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Assessment of archaeometallurgical residues from Burry Holms

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Abstract

The investigated material included 448g, 16 pieces, of metallurgical residues. This assemblage derived almost entirely from a sand deposit, context (3) and its correlatives (interpreted to be of Iron Age date), with just two pieces (6.99g) deriving from the underlying mixed deposit, context (5). In addition, context (43) produced a very small quantity of coal.

The residues included a tiny fragment of concreted microresidues, a small fragment of slagged hearth wall, and some small indeterminate iron slag fragments, but were dominated by just 8 pieces weighing 406g which were identifiable as being from smithing hearth cakes.

The smithing hearth cakes showed some signs of weathering, but most pieces were very dense and inspection of clean fractured surfaces suggested they were rich in wustite. Some fragments showed the presence of granules of quartzose material, probably derived from the hearth lining, but the slag textures and density both suggested that the contribution of hearth lining to the slag might have been rather low.

The SHC fragments were surprisingly similar in form and structure, and thus the cakes were probably within a narrow range of shape, size and texture. The form appears to have been plano-convex, with the upper surface smooth or very slightly indented. The bases were rough, probably as a result of the former presence of charcoal clasts. The upper parts of the cakes were markedly denser than the lower, but there was a high degree of vesicularity throughout.

The weight of the SHCs, to judge from a single mostly complete example and the very similar suite of smaller fragments) was probably approximately 250g. This is much lower than for typical bloomsmithing slags of Iron Age date and is probably indicative of an origin within blacksmithing.

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Methods

All materials were examined visually, using a low-powered binocular microscope where required. As an assessment, 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.

This assessment was conducted in March 2019 and was commissioned by Elizabeth Walker of NMGW.

Description of the assemblage

Smithing hearth cakes
The assemblage included 8 pieces weighing 406g which were identifiable as being from smithing hearth cakes.

The smithing hearth cakes showed some signs of weathering, but most pieces were very dense. Inspection of clean fractured surfaces suggested they were rich in wustite. Some fragments showed the presence of granules of quartzose material, probably derived from the hearth lining, but the slag textures and density both suggested that the contribution of hearth lining to the slag might have been rather low.

The SHC fragments were surprisingly similar in form and structure, and thus the cakes were probably within a narrow range of shape, size and texture. The form appears to have been plano-convex, with the upper surface smooth or very slightly indented. The bases were rough, probably as a result of the former presence of charcoal clasts. The upper parts of the cakes were markedly denser than the lower, but there was a high degree of vesicularity throughout. The most complete example was the 174g fragmented piece sf<283>. The original size of this example is unclear, but the surviving piece is likely to be within the range of 60%-80% of the whole – i.e. suggesting the original SHC had a weight of 220-290g.

Although preservation of fuel clasts (at least on the surface of the fragments) was poor, the evidence was for the use of charcoal as fuel.

Indeterminate iron slags
A few slag pieces were not identifiable as deriving from SHCs. Some of these (e.g. find <44>) were small chips of slag lacking diagnostic criteria. Others (e.g. finds <1147> and <281>) represent materials that have undergone some flow through the fuel bed of the hearth and do not form part of the main slag mass within the hearth.

Microresidues
Two tiny scraps of concretion (total 0.55g) were recovered (as sf<967> from context (5). They may be pieces of a single original piece. This concretion contained pieces of flake hammerscale, together with fragments of charcoal, all cemented by iron oxides, probably derived from the corrosion of a fragment of metallic iron.

Such concretionary material is sometimes referred to as ‘smithing floor’, although this texture may arise in any location where appropriate microresidues accumulate.

Coal
Six fragments of coal were recovered from context (43) with a total weight 6.5g.

Natural materials
Various pieces of chert and iron-rich rocks (five fragments of iron oxide weathering crusts and a single fragment of a goethite/haematite iron ore) were likely to be present through natural agency. Such materials occur widely in Gower within the Carboniferous limestones).

Distribution of the assemblage

The majority (total 251g) of the assemblage derived from context (3), with a small proportion (total 7g) from the underlying mixed deposits of context (5). A large single piece of SHC (sf<283>; 174g) was also recovered from the base of the red sand (possibly a correlative of context (3)) in TP1. The base of a dark stony sand layer (probably a mixed deposit) in TP2 produced a single piece of flow slag (14.9g).

Almost all of the recovered residues therefore derive from context (3) or its correlatives. This context is currently interpreted to be of middle to late Iron Age date.

Interpretation

This assemblage is small, but apparently consistent in its evidence for iron-working of Iron Age date that produced small SHCs. The SHCs appear iron rich, so cakes of the supposed approximately 250g original weight would contain perhaps 150g of iron metal. This represents a significant loss of metal to the hearth in each work period.

The residues from Iron Age smithing have received little detailed analytical investigation. Crew (1998) suggested that at the Iron Age site of Crawcwellt, the SHCs were of two sizes: 300-400g attributed to bloom refining, and distinctive flat-topped smaller cakes of 100-150g, interpreted to be from ‘the final stages of smithing’. More recently, investigations of SHCs found

on Iron Age iron smelting sites have produced much larger examples, for instance a range in weighs of 890g to 2050g from the Middle Iron Age site at Tregurra, Cornwall (Young 2016), from 332g to 1120g at the Middle Iron Age iron smelting site at Folly Court, Wokingham (Young 2018), and 230g up to 1035g from Late Iron Age site at Kingstone, Herefordshire (Young 2012). This suggests that Iron Age bloomsmithing slags were more typically of a similar size to the better-known examples from the Roman and early Medieval periods.

