

PLATING GUIDE

No. 62.01215

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FORWARD

The purpose of the Grobet USA™ Plating Manual is to provide a description of some of the more common plating processes and to explain how these processes can be carried out using comparatively simple equipment. No knowledge of chemistry will be required. It is assumed that prepared electroplating salts or solutions will be used.

Grobet USA™ offers three lines of plating products: Sal-Hyde® Brand Plating Salts, Vigor® Brand Plating Solutions and Clean Earth™, a new line of cyanide free plating solutions. The Sal-Hyde® and Vigor® brands will be referred to throughout this plating manual. Other prepared salts or solutions can be used if the instructions of the particular manufacturer are followed.

Similarly, whatever plating rectifier is used, it is important that the manufacturer's instructions are followed. The rectifier is used as the power supply and is a source of DC (direct current). The user should have an understanding of the capacity and capabilities of the rectifier.

DANGER

Many electroplating salts and solutions are extremely poisonous and can be lethal if ingested. Toxic fumes can be created if acids are added to cyanide solutions. Use of electroplating chemicals should be in accordance with all label instructions including, but not limited to:

Use with adequate ventilation

Protect hands and eyes

Keep out of reach of children

Do not ingest

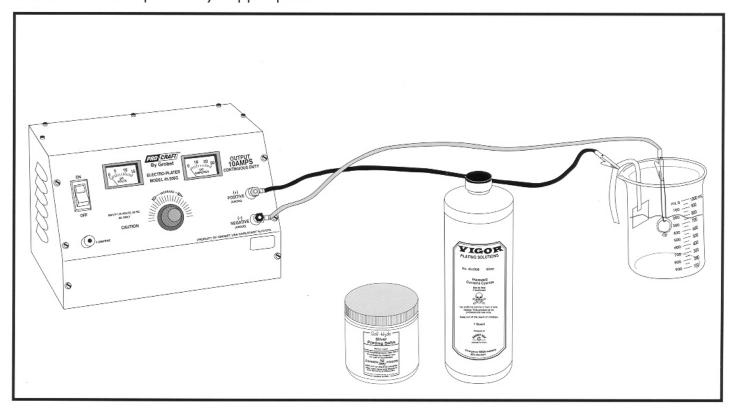
Do not inhale fumes

In addition, all federal, state, and local regulations, including disposal of hazardous chemicals and/or heavy metal wastes, must be followed. Federal law prohibits the use of cyanide based compositions in households. These compounds are for professional use only.

When mixing plating salts or solutions, always add the salts or solution to the water. Never add water to the salts or concentrated solution.

AN EXPLANATION OF ELECTROPLATING

The easiest way to understand the process of electroplating is to analyze the basic process in detail. Silver plating is one of the simplest processes to perform, particularly if the article to be plated is made of copper or brass or has been previously copper-plated.



A BASIC LAYOUT FOR SILVER PLATING

The "work", which is the article to be plated, acts as the "cathode". The "anode" is pure silver in this case. The anode and the work are hung by separate copper plating wires in the silver plating bath. Some anodes are supplied with a strip of metal attached (as shown) which conducts the electrical current to the anode. (See above.) The bath is prepared by adding Sal-Hyde® Silver Salts to hot distilled water, $140^{\circ}-160^{\circ}F$, or by using "ready to use" Vigor® Silver Plating Solution. Use the rectifier lead wires to connect the work to the **negative** terminal of a low voltage rectifier. Similarly, the anode wire or strip is connected to the **positive** terminal. Be sure that the anode is not completely immersed. The anode wire should not enter the plating solution. This will contaminate the bath.

The correct voltage for silver plating is between 1 and 2 volts. The rectifier must be adjusted to deliver this voltage. The rectifier must be turned on prior to immersing the article to be plated, which must be totally immersed in the plating bath. As current flows through the plating bath from one terminal to the other, the following action takes place:

- 1. Silver is removed from the anode and dissolved into the bath.
- 2. Silver is deposited from the bath on to the article to be plated, which is the cathode or the "work".

Although not strictly accurate (from the chemist's viewpoint), we can summarize this action by saying that silver is transferred from the anode to the work, through the bath. As plating continues, the deposit of silver on the work increases in thickness and the silver anode very gradually becomes smaller. The plated deposit on the work is usually very thin and is measured in thousandths of an inch or even ten thousandths. There will be no noticeable change in the dimensions of the silver anode until a considerable number of articles have been plated.

Many other plating processes operate in a manner identical to the silver process. Specific anodes and plating baths are required for each plating operation.

PRE-PLATING TREATMENTS

First we must consider certain preliminary operations which are absolutely necessary before the work is put into the plating bath. These preliminary operations are all based on two fundamental facts.

SURFACE FINISHING

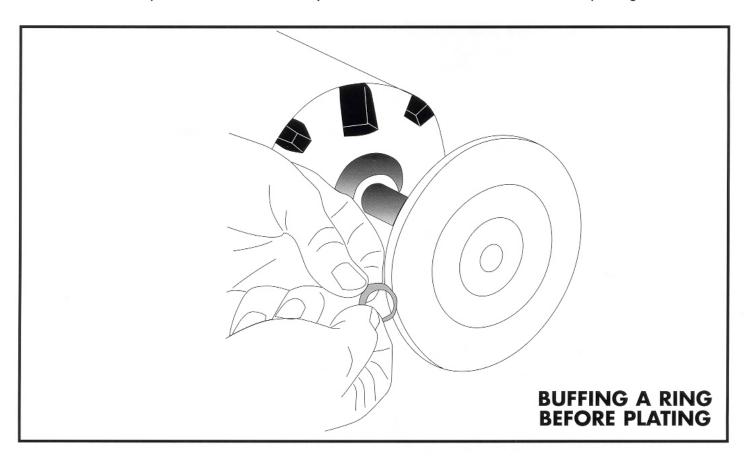
The final surface or degree of smoothness of the plated article is seldom better than the surface before plating. In ornamental plating, the deposit is so thin that every crack and imperfection in the original work will be visible after plating. If a specular or mirror-plated finish is desired, the original surface must be perfectly smooth before plating.

SURFACE CLEANING

The surface to be plated must be chemically clean before plating. A surface which appears to be smooth and clean may actually have a film of oxide, oil or grease. (Most polishing compounds are grease based.) This film will interfere with the plating process. Poor adhesion, which is the tendency for the plating to peel off or crack, is almost invariably due to poor cleaning before plating.

SURFACE FINISHING - POLISHING AND BUFFING

Polishing and buffing processes used to produce the desired finish before plating and after plating will not be discussed in this booklet. There are many kinds of polishing and buffing wheels as well as buffing compounds. The choice of these depends upon the metal being worked and the kind of finish desired. The point to remember is that the finish of the plated article is ordinarily no better than that of the work before plating.



