UCL INSTITUTE OF ARCHAEOLOGY - CONSERVATION FOR ARCHAEOLOGY AND MUSEUMS

CONSERVATION TREATMENT RECORD

Lab number: 8785
Brief description: copper alloy brooch(es)
Name of owner: Tim Schadla-Hall
Owner's number:

Name of student: Luciana Carvalho
Date allocated: 19/01/12
Date completed: 24/05/2012

Material type : Copper Alloy

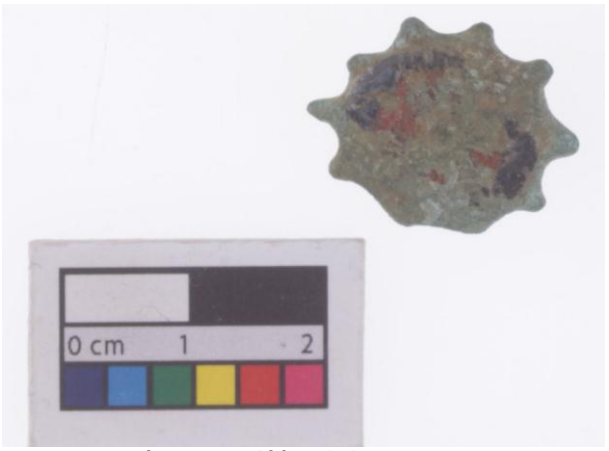

Figure 1a – Object 8785: Fragment 1

Figure 1b – Object 8785: Fragment 2

	Dimensions (cm)	Weight (g)	
		before	after
Fragment 1	2.1 x 0.4	2.85	2.91
Fragment 2	4.0 x 1.0 x 0.5	3.26	3.25

Technology

Fragment 1 was manufactured in a mould - the pin's hole and recesses for the red and blue/black enamels (Bayley & Butcher 2004, 46) tooled in afterwards. Enamel is a vitreous substance that has been fused onto a metal surface. It is applied as a dry frit and fused in an enamelling oven.

Fragment 2 was probably wrought given its thickness and uneven surface.

Pre-treatment condition

Fragment 1 (Figure 2) is a 10-lug flat disc hinged brooch decorated with concentric rings pattern of red and dark blue/black enamel - most of it missing - with a relief dot in the centre. The brooch's pin (missing) was originally on the back between two lugs .The lugs show various degrees of abrasion with the least abraded circled green on Figure 2a. Two of the lugs have almost disappeared, probably being the area exposed to the elements.

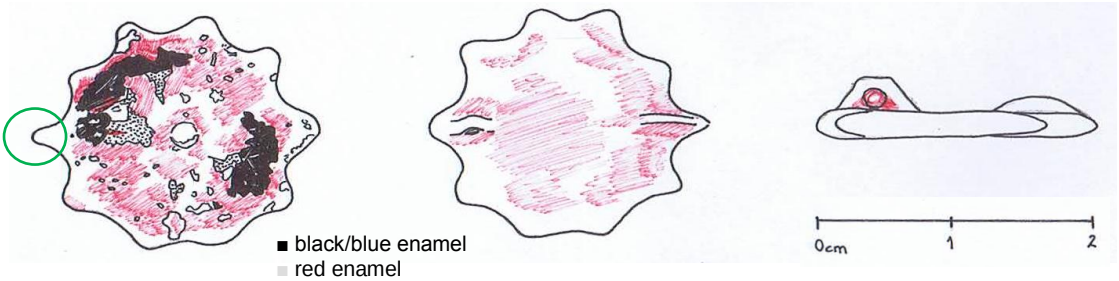

Figure 2 – Fragment 1

The fragment is lightly covered in soil (Figure 2) and corrosion products in various shades of green (figure 3a) mostly hard. At the back the corrosion layer appears more uniform, even appearing in crystalline form (figure 3b). The enamels have suffered fragmentation in the past but are now stable and firmly attached to the metal core. These enamelled areas are the original surface of the object. Below this surface there are some shallow craters filled with a powdery green corrosion (circled yellow in Figure 3c). The object as a whole has a matt appearance, except the enamelled areas which are vitreous, thus indicating the absence of a protective coating.

