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SITE 196

ANCIENT MONUMENTS LABORATORY REPORT NO 4539

EXAMINATION OF SOIL SAMPLES FROM YORK MINSTER

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March 1985

The material examined (AM 841156) consisted of 13 soil samples and 1 tile from sub-Roman contexts at York Minster. All of the samples were from in or near hearths. They were examined to determine whether there was any evidence that they were connected with industrial processes. All the samples were examined visually and using low power microscopy. They were also analysed elementally using energy dispersive X-ray fluorescence (XRF). The soil samples were also tested for the presence of magnetic hammer scale.

AJ61 Iron-rich soil with a few charcoal fragments. Lightly burnt under oxidising conditions, but the burnt lumps lose their coherence in water.

PE138 Soil containing a high proportion of sand and some ash.

PE156 Soil with ash and sand and lightly oxidised fired clay.

PE137 Soil with charcoal, ash, sand and calcareous and ferruginous lumps.

AJ61a Soil with charcoal, lightly oxidised fired-clay, and probably some ash. The lightly fired-clay lumps disintegrated in water.

PF0576 Soil containing ash, charcoal and stone.

XK345 Lightly oxidised fired clay with disintegrated in water.

PE155 Lightly oxidised fired soil, probably containing some ash. The fired soil lumps disintegrated in water.

PE130F An oxidised fired ceramic tile, with some porosity. It was not vitrified and was not very refractory.

XK337 Sand-rich soil with a small amount of charcoal and ash. Lead was detected at significant levels, but no metallic lead was found.

XK294 - Sample 6 Very sandy soil with a high proportion of charcoal and ash. A high level of lead was detected in the sample, but no metallic lead was found.

XK274 Sand-rich soil with some ash and charcoal and lightly burnt clay. A low level of lead was detected but no metallic lead was found.

XK294 - Sample 8 Essentially sand, but with at least one small dribble of lead. A low level of lead was detected in the sand.

XK286 Dark soil with a very high proportion of ash and charcoal and some hammer scale, which is flakes of a magnetic iron oxide (magnetite) produced during blacksmithing.

Discussion

XK286 The presence of significant amounts of hammer scale in the sample indicates that it includes blacksmithing waste. This is consistent with the high level of iron detected in the sample by Dr Ron West of the Royal Military College of Science, Shrivenham. As the sample is considered to be "sweeping from the immediate area" (Derek Phillips, letter) the blacksmiths forge was presumably in the area from which the sample was taken. The presence of coal dust could not be confirmed, but charcoal was present and it seems more likely that charcoal was the fuel used.

XK294, samples 6 and 8 The presence of lead in sample 6 was consistent with Dr West's result, although he also detected tin (0.06%). Tin was not detected in the present work, but the technique used was probably not sufficiently sensitive. A low level of lead was detected in sample 8 whereas Dr West found that this sample was uncontaminated except for zinc. Zinc may also have been present at a level below the detection limit of the method used in the present work, but the inconsistent results for both methods may be due to inhomogeneous distributions around the rim of the pit from where sample 8 was taken.

Overall the result strongly suggest that the hearth was used for melting lead. The conclusion was further supported by the presence of a dribble of metallic lead in sample 8, and it confirms Professor Tylecotes opinion that the hearth was used in melting non-ferrous metals. Dr West's results for sample 6 suggest that some tin was present in the metal being melted, however the presence of zinc in sample 8 (assuming that it was at a low level) is likely to be contamination unconnected with the metalworking activities.

Several activities involve molten lead but, in the absence of other evidence, the most likely is the melting down of scrap lead (perhaps associated with the removal of the roofs of the nearby offices?). Tin could be introduced accidentally in the form of solder, which would explain its presence in sample 6 (Dr West's analysis).

AJ61 and AJ61a No evidence was found that these samples were associated with any metalworking activity. The slightly enhanced zinc and iron concentrations found on the underside of tiles from this hearth are not sufficient, in my opinion, to suggest that the hearth was used in metalworking. Both zinc and iron are present in the soil in which the tiles were buried and it is possible that the levels detected were due to contamination from the soil. It is not, of course, impossible that the hearth was used in metalworking, but the results do not provide any evidence for it.

PE130F, PE137, PE138, PE155 and PE156 There was no evidence that the 'PE' hearth was used in ironworking or non-ferrous metalworking. It seems more likely that Professor Tylecotes view that it was used in malting or corn dying is correct.

PF 567 No hammer scale was found in this example, however this does not preclude the possibility that the culvert was used for quenching iron.

XK274, XK337 and XK345 These samples will not be discussed as they should, apparently (Derek Phillips letter), be ignored.