Canadian Conservation Institute
Institut canadien de conservation

CCI Notes 9/7

Silver — Care and Tarnish Removal

Caution:
This Note discusses actions that will physically affect the object, and/or procedures that involve the use of chemicals. Exercise caution, and seek qualified assistance if in doubt.

Introduction

A thin layer of dark tarnish can quickly destroy the surface lustre of silver. This layer consists mainly of black silver sulphide, and is caused by sulphur-containing compounds such as hydrogen sulphide in the air. (For more detailed information, see Selwyn 2004.) Tarnish can be removed from silver mechanically with a polish, chemically with a dip, or electrochemically. This Note describes these three methods for removing tarnish from silver, and explains how to store and display silver objects.

Tarnish removal should not be done frequently on museum objects, as each polishing or chemical tarnish removal takes away a certain amount of underlying silver along with the surface layer of tarnish. Preventing tarnish by using tarnish-inhibiting products in sealed storage containers or display cases should be a priority (see "Storage and Display" below).

Handling

When handling silver, wear clean cotton gloves. The salts and oils that are on skin can mark the silver and leave fingerprints.

Coins and medals have special requirements regarding handling. Please refer to CCI Notes 9/4 *Basic Care of Coins, Medals, and Medallic Art*.

Examination

Before cleaning or removing tarnish from a piece of silver, examine it carefully. Look for hallmarks or other identifying marks that will tell you if the piece is solid sterling silver or another metal covered with a thin layer of silver.

Try to determine how the piece was constructed. For example, are there solder joins or hollow sections such as handles and feet? If so, any method that requires the object to be totally immersed in a liquid cannot be used.

Check for gilding or other surface inlays. Polishes will damage gilding. Silver dips, if used without care, will over-clean silver that has a chased, engraved, or embossed decoration.

If the object is silver plated, any method of tarnish removal may be very damaging. Decide in advance what the final surface appearance should be.

The decision to remove tarnish from silver should be made jointly by a curator and a conservator.

Cleaning

First, clean the silver to remove any particles or residues that will interfere with the tarnish removal process. Washing or swabbing with a non-ionic or anionic detergent (see CCI Notes 13/9 *Anionic Detergent*) in distilled water will be safe for most objects, provided that any non-metallic parts (e.g. felt pads, bone or ivory handles) or wooden attachments are not allowed to get wet. After washing, rinse the object with distilled water and dry it with a soft cloth or warm air.

Tarnish Removal

Tarnish removal can be accomplished by one of three methods: polishes, chemical dips, or electrochemical reduction. The method chosen often depends on the object. For example, submersion in soapy water or chemical dips is not appropriate for composite objects

such as teapots with ivory handles, candlesticks with rosin or plaster in the base, or silver boxes lined with wood.

Polishes

Polishes are somewhat abrasive and, while they remove silver and tarnish from the surface of an object, they leave behind a pattern of fine scratches. The extent of this scratching can be tested by using the polish on unscratched Plexiglas. The depth and pattern of scratching that results on the Plexiglas will be similar to what would appear on the silver surface. Since manufacturers can change the content of a commercial polish without informing consumers, every new container of polish should be tested on Plexiglas before being used on silver.

The resulting finish, or scratch pattern, is often influenced more by the polisher than by the polish. The polisher must take care to minimize damage from abrasive polishing.

Do not use general, multi-purpose metal polishes on silver; they are more abrasive than silver polishes and remove more silver from the object.

Polishing cloths

Silver polishing cloths are impregnated with an abrasive material. These cloths are gentle because, by their very nature, they do not contain the concentration of abrasive particles that would be found in a liquid, paste, or foam polish. Such cloths are most useful for buffing lightly tarnished silver.

Waddings

Waddings (e.g. Duraglit wadding polish for silver) that contain an organic solvent instead of water are useful for polishing silver objects that cannot be exposed to water. However, abrasive particles will be left behind, so as much of this residue as possible should be removed by brushing with a soft brush or rubbing with a soft cloth.

Liquids, pastes, and foams

Some gentle liquids, pastes, and foams are recommended, e.g. Twinkle for silver, Goddard's products, Hagerty's products, and Silvo.

Do not leave polish containers open or use old polishes, because they tend to dry out. When this happens, the fine, abrasive material conglomerates into larger particles, making the polishes more abrasive and prone to leaving deeper scratches.

