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Evaluation of Archaeometallurgical residues from the M7/M8 Contract 1: Leap 1 (E2131)

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Abstract

Leap 1 yielded 1.3kg of archaeometallurgical residues, all of which were slags from the basal pits of non-slag tapping (slagpit) iron smelting furnaces. The material derived from four separate features, only one of which (F007) was identified as a furnace during excavation. Scorching within the basal pits of slagpit furnaces normally decreases rapidly downwards, so given the apparently high degree of truncation (F007 is described as 100mm deep, whereas slagpit furnace pits are typically 200-400mm deep), it is possible that one or both of the other circular pits bearing smelting slags (F010, F011) might also be a smelting furnace.

For the one fairly certain smelting furnace, the pit diameter is moderately large at 400mm, a feature seen in some other Iron Age furnaces.

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Methods

All investigated materials were examined visually, using a low-powered binocular microscope where necessary. All significant materials were summarily described and recorded to a database (Table 1). As an evaluation, the materials were not subjected to any high-magnification optical inspection, nor to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

Results

The catalogue of archaeometallurgical residues is presented in table 1.

The four samples form a relatively homogeneous set of iron smelting residues. They are all relatively small pieces, including blebs and prills as well as more "sintery" fragments, apart from material from F005, which included a substantial cross-floor flow. The blebs, flows and spheroids would all fall into the category of flow slag, that is to say slag which shows indications of having flowed inside the furnace, but which has not been tapped from the furnace.

The deposits in the base of a slagpit furnace comprise three related materials, all seen in these samples. Firstly the slag generated around the bloom will locally drip through the fuel bed into the pit, solidifying into small prills and dimpled spheroids ("coffee-bean" spheroids). Secondly unreacted charge, particularly ore dust, may fall to the base of the furnace, especially early in a smelt, and accumulate to form a granular, sinter-like material on the floor. Thirdly, on the blowing side of the furnace the slag flow may be stronger and more persistent, leading to larger downward flows, which may reach the floor before solidifying and be able to flow laterally across the floor of the slagpit. These strong downward and cross-floor flows may, as in the case of material from F005, preserve moulds of the large pieces of wood with which the pit was packed prior to smelting.

The four samples are very similar in the types of slag they contain, but differ slightly in the size of the fragments. It is unclear whether this is a genuine difference or merely one of sampling.

The small size of the flow slag pieces would be typical of material from low down in the slagpit. Commonly such material, when found without other slag types, may be indicative of slag remaining in the furnace bottom after a partial clearance. These assemblages may be indicative of in-situ furnace assemblages.

Interpretation

There are three 14C dates from this site, two on alder charcoal (F3 Cal. 200BC -AD10 and F6 50BC – AD90 and AD100-AD120) and one on oak charcoal (F4 390BC – 180BC).

There are a growing number of slagpit furnaces with 14C dates indicating an Iron Age date. Many of these, like F007, have a moderately large diameter (taken here as 400mm or more):

Cloncollig Co Offaly All of the listed material occurred within the fills of a single pit (007). The pit is described as being 0.57 x 0.60m and 0.32m deep. A 14C date on oak charcoal from the basal layer of the furnace gave a date of 261 – 94 cal BC (Young 2008b)

Cherryville 12 (Co. Kildare; 01E0955): 320-200 cal BC. Four slagpits 0.45 - 0.50m diameter. (Young 2008a)

Newrath Site 35, N25 Co. Kilkenny: 400-200 cal. BC and 350-40 cal. BC (Eogan pers.comm. 2006)

Morrett D, N6 Co. Laois: 170 cal. BC-30 cal AD and 770-410 cal. BC for charcoal pits, 370-110 cal BC and 400-200cal BC for ringditches. (Young 2005)

Adamstown 1 (Co. Waterford): Slagpit :0.53 x 0.47m and 0.15m surviving depth. Total cake weight of 18.5kg, no associated small material (Young 2006)

Tullyallen 6 (Co. Louth): Slagpit: 0.47 x 0.50m and 0.18m deep. Cake weighed 13.1kg, 4.4kg of prills below cake (26% of assemblage). Total slag weight of 17.5kg (Young 2003)

Clonrud 4;The working dimensions of the two slagpits (0.41m x 0.39m and 0.46m x 0.41m) are moderately large. The two dates together do however indicate that these structures are probably Iron Age, very likely at some date within the 4th-1st centuries BC (S6 is calibrated as 790BC to 500BC (93.5%) and 440BC to 410BC (1.9%); S5 is calibrated as 360BC to 90BC (95.4%)) (Young 2008e)

Derryvorrigan 1 (not only has paired furnaces, but also they appear to have working diameters of approximately 0.40m, so providing a very close parallel for the Clonrud 4 examples (Young 2008d).

Other Iron Age sites appear to have smaller diameter furnaces. Those at **Derrinsallagh 4** (Young 2008c)appear to be mainly approximately 0.30m working diameter (ignoring all arguments about whether any lining is present within a broader cut). The example with a furnace arch that was excavated in detail (Young 2008f) was rather irregular in plan but was approximately 0.36m diameter at the level of truncation (although slightly wider towards the base because the pit sides were overhanging).

Besides this comment that the furnace fits in with other examples of a similar age, the depth of truncation and the sparse residue assemblage means little detail can be added.

Evaluation of potential

Further analysis of these residue assemblages would be of little benefit at present.

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context	sample	context weight	no.	weight	notes
F2	S1	128	25	128	flow slag in mainly small blebby dense prills, yellow brown colour
F3	S2	324	42	305	dense prilly anastomosing flows
			8	18	dull sintery slags
			1	1	coffee bean spheroids
			1	2	stone
F5	S4	650	10	564	probably a single fragmented cross floor flow with moulds of large wood pieces
			27	86	small fragments of dense flow slag
F6	S5	98	28	82	dense blebs and flow lobes
			11	14	dull, sintery slags
			3	2	coffee bean spheroids

Table 1. Summary catalogue

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