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Report 2008/05

Evaluation of archaeometallurgical residues from Chorlton Fold Farm

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9th May 2008

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Abstract

This small (1.89kg) assemblage includes two pieces of slag from probable medieval contexts. These slag pieces are both slightly problematic (being incomplete and very worn) but are probably fragments from smithing hearth cakes (SHCs). The medieval contexts also yielded some iron-rich concretionary material.

Post medieval contexts (C17-C18) yielded several fragments of clinkery slag, indicating that some coal-fuelled metallurgical activity was being undertaken nearby. A single large block of tapped slag which solidified immediately below the tapping opening is of uncertain origin. Although superficially similar to a bloomery tap slag, the density of the slag (reflecting a very low vesicularity), the presence of apparent small slag splashes and the steep angle of accumulation of the proximal flows all hint that this may be an iron refining slag, from a finery or later technology such as a puddling furnace.

A C19 pit yielded a single piece of clinker. This is a low-density residue and is not necessarily of metallurgical origin.

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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 true slags (contexts 21, 26 and 186), as well as dense clinkers (contexts 6, 71), low density clinker (context 24) and coked coal (context 71). In addition context 21 yielded several pieces of iron-rich concretion of uncertain origin.

Most of the dense slags are not easily attributable to process, although the rounded base and tubular vesicles of the example from context 21 and the rounded form of the piece from context 21, with its upper surface rich in partially melted sandstone and ceramic, point towards these examples being smithing hearth cakes. The size of the materials would be entirely compatible with an origin in blacksmithing, rather than in bloom refining.

One large block of slag (context 186) was produced through solidification of slag immediately below the point of tapping liquid slag from a furnace or hearth. Although some of the lower flow lobes are fairly small, the upper most ones are very large, up to 50mm wide and 35mm deep, with a large central cavity up to 20mm wide and 10mm deep. The lower lobes appear to be smooth-surfaced, but the uppermost ones have transversely wrinkled surfaces. The lower flows appear

to define a (horizontal?) “puddle”, into which the upper flows poured at about a 45 degree angle. The upper flows suggest a point of origin of the liquid slag at least 80mm above the basal “puddle”.

Another curious feature of this slag is the occurrence of superficial blebs of slag, which appear to be splashes of fluid slag. This is not a feature normally seen in bloomery slags, but suggests a process in which fluid slags were encouraged to leave the furnace/hearth by raking or rodding.

Although this piece resembles bloomery tap slag, there are other possible interpretations. The piece is extremely dense, mainly because the individual flows have an extremely low degree of vesicularity. The high density coupled with the splashes and with the morphology of the flow suggests that the origin may not have been a bloomery, in which the usually slightly vesicular slags pour out relatively quietly along a sub-horizontal tapping channel. Marked vertical drops are associated with the slags tapped from puddling furnaces and probably (although these are less well known) earlier finery hearths. Thus an origin for the current piece in a post-medieval iron refining process is quite possible.

The clinker-like materials, include pieces which are simple clinker, the fused inorganic residue from the burning of impure coal (e.g. context 24) which may not necessarily be of metallurgical origin and pieces which are more dense (e.g. pieces from c6 and c71). These denser materials are more likely to be higher-temperature metallurgical residues, but the fragments are small and non-diagnostic. They pieces could be from an industrial process, or represent residue from a small-scale coal-fuelled smithing hearth.

Context 71 also yielded a piece of coke. Such materials may be fragments of incidentally incompletely burned coal, rather than deliberately-produced coke fuel. Unfortunately these possibilities cannot be distinguished.

Interpretation

This is a very small sample on which to base any significant interpretation, but the most likely interpretation is that the stratified probable medieval material is residue from blacksmithing. The material is not well preserved and not abundant, so may not have been preserved close to its source.

The material from the C17-C18 contexts suggests the operation of coal-fuelled metallurgical operations nearby, but give little clue to the actual nature of the process. A single block of “tap slag” may also indicate a refining process taking place nearby. At this period that is likely to mean a finery forge. There is however a small possibility that this piece is an unusual residual piece of early bloomery iron smelting waste.

The single piece of clinker from a C19 context is not necessarily indicative of metallurgical activity, but may be from a boiler, perhaps in an agricultural machine (e.g. a steam traction engine) or just possibly from a domestic hearth. There is also a slight possibility that this did derive from a coal-fuelled metallurgical process, but was just uninvolved with reaction with any metal.

Evaluation of potential

More detailed analysis could clarify the nature of some of these difficult residues. However, given the lack of direct association between the finds and any demonstrable activity within the excavated site, the intrinsic interest in the material might be outweighed by the costs involved.

In particular, the block of “tap-slag” could be analysed to compare with other examples of both bloomery and refining slags in order to establish its origin.

The utility of any further investigation must be viewed in the light of the potential to understand activities on site.

<i>Context</i>	<i>label</i>	<i>weight (g)</i>	<i>notes</i>
6 /1058	Fex1	12	dense rather clinkery looking slag, possible deep fuel contact holes on one side, partially melted shale on the other, 30x30x23mm, mixed glassy and crystalline textures
		56	slag sheet fragment with base somewhat convex and finely dimpled suggesting sediment contact. Upper part preserved is highly vesicular, with large rounded vesicles, 45x40x30mm
21 /1018	5 x Fe	368	dense iron slag lump. Possibly a SHC. Top (?) has inclusions of ceramic and sand(stone). Base is lobate in a manner suggesting it is folded, but with fuel contact dimples probably present. Not an easy slag to identify. 95x80x55. Probably SHC deformed on extraction - but not certain.
		96	rusty concretion fragment - all sizes of sediment up to quite large stones, some charcoal and rust. 70x70x40. Form of piece is bowl-shaped, but it isn't all slag - though it might be cored on some.
		28	coal with attached ironstone and corrosion. 45x35x18mm.
		6	iron concretion fragment - shows organics and sand bound by rust, possibly to vesicular slag/clinker - probably a fragment broken from the 96 piece. 30x20x13mm.
		6	gravelly concretion fragment as above. Both of these might just be coal residue related. 30x25x8mm
24 /1024	slag	18	clinker, 43x40x30mm.
26 /1022	Fe slag x3	88	rounded slag lump broken in two. Lower part of the sheet-like piece shows tubular vesicles. Quite possibly a SHC fragment, but not certain. No fuel visible, 60x40x25mm.
71 /1055	3 x Fe slag	3	coke fragment broken in two, 30x25x20mm
		4	dense crust of clinkery slag with small partially melted inclusions, 20x17x8mm
186 /1116	1xslag	1205	dense tap slag flow - appears to be right below raised tapping area - has small splashes of slag on upper wrinkled surface - possibly suggests raking? Dense enough to be a post-med refining slag of some sort. Slightly maroon surface tint. Main flows on top are large, 50x35mm with up to 20x10mm central cavity; main slag texture has very few, if any, vesicles. 95x125x80mm. The 80mm represents the drop of the slag onto the floor at roughly 45 degrees.
	total	1890	

Table 1: Summary catalogue of material.

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