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Assessment of residues from Grange Castle South [17E0578] [17E0590] [17E0591]

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Abstract

The submitted material comprised approximately 1740g of pyrotechnological residues, of which 410g (8 pieces, plus an assemblage of fragments with secondary iron mineralisation) were from Area 1, 1326g (8 pieces) from Area 2 and 4g (17 pieces) from Area 5.

The assemblage from Areas 1 and 2 was dominated by finds of smithing hearth cakes (SHCs) from iron working. These are indicative of the working of iron, rather than of iron production, and the scarcity may indicate that they were produced outside the limits of the investigated area.

There is a small amount of clinker (both certain and probable) present in the collection. Although some of this may derive from the use of steam engines in recent times, there is evidence that at least some may be a genuine indictor of the medieval use of coal on the site.

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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 July/August 2021 and was commissioned by IAC.

Description of the assemblage

General

The submitted material comprised approximately 1740g of pyrotechnological residues, of which 410g (8 pieces, plus an assemblage of fragments with secondary iron mineralisation) were from Area 1, 1326g (8 pieces) from Area 2 and 4g (17 pieces) from Area 5.

The materials were diverse as well as being sparse. Several small fragments from Areas 2 and 5, together (with less certainty) with a larger fragment from Area 1 are interpretable as being clinker (the melted, or partially melted, inorganic residue from the burning of coal). Iron smithing is represented by two examples of smithing hearth cakes (SHCs) from Area 1, three certain and one probable examples from Area 2 and perhaps by the indeterminate iron slags from areas 1 and 2. Copper corrosion products from Area 5 may be from metallurgical residues but are, perhaps, more likely to have been from weathering of a copper-alloy artefact. A small collection of ferruginous material from Area 1 is probably natural, as are some silicified limestone fragments form area 5.

Iron smithing residues

The smithing residues include several examples of smithing hearth cakes (SHCs). Where visible, the fuel employed was charcoal; there is no evidence for the use of coal.

Area 1 produced a single example of an SHC (from context (21) sample s#10. This example weighed 236g, but was very heavily weathered. Further evidence for iron working was provided by several small fragments of slag (4 fragments of concretion containing weathered slag, weighing 32g from context (43), sample s#17; 2 fragments of particularly charcoal-rich slag from context (99), sample s#40, weighing 14g) likely, but not certainly, also derived from smithing.

Area 2 produced one complete and two fragmentary SHCs, with weights of 304g, 274g and 690g respectively. The complete SHC (from context (18) sample #27) showed evidence for deformation during extraction from the hearth when hot. This type of folding of SHCs is observed sporadically across locations and time and is not currently believed to be indicative of any particular practice. The two fragmentary SHCs (from contexts (6) and 18)) were both parts from significantly larger SHCs than the complete example. Both were rather porous SHCs. The example from context (6) showed a thin basal crust with a basal toolmark, whereas that from context (18) had a thicker crust which contained tubular vesicles. Small fragments of probable smithing slag were also produced from the sieving of sample s#1 from context (29).

Area 5 produced no certain iron smithing residues.

Clinker

Several pieces of residue were identified as probable clinker (the partially melted inorganic component from the burning of coal), although it should be noted that the incorporation of substrate into metalworking slags can sometimes mimic clinker.

These materials included a 124g block from context (10) (sample s#17) in Area 1, a 6g fragment from context (1), sample s#4, and a possible 2g piece from the sieving of context (18), sample s#27, in Area 2 and a collection of 7 fragments from context (18), sample s#1, in Area 5. Only in the last-mentioned sample was coal also identified.

Copper alloy weathering products

Small flecks of copper alloy weathering products are present in sample s#1 from context (18) of Area 5. These are not identifiable but are likely to be from the alteration of metal rather than slag. It is not known whether the metal was present as production waste, or simply as an artefact.

Natural materials

Context (3), sample #14, produced an assemblage of fragments containing iron enrichment. Although this might indicate the redistribution of iron from a decomposed object or piece of slag, it is more likely that it is an entirely natural form of iron deposition (as a crude form of bog iron ore).

Interpretation

Iron smithing residues

The interpretation of smithing residues at assessment stage, without any form of instrumental analysis, relies largely on consideration of the weight-frequency distribution. In this case, the two intact SHCs were

both of a small size (236g and 304g) typical of the SHCs produced during blacksmithing (the working of iron into artefacts or the repairing of iron artefacts). This size would indicate the loss of at least 120g to 150g from the workpiece during a single work period. This is typical of the product of light general forge work.

