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Assessment of archaeometallurgical residues from Pound House Farm, Thornbury, South Gloucestershire

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Abstract

This was a small assemblage (49 pieces weighing 5.9kg), deriving from three phases of investigation of the site from 2013 – 2015.

The slag was extremely poorly preserved, showing a degree of weathering, alteration and leaching rarely seen in iron slags.

Most of the identifiable materials were waste from iron smelting; a small number of pieces were probably (but none certainly) from iron working (smithing). There were several fragments of iron (none identifiable as artefacts and so possibly material lost or discarded during ironmaking or ironworking). An uncharacteristically high proportion of the slag fragments also apparently contained metallic iron.

Most of the iron smelting slags were apparently slags that had been tapped from the bloomery furnace into a characteristic flow-lobed morphology with a maroon oxidised surficial layer. Such slags would be entirely compatible with the proposed Roman date. The presence of dense furnace slags with wood moulds, including round-wood suggests similarity with a group of large sites in S Wales and the Forest of Dean employing a distinct technological variant.

Iron smelting is commonly seen at Roman sites in the Severn Vale, probably reflecting the former abundance of woodland in which charcoal was produced to smelt ores either produced locally (e.g. Iron Acton) or shipped from the Forest of Dean to the west of the Severn. One tapped slag block bears a large fragment of iron ore on its base. The analysis of which might clarify the ore provenance.

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Methods

All materials were examined visually with a low-powered binocular microscope where required. As an evaluation, the materials were not subjected to any high-magnification optical inspection, not to any form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

The examined materials are listed in Table 1.

This project was commissioned by Nick Corcos, of Avon Archaeology Limited.

Results

Description of residues

The submitted materials amounted to an overall total of approximately 5.9kg (49 pieces). The summary catalogue of the material is presented in Table 1.

In general, the slag was extremely poorly preserved, showing a degree of weathering, alteration and leaching rarely seen in iron slags. Some broken sections through examples of tapped slags showed the thin chilled lobe margins standing out in marked relief against the weathered slag lobes.

Bloomery iron smelting residues

Much of the collection comprised flow slags (approximately 1.5kg), the majority of which show maroon surfaces and form sheet-like composite flows.

These characteristics indicate that most, if not all, of the flow slag had been tapped (i.e. the slag flowed from the furnace to cool outside it). One fragment of tapped slag contained a large piece of red, haematite or haematised iron ore on its base.

Other flow slags included small blebby prills that were too poorly preserved to be certain whether they had been tapped.

A few pieces of slag show textures indicative of slag that cooled within the furnace. One large block of such dense furnace slag (1400g; from (1004)) included the mould of long round-wood twig. Another large fragment (450g; from 1312) showed the impression of a large piece of fuel or more probably wood.

Smithing slags
There were no complete, certain examples of smithing hearth cakes (SHCs), but several fragments that may derive from SHCs were recovered. None was a certain example. A 486g piece from (1040) is the most likely example of a smithing slag. It is merely a fragment from the centre of a slag cake, which, if indeed an SHC, would have been at least 1.5kg in weight. Such large SHCs would, in the Roman period, be the residues from bloomsmithing (the working of raw bloom down to finished iron). It should be noted that large SHCs may also derive from end-use blacksmithing during the medieval and post-medieval periods.

Iron ore
The iron ore fragment mentioned above (contained within the base of flow of tapslag), was a red iron oxide ore. The bright red colour probably indicated that the ore had been roasted. Its presence on the base of the flow was probably because the piece had been dropped into the tapping area during the charging of the top of the bloomery furnace and picked up by the flow, rather than a piece that has passed through the smelting furnace unreacted..

Iron oxide ores are characteristic of the Bristol Channel Orefield (Young 2000; Young & Thomas 1998, 1999). Similar ores occur both to the west of the Severn in the Forest of Dean, and to the east in localities around Iron Acton, Pucklechurch and Hanham.

Iron
The macroscopic collections included, in addition to the material described above, several pieces of corroded iron, or of slag containing much metallic iron (e.g. from (603), (613), (890), (1012), (1015) and (1309). Not all of these are necessarily iron lost during its manufacture; some may be very poorly preserved artefact fragments. The largest piece (890g) is possibly a bloom fragment, but was, unfortunately, unstratified. The term ‘gromp’ is commonly used for small particles of iron lost during smelting.

Distribution of residues
The residues occur within a variety of features, none of which appears to have a metallurgical origin.

Interpretation

The assemblage can be broadly interpreted as residues from bloomery iron smelting using slag-tapping furnaces, with some additional evidence, albeit slightly less certain, for the subsequent smithing of the raw blooms.