SURFACE CLEANING

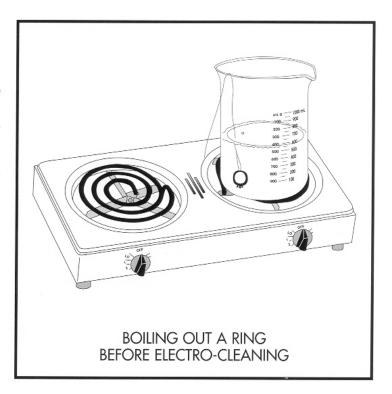
Generally, machining, grinding, polishing and buffing will mechanically remove tool marks, scratches, oxides, stains, etc. Surface cleaning is concerned chiefly with the removal of all traces of dirt and grease.

BOIL OUT

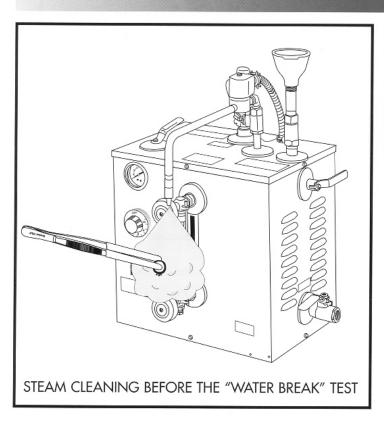
Attach a piece of copper plating wire to the article to be plated. This wire is used to handle the work and can also serve as the plating wire. Fingerprints frequently cause plating imperfections. After the work is completely clean, it should not be touched.

Suspend the article in a hot soap or detergent solution. Ammonia may be added if the work is unusually oily. The article should remain in the solution for 5 to 10 minutes. Ultrasonic cleaners work very well for this. A soft brush may be used to scrub every portion. Solvents, such as acetone, may be required in special cases to remove lacquers, etc..

The article should be thoroughly rinsed in hot water to remove all traces of soap, ammonia, etc. If a steam cleaner is available, the article should be steam cleaned then rinsed.

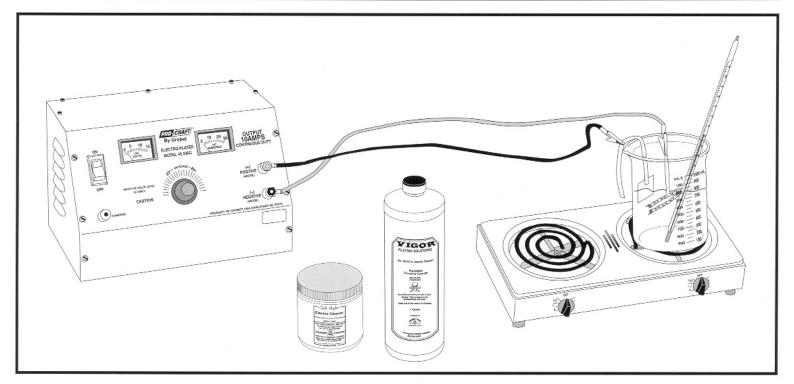


THE "WATER BREAK" TEST



There is a very simple and effective way of testing a metal surface to see if it is completely clean of oil and grease. Water will not remain on a surface which is greasy. Dip the cleaned article into clean, cold water. Withdraw and carefully inspect it without touching it with your fingers. If it is covered uniformly with a thin film of water, i.e., if it is "wet", then the surface is clean. If the film "breaks" and water does not run freely from the surface, then the cleaning operation is not complete and must be repeated until the water break test can be passed.

ELECTRO-CLEANING



ELECTRO-CLEANING A BRACELET

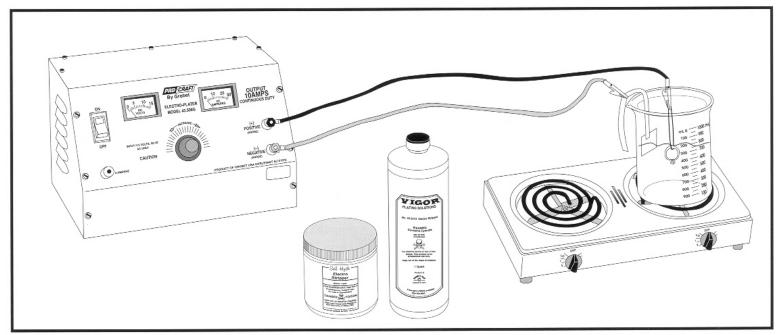
Electro-cleaning is a quick and effective method of cleaning articles prior to plating. The process uses an electrolytic bath and DC voltage, just as in electroplating, but chemically the action is quite different.

Sal-Hyde® Electro-Cleaner is a powder and is available in a gallon size. It is prepared by adding the powder to 1 gallon of hot distilled water. Vigor® Electro-Cleaner is supplied in a quart bottle and is prepared by adding it to 3 quarts of distilled water.

ELECTRO-CLEANING PROCESS

- 1. Prepare an electro-cleaning bath using a Pyrex® or stainless steel beaker.
- 2. The article to be cleaned should be attached to a piece of copper plating wire. This wire is connected to the negative terminal of the rectifier.
- 3. The bath temperature should be around 180°-200°F.
- 4. A stainless steel anode should be connected to the positive terminal of the rectifier. The anode serves only to pass current through the bath and no actual deterioration of the anode will occur.
- 5. Turn the rectifier power switch on and set the tank voltage to 10 or 12 volts.
- 6. Leaving the power switch turned on, totally immerse the article to be cleaned in the cleaning bath for 3 minutes. This is normally enough time to clean most work. At 6 volts, slightly longer immersion time may be required.
- 7. Without touching the article, rinse in clean hot water. Check for cleanliness with the water break test.
- 8. As soon as the work is considered "clean", it should be put through the plating process without allowing it to dry.

ELECTRO-STRIPPING



ELECTRO-STRIPPING FIRE SCALE FROM A CAST RING

Electro-stripping is a process sometimes confused with electro-cleaning. The two processes are fundamentally different. With electro-cleaning or any other plating operation, the work is connected to the negative terminal of the rectifier and acts as the cathode. With electro-stripping the work is connected to the positive terminal and acts as the anode.

Electro-stripping is used to "strip" old plating before replating. Frequently it is used by jewelry manufacturers to remove fire-scale from cast pieces. Since the work is the anode, electro-stripping should not be continued any longer than necessary to remove the old plate or fire scale. The work itself is being attacked and will deteriorate in size, just as the anode does in a regular plating process.

