Conservation and Restoration Procedures on Magnate Jewellery of Rudolf Normann von Ehrenfels

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1. Introduction

Presentation's main topic is the conservation-restoration carried out on magnate jewellery of Rudolf Normann von Ehrenfels but the presentation will particularly focus on certain techniques that were used in the course of conservation and restoration process. Primarily, objects will be described as well as the state they were found in.

Magnate jewellery is military equipment used for ceremonial purposes, parades etc. It was never used in real combat, but served to demonstrate power and social class in such occasions. As can be seen from the picture, the jewellery was kept in wooden leather coated box. The box is placed in protective textile cover. Objects are categorised as: buttons, belts, sword and holder.

2. Object description

Cap buckle is made of copper alloys using a casting technique. Front side is adorned with a relief. The buckle is also silver-plated and the silver is well preserved, but at the back there is a minor damage to the coating and a layer of corrosion products.
Small buttons are made of copper alloys. Torching or soldering is a procedure in which metal parts are pieced together using melted metal bonding agent (solders), whose melting point is at least 50°C lower than soldered material melting point.

There are several corrosion products. The state of the buttons varies but they are all generally corroded to a certain degree. Corrosion products are pale green and can be found on the front side. On the inside buttons are full of corrosion products in black colour.

Big buttons are made of copper alloys and some (4 pieces) contain traces of gold coating. Two of them are dented. There are corrosion products in green colour, dirt in dented parts containing whitish and greenish powder, and layers of corrosion and dirt on the inside.

Sword is placed in a wooden holder coated with copper alloys fittings and black cloth. On the upper side holders contain two movable rings used to fasten the sword to a belt. One holder’s side is decorated with flowery motif, while the other is just a smooth surface. The decorated side contains substantial amounts of greenish corrosion parts while these are not present on the other side. The surface is just slightly darkened. The sword is placed in a wooden holder coated with copper alloys fittings and black soft cloth.

Holders contain two movable rings on the upper side. They are used to fasten the sword to a belt. One holder’s side is decorated with flowery motif, while the other is just a smooth surface. The decorated side contains substantial amounts of greenish corrosion parts while these are not present on the other side. The surface is just slightly darkened.

The sword contains two parts – handle and blade. One side of the sword handle is decorated with engraving while the other contains flowery motifs. The blade is made of steel and has one side decorated with emblem using etching technique. The blade is in a pretty good shape, apart from corrosion layers at the handle and blade joint point. The reason for this level of corrosion might me the fact that the handle and blade are not made of the same alloy thus galvanic cell was created. The probability of this happening is not high because the humidity should be over 65%.

Belt is made of five different parts.
Part of the belt is made of cloth and copper alloys. Gold plating is only visible on buckles at the end of the object. Corrosion is mostly present where cloth and metal meet. There is lack of gold plating due to excessive polishing. Dimensions: 42,2 x 2 cm

Part of the belt is made of copper alloys and possible gold plating (it is presumed), present to a greater extent on one part, while completely worn out on the other (probably due to excessive cleaning). Other corrosion can be seen on the inside (green colour, dirt layers in dented parts). Parts of the belt are joined with buckles that enable bending, that is, shape adjustment. On the backside there is a piece of cloth and the rest of it is without corrosion. Middle part of the object is padded with fabric. Dimensions: 22,5 x 2,6, buckle 4,8 cm.

Part of the belt is made of copper alloys and assuming gold plated. Technique used is casting. Fabric is sewed under the metal part. The metal part consists of shackles (10 pieces), 6 larger plates attached with metal ornaments. Unlike the plates, they are bendable to adjust belt parts. On the other end of the object there is a hook attached to shackles. Damage of the product includes black and green corrosion parts, most of the gold plating is lost. Corrosion is present at points where metal and fabrics meet. Layers of dirt can be seen on small parts and on plates' relief. Dimensions: 94 x 3 cm – with holders 3,7 cm.