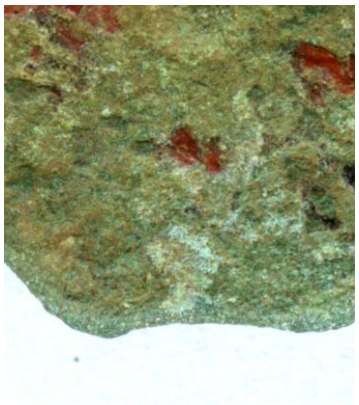

Figure 3a – Fragment 1 front: corrosion products in various shades of green

Figure 3b – Fragment 1 back: corrosion products in crystalline form

Figure 3c – Fragment 1 front: detail of enamelled surface

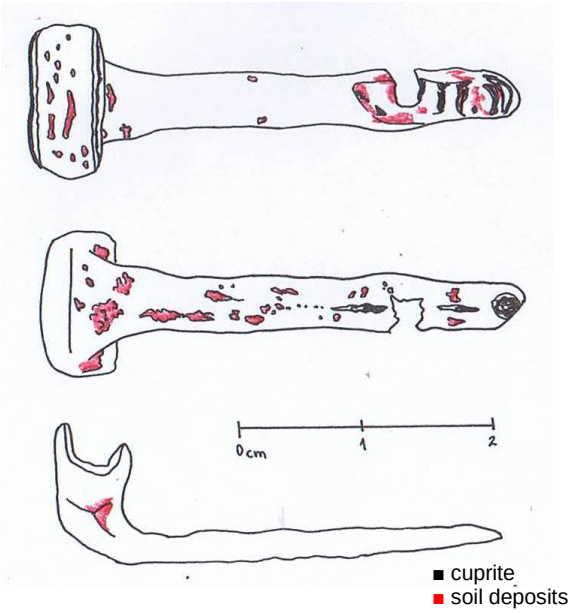

Figure 4 – Fragment 2

Fragment 2 (Figure 4) resembles a "T"-shaped brooch. There are soil deposits on the surface of the fragment over a layer of light green corrosion, some of which soft. Underneath there is a cuprite layer some of which exposed along the midrib (Figure 5a). The original metal is still visible where the cuprite layer has been lost (Figure 5b). Before the tip of the object there is an area of material loss (Figure 5c), possibly a broken side of a rivet hole. In its vicinity there are remains of a dark metal(s), possibly soldering.

Figure 5a- Fragment 2: cuprite layer exposed along the mid rib *(circled red)*

Figure 5b – Fragment 2: exposed metal *(circled red)*

Figure 5c – Fragment 2: area of material loss *(circled red)*

Significance

Fragment 1

Historical: During the Roman Period the most common object to be decorated with enamels was the brooch (McIntosh 2009, 4). Red was the most popular colour with yellow and blue enamels added to the palette in the beginning of the first century AD and green, orange, black and white being included in the second century AD (Butcher 1976, 43 in McIntosh 2009, 5). Thus this brooch could be dated to the 1st-2nd centuries AD.

Aesthetic: The object is a very delicate piece of jewellery decorated with red and blue/black enamels rings with a centre dot with smaller dots encircling it (revealed after treatment). The ring of dots pattern is often found in Disc brooches but seldom in brooches with peripheral lugs (Hattatt 1987, 173).

Scientific: Analysis of the copper alloy and enamels compositions.

Fragment 2

Scientific: Analysis of copper alloy and soldering compositions.

Historical: A copper alloy finds specialist may identify the piece in the future.

Both fragments contribute to our understanding of the history of the village of Thwing in Yorkshire, where they were found.

References:

Hattatt, R., 1987. *Brooches of Antiquity: a 3rd selection of brooches from the author's collection.* Oxford: Oxbow Books

McIntosh, F., 2009. *A study into Romano-British enamelling – with a particular focus on brooches*. The School of Historical Studies: Postgraduate Forum: Newcastle University: E-Journal Edition 7

Examination/ Tests / analysis

Test Type	Materials/Techniques	Results
Examination	UV light	Neither fragment contains substance that fluoresces under UV-light
	Metal pin	Some of the corrosion products is quite soft and powdery. However they cover very small and shallow areas of the object
	X-Ray	The fragments' metal core appears to have been preserved.
Dry Cleaning	Wooden stick	Remove loose soil and soft corrosion
Wet Cleaning	Acetone, ethanol and industrial methylated spirit applied with cotton swabs	Some of the soil and corrosion have been removed with ethanol and IMS
Fragment 1: Enamels Composition	Scanning Electron Microscopy	Mostly inconclusive given the low concentration of metal oxide colourants. However the blue/black enamel had traces of manganese which was used to make black (Hess & Wright 2005, 17)
Fragment 2: Soldering Composition		Confirmed the presence of tin (Sn). Whilst Roman solders are usually composed of a tin-lead alloy, tin-rich solders (80-100% Sn) have been found in 4th-5th century sites in Britain (Lang & Hughes 1991 in Humpston & Jacobson 2004, x).