A stainless steel anode should be used as the cathode and electro-stripping is usually done in a Pyrex® beaker. A stainless steel beaker can also be used to act as the cathode by attaching the plating wire directly to the beaker. One of the advantages of this is that the distance between the beaker and the surface to be stripped are approximately equal all the way around. Electro-stripping is a considerably more energetic operation than electro-cleaning.

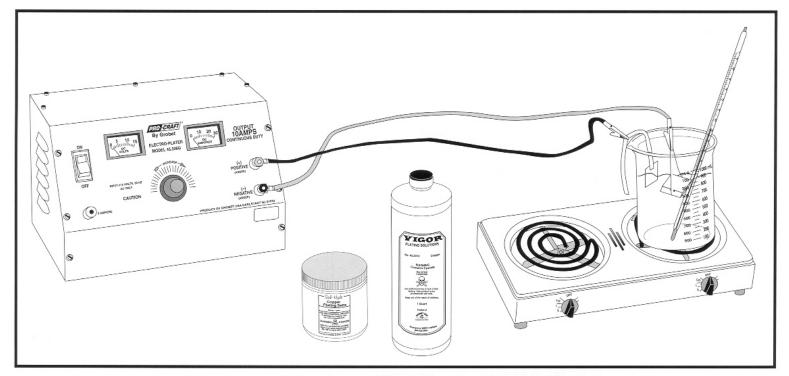
Sal-Hyde® Electro-Stripper is available in a gallon size and is prepared by adding the powder to 4 quarts of hot distilled water. Both Vigor® Electro-Stripper and Vigor® Cyanide Free Electro-Stripper come in a quart bottle and are ready to use.

GOLD STRIPPING PROCESS

- 1. Prepare an electro-stripping bath using a Pyrex® or stainless steel beaker.
- 2. The article to be stripped should be attached to a piece of copper plating wire. The wire should be connected to the **positive** terminal of the rectifier.
- 3. The bath temperature should be 180°F.
- 4. A stainless steel anode, which now becomes the cathode, should be connected to the **negative** terminal of the rectifier. As discussed above, a stainless steel beaker can serve as the cathode by attaching the negative lead wire to the edge of the beaker.
- 5. Turn the rectifier power switch on and set the tank voltage to 10 or 12 volts for fire scale. Old gold plating can be stripped at 6 volts.
- 6. Leaving the rectifier power switch turned on, totally immerse the article to be stripped in the bath until all old plating or fire scale is gone. Avoid over-stripping.

Rinse and wash thoroughly immediately after stripping. If desired, the work may then be dried and buffed after stripping. If buffed, further cleaning as previously described will be necessary to remove grease or other impurities before further plating.

COPPER PLATING



COPPER PLATING A PILL BOX PRIOR TO SILVER PLATING

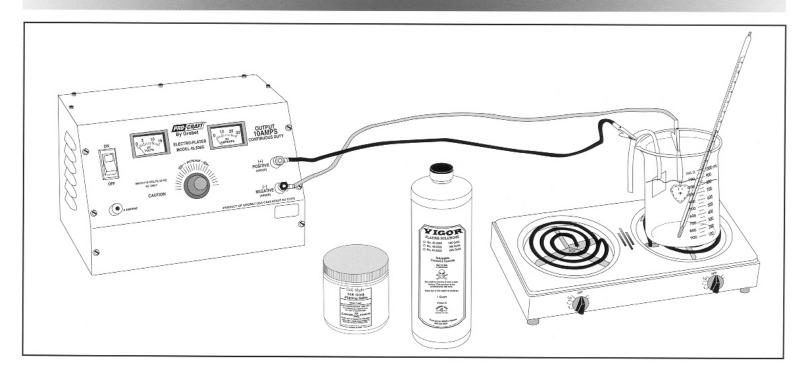
Copper plating is used primarily as a base plate for silver or gold plating. It produces a smooth, fine-grained deposit. Articles soldered with soft solder should be copper plated before silver or gold plating.

Sal-Hyde® Copper Salts are available in either quart or gallon sizes and are prepared by adding the salts to the appropriate amount of hot distilled water. Allow the bath to cool to room temperature before using. Vigor® Copper Plating Solutions are supplied in a quart bottle and are ready to use.

COPPER PLATING PROCESS

- 1. Prepare the copper plating bath using a Pyrex® or stainless steel beaker.
- 2. The article to be plated should be attached to a piece of copper plating wire and connected to the negative terminal of the rectifier.
- The bath temperature should be between 75° and 100°F.
- 4. A pure copper anode is connected to the positive terminal of the rectifier and immersed in the bath.
- 5. Turn the rectifier power switch on and set the tank voltage. When using Sal-Hyde® Salts, set the tank voltage to 2 or 3 volts. For Vigor® Solutions, set the tank voltage to 6 volts.
- 6. Leaving the power switch turned on, totally immerse the article in the plating bath for 30 seconds or until the desired finish is achieved.
- 7. Rinse in clean water. If the article is going to be further plated, plate as soon as possible to avoid oxidation which would require additional cleaning.

GOLD PLATING



GOLD PLATING A "HEART SHAPED" NECKLACE

Gold plating processes are used not only to plate articles made of base metals, but also to plate articles made of gold in order to obtain special gold colors. English Bright Gold and Rose Gold can be plated over gold articles. By using a masking lacquer it is possible to plate only certain areas. With a variety of gold solutions, it is possible to build up a design or pattern in several colors. Read more about this process under "Masking".

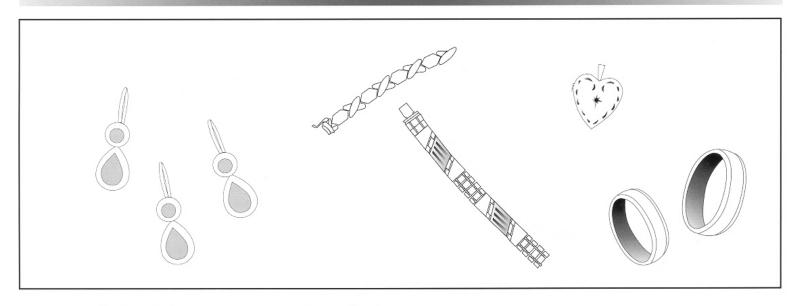
Most gold plating solutions contain gold cyanide, potassium cyanide or sodium cyanide and a mixture of other elements which determine the color of the gold plate. The solution is intended to produce a plated finish which will match the color of 18 karat or 14 karat solid gold even though the percentage of gold in the deposit may actually be higher than indicated by its name.

In the Sal-Hyde® line there are 14K and 18K plating salts and 3 colors of 24K gold plating salts; Roman Gold, English Bright and Rose Gold. The plating salts are prepared by adding the salts to one quart of hot distilled water. In the Vigor® line there are 14K, 18K and 24K solutions. These solutions are supplied in quart bottles and are ready to use.