Belt parts are made of the same copper alloys as the one previously described. As in the other belt parts, there are layers of dirt and corrosion parts. Dimensions: 20,3 x 2 cm and 17,8 x 2,6 cm buckle 4,8 cm.

There are four spurs all together. Some of them are eagle shaped while others have classical spur shape though the wheels have modelled human heads. Ornamented eagles are made of copper alloys in casting process and are generally in a good state with no serious changes caused by the corrosion process (cracks, dents, lack of material...).

There is only a surface change of colour due to darkening. Interesting spurs details are the heads, which will be shown in photos because it might not be clear at this point what we are talking about. Also, there are corrosion products in green colour (possibly cleaning agent residue). Now that the objects have been described, we will describe procedures that were carried out.
3. Gold plating test

This identification method was chosen to test its efficiency and confirm its harmfulness level. Testing using acid tin chloride solution was carried out on these objects.

Recipe for testing:
- 37 gr of sodium chloride melt in 100 ml of distilled water
- 5 gr anhydrous tin chloride melt in 100 ml of water
- Slowly add tin chloride solution 9 ml of hydrochloric acid.
- Finally, add the solution 6 ml of water and stir well.

Testing needs to be done on areas not easily noticeable (e.g. on the back side). We dip a small piece of filter paper in sodium chloride solution and hold it using tweezers attached to minus pole (represents cathode). We place the object for testing on plus pole (represents anode) and briefly tap the surface with soaked filter paper. After holding the filter paper on the object’s surface for around 10 sec. we remove it and add a drop of tin chloride on the filter paper. 9-volt battery is used in the process. If filter paper changes colour from light purple to black (depending on the quantity of golden ions) it is real gold. The object needs to be cleaned after testing.

In the case of magnate jewellery the test was carried out on belt part. Before it was brought to workshop copper alloys belt part was sewn inside out thus enabling us to carry out the test on less visible spot – object’s back side. After adding reagent filter paper changed colour to black.

Test results prove gold plating.
4. Conservation-restoration procedures

4.1. Buckle for the cap

The front of the object was only treated with ethanol and later washed with distilled water.

Removal of corrosion products from the back of the buckle was carried out with a mash of refine chalk (Bologne) mixed with distilled water. The chalk was subsequently washed with distilled water.

4.2. Parts of the belt

The fabric is sewn from the underside of the object being removed to treat the surface beneath it and because it was not desirable to soak it or bring it to contact with the cleaning solutions.

- The first step consisted of disassembling, separating the metal part from the fabric to make it easier to carry out the procedures without the risk of damage to the fabric.

- The second step consisted of removing dust and other dirt with the help of a soft brush and brush, residues of impurities are further removed by distilled water and cotton wool

- In the desire to remove any greasiness and possibly incoherent corrosive products, the surface of the object is cleaned with alcohol (96 % ethanol) on the cotton wool. This has successfully removed green deposits.

Greenish corrosion products may indicate the presence of quite a variety of compounds, such as chlorides, nitrogen and hydroxides. Wood can be a source of acetic and formic acid, so some of the corrosion products could be produced because...
the objects were in a wooden box. The black corrosion products were removed by a solution of the thiourea and hydrochloric acid. The exact texture of the fabric with the belt covered on the underside is unknown, but wool as well as protein adhesives can be a source of reduced sulphur. We could not be sure about the exact source of compounds that could have caused corrosion.

To remove any residues of the thiourea and hydrochloric acid objects and neutralize them, we washed them with tap water, pH neutral soap and at the end with distilled water. The belt parts are dried with the air compressor.

4.3. Small and big buttons

The small buttons are twenty-eight, seven of which are gilded, and the rest of them made of silver alloy, which was discovered after cleaning.

The conservation-restoration process is similar to the belt.

• The first step consisted of removing dust and other dirt with the help of a soft brush; residues of impurities are further removed by distilled water and cotton wool. Thus, green corrosion products are removed. The silver plated ones were more affected by the corrosion than the gilded ones. This is also to be expected because silver is more susceptible to changes.

• Black corrosion products were removed with EDTA solution, after which it was neutralised with tap water, pH neutral soap and at the end with distilled water.