References:

Hess, C. and Wright, K., 2005. *Looking at glass: a guide to terms, styles and techniques.* London: Victorian & Albert Museum

Humpston, G. and Jacobson, D.M., 2004. *Principles of Soldering.* United States of America: ASM International

Justification for treatment

Fragment 1: Soil and corrosion hinder the full appreciation of the object's enamelling decoration. The object is stable but handling and storage in an uncontrolled environment may promote new and/or existing corrosion processes

Fragment 2: The object is mostly stable. The soil deposits and soft corrosion layer may be covering features of the object that could enable its identification and/or increase its aesthetical appeal.

Cleaning

Soil remains were softened with ethanol applied with cotton swabs and removed with a wooden stick. Soft corrosion was dislodged with a wooden stick and picked up by cotton swabs immersed in acetone.

Stabilisation

Not required.

Reconstruction / repair

Not required.

Loss compensation

Not required.

Other

Both fragments received two coats of 5% w/v Paraloid (ethyl acrylate copolymer) in toluene, followed by a coat of microcrystalline wax diluted in white spirit.

Packaging

Each fragment was mounted flat onto a padded Plastazote (polyethylene foam) sheet wrapped with Tyvec (spun-bonded polyethylene). The mount was placed over a perforated polyethylene bag containing silica gel granules and places inside a polyethylene box with tight fitting lid with tissue paper to provide extra cushioning. Each box is labelled with a picture of its contents and the object's number. The boxes are fastened together by a Melinex (polyester film) ribbon.

Condition after treatment

Fragment 1: the brooch's decoration of small dots encircling the centre dot has been revealed (Figure 6). A tentative recreation of the object's original features is shown on Figure 7. The enamels appear much more vivid after the removal of soil/loose corrosion. The object as a whole is darker due to the protective coating.

Figure 6- Fragment 1 after treatment

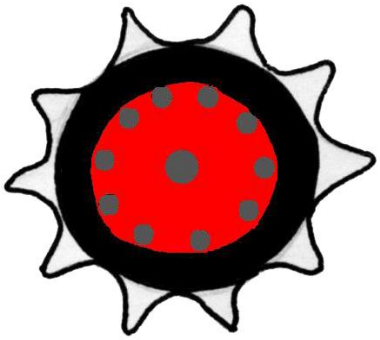

Figure 7- Fragment 1 Reconstruction

Fragment 2: loose corrosion has been removed to expose the midrib thus improving its aesthetic appeal (Figure 8). A tentative recreation of the object's original features is shown on Figure 9. The object is darker than before the treatment due to the protective cover.

Figure 8- Fragment 2 after treatment

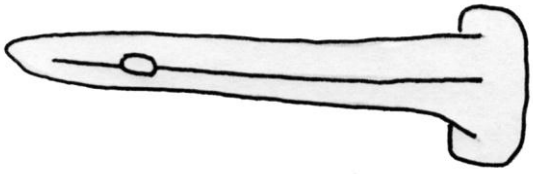

Figure 9- Fragment 2: Reconstruction

Student evaluation of treatment

The treatment undertaken was fairly simple. However the fragments are very interesting objects to work with, in particular the scientific analysis and its limitations. I expected the enamels's analysis to be more conclusive, although they testify to the complexities of ancient glass colouring chemistry.

Recommendations for further care Anyone handling the objects should have clean and dry hands or be wearing gloves. The boxes should only be opened when necessary to preserve their desiccated environment. When the silica gel granules turn from orange to blue they must be reconditioned. This can be done by placing them on a baking tray in a pre-heated (100^{o}C) fan-assisted oven for 1 hour.	
Photography / other illustrations ***Colour slide/digital/ print***	Other documentation (analytical, object report, etc) X-Rays, SEM reports
Student signature	Date
Staff signature	Date