In detail, the textures of the furnace slags may be significant. The presence of round-wood fragments in massive flowed slags has been reported from Roman sites in South Wales at Cardiff Castle (Young & Kearns 2011) and Caergwanaf (author’s unpublished data), as well as from Alvington, Glos. (Young 2009) and Cannop (Young 2011, 2013) in Dean. These sites appear to have operated a distinct, but as yet poorly understood furnace technology. There is overlap between this group of sites and those identified by Young (2014) as being probably military/imperial operations.

This technology may be slightly different from that employed on other sites in the region (e.g. Young 2012), but much more work is required to document and understand these variations.

Discussion

The material shows general features compatible with a Roman origin. Details of the dense furnace slags, particularly the large inclusions of probable wood and those of round wood or round charcoal, can be matched in examples of slags from some of the major roman smelting sites of the region. Despite recognition of this class of residues across the area, understanding of its relationship with furnace morphology remains only sketchy. The new material provides a welcome addition to the corpus of sites producing such remains, even if it is poorly dated and has yielded no metallurgical structure and only a very small residue assemblage.

The presence of a good-sized ore particle embedded in the base of a tapslag flow raises the possibility for further investigation of ore provenance.

The probable large SHC fragment provides some indication that bloom-compaction and -smithing took place at the site, in addition to the primary smelting.

The site fits into a zone of smelting of Forest of Dean ores that extends out some 50km from the ore sources in Dean (Young 2014). A source for the ore in South Gloucestershire (the southern Worcester Graben) is also possible, but is less likely on current understanding. The widespread of iron smelting in the Severn Vale probably reflects the abundance of woodland resources for charcoal production. This would have permitted diversification of estate economies, the relief of pressure on the woodlands close to the ore sources themselves and the production of iron close to a point of significant consumption.

Further work

The further investigation of Roman iron smelting in the region is highly desirable. However, detailed analytical investigation should be focused on well-preserved and well-dated assemblages, preferably in association with structural evidence for the furnace type. Accordingly no further investigation of the slags themselves is recommended.

In contrast, trace element analysis of the ore inclusion in one of the tap slags (from c(609)) should be capable of producing useful information, germane to the interpretation of this site: the source of the ore being smelted and whether it was east or west of the Severn (Young 2000; Young & Thomas 1998, 1999). Chemical analysis of this piece is therefore recommended.

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Table 1: summary catalogue.

Context	Context wt	Item wt	Item no	Notes
Evaluation 2013/43				
600	58	58	2	blebby slag, probably smelting
603	36	32	2	worn tapped slag fragments
		4	1	small exploding iron fragment
607	94	94	1	weathered flow-lobed tapslag
609	1148	1140	17	thick flow of tapped slag (total weight includes small debris). One piece carries large block of roasted ore.
613	42	42	1	very irregular iron lump - possible gromp
Excavation 2014/97				
unstratified	966	890	1	very irregular iron rich piece - possibly a weathered bloom?
		76	1	irregular slag fragment with iron - possible gromp
1004	1400	1400	1	large dense block of charcoal bearing slag, including one long mould of c10mm diameter round-wood. Contains significant amount of iron metal
1012	4	4	1	indeterminate iron slag fragment
1014	10	10	1	dimpled bleb of lining influenced slag
1015	56	20	3	small slag scraps, probably tapped slag
		32	1	corroding and exploding iron piece - possibly an inclusion in slag
1033	36	36	1	very odd corroded, basalt like flat slag fragment with small rounded iron oxide concretions on the surface. Very unusual and probably natural
1038	256	60	1	folded slag? With iron
		192	3	slightly prilly slags obscured by concretion
1040	486	486	1	segment from centre of large cake, prilly base, vesicular dense upper with some curved concentric layering - probable centre of large SHC

Context	Context wt	Item wt	Item no	Notes
Watching brief 2015				
1306	48	48	1	irregular lobed slag with maroon surface, deeply weathered, vesicular, some lobes/prills on base, probably a tapslag, but might be irregular SHC margin
1307	84	84	1	irregular granular slag fragment, deeply altered
1307	2	2	1	flow slag prill
1309	760	140	3	highly weathered tapslag
		304	1	iron rich rounded slag nub; fragment of SHC or furnace slag?
		44	1	indeterminate dense slag piece
		230	1	horseshoe-shaped iron rich fragment, possibly a smithing slag?
1312	450	450	1	irregular large lump of vesicular slag, now broken into three, with very strong lining component; one surface shows mould of a large wood fragment, like a slagpit slag; one face may have been in contact with limestone block

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