K 1226: Small gold rectangular plate or fitting with cloisonné garnets and blue enamel glass inlay

Conservation Report

See end for update 19/11/15

Before **After** **Scale 2:1**

Conservation started: 21.9.10 **Finished:** 23.9.10

Digital Photographs: Before treatment (b.t.) 21.9.10 – DSCN 4944-46 and 4952-4964, IC800042-57 and 59-72; during treatment (d.t.) 22.9.10 – IC800073-115; after treatment (a.t.) 23.9.10 – DSCN 5004-5016 and IC 800121-143.

The overall photos were taken with a Nikon Coolpix 4500 camera and a daylight lamp. The detailed photos were taken with a Leica stereo microscope with LED lighting at magnifications of 10-40 X.

Dimensions: 15.3 mm (l.) x 12.3 mm (w.) x 7.0 mm (d.)

Weight: 2.14 g with the soil before treatment

Number of garnets: 16 geometric cells with gold foil backing with a 'waffle' pattern – 3 split or cracked, 1 with a hairline crack, 3 slightly sunk, 3 slightly raised and 0 loose.

Other decorative material: 1 central square cell of blue 'millefiori' enamelled glass – light to medium blue, with I fragment of darker blue glass visible. There is also 1 circular glass fragment embedded in the soil on one side of the plate that appears to be dark blue-green in colour.

Catalogue number: 495

Description:

Visual and microscopic examination using a Leica stereo microscope with LED lighting and 10 – 40 X magnification

Small gold rectangular plate or fitting inlayed with 16 cloisonné gold foil-backed translucent red stones that appear to be garnets, in a symmetrical, geometric design with a central square of blue 'millefiori' enamelled glass. The gold cell walls are ca. 0.5 mm.

The garnets vary in colour from a translucent red to a darker red-brown. The gold foil backing has a geometric grid like pattern at different orientations or angles and appears to be present in all 16 cells.

There are small areas of loss and dark spots in the gold foil in all 16 cells, and it is difficult to see the foil clearly in the darker red-brown garnet cells.

The central enamelled glass inlay is mainly light to medium blue, but there is one fragment of a darker blue glass embedded in the cell adjacent to one edge.

The front surface of the plate is partly obscured by soil and all four sides and the back surface are completely covered with compact soil.

There is a small circular fragment of dark coloured glass, ca. 1.0 mm in diameter, and possibly blue-green in colour embedded in the soil on one side of the plate. This has been called 'side 2' in the conservation photos.

On the same side of the plate as the small circular fragment of glass, there is an area of gold exposed on which is recessed from the edge of the front surface of the plate and suggests that the plate could have been fitted into a larger object.

Condition:

Visual and microscopic examination using a Leica stereo microscope with LED lighting and 10 – 40 X magnification

The small rectangular plate or fitting is in a deteriorated condition, in particular the central square cell with the blue enamelled glass inlay. All four sides and the back surface are completely covered with granular, compact soil from the burial context, which contains small round inclusions up to 0.5 – 1.0 mm, such as quartz. These types of inclusions are abrasive, particularly to the gold surfaces since quartz has a hardness of 7 on the Mohs hardness scale, while gold has a hardness of ca. 2.5 – 3.0 and glass has a hardness of 5.0-6.0. Garnets have a Mohs hardness of ca. 6.5 – 7.5, and should therefore be less susceptible to scratching from the hard, granular soil than the gold or glass.

Front:

Blue enamelled glass inlay:

The blue enamelled glass inlay is the most deteriorated part of the plate and has cracked and fractured into numerous fragments that appear to be held in place by the soil deposits on the surface, particularly in the central part of the cell. This deterioration appears to be old and due to the burial context, as the soil is overlying the fragmented surface of the enamelled glass, and the edges of the cracks are covered in soil.

The colour of the glass enamel varies, from light to medium blue. This could be due to the deterioration process while buried, as well as the conchoidal fractures and the extensive cracking. In one area adjacent to a 0.5 mm transparent, almost rhomboid-shaped fragment or inclusion in the soil the glass appears slightly transparent, with very little blue colouring.

The surface of the enameled glass is uneven and disrupted by the cracking and splitting, which imparts a crushed or shattered appearance to this cell. There are numerous fragments jutting out of the surface at different angles, some of which are embedded in the soil on the surface.

One of these fragments is located at one edge of the cell and is a darker blue colour, which raises the question of whether it was originally part of the central blue inlay. However there are scratches in the surface of the dark blue glass fragment that are in line with scratches on adjacent lighter blue glass fragments, which suggest that it could be part of the central cell.