The two larger SHC fragments are indicative of rather heavier or more persistent activity in the forge. This might include busy forges with extended work periods as well as specific 'lossy' tasks (such as those rich in forge welding. Larger SHCs are also typical of the style of smithing undertaken in the early medieval and medieval periods. Given the extremely small size of the sample it would be unwise to over-interpret the archaeometallurgical evidence, but it is likely that two fragments of SHCs both derive from original cakes of less than 1000g, which within the early medieval or medieval periods in Ireland would be compatible with an origin in blacksmithing rather than in bloomsmithing (during the process of iron production). If the contexts from which these items derive were to be demonstrated to be of Iron Age date, then such a weight would be more likely to be indicative of bloomsmithing.

Clinker

Much clinker from archaeological sites is derived from the boilers of the steam engines employed agriculturally in the late 19th and early 20th centuries. Some clinker may represent much earlier use of coal. In this instance, one of the contexts that yielded clinker (context (18) Area 5) produced a radiocarbon date (FTMC-MH54-15, *Triticum,* AD 1265 – 1304 and AD 1366 – 1382) which is compatible with the documentary evidence for the medieval use of coal (e.g. coal is listed amongst taxable items at Fethard in 1292, Cosgrove 1987, 238; and in 1322-3 a ship carrying coal was detained in Dublin, O'Neill, 1987).

Coal has been noted from probably medieval archaeometallurgical assemblages from Carrickmines Castle, Co. Dublin (Young 2006; Young & Kearns 2010; Young 2011), Greencastle, Co. Down (Young 2010) and Balbriggan (Young 2016), but in one of these cases is the date of commencement of coal use particularly well-constrained.

Further work

The assemblage.is sparse and therefore not suggestive of metalworking having taken place (at least regularly) within the confines of the investigated area. No further investigation of these materials is recommended.

Unless any of the metallurgical residues occurs in a context of unexpected provisional age (e.g. a fragment of iron slag in an earlier prehistoric context), then the assemblage can be considered as of low importance for retention.

References

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Table 1: summary catalogue of materials. Weights in g. Dimensions of SHCs expressed as L x W x D (depth of bowl).
Assm. = assemblage, SHC = smithing hearth cake,

site		context	sample	wt.	no.	description
17E0590	Area 1	c[21]4	s#10	236	1	neat dense SHC, 70x90x25mm, slightly dished topped; vesicular, rusty, fine charcoal impressed into base, rotten
17E0590	Area 1	c[3]6	s#14	4	Assm.	collection of small fragments of rusty material with dark (probably organics/charcoal) soft areas and some harder tiny patches or veins. It is not entirely clear whether this iron oxide material has formed from a piece of rotten slag, or more likely is a bog iron ore.
17E0590	Area 1 slot D	c[10]28	s#17	124	1	large angular block of strongly bloated grey material with pink surface. One deformed side with adhering white shale fragments. Bloated stone - probably from clinker
17E0590	Area 1	c[43]70	s#38	32	4	fragment of gravely concretion cored on rotten iron slag, also has abundant charcoal
17E0590	Area 1	c[99] 101	s#40	14	2	rusty slag fragment with little matrix and abundant charcoal fragments
17E0591	Area 2	c1	s#4	6	1	shale-rich clinker, locally grey slaggy, but maroon surface and mostly shale
17E0591	Area 2 E slot section B	c6	s#3	274	1	large fragment from the base of a thin crust SHC, upper surface of fragment is highly vesicular, crust mostly up to 10mm thick, but thickens into basal toolmark, 5mm wide, 20mm high, a few iron-rich clast in vesicular slag
17E0591	Area 2 E slot section B	c18	s#27	304	1	65x95x50mm, irregular shaped block, probably an SHC folded through almost a 90-degree angle
				690	1	120x80x50mm broken fragment of thick crust SHC; top irregular micro-dimpled, porous and coarsely crystalline, probably missing its upper surface; base rough in rounded neat surface; internally dense vesicular slag with tubular vesicles; base shows concealed iron fragments on use of metal detector
17E0591	Area2 sieving	c18	s#27	2	1	coalesced lobes of vesicular grey slag with rough surface, locally rough surface, probably a clinker
17E0591	Area2 sieving	c29	s#1	48	1	highly vesicular dense grey slag with void of up to 30mm, well-formed base with fine dimples and one ceramic clast, but of generally non-wetted appearance, shiny, top not preserved but upper most part show some smooth lobate surfaces on a small scale.
				2	2	tiny dense flowed grey slag blebs
17E0578	Area 5	c18	s#1	0.17	8	5 tiny fragments with green copper corrosion products, 1 dark slaggy fragment, 2 ferruginous fragments.
17E0578	Area 5	c18	s#1	4	9	7 fragments of clinker, 1 burnt coal piece, 1 small bone
17E0578	Area 5	c39	s#8	2	2	very irregular fragments of silicified limestone

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