

GeoArch

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Evaluation of possible metallurgical
residues from Scholes Lodge Farm

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Abstract

Approximately 590g of possible metallurgical residues were submitted from Scholes Lodge Farm. The possible archaeometallurgical materials were almost all residues from the burning of coal. The vast majority comprised clinker, with abundant fragments of vitrified shale, derived from impure coal. A minority of the pieces graded into a vesicular grey slag. Interpretation of such assemblages is difficult, for clinkers may be generated in all coal-burning fires and where the usage is long or intense, the proportion of melt produced may produce a slag very similar to that produced in a coal-fired smithing hearth. In this instance, the presence of some denser fragments (particularly one in c798) provides some very tentative evidence for possible smithing, but this material is in such low abundance that it is unlikely, even if these materials are smithing residues, that smithing was a significant activity on site. An alternative explanation for some of the denser slags is that they may have accumulated in a substantial and long-lived coal fire, such a boiler.

Building 1 had been tentatively interpreted as a smithy, but the lack of certain smithing slags makes this unlikely. The building contained a "fire-pit" linked by a horizontal flue to a chimney; a configuration unlike that in a smithy, but resembling that of an oven or boiler.

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Methods

All residue particles were individually weighed and examined under a low-powered binocular microscope. The results are summarised in Table 1.

Results

The Materials

The residues were dominated by clinker (the incombustible residues left behind after the burning of coal). The clinkers comprised three broad categories, although more than one material may occur within a single pieces in a few cases.

The first category consists of pale burnt shale, variably vitrified, with a low proportion of associated melted material. The melted material is commonly bright brick red, and may form coatings of "blistered" appearance on the shale fragments.

The second category has a higher proportion of melted material that typically forms a grey crystalline or black glassy slag, generally bearing abundant small fragments of burnt shale. The slag has an internal structure suggestive of accretion of viscous blebs of melt, giving the exterior a crudely lobate, but not flown, appearance. The external surface of the slags is typically a maroon colour.

The third category is melted material, which has formed a dense, vesicular, grey crystalline slag. This material appears to have formed in crude sheets. There appears to be a complete gradation from the low-density black glassy slags through to the dense grey crystalline forms. The dense slags also have crudely lobate, maroon, exterior. Some of the dense slags appear to share a similar origin with the shale-

based clinkers, but are cored on partially vitrified sandstone pebbles.

Distribution

72g of residues come from contexts assigned to Phase II and 494g from Phase III contexts. Of the Phase III material almost 100g from inside Building 1, including approximately 40g of material from the “fire-pit”.

The dense residues, most closely resembling a smithing slag, were recovered from c798 and c886, both of Phase III.

Interpretation

The assemblage is small (total 560g) and difficult to interpret. Much of the material can be described as clinker, which is the incombustible component of coal, including very often pieces of shale in a glassy “slag” groundmass. Some of the assemblage forms larger, denser pieces, suggestive of derivation from iron-working. However, none of the material is entirely diagnostic, although all might have been produced in a blacksmith’s hearth, even large domestic coal fires can produce significant clinker.

The structure identified as a smithy appears rather unlikely to be one. The fire-pit is in front of a horizontal flue and a chimney. This arrangement suggests that the flue is being employed to provide heat to something directly above, perhaps an oven or a boiler. This is completely unlike any hearth normally employed in a smithy. The residues from the “fire-pit” are dominantly those with a low proportion of melt and a bright red colour. Such residues are very likely to be therefore the simple products of coal combustion with no metallurgical connection. The assemblage does however include at least two fragments that are slightly denser, providing corroborating evidence that the denser clinkers are not necessarily of metallurgical origin either.

Evaluation of potential

The assemblage is indicative of the use of coal as fuel in both Phases II and III. The denser residues might be from iron-working, but the extremely small amount of this material means it is unlikely to be related to processes undertaken with the immediate bounds of the site. Further analytical work might reveal whether the dense slags were metallurgical, but in view of the apparent lack of direct connection with the excavated features and the widespread occurrence of smithing debris in post-medieval rural locations in general, pursuing such analysis would probably be of only very limited value.

Further analysis of the residues in the fire-pit is unlikely to reveal more about the nature of the activity being undertaken in Building 1, since the fire provided only indirect heat to that process.

In view of these findings, it is not recommended that further analysis be undertaken.