If the object can safely be exposed to water, remove polish residues with a non-ionic detergent (e.g. Triton XL-80N) or an anionic detergent (e.g. WA Paste) and distilled water.

Most commercial silver polishes contain a tarnish inhibitor. The presence of inhibitors is not necessarily beneficial because, although they slow the tarnishing rate of silver for a short time, when the objects start to tarnish they do so rapidly and unevenly. Inhibitors might also make it difficult to apply a lacquer if one is necessary.

Another drawback of many commercial silver polishes is that they usually contain ammonia, which will dissolve copper (from sterling silver or from the base metal beneath silver plating) by forming soluble copper–ammonia complexes. If any commercial silver polish residue remains trapped in crevices on silver after polishing, the ammonia will dissolve some copper, which can then further react with gases in the air to form other copper corrosion products and turn the polish residue green.

Wharton et al. (1990) recommend making a polish using an abrasive suspended in distilled water containing a non-ionic detergent. They studied many abrasive materials, and recommend suitable ones for polishing silver. They also conclude that it is less damaging to clean silver with a mild abrasive over a longer period of time than with a more aggressive material for a shorter time.

An effective polish can be home-made by mixing a small amount of precipitated calcium carbonate (precipitated chalk) with water to form a thick paste. It is important to use precipitated chalk because the particles are small and, after polishing, the final scratch pattern is fine. Do not use ground chalk or whiting because these particles are larger in size and, after polishing, the final scratch pattern can be coarse. Before using newly purchased precipitated chalk to clean silver, test it on Plexiglas to confirm that it is not contaminated with larger particles that will produce visible scratches. (For more detailed information, see Drayman-Weisser 1992; Long 1999.)

Chemical dips

Chemical dips work by dissolving the tarnish on an object at a faster rate than they dissolve the underlying silver.

Although manufacturers of commercial dips recommend submerging the object totally, this can often lead to over-cleaning if the object is left in the dip until all tarnish, including local stains, is removed. The recommended, safer practice is to apply the dip locally using a cotton swab, and then rinse the object with distilled water to remove any excess dip.

Chemical dips are composed of an acid and a complexing agent. Acids are corrosive and will damage niello, bronze, stainless steel knife blades, and organic materials such as wood. In addition, the acids and complexing agents may be harmful to the user. Therefore, be sure to work in a well-ventilated space, and wear rubber gloves when using these products.

Silver should be exposed to the dips as little as possible to avoid pitting the metal. Chemical dips should never be used on objects that have sealed hollow components, such as candlesticks and trophies with hollow feet or teapots with hollow handles. Once the dip leaks into the cavity through small holes or imperfections in the joins, it becomes virtually impossible to wash the chemical out.

A yellow discoloration may be left on the silver object after dipping. This can be removed by gentle polishing with a silver polishing cloth. Keep in mind that objects cleaned with a chemical dip often look "new" because there is no tarnish left in the deeper recesses of the design.

Electrochemical reduction

When a silver object is placed in contact with aluminum and both are submerged in a warm solution of sodium carbonate (washing soda), any tarnish on the silver slowly disappears. The process is electrochemical, with the carbonate solution acting as the electrolyte. As long as contact is maintained between the two metals, the aluminum corrodes and hydrogen gas is produced. This gas then reacts with the tarnish, reducing it back to silver metal. After using this method, the object must be rinsed well with distilled water to remove any traces of electrolyte.

Silver from the tarnish remains on the surface of the object in the form of rough particles that leave a dull, matte finish. This can be removed by gentle polishing with a silver polishing cloth.

Pitting of the object can occur if the aluminum plate has become inert due to a build-up of corrosion products or residue from the dissolution of the aluminum. Periodically removing the surface layer on the aluminum with abrasive cleaning or by boiling in a fresh carbonate solution will avoid this problem.

Objects cleaned by this method may tarnish more quickly than silver that has been polished. As in the case of chemical dips, objects with sealed hollow components should not be subjected to aqueous solutions.

Storage and Display

All silver objects should be kept clean and free of dust and surface grime.

The formation of tarnish inside display cases can be minimized by using desiccated silica gel to keep the relative humidity (RH) low, and activated charcoal or a suitable commercial product to remove tarnishing gases.

Tarnish need not be removed before storage. It is better to remove tarnish from silver only when necessary, e.g. for display purposes. Whether or not silver needs to be stored with a bright and shiny finish will depend on a variety of factors that must be considered for each collection.

