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Evaluation of archaeometallurgical residues from Prior Park, Cricklade

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Abstract

This small (7kg) assemblage comprises the macroscopic residues from iron-working. The collection includes 17 examples of effectively complete smithing hearth cakes (SHCs), 7 from the later medieval deposit (128) and 10 from the earlier level (130).The collections are small; the statistical analysis of the SHC sizes is of limited reliability therefore. The SHCs are however, apparently slightly smaller than contemporary material from either Burton Dassett or Worcester Deansway, and are more comparable in size to some Roman blacksmithing assemblages.

The size of the SHCs will depend not only on hearth design, technology and technique, parameters related in part to the age of the material, but also on the nature of the smithing task being undertaken – with larger SHCs being produced if the process involves a greater loss of iron to the hearth. The current assemblage therefore suggests relatively light work, with perhaps a low proportion of forge welding.

Contents

Methods

All materials were examined visually, using a low-powered binocular microscope where necessary. All significant materials were weighed and recorded to a database (Table 1).

As an evaluation, the materials were not subjected to any high-magnification optical inspection, nor to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

Results

The residues comprise macroscopic residues from iron-working (smithing). 96% of the assemblage by weight comprised slag pieces identifiable on morphological criteria as smithing hearth cakes or parts thereof.

The SHCs are typically small, with only 3 of the 17 complete specimens weighing over 500g. Most examples are plano-convex with upper surfaces glassy and with abundant lining-influence. Most examples show inclusions of charcoal, particularly in fine inclusions on the lower surface. Some specimens show additional low-density charcoal-rich slag adhering to part of the upper surface.

Only a single SHC was recorded as showing possible deformation on extraction and there were no observed tool marks.

The assemblage also included a few specimens of vitrified or slagged lining. Most of these were probably from the wall immediately adjacent to the blowhole. There was no evidence whether the blowhole was part of the wall or within a discrete tuyère.

Interpretation

Deposits (130) and (128) contained the majority of the slag. A single piece of vitrified lining was recovered from (132). These deposits appear to be general rubbish deposits, with many sorts of included artefact. There appears to be no direct link between these contexts and metallurgical activity.

The assemblage comprised mainly relatively intact smithing hearth cakes, of a fairly small size. The mean size for the collection is 329g (Table 2), which is more directly comparable with some Romano-British assemblages than medieval ones – although the current database of fully weighed assemblages is small.

SHC weight is controlled by many factors, including the nature of the hearth, the fuel, the form and chemistry of the tuyère/blowhole as well on the nature of the tasks being undertaken.

In this instance the fairly small size compared with the published medieval assemblages may be largely a product of the undertaking of tasks involving a relatively low loss of iron to the hearth.

Evaluation of potential

More detailed analysis could clarify the chemical processes involved in slag generation – which may in turn assist with interpretation of hearth function.

The utility of any further investigation must be viewed in the light of the potential to understand activities on site. In this case, the assemblage is small and not directly linked to metallurgical structures. In addition it is to be noted that the assemblage contains no smithing fines (hammerscale and other microresidues). Whilst this may be a sampling failure, the separation of macro- and micro- residues is common on sites. It is often observed that the micro-residues accumulate close to source (perhaps by brushing-out the smithy for instance), whereas the larger slags may be easier to remove and dump, by carrying or even throwing, at a distance from the smithy.

In this instance, these various considerations reduce the possible utility of detailed analysis, so none is to be recommended.

References

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context	sample weight	item weight	notes
128	2270	326	105x80x55mm, concavo-convex SHC with smooth slag top surface and rather lobate lower with lower protrusion, probably an attached fragment of earlier SHC
		196	90x85x25mm, flat plano-convex SHC, both faces have adhering accretion with organics
		282	105x80x40mm plano-convex SHC, bowl 35mm deep, flat top with lining influenced glass, base very irregular with large charcoal inclusions
		436	120x100x50mm, SHC, of which bowl 40mm deep, irregular asymmetrical base with much charcoal, top dimpled with probable charcoal impressions
		318	93x90x35mm, sub-circular plano-convex SHC, lots of fine ashy charcoal inclusions on base
		172	85x55x30mm very dense tiny elongate plano-convex SHC
		140	(60)x60x30mm part of small dense elongate SHC
		76	40x45x20mm small SHC fragment
		212	85x50x45mm very irregular small SHC with slag piled high on top of bowl at one end
		110	60x65x23mm incomplete small SHC, probably >70%
130	4075	534	108x100x52mm of which bowl 28mm deep, neat sub-circular SHC with dense bowl supporting irregular low density convex top
		304	97x60x37mm irregular oval upper layer resting on broken fragment of a lower cake
		794	140x115x57mm irregular SHC with bowl only c25mm deep
		258	95x85x25mm sub-circular concavo-convex SHC bowl, smooth top no filling,
		302	95x95x40mm of which bowl 25mm deep, bowl has flat top and slightly lobate margins, upper surface bears rusty glassy lining slag on one end
		592	130x90x70mm irregular broken block, has tightly curved dense slag inclusion, possibly a burr, and has slab of lining slag on top, but no coherent structure - possibly deformed on extraction
		156	95x65x35mm small curved slab - probably entire SHC but might be incomplete.
		208	85x70x35mm small dense triangular SHC, flattish top with minor adhering charcoal-rich slag
		160	70x65x35mm irregular lobate lump of slag, possibly an entire small SHC, but not quite certain.
		212	part of SHC with 20mm crust in smooth topped concavo-convex bowl, 100x50x40
		142	55%? of small sub-circular SHC, 78x(45)x25mm, plano convex, neat, dense
		294	4 fragments from thin SHCs
		74	Low density SHC or tongue - raised balls of pale lining slag on one side, denser dark prills on the other
		10	8 piece of debris
		40	2 pieces of vitrified lining, larger seems to be hood over blow-hole, but blow-hole itself not seen
		20	small irregular piece of lining-dominated slag
130	392	342	110x100x50mm of which bowl 35mm deep, slightly dished wide flat SHC, thickest right at proximal end giving wedge shaped longitudinal profile
		44	dished slag fragment - could be slag adhering to wall close to blow-hole
130	232	20	vitrified lining
		122	SHC fragment - rather worn?

	54	?gravelly lining slag with "pebbly" texture
	8	small slag fragment - possibly lining dominated
	20	small slag fragment - probably from an SHC
132	6	small fragment of lining slag

Table 1: Summary catalogue of material. Measurements of SHCs are given as LxWxD, in mm, with figures in brackets where SHC incomplete.

	Prior Park (130)	Prior Park (128)	Prior Park total	Marsh Leys Farm	Carmarthen	Worcester Deansway (period 8)	Worcester Deansway (period 9)	Burton Dassett
	11^{th} – 13^{th}	13^{th}-15^{th}		Roman	Roman	11^{th} – 13^{th}	13^{th}-15^{th}	14^{th}- 15^{th}
count	10	7	17	30	136	61	32	60
min	156	172	156		100	168	144	130
max	794	436	794	824	820	1490	1800	1670
average	329	277	329	333	227	492	499	550
<500	70%	100%	82%	77%	94%			
<1000	100%	100%	100%	100%	100%			
>1000	0%	0%	0%	0%	0%			
>3000	0%	0%	0%	0%	0%			

Table 2: Comparison of the Prior Park SHC assemblage with other British Roman and medieval blacksmithing assemblages. Burton Dassett from McDonnell 1992; Marsh Leys Farm from Young 2005; Carmarthen from Crew 2003; Worcester Deansway from McDonnell & Swiss 2004.

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