• With the electrolytic cleaning, corrosion products that were inside the buttons were removed. By any other method it would be very difficult to achieve the result of this method.

• Black spots appeared on the buttons, for which we are not sure why they occurred. These spots also appeared on other objects, so they were probably due to excessive moisture or some air pollution. In any case, we cannot determine the
cause with certainty, but after the buttons are protected, no stains emerge. Those black corrosion stains were removed with EDTA solution, after which it was neutralised with tap water, pH neutral soap and at the end with distilled water.

Before the conservation-restoration processes, we thought all the little buttons were gilded, and that golden layer was removed, but after the removal of the dark layer was discovered that some were made of silver alloy, with the bottom of the label "LP" and seven were gold-plated (the gilded pins had no label).

- On gilded buttons gold almost didn’t exist any more so it was decided to gilt it again, because it was hard to precipitate the whole collection because of the state those buttons. It was probably removed because of the overcleaning in the past and using aggressive abrasives during maintenance objects.

- At the end all small buttons were protected by Paraloid-B72 solution in acetone (the ratio of Paraloid B-72 to acetone was 3.5%).

**Big Buttons** were altogether fourteen, most of which were gilded (10 gilded and 4 made of silver) which was also discovered after cleaning.

- Ethanol has not proved to be too effective.

- Some buttons were treated with a cleansing solution (tiurea /alkaline/ and acid chloride /acid/) but within a week there was a manifestation of black spots on treated buttons. Because of this and previous experience with small buttons, it was decided to use some other treatment. The black spots on the shoots did not necessarily have to be produced by the action of the tiuree, but from the precautionary treatment the treatment is still abandoned regardless of the fact that it has successfully eliminated the corrosion.
• The mechanical cleaning was carried out with a mash of refine chalk (bologne) mixed with distilled water. The chalk was subsequently washed with distilled water and ethanol.

• After this treatment it was discovered which were gilded and which were made of silver alloy (LP).

• Because of the same reasons like for the little buttons, also the big ones were gilded again by electroplatening.

• Golden buttons are not protected (gold has the role of protection), and silver are immersed in 3.5% solution of Paraloid B-72 in acetone.

4.4. Sword

The object consisted of two parts. The handle is made of copper alloy and the blade is steel. The blade was in a fairly good condition, so there was no need to intervene too much on it.

• Etanol has not proved to be too effective only some surface clusters from the blade were removed and on some parts not effective at all, like the part where handle and blade were connected.

• Therefore, an EDTA test was performed at the place where the blade and handle were connected, which was most affected by corrosion. With this test EDTA proved inadequate because it reacted too aggressively and left a trace.

• On those parts and also black spots on the blade were mechanical cleaned with a mash of refine chalk (bologne) mixed with distilled water. The chalk was subsequently washed with distilled water and ethanol. These procedures also equalize the stain caused by the EDTA test.
• The handle was decorated on one side with a floral motif and on the other was engraved. Because of the floral relief, it was a bit harder to clean than a mash of refine chalk, but the results were still more than satisfying.

• Unlike the blade, EDTA showed good results on the handle, removing the dark layers that could not be removed with the bologna chalk.

• The object was washed with tap water and slightly alkaline soap, and then with distilled water to neutralize it.

5. Conclusion

Conservation and restoration works on magnate jewellery were demanding and included many methods used in conservation-restoration procedures, but one of them is the use of electrolysis, most currently used for metal chloride extraction, sometimes for cleaning newer objects made from metal, however very rarely as a kind of metal retouch. The reason for this is that the use of electrolytic gilding in the conservation-restoration procedures must have a justified reason, that is, it will not be used on all objects that have "lost" gilding, but only on objects that we can not be perceived as they should and where the gilding is not “lost” for some historical aspect or wear, but in this case by inadequate maintenance of the collection itself. Correctly used electrolytic procedures can greatly facilitate the processes of cleaning for example, and are in some cases irreplaceable; however, it is necessary to have adequate knowledge and experience to carry them out.