GeoArch

Report 2024/19

Assessment of archaeometallurgical materials from Llanfairfechan (G2495)

Dr Tim Young
24th August 2024

Assessment of archaeometallurgical materials from Llanfairfechan (G2495)

Dr T.P. Young

Abstract

The submitted assemblage comprised a total of approximately 100 significant pieces, plus some fine debris (total 1.7kg).

The majority of this material (1.6kg) derives from a deposit of smithing waste investigated in adjoining Testpits 16 and 73 at Ty'n y Llwyfan. The waste was present in TP16 as a spread that contained several small smithing hearth cakes (SHCs). The SHCs are of a size typically formed during fairly 'light' blacksmithing that did not involve much welding. In TP73, some residues occurred in deposit (7303), but most were in context (7305), the fill of pit [7307]. This pit (PRN 100568) may the smithing hearth itself. The fill of the pit contained a single 'fiddle-key' nail, suggesting that the feature may be medieval. The hearth ceramic assemblage rom the pit contained several fragments from around the blowhole of the hearth. Context (7505) in TP 75 produced a single small ceramic fragment suggestive of derivation from a ceramic tuyère. Ceramic tuyères are known, if relatively uncommonly, from the Iron Age in Wales and adjacent areas, but the use of a ceramic tuyère in the medieval period would be an unusual occurrence in Wales (but is typical of medieval ironworking in Ireland.).

The microresidue assemblage from pit [7307] is also rather unusual, for it includes large flakes of particularly flat and shiny flake hammerscale (FHS) and very little, if any spheroidal hammerscale. Such an assemblage suggests prolonged heating of iron with flat surfaces, but at below welding temperature.

TP40 produced a single fragment of hearth lining, suggesting the smithing may have been undertaken at others points in the landscape.

TP129 also produced a small quantity of pyrotechnological residue from a hearth. This hearth may have been non-metallurgical. The sampled material contained burnt organic material (of ambiguous origin), some finely granular fuel ash slag, and two fragments of stone that probably derived from the Carboniferous coal measures. It is unclear whether they are purely coincidental (with an origin in the glacial drift), or whether the hearth had burned coal.

Contents

Abstract 1

Contents 1

Methods 1

Results 2
- General 2
- Iron-working (blacksmithing) residues..... 2
- Other materials 2

Interpretation 2

Further work 2

References 3

Table 1: summary catalogue 4

Methods

All materials were examined visually, using a low-powered binocular microscope where required. The identifications of materials in this report, as an assessment during which no instrumental analysis was undertaken, are necessarily limited and must be regarded as provisional.

This assessment was conducted in August 2024 and was commissioned by Jane Kenney of Heneb. The materials derive from a programme of test-pitting undertaken by the former Gwynedd Archaeological Trust as part of the *Landscape of Neolithic Axes Project* (Project G2495).

Results

General

The submitted assemblage comprised a total of approximately 100 significant pieces, plus some fine debris (total 1.7kg). The majority of this material (1.6kg) derives from a deposit of smithing waste investigated in adjoining TPs16 and 73 at Ty'n y Llwyfan. TP40 produced a single fragment of hearth lining and TP129 a small quantity of pyrotechnological residue from a, probably non-metallurgical, hearth.

The summary catalogue is presented as Table 1.

Iron-working (blacksmithing) residues

Residues from ironworking (blacksmithing) were primarily associated with adjacent TPs 16 and 73.

Two contrasting suites of residues were recovered from the charcoal-rich spread in TP16 and from the pit in TP73.

The spread in TP16 (context (1603)) produced a small, dense smithing hearth cake (SHC) weighing 128g, an apparently 'double' SHC, with an upper conventional small, dense SHC attached to an obliquely-descending cake, possibly an earlier, displaced SHC, but with the two sharing a finely-dimpled surface. There was also a small fragment probably derived from a similar SHC. The overlying context ((1602) yielded two small scraps of smithing slag.

In contrast, the fill of pit [7307] (context (7305)) produced several fragments of technical ceramic (total 192g) including fragments of a blowhole through the ceramic, as well as 16 fragments of slag (total 352g) comprising fragments from dense sheets, lobate flows and lower density blebby slags. Overlying contexts (7303) and (7302) produced small quantities of similar residues. The ceramic is insufficient to determine whether the blowhole was located within a simple clay wall or within a preformed ceramic tuyère.