DESCRIPTION OF SALTS AND SOLUTIONS

- 14K matches the color of 14K yellow gold.
- 18K matches the color of 18K yellow gold.
- 24K Roman Gold provides a deep yellow, typical "gold" color.
- 24K English Bright a paler color, produced by certain brightening agents included in the compound.
- 24K Rose Gold pink or rose tones, produced by a percentage of copper in the compound, which is deposited simultaneously with the gold.

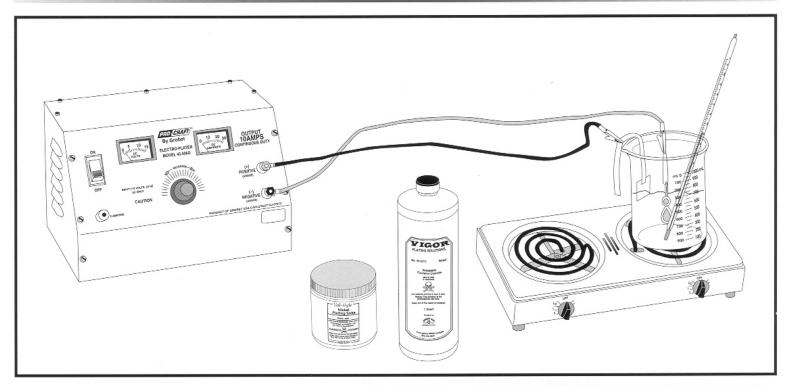
GOLD PLATING PROCESS



- 1. Prepare gold plating bath using a Pyrex® or stainless steel beaker.
- 2. The article to be plated should be attached to a piece of copper plating wire, which is connected to the negative terminal of the rectifier.
- 3. The bath temperature should be between 120° and 160°F. Changes in temperature will affect the color of the plating. For consistent results the temperature should always be the same.
- 4. A pure gold anode should be connected to the positive terminal of the rectifier. A stainless steel anode may be used for economy. When a stainless steel anode is used, the gold is deposited onto the work from the solution and is not replaced by the anode. The solution becomes progressively depleted in gold content and must be replenished sooner than when a gold anode is used.
- 5. Turn the rectifier power switch on and set the tank voltage to 2 or 3 volts.
- 6. Leaving the power switch turned on, totally immerse the article to be plated in the plating bath for 30 seconds or until the desired finish is achieved.
- 7. Rinse in clean water.

Gold is best applied on a copper or nickel surface. Therefore, articles cast or fabricated of other metals are usually copper or nickel plated before gold is applied. A preliminary plate of copper is preferred for deep Roman Gold or Rose Gold, whereas nickel plate is preferred under bright English Gold. Copper or brass articles may be plated directly without previous undercoat.

NICKEL PLATING



PLATING AN EARRING WITH A NICKEL BASE PRIOR TO RHODIUM PLATING

Nickel provides excellent protection against corrosion. Many tools are nickel plated to prevent rusting. Nickel plating is also used to obtain a white undercoat prior to some types of gold plating. Nickel plating is **essential** as an intermediate step before rhodium plating.

Nickel adheres well to copper and it is recommended to plate some metals with copper before nickel plating.

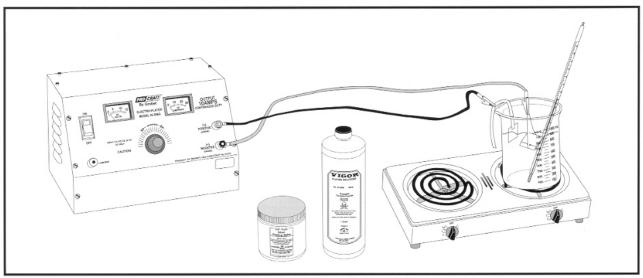
Sal-Hyde® Nickel Salts are available in a one gallon size and are prepared by adding the salts to 4 quarts of hot distilled water. Allow mixture to cool to room temperature before using. Vigor® Nickel Plating Solution is supplied in a quart bottle and is ready to use. Both Sal-Hyde® Nickel and Vigor® Nickel are acid based and do not contain cyanide.

If you want a bright nickel finish, the work must be polished and buffed to a high luster before beginning the cleaning and plating processes.

NICKEL PLATING PROCESS

- 1. Prepare the nickel plating bath using a Pyrex® or stainless steel beaker. Plastic or rubber containers can also be used.
- 2. The article to be plated should be attached to a piece of copper plating wire and connected to the negative terminal of the rectifier.
- 3. The bath should be at room temperature.
- 4. A pure nickel anode is connected to the positive terminal of the rectifier. (Note: Slight impurities in the anode will ruin the appearance of the plate.)
- 5. Turn the rectifier power switch on and set the tank voltage. When using Sal-Hyde® Nickel Salts or Vigor® Solution, the tank voltage should be 2 volts or less.
- 6. Leaving the rectifier turned on, totally immerse the article to be plated in the plating bath for 30 seconds or until the desired finish is achieved.
- 7. Rinse in clean water. If the article is going to be further plated, plate as soon as possible to avoid the need to clean again.

SILVER PLATING



SILVER PLATING A PILL BOX

At the beginning of this manual, silver plating was chosen to illustrate the basic principles of electroplating. Silver plating is the easiest of all the metals to plate. It is so easy, that in some cases, an item immersed in a silver plating solution will begin to plate itself without any electrical current. Unfortunately, this chemically-deposited silver is spongelike and has poor adhesion to the base. If further silver is electrically deposited, the final plate may easily peel or flake off. To avoid this, it is recommended you "Silver Strike" the work for a short period before silver plating where the major deposit occurs. Silver plate is most easily applied to a copper base or a copper alloy such as brass or bronze. It is recommended you first copper plate any items that are not copper or copper alloy.

Sal-Hyde® Silver Salts are available in quart or gallon sizes. They are prepared by adding the salts to the appropriate amount of hot distilled water. Allow mixture to cool to room temperature before using. Vigor® Silver Plating Solution is supplied in a quart bottle and is ready to use.

