**Electrolytic cleaning and silvering**

**Introduction**

The plate is made from copper alloy coated with silver. Because of mechanical damage and chemical reactions, some of the silver plating is removed. Also, corrosion products are made on the top of the copper alloy and on top of the silver (mostly black and yellowish silver sulfide (Ag2S)) that changes stability and the aesthetic experience of the object, so it is decided to remove corrosion products and renew silver plating, because the perception of the object and silver plate also has the role of protection for the copper alloy. The object is chemically cleaned with distilled water and 96% ethanol in order to remove any dirt from the surface and in order to soften corrosion products. The object is also cleaned with Bologna chalk and distilled water.

**Electrolytic cleaning**

A metal object is connected to an electrochemical cell in order to stabilize and clean the corrosion products on its surface or to return the surface to its natural state. For electrolytic cleaning/silvering it is necessary to have a requirements: electrolyte, metal conductor, anode, cathode. ELECTROLYTE serves as a way for the ions created in the reaction. EXTERNAL SOURCE OF ELECTRIC ENERGY serves to transmit electrons and to trigger an undesired redox reaction to cathode and anode. The maximum current should be 2A/dm3.

**RECIPE**

5% sodium hydroxide solution (NaOH) in distilled water. The object and piece of silver are connected into the electrolytic cell, so that the silver ions can flow to the cathode and anode. ELECTROLYTE serves as a route for silver ions. The negative pole of an external power source is connected to the stainless steel tweezers and becomes ANODE. Around a piece of pure silver and becomes CATHODE. Silver loses electrons and converts to positively charged object attract positive ions and they are released into the electrolyte. Negatively charged object attract positive ions and they bind to the surface of the object and connect it to the electrodes. In this way the silver ions become elementary silver related to the surface of the object.

**Silvering**

The object and piece of silver are connected into the electrochemical cell, so that the silver ions can flow to the object and silver – plate it. ELECTROLYTE serves as a route for silver ions. The object and piece of silver are connected into the electrochemical cell, so that the silver ions can flow to the cathode and anode. The maximum current should be 2A/dm3.

**RECIPE**

15 gr silver nitrate, 10 gr ammonium chloride, 30 gr sodium thiosulfate and 1 liter of distilled water.

**EXTERNAL SOURCE OF ELECTRIC ENERGY**

It serves to trigger the undesired redox reaction to cathodes and anodes. The maximum current should be 2A/dm3.

The positive pole of the external power source is connected to a piece of pure silver and becomes ANODE. Around a piece of pure silver is wrapped, keeping in mind that the entire metal tip is covered. A negative pole of an external power source is connected to the plate. So he becomes a CATHODE. Cotton wool is immersed in the electrolyte and crossed over only those parts that we want to silver, because the reaction can happen only in parts where we have electrolyte. Oxidation is performed on the positive anode. Silver loses electrons and converts to positive ions of silver. Electrons move to the object and the ions are released into the electrolyte. Negatively charged object attract positive ions and they bind to the surface of the object and connect it to the electrodes. In this way the silver ions become elementary silver related to the surface of the object.

**Conclusion**

If all the rules of electrolytic cleaning and plating are respected, it is possible to return the acceptable aesthetic appearance without mechanical damage and make retouching on the object that was originally electroplated.

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Authors

Iva Fabric – fabrinsa@gmail.com
Antonia Kunjalić – krunjac.antonia@gmail.com

Marta Stanić, mag.art, assistant