Context (7305) also produced an assemblage of smithing fines, comprising flake hammerscale (FHS), slag spheroids and rounded blebs, many of maroon-surfaced FAS/lining slag; some fired clay; some probably oxidised iron debris in thin sheets and some rare blebby pieces of dense slag.

TP75 produced a fired clay fragment (from context (7505) possibly from the margin of a ceramic tuyère.

Other materials

TP129 (context (12903)) produced a small assemblage from a hearth. This assemblage contained much concretionary material (including some probable natural Mn/Fe crusts). There are fragments of burnt organic material of uncertain origin, and also some of very fine clinker, formed by agglomerations of with globules on millimetre scale. There are also some lithic grains including one piece of ferruginous sandstone and one probably of sphaerosiderite, both lithologies suggestive of derivation from the Carboniferous Coal Measures. The magnetic nature of the now-pinkish shale, that dominates, may suggest that it has been burnt. The co-occurrence of burnt shale, ferruginous sandstone, sphaerosiderite, and the unidentified burnt organic material might suggest that these materials are residues from the burning of coal, although the fuel ash slags are not conclusively the product of any particular fuel. One fragment within this sample appears to be of an organic-tempered plaster or mortar.

Interpretation

The SHCs in the assemblage are small, the isolated example weighs 128g and the example with two fused masses (suggestive of accumulation in two work periods) weighs 166g. The SHCs are dense and well-formed, typical of those formed in a hearth using a ceramic tuyère or a blowhole in a ceramic wall, rather than an iron tuyère. Other associated macro-residues include various low-density slags, including some slightly unusual highly clinker-like vesicular spheroidal particles.

If the presence of the fiddle-key nail is taken as evidence for a medieval age, then there are very few assemblages in the region for comparison (a medieval smithing hearth was recorded from site 3/14 of the Pwllheli to Blaenau pipeline, Young 2011; medieval smithing was recorded from Parc Cybi, Young 2019; medieval smithing residues were found at Hen Gastell, Young 2016). There are distinct similarities with the SHC assemblage from Hen Gastell where besides one large and one medium SHC (c. 1000g, 306g), there was a range of small examples (72g, 80g, 84g, 104g and 168g similar to those in the present assemblage. These included one attached to an inclined second mass of slag. The Hen Gastell assemblage was also noted to contain a 'large proportion of nubs and fragments of gravelly slag'. Whilst far from conclusive, the observations suggest that the present assemblage and that from Hen Gastell may lie within the same technological milieu.

The purpose of the smithing at Llanfairfechan is not readily apparent. The microresidues (with large, shiny FHS but an absence of SHS) suggest iron being heated for a considerable period of time at a relatively low temperature (although this requires further investigation). The SHCs indicate some modest loss of iron from the workpiece. Taken together, this suggests forge work involving significant shape change of the iron, but not welding.

The context of the smithing at Hen Gastell suggested that it may have been associated with construction. The same could be true here, even if a nearby medieval structure has not yet been recognised. Medieval smithing hearths in fields are commonly attributed to the need to repair implements like scythes close to the point of use during busy seasons, but the residues here point to a high degree of forging than that simple use would require.

Further work

The evidence for the smithing is slightly unusual, particularly in the nature of the hammerscale present. A limited analytical investigation of the scale and the associated macroresidues is recommended to enable further clarification of the purpose of the activity.

References

YOUNG, T.P. 2011. Assessment of the archaeometallurgical residues from the Pwllheli to Blaenau pipeline (G2148). *GeoArch Report 2011/38*. 3 pp.

YOUNG, T.P. 2016. Archaeometallurgical residues from Hen Gastell, Llanwnda, Gwynedd. *GeoArch Report 2016/37*. 97pp.

YOUNG, T.P. 2019. Archaeometallurgical residues from Parc Cybi, Holyhead, Ynys Môn. *GeoArch Report 2018/26*, 263pp.

Table 1: summary catalogue, weights in g, assm = assemblage of small pieces.