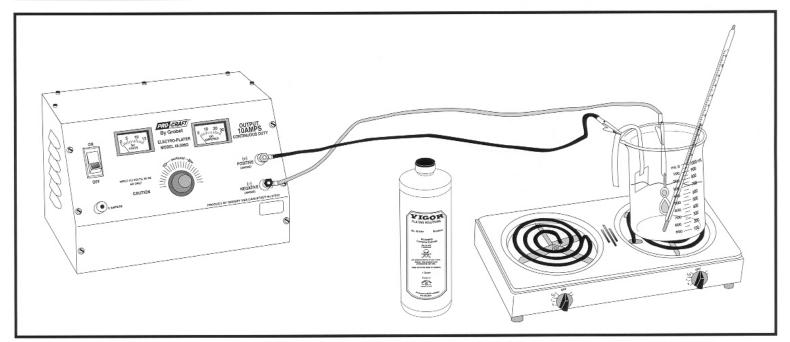
"SILVER STRIKE" PROCESS

- 1. Prepare the silver plating bath using a Pyrex® or stainless steel beaker.
- 2. The article to be plated should be attached to a piece of copper plating wire and connected to the negative terminal of the rectifier.
- 3. The bath should be at room temperature.
- 4. A stainless steel anode should be connected to the positive terminal of the rectifier.
- 5. Turn the rectifier power on and set the tank voltage to 5 or 6 volts.
- 6. Leaving the rectifier power switch turned on, totally immerse the article in the plating bath for 15 to 30 seconds, just long enough for a "flash" of silver coating.
- 7. Rinse in clean water. You should begin silver plating as soon as possible to avoid oxidation.

SILVER PLATING PROCESS

- 1. Use the same plating bath used during the silver strike process.
- 2. The article to be plated should still be attached to the piece of copper plating wire used in the silver strike process. This wire is connected to the negative terminal of the rectifier.
- 3. The bath should be at room temperature.
- 4. A pure silver anode, not less than 999.5 fine, should be connected to the positive terminal of the rectifier.
- 5. Turn the rectifier power on and set the tank voltage to 2 volts.
- 6. Leaving the rectifier power switch turned on, totally immerse the article in the plating bath for 1 to 10 minutes depending on the thickness of silver you desire.
- 7. Rinse in clean water. The article will have a matte white finish that is not "silvery." The typical silver color may be obtained by rubbing the article with a paste of sodium bicarbonate and water; or, if preferred, the work may be dried and then buffed lightly.

RHODIUM PLATING



RHODIUM PLATING AN EARRING

Rhodium is one of the metals in the platinum group and has come into wide use for plating rings and other jewelry. Rhodium has a color similar to platinum, does not tarnish and takes a high luster.

Rhodium should be plated over a fairly heavy nickel plate. The nickel provides a white base to back up the rhodium and, more importantly, provides good resistance to corrosion. Do not attempt to rhodium plate directly on any of the usual tin alloys used in making jewelry. If the nickel underplate is omitted, the rhodium plate will be dark and unsatisfactory.

Rhodium plating requires extreme cleanliness and exceptional care must be taken not to introduce impurities into the bath. Even using copper wires to suspend the work or the anode will contaminate the bath. The plating wires must be of platinum and the anode must be platinum or platinized titanium.

Vigor® Rhodium Plating Solution is available in a quart bottle and is ready to use.

RHODIUM PLATING PROCESS

- 1. Prepare the rhodium plating bath using a Pyrex® beaker. The minimum size for a rhodium bath is 1 pint. You should not attempt to plate with a smaller bath.
- 2. The article to be plated should be attached to a piece of platinum wire which is connected to the negative terminal of the rectifier.
- 3. The bath temperature should be 100°F.
- 4. The anode should be platinum. (For economy, platinized titanium works just as well.) The anode should be connected **with platinum wire** to the positive terminal of the rectifier. Be careful not to let the attaching wire dip into the bath.
- 5. Turn the rectifier power switch on and set the tank voltage to 4 volts.
- 6. Leaving the rectifier power switch turned on, totally immerse the article in the plating bath for 20 to 30 seconds.
- 7. Rinse in clean water.

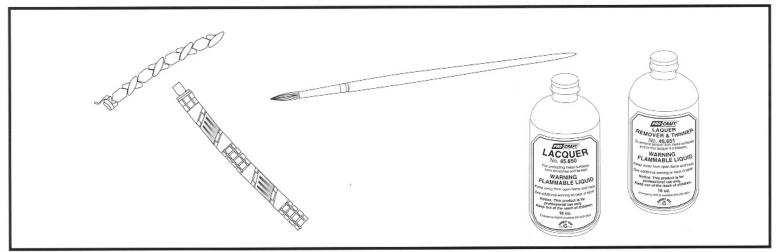
When a rhodium bath is not in use, it should be poured into a container and closed tightly. Rhodium solution must always be protected from every possible source of contamination.

RHODIUM TROUBLES

Following are some notes on possible difficulties with rhodium plating:

- 1. Contamination of the bath. If this occurs, the bath must be discarded and replaced with a fresh solution.
- 2. Omission of the nickel plate undercoat. All of the following must be nickel plated first: brass, nickel-silver, iron, brittania metal, pewter, "white metal." The safest rule is to apply a heavy nickel plate to any surface before attempting to rhodium plate.

MASKING



In the section on gold plating, brief reference was made to "masking". Masking basically consists of applying a coating of lacquer to that part of the work which is not to be plated; i.e., which is to be masked. After plating, the lacquer is removed. In industrial plating there are technical reasons why unplated surfaces are required on some parts of the work. In jewelry and art work, masking may be used to avoid plating precious metal on portions of the work which will not finally be visible.

The most frequent use of masking in jewelry work is to obtain a multi-color effect. A design is brought out by contrasting several different colors on the same article.

A satisfactory masking lacquer must meet the following requirements:

- 1. Primarily, it must positively protect the masked surface during the plating process.
- 2. It must be easily applied and must follow the artist's brush accurately without subsequent shrinking or bleeding.
- 3. It must dry quickly.
- 4. It should be easily and completely removable by a solvent which will not discolor either the plate or the base metal.
- 5. It must not react with the plating solution nor contaminate the bath.

The Pro-Craft® line includes Lacquer and Lacquer Remover and Thinner. The lacquer is usually applied with a red sable brush. This is an artist's technique which is learned by practice. The lacquer dries in a few minutes and the work may then be plated. The work must be thoroughly cleaned and dried before applying the lacquer. It is important not to touch the work with your fingers before lacquering or after lacquering and before plating. If the work has been touched accidentally, electro-clean the piece before plating.

After plating and washing, the work is dipped in remover to loosen the lacquer. The lacquer is removed by using a cloth or soft brush under running water. In two-color work where one plate uses a heated bath and the other uses a room temperature bath, plate the article first in the heated bath. Use the masking process during the cold plating operation.

Both the lacquer and the remover are volatile and flammable and should be stored in tightly closed containers.

THROWING POWER

In the plating bath, electrical current flows from the anode to the work. The distance between the anode and the article to be plated introduces some resistance to current flow. If some parts of the work are farther from the anode, the distance is greater and the quantity of electricity reaching this part will be less. This may result in a thinner deposit on the distant portion or, under extreme conditions, no deposit at all.