The present material, with its much smaller SHCs, would therefore appear unlikely to be associated with iron production, but rather to be residues from blacksmithing (e.g. see Young 2017 for a site at Kingswood producing both blacksmithing and bloomsmithing residues). Sites with wide range of dates from Roman to earlier medieval have produced SHC assemblages with maximum SHC weights of up to 850g and with mean weights of around 220 to 350g. These assemblages are interpreted as the waste from periods of continuous, mostly high temperature, smithing and are thus most commonly associated with urban smithies or those on larger estates. Other assemblages of similar age range only up to maximum SHC weights of 200-250g, with mean weights in the range of 100 to 150g. These would be associated with lower temperature work and/or shorter work periods; they have thus been associated with the less active estate/settlement forges. The present material is much too sparse to determine comparative statistics, but lies within this general blacksmithing range and probably within the heavier part of the range. The tasks being undertaken are therefore likely to have involved a significant proportion of forge welding, for the loss of iron is greater when at high temperature.

The presence of coal on blacksmithing sites is typically an indicator of a post-Iron Age date. In this instance, however, the finds of coal are not directly related to the iron working (for which the direct evidence is for the use of charcoal as fuel) and there is a significant possibility of the coal having arrived on the site through entirely natural agency.

Further work

This small assemblage has limited research potential to inform understanding of the site and no further work is suggested. The SHCs are however unusual in their density and apparently high iron content and would be worthy of some investigation in their own right, should further stratified material be recovered in the future.

References

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Table 1: summary catalogue of submitted materials.

year	accn	find	c notes	c	wt	notes
Iron slag						
98	36H	37	T1 E10 red sand	3	21.44	irregular fragment of very dense slag, with dense flow lobe overlying finer, downwardly prilly, slag that flowed around a fuel piece; although probably from the flowed margin of an SHC, an origin in smelting cannot be excluded for this piece
98	36H	38	T1 G12 red sand	3	28	small fragment from the margin of a dense SHC, contains inclusions, concentrated marginally, of quartzose material; base eroded but apparently smooth, top apparently planar with adhering quartzose fragments
98	36H	44	T1 G12 red sand	3	3.51	chip of weathered iron slag
98	36H	52	T1 G12 red sand	3	8.33	small angular fragment, probably from SHC, has a denser layer with a dimpled surface, possibly the top, in contact with more strongly vesicular material
98	36H	130	T1 G12 red sand	3	8.33	irregular fragment of iron slag with some quartzose inclusions, presumably from wall or the margin of a SHC
98	36H	137	T1 G12 red sand	3	30.36	small fragment from near margin of SHC, dense, properties broadly as 38/283
98	36H	139	T1 G12 red sand	3	0.45	small concretionary ball of rusty material - probably rust from metal not slag
98	36H	151	T1 G12 red sand	3	100.93	86g rounded piece fragment of SHC, bowl shows some tubular vesicles and there are some charcoal vestiges near the top, base indented and locally crudely prilly
		ditto				10.35g, irregular dense iron slag, one face with downward lobes with deep hollows between, deeply weathered
		ditto				1.57g, lining slag with partially-melted fragments of sandy ceramic with some coarser quartz clasts
		ditto				3.01g tiny fragment of slightly lobate slag, not unlike 10.35g fragment
99	43H	281	TP2 base of dark stony sand	SS	14.88	elongate amalgamated flows of dense iron slag, probably through fuel bed
99	43H	283	T1 base of layer 3	RS	174	65x80x35mm fragment, now in four pieces, of major part of small (probably) SHC; top is faintly dimpled or ridged, possibly slightly concentrically, but otherwise planar and solid, base is irregular with holes, probably after fine charcoal; interior is highly vesicular, but with coarse texture present in places.
99	43H	285		3	50	fragment from thin SHC, starting to explode so presumably contains metallic iron, lower surface irregular (originally charcoal rich?) but top dense smoother with some quartzose clasts.
2000	35H	1147		5	6.44	irregular rounded dimpled bleb of dark material with some fine, shiny 'clasts'; unclear if this is highly weathered slag or a manganese-rich material; exterior has rusted accretion, possibly favouring a slag origin
Microresidues						
99	43H	967		5	0.55	2 tiny scraps of smithing floor concretion, probably formed around small weathered iron fragment, shows charcoal and flake hammerscale
Coal						
2000	35H	1341		43	6.51	six fragments of coal
Natural materials						
99	43H	282	TP1 red sand	RS	2.3	thin curving sheet of dense 'limonite'; iron oxide crust from rock weathering
99	43H	304		3	5.51	concretionary material dark, probable mould of 'twig', plus a dense clast - unclear if slag or just denser concretion
99	43H	360	clay drift		5.5	4 fragments of 'limonite' weathering crust and one small piece of chert
2000	35H	1121		6	118	chert nodule
2000	35H	1264	S512	6 or 7	8.36	chert
2001	36H	3106	S/805	46 or 47	3.84	fibrous goethite/haematite ore fragment, dark dense goethite on margin, red softer (still fibrous) within

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