TP	context	find	bag label	bag wt.	item wt.	item no.	description
TP16	1602	1606			6.92	1	fragment of thin dense sheet, top smooth, but slightly lobed and hints of broad dimples, base finely fuel dimpled, dense slag
					2.6	1	apparently very viscous prill of highly vesicular lining slag; maroon surface to glass dark with sand grains
TP16	1603	1605	slag		166	1	double SHC; upper. 50x90x20mm, SHC, possibly deformed by folding, attached to lower SHC, 35x60x15mm; inclined in such a way that the two are continuous on one side; base finely prilly with fuel impressions and rust; top smoothish, dimpled with faint hint of lobes only
					128	1	60x70x30mm, small dense SHC; crudely plano-convex; top with fine fuel impressions on a poorly lobate surface, partly obscured by rust; base also crudely lobate, but rusty, with abundant adhering flake hammerscale, internally vesicular, but fracture obscured partly by rust
					32	1	lobate piece of slag; low density; some gravel, but resembles the slags in the SHCs
					72	5	lower density slags - lining slags, coarsely sandy clinkery slags, maroon surface, in rounded and more sheet-like forms
					7	assm	bag with small fines sample - dust and charcoal
TP73	7302	7304	slag		7.02	1	small fragment of rather sintery-appearing slag; finely granular and rich in very fine charcoal debris
TP73	7303	7305			8.27	1	vitrified and slagged oxidised-fired lining
					7.06	2	nubs of fuel ash slag
					12.8	1	small sheet of dense slag, smooth top, fuel dimpled base; must be a modified small flow
					68	2	highly altered iron-bearing slag?
TP73	7305	7309	burnt clay, slag, charcoal	584	132	9	fragments of fired clay, all oxidised-fired with dark glassy slag; of identical aspect to b/h piece
					36	1	tip of clay around protruding blow-hole; slagged and vitrified; blow-hole slightly deformed, originally c25mm diameter? blow-hole partly occluded by slag descending across it
					24	1	slagged and vitrified oxidised-fired clay; one side shows a pale curved lateral face suggests a tuyère margin
					352	16	Iron slag; of the two largest pieces, each 64g, one shows lobate flow across hearth floor, the other may be a proto-SHC; other fragments very variable - the denser slags tend to be fragments of sheets, lower density ones tend to be more blebby and lobate
					8	assm	small bag labelled 'iron rich material from soil' which includes slag debris and hammerscale

TP73	7305	7311	slag/hammerscale from <5>	360	360	assm	unusual assemblage with very large, very shiny FHS fragments; lots of spheroids and rounded blebs, many of maroon-surfaced FAS/lining slag; some fired clay; some probably oxidised iron debris in thin sheets and some blebby pieces of dense slag, but these are rarer
TP73	7305	7312	slag from coarse residue <5>	140	3.96	1	fiddle key nail
					61.6	27	blebby low-density slags
					15.61	8	oxidised-fired clay
					0.72	1	slagged oxidised-fired clay - possibly from blow-hole margin
					0.66	1	slagged oxidised-fired clay
					16.65	4	probable scraps of iron
					16.55	3	laminated iron cemented sand; has rounded cavities, but does not appear to be a slag
					8.74	4	rounded pebbles of natural rock
					6.92	4	dense slag, mostly finely prilly
					5.51	1	laminated sandy material with charcoal clast
TP75	7505	75131	furnace lining		4.67	1	small fragment of fired clay, oxidised in core, reduced on surface; front face is 14x24mm, then turns to side 12mm high, along a line with a radius of 30mm (but angular so this estimate is only approximate); could be from the margin of the face of a tuyère
TP40	4002	4004			11.27	1	lining slag with small amount of attached vitrified lining; slag surface shows some deep dimples and a slightly pendent lobe?
TP129	12903	12907	mag material from <8>	92	92	assm	assemblage with much concretionary material; one fragment appears to be plaster with moulds of organic temper; there are fragments of burnt organic material, and some of very fine clinker with globules on millimetre scale forming agglomerations, other concretionary materials may be natural Fe/Mn crusts; one piece appears to be sandstone grain from inside coal seam and another is possibly a sphaerosiderite grain; the magnetic nature of the now-pinkish shale, that dominates, probably suggests this is partly burnt, however, the intergrowth of Mn oxides and what appears to be fired clay, may suggest that some of the colour is natural.

GeoArch

geoarchaeological, archaeometallurgical & geophysical investigations

Unit 6,
Western Industrial Estate,
Caerphilly,
CF83 1BQ

Office: 029 20881431
Mobile: 07802 413704

E-Mail: Tim.Young@GeoArch.co.uk
Web: www.GeoArch.co.uk