Garnets:

The 16 foil-backed cloisonné garnets on the front surface appear to be secure, and are relatively complete. There are 3 cracked or split garnets, 1 with a hairline crack, 3 raised up slightly from the cell walls and 3 sunk slightly below the cell walls.

There are conchoidal fractures in 2 garnet cells, and gaps or small areas of loss filled with soil in the garnets that have cracked. As a result of the cracks and breaks the surface of these garnets is uneven.

There are fine scratches in the surface of the garnets, which appear to be old and due to general wear. However the abrasive soil deposits on the front surface, as mentioned above, could have also caused some scratching.

The gold foil backing under the cloisonné garnets appears to be stable, though the soil on the surface of 3 of the garnets made it difficult to see the gold foil clearly before treatment.

During treatment it was possible to see that there are small areas of loss, particularly at the edges in at least 11 of the cells and dark spots in all 16 garnets. In the darker red-brown garnets it remained difficult to see the gold foil backing clearly.

The black deposit on the gold at the edge of 2 of the garnets that was exposed during treatment could be related to the areas of loss in the foil in these 2 cells.

Gold:

The ca. 0.5 mm gold cell walls appear to be intact and stable. There is only one area with a small ca. 1.0 mm gap in the gold dividing wall, and this is filled with soil. The edges of the gold plate are slightly bent downwards and there is a small area of loss at one corner adjacent to one of the cracked garnet cells.

There are numerous scratches in the surface of the gold, particularly on the edges of the plate, and in areas where there are soil deposits. The majority of the scratches are relatively fine, however, there are several deeper scratches on the two ‘long’ edges, which extend 1.0 – 1.5 mm, and a 1.0 mm indented mark on one of the ‘short’ edges. The scratches and abrasions appear to be old as there is soil in the surface.

There are also small areas of loss in the gold surface along the edges, and slight red-brown tarnishing of the gold surface visible in the areas where there are soil deposits.

Sides:

All four sides are covered with the compact, granular soil. The soil is relatively hard and has a rough texture due to the numerous inclusions such as quartz. The size of the inclusions varies up to ca. 0.5-1.0 mm and the colour of the inclusions ranges from transparent to translucent white to brown to dark brown/grey. There are also variations in the colour and texture of the soil matrix in some areas.

There is a small circular fragment of dark coloured glass embedded in the soil on one side, called side 2 in the conservation photos. This fragment is ca. 1.0 mm in diameter and appears to have a worked and polished surface with a slightly carinated profile. It is incomplete, with ca. one quarter missing from one side. The surface appears to be slightly opaque on one side, but this could be due to a thin layer of soil. The shape of this glass fragment suggests that it may be a part of an inlayed surface.

Adjacent to the small glass fragment is an area of exposed gold that appears to be part of a recessed edge, which suggests that the plate could have been fitted into a larger object.

The other three sides are completely covered in the compact, granular soil, with a depth of 5.0-6.0 mm. Therefore before the investigative cleaning treatment it was not possible to say what these sides looked like or assess their condition.

Back:

The back surface is also completely covered with the compact, granular soil from the burial context, with a depth of ca. 5.0-6.0 mm. The surface is lumpy and uneven and slightly higher in the centre. The numerous round inclusions in the soil are clearly visible on the back surface and give the soil a course texture.

There are several fibres caught in the soil on the back surface, one of which is dark grey and the others translucent. These appear to be recent.

Treatment:

Carried out using a Leica stereo microscope with LED lighting and 10 – 40 X magnification

The aim of the conservation treatment was investigative cleaning to remove or reduce the soil deposits on the surfaces of the gold plate to facilitate analysis of the different components.

After discussion with Deborah Cane it was decided to remove/reduce the soil from the entire front surface, and then remove the small glass fragment embedded in the soil on one side and place it in one of the conical polypropylene (PP) sample containers to avoid it becoming dislodged during handling and analysis. The sides and back surface were then to be investigated and the soil layer reduced to give a clearer idea of the form and possibly function of the small rectangular plate.

1. The soil on the front surface was carefully mechanically removed with a combination of a fine thorn held in a pin vice, a cocktail stick with a sharpened tip and a plastic tooth pick with a pointed tip.

Water applied on a fine, slightly damp pure bristle paint brush was used to soften the compact granular soil to help lift it more easily from the surface of the gold, due to the possibility of the inclusions in the soil scratching the gold. Where possible the soil was retained and placed in a small PP sample container.

