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Assessment of archaeometallurgical residues from Cefn Graianog, G1598 (2014)

Dr Tim Young
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Dr T.P. Young

Abstract

This was small assemblage (64 pieces with total weight 1631g, from 17 distinct contexts) almost entirely (57 fragments, 1306g) comprising fragments of flow slags from bloomery iron smelting. Although some of the fragments of coalesced horizontal flows resembled tapped slag, there was no indication of surficial oxidation and all the smelting slags may confidently be attributed to non-slag tapping 'slag pit' furnaces. Such forms of furnace were the main form of furnace in the region in the pre-Roman Iron Age as well as in the early medieval period, with some evidence that their use may even have persisted through the Roman period in N Wales.

Seven fragments of slag (total weight 325g) with more massive, charcoal-bearing, microstructures cannot be identified with iron smelting with certainty and might equally have been produced during smithing, although there is no evidence that they did.

The material closely resembles that recovered during the 2012/13 seasons, but which appears to have been in primary assemblages, whereas the present material was dispersed into a variety of non-metallurgical contexts.

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Methods

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.

The examined materials are listed in Table 1.

This project was commissioned by Dave McNicol, of the Gwynedd Archaeological Trust.

Results

Bloomery iron smelting residues

Most of the collection (57 pieces, 1306g) comprised prills of flow slags. Some of these were elongate and fragile (e.g. a fragment from context (218)), but most of the pieces were either from slightly stouter flows or were from masses of coalesced flows, commonly superficially resembling tapped slag. There was no reddening that would indicate surficial oxidation and it is likely that all the flow slags were from non-slag tapping furnaces and dominantly in the form of 'cross-floor' flows.

Most of the individual flow lobes and tubes within the flow slag were small, mostly less than 15mm diameter and the majority of only half that value.

Most of the flow slags showed bases dimpled through contact with fuel, although some were entirely rough-surfaced, suggestive of flow through the basal ashy sediment. Some of the otherwise smooth-surfaced flows showed slight wrinkling of the upper surface from contraction or deflation, and some showed an unusual minutely dimpled texture cause by a very high vesicularity just below the top of the flow lobes.

In summary, these materials are typical of the flow slags formed within the lower parts of a non-slag tapping bloomery iron furnace.

Indeterminate residues

In addition to the flow slags, there were a variety of slags with a charcoal-rich or more massive fabric. These would also be compatible with an origin in a slagpit iron smelting furnace (but typically from the upper levels of the slag within the pit). However, they might equally have an origin in the working of iron (smithing). None of these pieces was certainly from smithing.

One of the more significant of these items was a 52g piece from content (218), that showed the contact between a charcoal-rich slag and oxidised furnace or hearth wall, probably from immediately beneath the blowhole.

Interpretation

The residues are indicative of bloomery iron-smelting in a non-slag tapping furnace. Such furnaces may have had a simple basal pit, into which the slag descended during the smelt, or they may have had a lower section of the shaft with a frontal arch (to permit clearance of the slag and probably the bloom) which functioned in the same manner.

The residues are very similar to those recovered in the 20102/13 campaigns (Young 2015), which occurred in larger amounts in assemblages of primary appearance (although the originating contexts appear to be working deposits rather than furnace bases). The report on the earlier material discussed the problems of ascribing a date to such material.

Conclusion

The material from the 2014 season is similar to that found on the site previously and may derive from the same furnace(s), but appears to have occurred only dispersed into non-metallurgical contexts. The occurrence of iron smelting is, however, significant, and so the material should be retained within the site archive.

No analysis is recommended for the present material, since detailed investigation would be more appropriate for the residues from the more primary assemblages, described previously.

Reference

YOUNG, T.P. 2015. Assessment of archaeometallurgical residues from Cefn Graianog, G1598 (2012-13). *GeoArch Report 2015-09.* 4pp.

Table 1: summary catalogue

Context	Item wt.	Item no.	Notes
69	21	1	flow lobed slag fragment, with fuel-dimpled base
	16	1	slag lump with dimpled base.
99	100	3	highly Mn-encrusted fragments of massive and/or charcoal bearing slag, details obscured
	38	1	dense flow slag fragment, one side dimpled, the another a sandy attachment
125	14	1	flow slag fragment
	10	1	heavily accreted and altered slag fragment
	10	1	burr like fragment of dense slag with quartz grains and rough attachment surface
127	74	1	tapslag like block, but on reddening. Dense flow lobes rest on highly vesicular basal fracture
	30	1	fragments of tap-slag like material
	11	1	rounded slag fragment
133	36	2	flow slag fragments
148	86	1	fragment of composite flow slag flow, rather like tapslag, but no reddening, fuel impressions on base, smooth grey, waxy internal texture
150	70	1	fragment of charcoal rich slag with small-scale prilly base
155	16	1	anastomosing prills of flow slag, wrinkled, with dimpled base
	9	1	vesicular slag adhering to fired clay
	3	1	vesicular slag fragment
160	15	1	flow slag prill
173	151	4	smooth masses of flow slag prills,
	142	3	rough surfaced flow slags in broader flows
	97	6	fragments of prilly charcoal rich slags
199	70	6	slag prills, one rough, the others smooth. One of the smooth pieces is very pale and glassy

Context	Item wt.	Item no.	Notes
212	111	7	flow slag fragments, mostly with dimpled bases and one with cavernous top caused by upper vesicular layer
218	52	1	charcoal-rich slag attached to oxidised fired wall - probable sub blowhole attachment.
	37	4	flow slag fragments, one very long and delicate
221	64	1	prills - probably part of a small 'birds foot' of divergent flows
	3	1	prill fragment
	93	1	irregular block of vesicular, possibly charcoal-bearing, slag. Encrusted in secondary oxides.
241	62	3	coalesced flow slag prills
246	117	1	anastomosed flow slag prills, individual prills only rather loosely bonded
	12	1	flow slag prill
260	61	5	elongate prill fragments, two largely clear of adhering materials and smooth, the other three rough.

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

Office:	029 20881431
Mobile:	07802 413704
Fax:	08700 547366
E-Mail:	Tim.Young@GeoArch.co.uk
Web:	www.GeoArch.co.uk