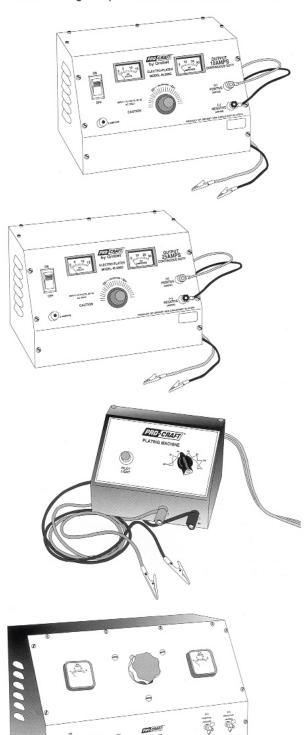
Some kinds of plating baths, and rhodium in particular, are very critical with regard to uniform spacing between all parts of the work and the anode. These baths are said to have poor "throwing power". In order to ensure a uniform deposit on the work, care should be taken to see that there is uniform spacing between the anode and the surface to be plated. With flat work and a flat anode, this is a simple requirement. If the work is curved, then the anode should be bent to conform to the shape of the work. If the work is to be plated on all sides, it may be necessary to use two or more anodes on opposite sides of the work, to frame the work. The wires holding the anodes are all connected together and attached to the positive terminal of the rectifier.

Many styles, sizes, and brands of plating equipment and supplies are available. To familiarize you with these products, this section will describe some of the items in the Grobet USA™ line. The Grobet USA™ part numbers are shown for reference. Many of the solutions shown in this section are subject to DOT regulations. Check with your supplier for shipping requirements.

PRO-CRAFT® RECTIFIERS by Grobet™

These are precision-built, continuous-duty, solid-state electonic units with a variety of power levels to handle all plating needs. They work by means of the powerstat control to produce desired voltage. The 10 and 25 amp units have pilot lights, and both DC ammeter and voltmeter for measuring current load. All units come with a set of lead wires with alligator clamps and terminal lugs.

3 amp, 10 amp and 25 amp rectifiers are available with an accessory kit which includes: a pair of 600 ml Pyrex® beakers, copper plating wire, electro-cleaning compound and a stainless steel anode.



10 AMP RECTIFIER

SPECIFICATIONS:

0 to 10 amps output, continuous duty

0 to 10 volts DC output

Runs plating baths up to 1 gallon, except for rhodium which is 2 quarts. Steel cabinet measures $13''W \times 8''H \times 8^1/2''D$, compact cabinet measures $6^1/2W \times 5^3/4"H \times 11"D$.

No. **45.504** 110 volt rectifier with accessories

No. **45.506G** 110 volt rectifier only

No. **45.506GX** 220 volt rectifier only (CE Approved)
No. **45.531** 110 volt compact rectifier (not shown)
No. **45.531X** 220 volt compact recitifer (not shown)

25 AMP RECTIFIER

SPECIFICATIONS:

0 to 25 amps output, continuous duty

0 to 12 volts DC output

Runs plating baths up to 5 gallons except for rhodium which is 1 gallon. Steel cabinet measures $13''W \times 8''H \times 8^1/2''D$, compact cabinet measures $6^1/2''W \times 5^3/4''H \times 11''D$.

No. **45.508**110 volt rectifier with accessories
No. **45.508X**220 volt rectifier with accessories

No. **45.510G** 110 volt rectifier only

No. **45.510GX** 220 volt rectifier only (CE Approved)
No. **45.532** 110 compact rectifier (not shown)
No. **45.532X** 220 compact rectifier (not shown)

3 AMP SWITCH CONTROLLED RECTIFIER

SPECIFICATIONS:

0 to 3 amps output continuous duty

Switch control has settings of 2, 4, 6, 8 and 10 volt DC output.

Steel cabinet measures 6"W x 4"H x 4"D.

No. **45.500** 110 volt rectifier with accessories

No. **45.502** 110 volt rectifier only

60 AMP RECTIFIER

SPECIFICATIONS:

0 to 60 amps output, continuous duty

0 to 12 volts DC output

Runs plating baths up to 20 gallons, less for rhodium.

Steel cabinet measures $18^{1}/8^{\prime\prime}W \times 9^{1}/8^{\prime\prime}H \times 8^{1}/8^{\prime\prime}D$.

No. **45.511** 110 volt rectifier only

Platinized titanium

VIGOR® ANODES

Used with copper wire attached to lead wire.

No. **45.0315** Copper 1" x 6"

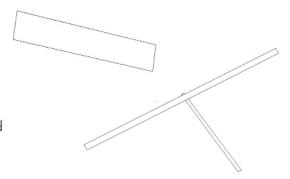
No. **45.0316** Stainless steel 1" x 6"

No. **45.0317** Brass 1" x 6" No. **45.0318** Nickel 1" x 6"

No. **45.606** Fine silver 999 1" x 6"

No. **45.0324** 24K gold, .75 dwt., 3/4"x 1" x 3/1000" with lead wire attached

No. **45.0320** Platinized titanium $10^{1}/4'' \times 1^{1}/4''$



PRO-CRAFT® ANODES

The base metal portion of these anodes measures $^{1}/^{2}$ "W x 2"L in varying thicknesses. Attached to a stainless steel stem which can be bent to hang onto edge of beaker and connected to lead wire.

No. **45.592** Copper No. **45.600**

No. 45.594 14K gold No. 45.602 Silver

No. **45.597** 24K gold No. **45.604** Stainless steel

No. **45.598** Nickel



PYREX® BEAKERS

Suitable for all electroplating operations.

No. **45.640** For 600 ml/pint baths

No. **45.641** For 1000 ml/guart baths



STAINLESS STEEL BEAKERS

Can be used as the anode needed for electro-stripping and gold plating. Just attach your lead wire to the lip of the beaker.

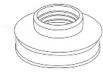
No. **45.642** 600 ml No. **45.643** 1200 ml



BEAKER COVERS

Easy-on, easy-off, snug-fit covers protect against spills or contamination of beaker contents.

No. **45.644** Fits 600 ml beakers No. **45.645** Fits 1000 ml beakers



PRO-CRAFT® IMMERSION THERMOMETER

For determining solution temperature. Reads temperatures to 230°F.

No. 45.696





ELECTRIC HOT PLATES

With three ring burners, tubular elements, and infinite control switches. Have chrome top and white trim. 120V AC, 50/60 Hz, with three-prong grounded cord. UL listed. One year warranty.

No. **45.710** Single burner- $8^{1}/2'' \times 8^{1}/2'' \times 3^{1}/4''$, 6 amps,

No. **45.712** Double burner-17" x 81/2" x 31/4", 13 amps, 1400 watts



GAS HOT PLATES

No. **45.701** Single burner- $11'' \times 9^{1}/2'' \times 6^{1}/4''$ No. **45.700** Double burner- $11'' \times 19^{1}/2'' \times 6^{1}/4''$



SOFT COPPER WIRE

Comes in 4 oz. spools.