2. During treatment photos using the Leica stereo microscope with LED lighting were taken at regular intervals to record the different stages of the work carried out on the front surface. In particular photos of a black deposit on the surface of the gold along the edges of two of garnet cells were taken. This deposit could be corrosion, such as preferential corrosion of silver in the gold alloy, e.g. black silver sulphide. Detailed photos of a 'caramel' brown coloured deposit along the edges and in the corners of some of the garnet cells were also taken, as this deposit may be relevant to the way the garnets were secured in the cells.

3. The soil was not completely removed from the front surface to ensure that the decorative elements were not destabilized. In particular the central blue enamelled glass cell was only partly cleaned, and it is recommended that further removal or reduction of the soil from this area is carried out after analysis, so that consolidation of any loose fragments can be carried out at the same time if necessary. During treatment photos of the central blue enamelled glass cell were taken to record the work done.

4. The soil around the small dark coloured glass fragment on one side of the plate was mechanically reduced using a combination of a fine thorn held in a pin vice, a cocktail stick with a sanded tip and a plastic tooth pick with a pointed tip, so that the glass fragment could be removed and placed in a PP sample container. Photos of the glass fragment with a black and white mm scale were taken before and after it was removed.

5. The soil on the edges of the sides was softened slightly using a combination of ethanol and water applied on a fine, damp paint brush, before it was mechanically removed/reduced using a combination of a fine thorn held in a pin vice, a cocktail stick with a sharpened tip and a plastic tooth pick with a pointed tip. This revealed recessed gold surfaces on the four sides, and considerable amounts of green

copper corrosion on the surface in association with what appears to be copper alloy components. Ethanol was used in these areas to soften the soil due to the presence of the light green copper corrosion products and the possibility of active corrosion such as copper chlorides or bronze disease. Photos of the edges on all four sides were taken to record the recessed gold surfaces and the green copper corrosion products.

6. The back surface was investigated by reducing the amount of soil where possible using a combination of a fine thorn held in a pin vice, a cocktail stick with a sharpened tip and a plastic tooth pick with a pointed tip. The soil was softened slightly to aid its removal, using water applied on a fine, damp paint brush. The soil was then collected and placed in a small PP sample container. Small fragments of glass or metal in the soil were collected in a separate PP sample container. These fragments were generally 0.5-1.0 mm in size.

7. The investigative cleaning on the back surface reduced the soil deposit to ca. 2.0 mm and in the process revealed a number of larger fragments of different materials. This included a ca. 1.5 mm (w.) x 4.0 mm (l.) piece of organic material, possibly wood or plant material, protruding areas of gold on one side that turned out to be part of the recessed edge, small fragments of dark coloured glass and a small metal fragment that appears to be copper alloy, adjacent to the edge on one side where there is considerable green copper corrosion. Overlying this copper alloy fragment is a rectangular fragment that could be metal, such as silver. Smaller fragments less than 1.0 mm were collected and placed in separate PP sample containers labelled for the different materials. Photos during this investigative cleaning on the back surface were taken using the Leica microscope to record these materials and the work carried out.

7. After further discussion with Deborah Cane, it was decided to leave the larger fragments of the different materials embedded in the soil on the back surface for possible analysis. A representative area on the surface of the different materials was cleaned where possible for analysis, and photos were taken using the Leica microscope to record the work carried out. After analysis the investigative cleaning could be continued, so that more remedial treatments involving the use of solvents and consolidation could be carried out at the same time as the removal of the soil if necessary.

8. A storage container was made for the small rectangular plate or fitting, using a transparent polystyrene box padded with white polyethylene (PE) foam. The six small PP sample containers were fitted into the PE foam in the storage box, with container no. 1 holding the 1.0 mm circular glass fragment supported with PE foam. The small paper label was adhered to the PE foam directly below the object with dots of Paraloid B72 (45% in acetone, HMG, U.K.). The original paper label and PE ziplock bag were also placed inside the storage box.

Soil pH Test:

A 0.5 g sample of the soil collected from the back surface of the gold fitting during treatment was made into a solution with 10 ml of tap water which had ph of 7. The solution was stirred with a magnetic stirrer for several minutes and then the pH was measured using Merck pH indicators in the range 4.0 – 7.0. The results indicated that the soil had a pH of 6.0. The pH indicator for the soil and the control for the tap water were photographed while the pH indicators were wet. As a comparison, the pH of the deionised water in the paper conservation lab was also measured. This proved to be more acidic than the tap water, with a pH of 5.0, therefore the tap water was used in the test. The test is qualitative, and indicates that the pH of the soil adhered to the gold plate is nearly neutral.

Recommendations:

1. The green corrosion products could be tested with a chemical spot test or analysed for the presence of chlorides, as there may be active copper chloride corrosion or bronze disease. If this is the case, a sealed storage and transport container could be made with a relative humidity of less than 40%.

