2 %
Cl_2O	0.7 %	0.6 %
K_2O	0.6 %	0.6 %
CaO	6.8 %	6.6 %
TiO_2	0.2 %	0.1 %
Cr_2O_3	0.0 %	0.0 %
MnO	0.6 %	0.6 %
Fe_2O_3	0.8 %	1.0 %
CuO	0.4 %	0.5 %
SnO_2	0.0 %	0.0 %
PbO	0.9 %	0.3 %
Total	102.7 %	101.3 %