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Assessment of archaeometallurgical residues from Harlech

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Abstract

This was a small collection of items, of which two items (one now broken) were pieces of archaeometallurgical residue, twenty pieces (probably representing a small number of original, now broken, items) were ferruginous concretions of unknown origin and three were concretionary masses formed around weathered iron objects. There were also a few natural rock fragments and pebbles.

The two pieces of archaeometallurgical residue were both incomplete large smithing hearth cakes (SHCs). One of the cakes (from spread (113)) was a fragment of at least 570g, mainly formed of a dark glass, locally bearing coarse olivine and quartz grains and with a partially reddened surface. These features are common characteristics of coal-fuelled smithing, but no associated coal residues were observed and other interpretations are possible. The second (from fill (169)) was an 820g of a large, charcoal-fuelled, SHC, with evidence for having been deformed during removal from the forge when hot. Although both SHCs were clearly large, neither need have been exceptionally so and they may both derive from the end-use of iron, blacksmithing. Large charcoal-fuelled slag cakes may also be indicative, in the medieval period, of the working of raw iron bloom into finished iron.

The concretionary material cored on iron metal included, besides two unidentified pieces, what was probably a short length of iron chain, with three, 35mm-long, links. The irregular form of at least one of the other iron fragments raises the possibility that it too was waste from ironworking.

The archaeometallurgical materials are not strongly indicative of age. The use of coal as a fuel for blacksmithing occurred from at least the period of construction of the Edwardian castles until recent times. The use of charcoal as a fuel declined in the post-medieval period. Both items could therefore be of either medieval or post-medieval age.

Contents

Abstract 1

Methods 1

Results
- Description of Residues
  - Smithing slags 2
  - Other 2
- Distribution of residues 2

Interpretation 2

Discussion 2

Further work 2

References 2

Table 1: 3

Methods

The material described here derives from excavations around the Castle Hotel, Harlech, Gwynedd (SH 58172 31229), during the construction by Cadw of a new visitor facility for Harlech Castle.

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 Kate Pitt, of Archaeology Wales. The Archaeology Wales project details and site code were: Project 2173A, HCVC/13/PX.

Results

Description of residues
The submitted materials amounted to approximately 3kg in weight. Of this material, just 1.4kg was actually archaeometallurgical residue, probably representing two original pieces, one now fragmented.

Smithing slags
There were two examples of smithing hearth cakes (SHCs)

One of the cakes (from spread (113)) comprise fragments of at least 570g, mainly formed of a dark glass, locally bearing coarse olivine and quartz grains and with a partially reddened surface. These features are common characteristics of coal-fuelled smithing, but no associated coal residues were observed and other interpretations are possible. The cake was represented by fragments of 455g and 165g, together with 15g of fine debris. It was unclear what proportion of the original cake was present, but it was probably only approximately half, implying the original cake would have weighed approximately 1kg.

The second (from fill (169)) was an 820g of a large, charcoal-fuelled, SHC, with evidence for having been deformed (torn and twisted) during removal from the forge when hot. The top of the cake locally showed a glassy veneer, where melted hearth lining had flowed from the wall. The top was also deeply dimpled through contact with the fuel. The interior of the cake was a conventional crystalline iron slag. The base of the cake was rough, ashy and showed abundant inclusions of fine to medium sized charcoal.

Other
The majority of the remainder of the submitted material was formed by fragments of ferruginous concretions. Three of these pieces contained the remains of highly degraded metallic iron.

One of the iron-bearing concretions, from layer (49), contained what appears to be three links of chain, each approximately 35mm long. A further concretion contained a small block of iron of c.40x15x15mm; it is unclear if this is an object or if it is an offcut or waste piece of iron from a smithy. The third iron-bearing concretion weighs 205g, but the nature of the iron within is unknown.

Other concretion fragments either do not contain iron objects or are very small fragments of concretions.

Distribution of residues
The residues are not associated with metallurgical features and presumably represent either residual material or a low level of causal disposal. The SHC fragments occur within post-medieval contexts.

