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Ancient Monuments Laboratory
Report 200/88

EXAMINATION OF AN INLAID ROMAN DAGGER SHEATH-PLATE FRAGMENT FROM OLD MARKET HALL 67-9, CHESTER.

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Summary

Examination of an iron sheath-plate fragment under the binocular microscope suggested that it was inlaid with niello. Analysis of the inlay by energy dispersive X-ray analysis and by X-ray diffraction failed to confirm the suspected niello. The inlay was silver-based but had corroded to silver chloride. Originally it may have been a metallic silver or a silver niello inlay.

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EXAMINATION OF AN INLAID IRON ROMAN DAGGER SHEATH-PLATE FRAGMENT FROM OLD MARKET HALL 67-9, CHESTER

Object number

OMH67-9 YS/SW (YWU) 1346
Lab. no. MANAM 2816

Description of the plate

X-radiography (Pl 1) revealed that the iron plate was corroded but the design of the inlay was clearly visible, although at some areas, corrosion pressures had displaced parts of the inlay. Rivet-holes for the attachment to an organic sheath were visible also but there was no evidence for the organic sheath. The construction and dating of Roman dagger sheaths is discussed by Scott (1985, 154-6). Plate 1346 is a centre fragment of a Type B sheath.

Description of the inlay

Selective removal of surface accretions revealed some areas of the surface of the inlay (fig 2, top of layer b). This was lustrous, soft and waxy, grey with some beige-white waxy deposits, and was proud of the apparent original surface of the iron plate.

A sample taken deeper into the inlay cleaved off the outer inlay layer (fig 2, layer b) to expose a black compact layer of even colour and density (fig 2, layer a). The outer surface of this layer (interface between a and b) was slightly proud of the iron plate, essentially flat with some preservation of original surface blemishes (scratches). This was probably the 'original surface' of the inlay, now raised due to volume expansion resulting from corrosion processes within the inlay.

In attempts to identify the inlay, samples were taken by the three conservators who contributed towards the investigative conservation of the plate. Removal of accretions was kept to the minimum since it was felt that unnecessary intervention would damage the fragile inlay and weaken the iron plate. The design on a severely corroded plate such as 1346 is best studied from X-radiographs. About one tenth of the inlaid surface was exposed in order to check that no other metals, or enamel, formed part of the decoration.

Analysis of the inlay

Sample 1

A sample described as a grey waxy deposit from the centre of the plate was submitted for scanning electron microscopy with energy dispersive X-ray analysis (SEM-EDX) by Julie Vint, 1985. At this stage the inlay had not been exposed and the sample description fits the superficial corrosion products above the inlaid areas.

Detected large amounts of silver and chlorine and trace amounts of sulphur and phosphorus, (plus silicon and aluminium).

Samples 2 - 4

Two samples of iron corrosion products and one sample of the outer corrosion layer from the inlay (layer b); submitted for X-ray diffraction analysis (XRD) by Adrian Tribe, 1987.

2 Outer iron corrosion products - goethite [FeOOH], natrojarosite [$NaFe_3(SO_4)_2(OH)_6$], (plus quartz).

3 Inner iron corrosion products - goethite, magnetite [Fe_3O_4], (plus quartz).

4 Inlay, layer b - silver, chlorargyrite [AgCl], (plus quartz and calcite).

Sample 5

A sample of the inner layer of inlay (layer a); submitted for SEM-EDX analysis by Vanessa Fell, 1987.

Detected large amounts of silver and chlorine with trace amounts of gold and iron.

Discussion

The iron salts are typical iron corrosion products from an oxidising burial environment. Sulphur from niello mixtures is known to convert to chloride in oxidising burial conditions; metallic silver could be expected to form a sulphide and/or chloride.

Analysis of niello inlays on non-ferrous metals and alloys (La Niece 1983; Oddy et al 1983) has suggested that Roman niello was composed of silver sulphide or copper sulphide whereas silver-copper and silver-copper-lead sulphide mixtures were used later.

Analysis of 1346 plate indicates that the inlay was silver-based. Subsequent corrosion has converted this to silver chloride. The presence of trace amounts of gold is not significant; this could have been present in the original ore, or have arisen

during purification or later re-use of metal. As may be expected, sample 5 is less contaminated with iron corrosion products and elements from the burial environment (calcite, quartz) compared with sample 1. The sulphide detected in sample 1 could be traces of an original niello or may be a corrosion product from silver, or iron (as sulphate), or unrelated.

Conclusion

Although examination of the inlay under the binocular microscope suggested the possibility of niello, this was not confirmed by analysis. The inlay was silver-based (unalloyed, with trace amounts of gold) and may have been either metallic silver or silver niello.

Acknowledgements

Mr Ian Brough, Department of Metallurgy, University of Manchester for SEM-EDX analysis (samples 1 and 5).
Dr C.M.B. Henderson, Department of Geology, University of Manchester for XRD analysis (samples 2 - 4).
Adrian Tribe for the X-radiograph shown as Pl. I. Adrian, and Julie Vint for their investigations of the plate.

References

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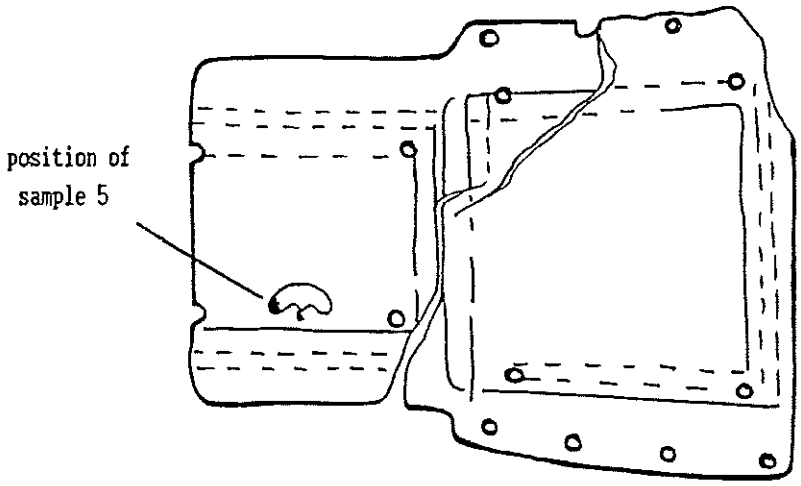

Fig 1. Outline of the sheath-plate fragment and inlay, showing position of rivet-holes and sample 5. Drawn from X-radiograph. Scale 1:1.

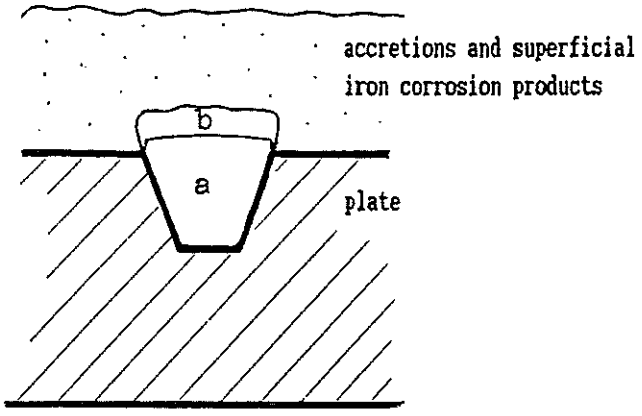

Fig 2. Hypothetical cross-section of an inlaid groove. Scale much exagerated.

PLATE I

X-radiograph of the sheath-plate fragment