No. **43.562** 20 gauge





PRO-CRAFT® LACQUER and LACQUER REMOVER AND THINNER

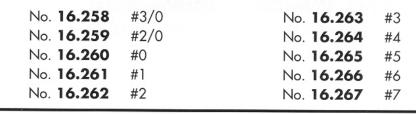
A high-grade lacquer that can be brushed on articles to provide a tough, smooth, even surface to protect them from tarnish, and to eliminate metal deposits from plating solutions. Lacquer thinner is used for removing and thinning lacquer. Both are supplied in pint bottles.

No. **45.650** Lacquer

No. 45.651 Lacquer Remover and Thinner



Sizes from #3/0 (smallest tip) to #7 (largest tip), with needle sharp points.



VIGOR® BACKGROUND ANTIQUE and SOLVENT for JEWELRY

For highlighting or subtle dark background effects. Gives a dark, dull antique finish to class rings or any other jewelry. Adheres to any metal, dries in minutes. The solution is resistant to wear and needs no lacquer. The solvent is used to remove the color from raised surfaces or to add highlights.

No. 45.0233 Set of all three colors with solvent

No. 45.0230 Black solution with solvent

No. 45.0231 Green solution with solvent

No. 45.0232 Brown solution with solvent

No. 45.0130 Black solution

No. 45.0131 Green solution

No. 45.0132 Brown solution

No. 45.0135 AUL solvent



VIGOR® BLACK GROUND

Produces black oxide background in one minute on brass or copper base metals. Item can be immersed or painted with brush or swab. 4 oz. bottle.

No. 45.0550

VIGOR® OXIDIZER*

Use on both gold and silver to produce all shades from French gray to black. Solution can be brushed on or item can be dipped.

No. 45.0329 4 fl. oz.

No. 45.0331 8 fl. oz.



PRO-CRAFT® SILVER OXIDIZER

Non-corrosive solution can be used at full strength to blacken silver or copper. When diluted with water, the action is slowed down so that color can be controlled for all shades of gray. No heating is required, since it works at room temperature. Biodegradable.

No. **45.681** 8 oz.

No. **45.682** 16 oz.



PRO-CRAFT® LIVER of SULPHUR

Contains 8 oz. in lump form. When dissolved in hot water, can be used to oxidize most metals.

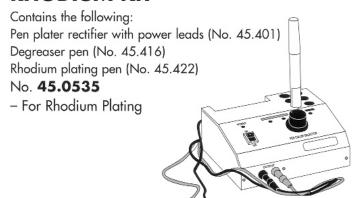
No. 45.690



VIGOR® PEN PLATING SYSTEM

Electroplate safely and quickly using a series of interchangeable, disposable pens. Perfect for jewelry, findings, small parts, etc. Eliminates spills and contamination. The pinpoint accuracy is ideal for spot plating, making it unnecessary to mask areas which will not be plated. Correct voltage is pre-set for all metals, and there's convenient pen storage in the rectifier. All pens contain .5 fl. oz. of solution. Rectifier measures $5^{1}/4^{n} \times 6^{1}/2^{n} \times 3^{1}/2^{n}$.

RHODIUM KIT



COMPLETE KIT

Contains the following:
Pen plater rectifier with power leads (No. 45.401)
Degreaser pen (No. 45.416)
Copper plating pen (No. 45.417)
Silver plating pen (No. 45.420)
Rhodium plating pen (No. 45.422)
14K gold plating pen (No. 45.424)
No. 45.0530

– For Assorted Metal Plating

ADDITIONAL PLATING PEN SYSTEM ACCESSORIES

The following components may be purchased separately.

-					
No. 45.401	Pen plating rectifier	No. 45.418	Nickel plating pen	No. 45.432	Set of black and red power leads
No. 45.424	14K gold plating pen	No. 45.428	Black nickel plating pen	No. 45.421	Heavy silver plating
No. 45.416	Degreaser pen	No. 45.419	Chrome-color plating	No. 45.433	Replacement felt tips
No. 45.425	18K gold plating pen	No. 45.431	Replacement fuses	No. 45.422	Rhodium plating pen
No. 45.417	Copper plating pen	No. 45.420	Silver plating pen	No. 45.423	Degreaser pen for stainless steel



PRO-CRAFT® PEN PLATERS

The Pro-Craft® compact rectifiers are designed for easy, economical, accent plating, using a platinum anode. The fiber tip may be trimmed to any desired shape, assuring on-the-spot plating. Dual voltage 120V/240V. One year warranty. Made in USA.

No. **45.400** Single model with all-plastic cabinet, black lead with alligator clip, one pen, and one plating jar.

No. **45.403** Deluxe model (not shown) with all-metal cabinet completely fused to prevent accidental damage, black lead with alligator clip, one pen, three plating jars. Cabinet holds three pens and three jars.

REPLACEMENT PARTS

No. 45.405 Package of five replacement pen plater tips

No. **45.406** Replacement plating pen

No. 45.407 Replacement black lead with alligator clip

PRO-CRAFT® PEN PLATING SOLUTIONS

Specially formulated, state-of-the-art pen plating solutions designed to provide quality results. One oz. in plastic jar.

No. 45.410 14K gold

No. 45.411 18K gold

No. 45.412 24K gold

No. 45.414 Rhodium

No. 45.415 Black rhodium



JNT BRUSH-PLATING and DIP-COTING KITS

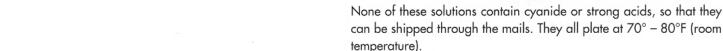
A simple way to plate without expensive equipment for occasional jobs. Just the right amount of current is supplied by the two penlight batteries (not included) to either brush or bath-plate with the specially formulated solutions listed. Brush-plating is especially useful for retouching large objects which cannot be plated easily. Cyanide-free kit contains dip-coter heads so that small articles can be dipped right into the wide mouthed jars, as well as brush-plating heads.

No. **45.750** Gold kit No. **45.752** Silver kit

No. **45.754** Combination gold and silver kit containing all the

necessary supplies for use on both of these metals





COPPER A sulfate-based solution which plates directly on all common metals, except chromium, stainless steel, and aluminum. Usually used as an

JNT PLATING SOLUTIONS

except chromium, stainless steel, and aluminum. Usually used as an under-plate for other metals. A stainless steel or copper anode can be used with this solution.

No. 45.634

GOLD

A chloride-based solution which plates directly on tin, copper, brass, bronze, nickel, and silver. Available in either 24K (fine gold) or 14K to match karat colors. Stainless steel or gold anode can be used.

