GeoArch

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Assessment of potential archaeometallurgical residues from City Way Carpark, Sunderland, Tyne & Wear (CWC20)

Dr Tim Young
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Dr T.P. Young

Abstract

The investigated materials comprised a small collection of iron artefacts, glass materials and clinker from the burning of coal. No piece can be assigned to a metallurgical origin with certainty, although the clinker fragments could be from blacksmithing (amongst other potential origins) and the two green glass fragments could be from iron working, perhaps as waste from a foundry. None of the materials need date to the medieval period or earlier.

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Methods

All materials were examined visually, using a low-powered binocular microscope where required. As an assessment, 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.

This assessment was conducted in December 2020 and was commissioned by Jon Welsh of AAG.

Results

General description of the assemblage

The investigated materials comprised a small collection of items from evaluation trenches at a site suspected of having of archaeometallurgical potential.

The collection included nine items: two iron objects, two fragments of clinker and five fragments of glassy composition.

Iron objects

U VII produced a substantial (162) fragment of an iron object. The piece was broken at one end, which was tubular, 30mm o/d and 12mm i/d, with the cavity extending 40mm from the broken end. The fragment was 60mm long, with the solid end having a eccentric square extension, 15mm wide by 13mm tall, in continuity with the external face. The piece has obscured surfaces (because of weathering) but has the appearance of being formed in cast iron. The purpose of the piece is unclear. If cast iron, it must be post-medieval and has the general appearance of a later post-medieval/modern engineering piece.

U III produced a 5.23g slightly incomplete corroded iron nail, 37mm long, but missing its tip. The head is crudely semicircular,10mmx15mm. The nail is probably a hand-forged nail, formed of wrought iron and thus of any date from the Roman period to the late nineteenth century.

Glassy materials

The assemblage contains five fragments of glassy materials, with a variety of forms and colours.

Two pieces, a 1.10g prill from U II and a 1.55g fragment from U III, are of clear glass with indications of flow. The most likely interpretation of these two fragments is that they are melted fragments of clear vessel glass. Without compositional analysis it is not possible to suggest what age these materials might be, although a later post-medieval to modern age would be most likely.

U I produced a 5.21g piece of a dark, effectively black, bubble free, glass in an irregular flow with a surface dimpled and made slightly opaque through contact with the substrate over which it flowed. The homogeneous nature of the glass and the lack of bubbles strongly suggest that this too is a melted vessel glass, although similar black glasses may be produced by some industrial processes (most notably by cupola furnaces in later post-medieval to modern iron foundries).

A 0.80g bleb of green glass, showing surface devitrification, from U VII is less certainly from melted vessel glass, although that is certainly possible. Blebs of greenish glass may some form as the most fluid fraction of clinker (e.g. in steam engine fireboxes).

A small angular shard of glass weighing 0.39g from U VI shows variegated colours of green, blue and cream. The fragment has no original surfaces. This piece is probably metallurgical in origin. Variegated green/blue glass is a common waste material from blast furnaces, particularly after introduction of the hot blast in the early to mid-nineteenth century.

Similar glass can result from iron foundry process if a limestone flux is employed. Greenish glass may be produced in earlier furnaces and hearths, particularly from reaction of technical ceramics (e.g. hearth lining) with fuel ash. Such glasses are typically particularly inhomogeneous and carry grains from the ceramic.

Clinker

U V produced two small fragments of clinker weighing 9.41g and 5.66g. Clinker is the partially-melted inorganic residue from the burning of coal. It can be produced in contexts simply involving coal fuel (e.g. the fireboxes of steam boilers), but can also be produced in some metallurgical activity (e.g. coal-fuelled blacksmithing).

Interpretation

The assemblage contains no materials that necessarily derive from medieval or earlier metalworking. Some pieces are reasonably certain from relatively recent waste disposal (burnt vessel glass…), while others have a more ambiguous origin. In particular, the two clinker fragments and the two fragments of green glass might be industrial residues, but it is not possible to refine that more closely.

Further work

The residue does not require further analytical investigation at this stage.

Table 1: summary catalogue of material submitted as potential archaeometallurgical residues, listed by bag.

context	wt (g)	no	notes
u I	5.21	1	black translucent, bubble-free, glass in irregular flows; surface locally dimpled and opaque.
u II	1.10	1	flowed prill of clear glass, some bubbles, surface clear although slightly contaminated.
u III	5.23	1	37mm long fragment of nail, broken before tip, head sub-semicircular 10mmx15mm
	1.55	1	contorted clear glass, surface whitened
u V	9.41	1	vesicular dense dark grey clinker, some voids contain coke particles, other laminated clasts are incorporated into main slag
	5.66	1	maroon surfaced, grey dense clinker, microstructure very fine to slightly granular, one surface shows minor blisters and flows developed on surface of clinker.
u VI	0.39	1	small angular chip of glass, swirled texture of green, blue and cream coloured glass.
u VII	162	1	fragment of (probably) cast iron, 30mm in external diameter, with central 12mm diameter hole extending at least 40mm in from broken end. Main tube terminates (or is broken) at 60mm from open end, but square extension 15mm wide by 13mm tall extends up from one side. Unclear if this is an eccentric component of object (e.g. to facilitate turning via a spanner), or just an irregular fracture.
	0.80	1	bleb of green glass, flowed as a viscous melt, external surface has rosettes of pale crystals from devitrification.

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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