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Evaluation of archaeometallurgical residues from Dwr-y-Felin, Neath

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Abstract

The assemblage from Dwr-y-Felin comprises 9 pieces of macroscopic residue and 8 processed sieved samples.

The sieved samples are all dominated by brown sedimentary grains. These are probable sedimentary grains derived from ironstones, which are not normally magnetic; magnetic properties arising when the grains are heated. They are thus probably indicative of human activity, but not necessarily of metallurgical processes. Three samples (634, 635, 639) contain flakes of magnetic material that are probably rust. 615 has some small particles which are probably slag. Only 626 contains any true flake hammerscale, and that is restricted to a very small quantity.

The macroscopic material includes four pieces (from 615, 616, 623 and 626) which are clinker; the partly melted residue from the burning of impure coal. Such material need not be indicative of metallurgical processes, for clinker can be generated at relatively low temperatures.

The specimen from 622 is a small ironstone pebble, and is probably of entirely natural origin.

Contexts 603, 608 and 640 yielded pieces of well-flown dense fayalitic slag, with upper lobate flow surfaces. Such material is similar to bloomery tap slag from early iron-smelting. However, caution must be exercised in this identification. The piece from 603 shows an unusually coarse-grained internal crystal structure and an extremely smooth surface. Such features may hint that this is an industrial period slag; fayalitic compositions can be found in both copper smelting slags and puddling slags of post-Medieval age. The piece from 640 also has a very shiny surface, but both it and the piece from 608 are too small for identification on the basis of morphology.

The piece of slag from 645 differs from the other slag material in being heavily weathered. It is likely to be ancient, but its origin is unclear; it is probably a slag produced on the wall of an iron-working hearth or smelting furnace.

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Methods

All materials were examined under a low-powered binocular microscope and wherever possible identified on the basis of morphology. This approach is limited in its ability to provide firm identifications, particularly on extremely small microresidue material. This document therefore provides, an evaluation of the assemblage, but cannot always be definitive in identifications.

The summary catalogue is presented in Table 1.

Results

The material from 615, 616, 623 and 626 are all various forms of clinker (the residues from the burning of coal). The large piece from 626 shows an almost unaltered slab of coal measures shale with a coating of well-flown slaggy material. The other three are lobes of moderately well-flown residue with small inclusions of shale, in one case (615) the included material has almost completely melted, suggesting a fairly high temperature of formation.

The specimen from 622 is a small pebble of iron-rich rock (ironstone). It is well-polished, probably as a result of river transport. Such materials occur naturally in the area.

Slags from 603, 608 and 640 are pieces of well-flown, dense, fayalitic slag, with upper lobate flow surfaces. This material is similar to bloomery tap slag from early iron-smelting.. The piece from 603, however, shows an unusually coarse-grained internal crystal structure and an extremely smooth surface. These features would indicate that this slag was generated from an extremely low viscosity flow at very high temperature and that it cooled slowly. This suggests the possibility that the slag was generated in an industrial-scale process, and may therefore be post-medieval. Compositions similar to those of bloomery slag are also seen in copper smelting slags and puddling slags. The piece from 640 also has a similar shiny surface, but both it and the piece from 608 are too small for certain identification on the basis of morphology. The piece from 640 is not however a tap slag flow lobe, but the dimpling indicates its cooling within a charcoal bed. Such textures may occur in both iron-smelting and iron-working slags.

The piece of slag from 645 is deeply weathered, and forms a strong contrast with the well preserved slags from 603, 608 and 640. The upper surface of this slag shows as slightly maroon and smoothly lobate. The body of the slag is highly vesicular and weathered to pale colours. The base shows some preserved patches with a finely dimpled wall contact in a pale glass with abundant sand grains derived from the wall fabric. Slags formed on the walls of iron-working hearths and iron-smelting-furnaces are not differentiable.

The sieved material is dominated by brown sand-grade sedimentary grains. These appear to be natural, although natural ironstones are not normally magnetic. It is likely that this material comprises grains derived from natural subsoil that have been heated. Many routes are possible for this, and the material is not indicative of metallurgical activity.

The samples from 615 and 628 contain small grains which are probably, but not certainly slag, Samples from 634, 639 and 640 contain probable fragments of rust. Certain determination of these materials is extremely difficult, for slag, rust and some natural weathering products may all comprise grey magnetite, and when the particle size is small diagnostic textures may not be visible.

Only the sample from subsoil 626 contained any true hammerscale, and that was restricted to just two small pieces of flake hammerscale.

Interpretation

The site has produced evidence for coal use from within the pits, and this potentially adds to the range of sites in South Wales from which early use of coal has been recorded.

A single piece of dense slag from pit 640 and a lower density weathered wall-slag block from channel 645 are both indicative of early metalworking. In neither case is the attribution certain, and both could be from either iron-working or iron-smelting. The evidence for smithing is supplemented by the small amount of hammerscale from 626. The small quantity of material suggests that smithing was taking place within the general area, but probably not within the limits of the excavation.

The two slag pieces from the upper deposits 603 and 608 may be evidence for early iron-smelting, but the texture of the larger piece suggests it derives from an industrial process.

Evaluation of potential

The material recovered from the stratified contexts has little potential to yield additional useful information. Chemical analysis might clarify whether the samples were from iron-smelting or iron-working, but given the small amount of material this is probably not worthwhile.

Chemical and textural analysis of the slags from the ploughsoil would be able to reveal whether they are early iron-smelting slags or later copper slags/puddling slags. However, given the (lack of) context of this material this is probably not a valuable exercise.

Context	Context type	Sample	Label	Weight	Notes
603	ploughsoil		slag	70	tap slag-like flow with a large tubular(?) internal cavity with olivine “honeycomb” surface. Like a tap slag but very smooth surface and very coarse crystals – probably therefore industrial (could be copper slag or puddling slag)
608	plough/subsoil		slag	14.4	fragment of tap slag like flow, smooth lobate top, large internal vesicles
615	pit		slag	3	poorly flown lobate clinker bearing blebs of white melted shale
616	subsoil		slag frag	4.4	partially flown clinker, dull maroon lobes with contained shale, glassy slag is pale internally
622	pit		undiagnostic slag	4.5	ironstone pebble
623	pit		slag	37.9	slagged coal shale - clinker
626	subsoil		slag	4.6	moderately well flown vesicular clinker, pale internally maroon near surface, probable included shale
640	pit		slag	8.9	tap slag like dimpled lobe, very shiny surface, dense even slag slightly brownish - probably not a bloomery slag
645	channel		slag	52	very heavily weathered piece, top has lobate maroon smooth bumps, base has pale glassy dimpled texture. Internally a weathered vesicular slag, turned pale. Quite likely to be iron slag, but origin not clear - perhaps a smithing slag
613	pit	002	Fe/hammerscale		brown iron-rich granules
615	pit	004	Fe/hammerscale		brown iron-rich granules and possible slag fragments, no true hammerscale
622	pit	007	Fe/hammerscale		brown iron-rich granules
626	subsoil	006	Fe/hammerscale		brown iron-rich granules, with two possible flakes of hammerscale
628	post setting	008	hammerscale		brown iron-rich granules and possible slag fragments, no true hammerscale
634	pit	009	Fe/hammerscale		brown iron-rich granules, with one possible flake of hammerscale, but prob rust
639	possible post setting	010	Fe/hammerscale		brown iron-rich granules, some possible rust
640	pit	011	hammerscale		brown iron-rich granules, some possible rust

Table 1. Summary Catalogue

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