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Assessment of archaeometallurgical residues from Much Wenlock

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Abstract

This assemblage comprised just two pieces of slag, with adhering concretionary matrix, from a wider deposit of metallurgical waste.

The two pieces were both smithing hearth cakes from coal-fuelled blacksmithing. The concretion and loose debris contained abundant hammerscale, also compatible with blacksmithing.

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Methods

The material described here derives from an evaluation in Much Wenlock, Shropshire. This project was commissioned by David Brookes.

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.

Results

Description of residues

The submitted materials comprised two lumps of slag with abundant adhering concretionary material. As supplied, the two lumps weighed 496g and 221g.

Both pieces were then cleaned vigorously to remove as much adhering concretion as possible. After cleaning the two blocks weighed 462g and 202g; in neither case was all the concretionary material removed during washing.

In both cases the slag underlying the concretion was locally visible following cleaning. The slag was a pale grey, with a highly reflective surface. Many surfaces were dimpled, with the dimples commonly still filled with fuel particles. The included fuel particles all appeared to be coal residues.

The slags were of low density. They showed dimpled bases, and locally also tops, but the upper surface of the larger piece also contained raised lobes of pale grey glassy slag.

The larger piece was crudely concavo-complex, with the upper hollow partially surrounded by a semi-circular raised lip. The form was suggestive of a slightly irregular cake with original length 105mm, 135mm wide and 50mm thick. The glassy lobes were present on what is interpreted as the proximal side of the central hollow. The base was very irregular, possibly suggesting displacement of the first-formed slag during growth of the cake. Although the majority of fuel was coal, there were also small fragments of charcoal present within the adhering accretion.

The smaller piece is also crudely concavo-convex, but might be interpretable as a folded sheet. It measures 95mm by 110mm and is 40mm thick. The base is rough and largely coated in a thin layer of rusty concretion. The upper surface is dimpled with small coal residue particles deeply embedded in dimples,

giving a coralline appearance. The lower face is divided into three section by shallow grooves, possibly suggesting a central tool-mark.

The washing from the cleaning process and fine debris present in the box with the samples were washed and sieved to determine the presence of micro-residues. The material (as in the concretion adhering to the macroscopic slags) proved extremely rich in both flake and spheroidal hammerscale (Young 2011), as well as in slag fragments and fuel debris, along with a limited amount of sand.

Distribution of residues

The details of the stratigraphic distribution of the material were not supplied, but it is understood that they were present in continuous ferruginous material and representative of the slag inclusions in that layer. The deposit is tentatively dated to the later medieval period.

Discussion

The two pieces are both crude smithing hearth cakes (SHCs) indicative of blacksmithing in a coal-fuelled forge. The adhering and separate micro-residues would also support an origin in blacksmithing.

The weight of the two slag pieces is uncertain, because of the adhering concretion, but in their cleaned state they are probably only a little over their actual weight; weights of approximately 460g and 200g are suggested. Such weights are within the range of typical SHCs from blacksmithing.

There has been no published overview of the use of coal in the medieval period in Britain. It appears that renewed interest in coal (it had previously been exploited in the Roman period) arose from the 13th century onwards.

Previous finds of medieval slag from Much Wenlock (Young 2007) also reported coal use, but only in SHCs rather larger and denser than the present examples. This was attributed to the continued use of a ceramic tuyère/blowing wall. The present material shows a low density texture, very similar to what is termed 'forge cinder' by modern blacksmiths. This low-density material reflects the situation where the only significant silica and alumina inputs to the slag are from the fuel, since there is no hearth ceramic present in the hot-zone when a protruding iron tuyère is employed.

The onset of the use of iron tuyères (commonly referred to as tuy irons or tuirons) is not well-dated in Britain. They appear to have been typical in blacksmithing by the late 17th century (Moxon 1703), although these early forms are likely to have been wrought iron tubes, rather than the cast iron tuyères familiar from the 19th and 20th centuries. Evidence for the use of iron tuyères prior to the 17th century is sparse, but it is likely blast furnaces may have used iron tuyères from the start (e.g. Plot 1686, 132, Dudley 1665, 61, and Nicholls 1866, 35, for 17th century examples of the use of 'tuiron') and there are references to tuirons of uncertain purpose (either smelting or smithing) of much earlier date (e.g. the Byrkeknott accounts of 1408 (Myers 1969, 1005-1008).

Thus the present material is likely to date from approximately the 14th century or later (based on the use of coal and the probable use of an iron tuyère). Similar slag would be produced by a blacksmithing working with a side-blown coal-fuelled hearth today.

The deposit appears to have been a thick layer of slag, with hammerscale and fuel debris. Such a coarse-grained deposit is likely to be external to the smithy, rather than a floor deposit within it.

Further work

Although no additional analysis is recommended on the basis of the present material, if the site is medieval as suspected, then the importance of an early coal-fuelled forge should be flagged up. Detailed recording and investigation of such a site would be desirable as no good example has yet been recorded.

Key elements of understanding of the medieval forge that might be illuminated by such work would be:
- the onset of the use of coal
- the onset of the use of iron tuyères
- the onset of the use of waist level hearths

All three developments occurred during the later medieval period, but are poorly understood. These issues should be considered as part of the research agenda should further work be undertaken on this site.

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