2. Further investigative cleaning of the sides and back surface of the plate after analysis is recommended so that solvents such as ethanol and water could be used to aid the removal or reduction of the abrasive soil deposits. At the same time the different materials uncovered on the back surface could be stabilized/consolidated if necessary during their removal, using tested conservation materials such as Paraloid B 72 in a dilute solvent solution. If there are active copper chloride corrosion products they may also need to be stabilized with a corrosion inhibitor.

Samples collected in small polypropylene (PP) containers:

1: Small circular glass fragment

2: Soil from central cell with blue enameled glass

3: Soil with traces of the black deposit from the front surface

4: Soil from the front surface

5: Soil from the back surface

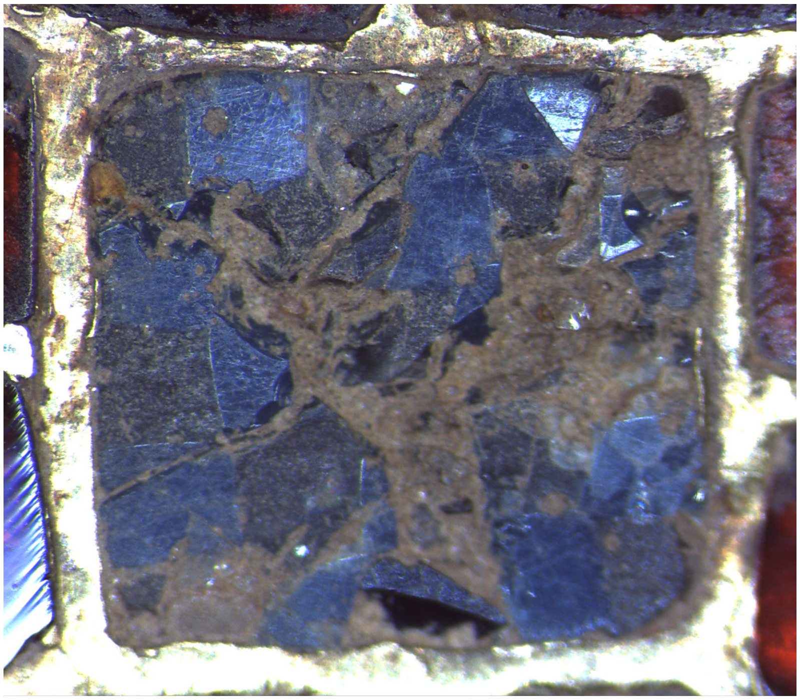
6: Small glass and metal fragments < 1.0 mm in size

Time: 15 hrs including digital photography, microscopy, investigative cleaning, documentation, soil pH tests, new storage container

J.W. - 23.9.10

Addendum:

When Deborah Cane examined the gold fitting after the investigative cleaning in an inverted position and using the Meiji Techno RZ stereo microscope with fibre optic lights, rather than the Leica microscope with the LED lights that was used to treat the fitting, she noticed that the different coloured blue inlay fragments may form a checker board pattern. See the photo below showing the blue inlay cell inverted, with the dark blue fragment at the lower edge rather than the upper edge. The differences in the colour of the blue inlay may therefore be due more to an intentional pattern in the inlay than the deterioration process.



Addendum:

Removed a small amount of soil from front of object in preparation for display. Used thorn mounted in pin vice and worked under 40x magnification. 10/08/2011 CS

UPDATE: 19/11/15 Lizzie Miller

Further cleaning carried out.

Weight before: 1.67g

Weight after 1.59g

Dimensions after:
14.5mm (L)
11.1mm (W)
2.6mm (D) (3.6mm (D) if you include the rivets)

Paper K label removed with acetone to allow access for cleaning. The soil was removed from the back of the object using IMS applied with a paintbrush and a natural thorn held in a pin vice. Microphotographs were taken during cleaning. Plant fibres and a small piece of plant matter/bark was present however this was not felt to be significant and was not required to be retained in situ. The soil etc that was removed was retained in a plastic vial in a box with the object – note some of the soil may be contaminated with Paraloid B-72 from the original K label.

A new paper K label was adhered using 40% Paraloid B-72 (w/v) in acetone applied with a paintbrush.

Following further cleaning the reverse surface of the object was visible. Bright green copper corrosion covers approximately 40% of the surface in a thin even layer. There are for rivet holes, one in each corner, and within these appears to be a dark black coloured metal ‘stump’ of a rivet (silver?).

Samples:

1. Soil from reverse *note this may be contaminated with Paraloid B-72 from old paper K label*