Tarnishing can be minimized during storage by placing individual silver objects inside polyethylene bags and then sealing the bags using tape, heat sealing, or a self-sealing bag. It is always good practice to wrap or support each piece of silver with acid-free tissue paper ("non-buffered" or "unbuffered" which is sulphur-free and of archival quality) to buffer changes in RH and to prevent transfer of harmful materials from the storage environment to the silver. Additional protection against tarnishing can be achieved by placing small containers of desiccated silica gel and activated charcoal inside the bag. Alternatively, the silver may be wrapped in a tarnish-inhibiting cloth before being placed in the polyethylene bag. Tarnish-inhibiting cloths that are embedded with tiny silver particles (e.g. Pacific Silvercloth) are particularly effective because any tarnishing gases that are present will react with the silver in the cloth before they can reach the object inside. Because of the processing method used to introduce the silver particles, this type of cloth is available only in dark brown. Tarnish-inhibiting cloths that contain metal salts are also available, but these are less effective than those that contain silver particles.

Lacquering or waxing is not recommended for silver because of the difficulties in obtaining an even coating. If the coating has not been applied well, it may be uneven or have streaks and small holes. If this is the case, the end result of any retarnishing may be worse than if no coating had been applied at all. However, in an open display where a coating is deemed to be necessary, microcrystalline wax or lacquers such as the acrylic Incralac or the nitrocellulose Agateen #27 are suitable.

Suppliers

Note: The following information is provided only to assist the reader. Inclusion of a company in this list does not in any way imply endorsement by the Canadian Conservation Institute.

Commercial silver polishes and dips:
jewellery stores, department stores, grocery stores, and hardware stores

Duraglit wadding polish for silver:
conservation suppliers such as:

Conservation Support Systems
924 West Pedregusa Street
Santa Barbara CA 93101
USA
tel.: 1-800-482-6299
www.silcom.com/~css/

Precipitated calcium carbonate:
chemical suppliers such as:

Fisher Scientific
112 Colonnade Road
Nepean ON K2E 7L6
Canada
tel.: 613-226-3273 or 1-800-234-7437
www.fishersci.ca

Plexiglas:
plastics suppliers

Silica gel:
most laboratory equipment and chemical suppliers

Pacific Silvercloth:
conservation suppliers such as:

Carr McLean
461 Horner Avenue
Toronto ON M8W 4X2
Canada
tel.: 416-252-3371 or 1-800-268-2123
www.carrmclean.ca

Neutral, acid-free tissue paper ("non-buffered" or "unbuffered" tissue):
conservation suppliers such as:

Carr McLean
461 Horner Avenue
Toronto ON M8W 4X2
Canada
tel.: 416-252-3371 or 1-800-268-2123
www.carrmclean.ca

or

Conservation Resources International
8000-H Forbes Place
Springfield VA 22151
USA
tel.: 703-321-7730 or 1-800-634-6932
www.conservationsources.com

Incralac:
conservation suppliers such as:

Conservation Resources International
8000-H Forbes Place
Springfield VA 22151
USA
tel.: 713-321-7730 or 1-800-634-6932
www.conservationsources.com

or

Conservation Support Systems
924 West Pedregusa Street
Santa Barbara CA 93101
USA
tel.: 1-800-482-6299
www.silcom.com/~css/

or

MuseuM Services Corporation
385 Bridgeport Drive
South St. Paul MN 55075-2466
USA
tel.: 1-800-672-1107
fax: 1-651-554-9217
www.museumservicescorporation.com/

Activated charcoal:
chemical suppliers

Agateen:
conservation suppliers such as:

Conservation Support Systems
924 West Pedregusa Street
Santa Barbara CA 93101
USA
tel.: 1-800-482-6299
www.silcom.com/~css/

Anionic detergents:
conservation suppliers such as:

International Guilders' Supplies Ltd.
1541 Startop Road, Unit 12
Ottawa ON K1B 5P2
Canada
tel.: 613-744-4282
www.gilding-supplies.com

Non-ionic detergents:
conservation suppliers such as:

MuseuM Services Corporation
385 Bridgeport Drive
South St. Paul MN 55075-2466
USA
tel.: 1-800-672-1107
fax: 1-651-554-9217
www.museumservicescorporation.com/

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Wharton, G., S.L. Maish, and W.S. Ginell. "A Comparative Study of Silver Cleaning Abrasives." *Journal of the American Institute for Conservation* 29 (1990), pp. 13–31.

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