GeoArch

Report 2016/12

Assessment of archaeometallurgical residues from the Bishops' Palace, Bangor, G2358

Dr Tim Young
6th May 2016

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Dr T.P. Young

Abstract

This assemblage comprised approximately 190g of material, dominantly fired clay and fuel ash slag. The fuel ash slag included both small accumulations in a thin sheet and, in one sample, abundant small spheroidal particles. Fragments of fuel ash in sheet form commonly had adhering spheroidal particles. Many of the fuel ash particles showed a variegated khaki to maroon surface colour, typical of clinkers. In this instance, no certain coal-residue particles were observed, and the slaggy materials were probably derived from melting of wood ash and clay-rich substrate.

There assemblage also contained a corroded iron object, possibly a small nail.

There is no indication that the assemblage was derived from metalworking. Fuel ash slags of this general type occur widely in the ashes of large hearths and kilns. Considerable periods of time may be required for the generation of significant build-ups of this class of fuel ash in wood fires, and they appear to preferentially occur in association with cereal-drying kilns and semi-permanent domestic hearths, but other similar types of fire would also be capable of their generation.

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Methods

The material described here derives from excavations at the Bishops' Palace, Bangor, conducted by Gwynedd Archaeology (Project Number G2358). This project was commissioned by Jess Davidson.

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 amounted to approximately 190g in weight and derived from two samples taken from a single context (C124).

Burnt clay

The burnt clay fragments ((124) <11>) were mostly small and irregular fragments. Several pieces show and indurated (probably fired) sub-planar surface, sometimes with attached fuel ash slag. The clay was pinkish, with abundant white inclusions, probably including both small stone fragments and ashy particles. The clay also locally contained darker slaggy material, possibly suggesting reworking of the clay.

Fuel ash slags

There were several particles in sample <11> of crudely tabular form, suggesting broken fragments of an irregular sheet. The same sample also produced a few particles of elongate, prill-like, form, up to about 3mm in diameter, suggesting some limited generation of more fluid melts.

Microresidues

There were abundant spheroidal and sub-spheroidal particles within sample <12>. Some of these were very close to spheroidal, up to 2mm in diameter, and with a metallic lustre, most however showed variation from this, with multiple conjoined spheroids, irregular shapes and dull grey, maroon or green glassy colours. This indicates that the particles are mostly not spheroidal hammerscale, and probably all not spheroidal hammerscale. Instead they can be interpreted as fine slag droplets generated inside the fuel bed of a hearth.

Iron
Sample <11> item 80 contained a single small fragment of corroded iron (possibly a small nail) and approximately six pieces of rust-stained concretion.

Distribution of residues
The residues were recovered from ashy, and charcoal-rich, lenses within a probably medieval building (although potentially post-dating its demolition). The material appears unlikely, therefore, to have been in situ within a hearth, but more likely within a hearth clearance deposit.

Three samples were provided:
(124) <11>: this was presented as two subsamples, one large fired clay and associated fuel ash slag, the other smaller sample was of darker fuel ash slag particles and charcoal.

(124) <12> included ashy particles, charcoal, a few larger particles of fuel ash slag, but many spheroidal and sub-spheroidal droplets.

Interpretation

Small accumulations of fuel ash slag in an ashy matrix are typical, not of metallurgical processes, but of settings such as cereal-drying kilns, in which long periods at high temperature permit interaction of the fuel ash (rich in alkalis and alkali earth elements) and the hearth substrate (or any included sediment within the fuel). The interaction (fluxing) lowers the melting point of the sediment, permitting both the slagging of surfaces and the generation of slag within the fuel bed.

The generation of spheroidal droplets of fuel ash slag has been noted at Bornais (Young 2005) and the incorporation of droplets to form a sheet described at Llandeilo (Young 2015). In both instances, these occurrences were in residues from cereal-drying kilns, although it is likely that other forms of hearth/kiln might produce similar particles.

Very similar particles were recovered from a burnt mound near Caernarfon (Young 2016).

Further work

The material is unlikely to be able to provide further useful information through detailed investigation, although trace element studies of similar assemblages elsewhere have provided clues to their origin. In particular a potential chemical signature acquired from burnt grain has been proposed (Young 2015, 4). In this instance, the lack of direct connection between a physical structure and the ash deposits limits the potential for calculating a mass-balance description of the slag, in turn limiting the benefits of detailed investigation. No further work on this material is proposed.

References

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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