<i>context</i>	<i>note</i>	<i>weight (g)</i>	<i>description</i>
Phase II			
1053	s177	3.43	highly vesicular green glass slag with pillulous structure
1059	area a	25.81	dense nub of grey vesicular slag with maroon surface, has included fired shale, somewhat lobate pillulous surface
		13.73	large low density piece of slagged vitrified shale
		6.47	vitrified shale with adhering red bubbly slag with covering of grey vesicular slag
		0.85	tiny fragment of grey-red vesicular slag with abundant tiny shale chips
		1.16	tiny chip of shale rich grey vesicular slag
		2.24	grey vesicular slag with irregularly lobate surface with red tint
		4.56	small part of rounded lump of grey vesicular slag with shale
		7.57	dense grey vesicular slag with pillulous nature and one well developed lobe; contains a soft brown clast
1096	area a	6.17	grey slag with large vesicles, dense, possibly worn, and adhering shale fragment
Phase III			
148	s23	2.04	6 tiny fragments of maroon slag on various vitrified pieces, some at least appear to be discrete blebs
204	s32	4.59	irregular broken nub of grey vesicular slag
611	area b	9.24	pillulous dark slag, mainly crystalline with reddened lobate surfaces and shale fragments
692	area a	5.83	irregularly pillulous lump of grey slag with maroon surface, no obvious shale but one soft yellow inclusion
756	s145	20.59	dense reddish grey slag in irregular spiky mass
		3.2	most pieces in this collection are markedly red, friable, sintery/spiky looking slags with vitrified shale, some have smooth outlines suggesting they were discrete nubs
		0.58	
		2.84	
		4.39	
		6.31	
		0.42	
		1.66	
		0.71	
		0.52	
		14.93	moderately dense slag otherwise similar to remainder of this assemblage

782	area a	10.69 5.58 3.01 3.26	4 pieces all similar, variably vitrified shale debris cemented by brick-red melt phase, low density and friable, melt is fairly low proportion of total
782	s143	1.11 1.47	2 irregular but somewhat rounded clinkery nubs, reddened surfaces
798	area a	84 40 12 24 16 12 12 3.02 8.73 4.92 8.3 3.74 3.82 4.78 1.21 1.05 0.97 0.6	crescentic slab of dense slag up to 20mm thick, full of altered shale fragments, one side smoother than other. Slag vesicular, grey, dense with maroon surficial bloom irregular lobate lump of dark slag with maroon surface, bearing abundant shale fragments vitrified shale fragment with red bubbly slag coating angular block of extremely shale-rich dark slag, becoming glassy on one surface dense vesicular grey slag, similar to other pieces but probably worn dense grey vesicular slag, possibly enclosing piece of sandstone irregular dense vesicular slag lump with upper surface very smooth, lower similar but rougher? vitrified shale fragment dense grey vesicular slag with a rather irregular lobate surface grey slag with one lobate surface with small spherical(?) adhesions, internally has shale and has spalled from large vitrified surface nub of dense grey slag with reddened smooth surface and shale fragments grey slag with large vesicles and smooth surface, shale inclusions fragment of rounded nub of maroon surfaced grey slag, vesicular with shale small fragment of slag with shale with smooth surfaces like large piece extremely vesicular grey slag with shale vitrified shale fragment grey vesicular slag fragment with shale chip of grey slag with shale and maroon surface
809		4.4	poorly-seen vitrified shale fragment, coated in variable slag, mainly rather red, with a few shale fragments
827	s156	3.95 2.44 1.85 2.84 1.54	four rounded reddened nubs, slightly plastic lustre broken spiky piece revealing shale chip inside, very spiky surface
886		100	dense grey/maroon slag in sheet 20-25mm thick. Vesicular, lots of shale fragments and one piece of adhering coal. Has much rougher, irregular surfaces than the large piece from 798, and is essentially non-lobate

1063	s179	0.97	angular chip of weathered iron rich rock with cemented coal and other debris
		8.84	grey vesicular slag with red surface in rounded lump
		2.21	smaller rounded lump as above
		7.32	10 pieces of small reddened slag, most have discrete rounded surfaces suggesting they are nubs of clinker
1063	s178	7.29	irregular lobate moderately dense maroon-surfaced slag lump
		7.21	5 pieces of greyer, more irregular clinker pieces, most with shale, 1 piece may be cored on a an ironstone chip

Unphased

1057	area a	4.37	2 pieces similar, dark dense slags with reddened crudely lobate surfaces, pillulous, lots of included vitrified shale
		17.86	

Table 1. Catalogue of materials

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