Interpretation

The amount of archaeometallurgical waste recovered from the site is very low, making it unlikely that the smithing activity was conducted in the immediate area.

Both SHCs were relatively large. Charcoal-fuelled smithing, particularly where a ceramic tuyère or blowhole was employed, may generate large SHCs, even where blacksmithing was being undertaken, rather than iron processing as part of the process of the working of raw bloom into finished iron. The maximum weight of SHCs in assemblages from medieval smithies ranges from approximately 500g from rural smithies such as that at Exminster (Young 2014), up to 1800g at some later medieval urban sites (e.g Worcester Deansway Period 9, McDonnell & Swiss 2004).

Discussion

The limited archaeometallurgical residue from the site implies the existence of a smithy nearby, but not within the site limits.

Despite the moderately large size of the SHCs recovered, it is likely that they represent the residue from blacksmithing. Blacksmithing was a widespread craft activity in medieval and post-medieval settlements, so little can be read into the occurrence of sporadic iron working waste on urban sites.

Further work

The material would be unlikely to produce further useful information from additional analysis, so none is recommended. A sparse collection of poorly-dated material found with no association to metalworking structures is of limited value and retention of these archaeometallurgical residues with the site archive is of low priority.

The iron-bearing concretions should be passed along with the ferrous artefacts for X-Radiography.

References

Young, T.P. 2014. Assessment of archaeometallurgical residues from Milbury Farm, Exminster, Devon (ACD478). *GeoArch Report 2014-09.* 16pp.

McDonnell, J.G. & Swiss, A. 2004. Ironworking residues. pp. 368-378, *in:* H. Dalwood & R. Edwards, *Excavations at Deansway, Worcester, 1988-89: Romano-British small town to late medieval city*. CBA Research Report 139.

Table 1: summary catalogue.

sf#	context	label	sample weight	item weight	item number	notes
101	c49	slag	126		1	exploded irregularly shaped piece; apparently concretion on iron object, possibly 3 interlinked chain links, each c35mm long
102	c113	slag	770	15		small slag fragments probably formed from breakage of >570g slag fragment, itself probably only around half the whole original SHC
				100	1	small piece similar in texture to 455g piece and probably broken from it
				455	1	fragment from substantial crudely concavo-convex hearth cake; slag is mainly black and glassy, highly vesicular with some maroon surfaces, rare quartz grains in slag, well-formed rough basal surface is slightly reddened; some of the glass bears extremely large platy olivine of up to 10mm.
				165	1	gravelly concretion on fragment of iron c. 40x15x15mm but obscured by concretion
				30	8	gravel , natural
103	c156	slag	15		3	fragments of hard, iron cemented concretion in gravel
109	c162	slag	205		1	now exploded gravelly concretion around weathered iron object
105	c169	slag	1240	820	1	fragment of large smithing hearth cake; shape suggests that the cake was removed hot, being twisted and torn in the process; fragment 110x70x50mm deep; top surface shows some lining influenced patches, is deeply dimpled, with charcoal in dimples; base is rough, ashy with abundant fine-medium charcoal - locally penetrated through by broad lobes of dense slag.; fresh breaks in slag show typical grey crystalline iron slag
				420	13+ debris	pieces of degraded iron concretion in gravel; several pieces show planar hard oxide surfaces - probably contacts with (now removed) pebbles; one piece shows additional dense crusts arcing away from such a surface through the matrix; one piece (45g) shows particularly dense crusts and a central void - so may indicate an original lost iron object
106	c182	slag	335		1	low density block of mineralised material, bears euhedral quartz and tabular voids with surrounding cavities after equant former crystals
108	c1004	slag	50	35	2	brown void rich iron-rich concretionary material, origin uncertain
				15	1	ferruginous crust with concave sharp surface and outer sand-rich layer - possibly concretion spalled from cobble
107	u/s outside w wall Room2	slag	280		1	iron rich concretion in gravel; metal detector does not show any iron metal

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