No. **45.635** 14K gold No. **45.636** 24K gold

SILVER

A sulfate-based solution which plates directly on copper, brass, bronze, nickel, tin, pewter, and most white metal alloys. Stainless steel or pure silver anodes can be used.

No. 45.638



PLATING SOLUTIONS AND SALTS WARNING

Many of the following plating solutions contain cyanide. Our Clean Earth™ plating solutions, shown on a seperate flyer, are cyanide free! The Federal Hazardous Substance Act classifies cyanide as a BANNED HAZARDOUS SUBSTANCE if sold or packaged in a form suitable for household use. Accordingly, our solutions containing cyanide are not for sale, for use, or for storage in a household, garage or any other place where children or uninformed adults may have access. THEY ARE FOR SALE FOR PROFESSIONAL USE ONLY. They are not to be repackaged or separated from their appropriate labels.

VIGOR® PLATING SOLUTIONS

VIGOR® RHODIUM

Acid base containing no cyanide. Use with platinum anode or platinized titanium anode. Contains one gram of rhodium.

No. **45.0301** One pint

VIGOR® GOLD

Contains cyanide. Each quart contains one dwt. gold. Use with fine (24 K) gold anode.

No. **45.0303** 24 K gold color

No. 45.0305 18 K gold color

No. 45.0304 14 K gold color

VIGOR® SILVER

Contains cyanide. Use with fine silver anode.

No. 45.0309 One quart

VIGOR® COPPER

Acid base containing no cyanide. Use with copper anode as a pre-plating for most gold plate, or as a test plating. No. **45.0310** One quart

VIGOR® NICKEL

Acid base containing no cyanide. Use with nickel anode.

No. 45.0311 One quart

VIGOR® CYANIDE-FREE ELECTRO STRIPPING SOLUTION

For removing old plating, except for rhodium and chromium. Article to be stripped is hung on stainless steel strap and connected to positive terminal. Brass or copper anode is connected to negative terminal. Recommended operating temperature is 160°F at 6 volts.

No. 45.691 One quart

VIGOR® ELECTRO-STRIPPER

Contains Cyanide. Removes old plating, except rhodium and chrome. Use with stainless steel anode and reverse lead wires. No. **45.0313** One quart



SAL-HYDE® PLATING SALTS

Formulated for professional plating specialists, the well-known Sal-Hyde® product line offers exceptional, high-quality results. Cyanide-based compositions provide uniform deposits and a long-lasting chemical bond. Sal-Hyde® plating salts are to be added to specific amounts of distilled water to form the plating solutions. All cyanide-based compounds are available in special UPS packaging.

COPPER

Cyanide-based composition. Suitable as a final finish for jewelry and similar work, or as a preliminary plate before silver, nickel or gold plating. It produces a smooth, fine-grained deposit which is an excellent base for the final plate and is a satisfactory bath for plating soft solder.

GOLD

Cyanide-based composition. Available in a variety of colors and karats. Used to plate cheaper base metals or to plate objects made of gold to obtain special gold colors. The formulas for 14K and 18K are such that they will match the color of 14K or 18K even though the percentage of gold in the deposit may actually be higher than indicated by its name. Piece should be copper or nickel-plated as a base, although it will also plate on brass, bronze or silver. A coin gold or stainless-steel anode should be used with 14K or 18K solutions, while a pure gold or stainless steel anode should be used for all 24K solutions.

NICKEL

May be used for the final finish on metal objects. Nickel provides excellent protection against corrosion and for this reason, as well as to obtain a white undercoat, it is frequently used as a base for gold plating. Nickel plating is essential as a base for rhodium plating. Base metals should be copper plated prior to nickel plating. Use with a pure nickel anode.

SILVER

Cyanide-based composition. Can be applied most easily to a base of copper or a copper alloy, such as brass or bronze; however, it will plate on nickel, tin, pewter, gold and most white metal alloys. Use with a pure silver or stainless steel anode.

ELECTRO-CLEANER

A quick and effective method of cleaning objects prior to plating. The cleaning process uses an electrolytic bath, similar to plating operations.

ELECTRO-STRIPPING

Cyanide-based composition. Frequently used to remove fire-scale from casting or to remove old, worn plating before re-plating. Unlike normal plating operations, the polarity is reversed and the work actually becomes the anode, which is attacked by the plating bath. May be used with stainless steel anode (cathode).

SAL-HYDE® PLATING SALTS

STANDA	RD PACK #	SPECIAL UPS PACK #			
Quart	Gallon	Quart	Gallon	Description	
45.540	45.541	45.540UPS	45.541UPS	Copper	
45.542	-	45.542UPS	-	Gold 14K	
45.543	-	45.543UPS	-	Gold 18K	
45.544	-	45.544UPS	-	Gold 24K English Bright	
45.545	-	45.545UPS	-	Gold 24K Roman Gold	
45.553	-	45.553UPS	-	Gold 24K Rose Gold	
-	45.546*	-	-	Nickel	
45.549	45.550	45.549UPS	45.550UPS	Silver	
	45.551*	-	-	Electro Cleaner	
	45.552	-	45.552UPS	Electro Stripper	



^{*}Note: Items marked with an asterisk (*) are not cyanide-based and may be shipped UPS as standard pack.

Cyanide-based Sal-Hyde® items are available either as standard pack or special UPS pack. Standard pack cyanide-based items must be shipped via motor freight. Cyanide-based items are not UPS shippable for resale or transport unless purchased in special UPS pack. Salts are to be added to specific amounts of distilled water to form plating solutions. Mixing bottle included with UPS shippable items.

SPECIFICATIONS

VIGOR® PLATING SOLUTIONS SUMMARY

Description	Anode	Tank	Bath Temperature	Tank Voltage
Copper Plating	Copper	Pyrex® Beaker or Stainless Steel	75° to 100°F	6
Electro-Stripping	Stainless Steel	Pyrex® Beaker or Stainless Steel	180°	6 for gold
				10 to 12 fire scale
Electro-Cleaning	Stainless Steel	Pyrex® Beaker or Stainless Steel	180° to 200°F	10 to 12
Gold Plating	Pure Gold	Pyrex® Beaker or Stainless Steel	120° to 160°F	2 to 3
	or Stainless Steel			
Nickel Plating	Pure Nickel	Pyrex® Beaker, Stainless Steel	Room Temperature	2 or less
		Rubber or Plastic		
Rhodium Plating	Platinum or	Pyrex® Beaker	100°F	4
	Platinized Titanium			
Silver Plating	Pure Silver	Pyrex® Beaker or Stainless Steel	Room Temperature	2
Silver Strike	Stainless Steel	Pyrex® Beaker or Stainless Steel	Room Temperature	5 to 6

SAL-HYDE® PLATING SALTS SUMMARY

Description Anode		Tank	Bath Temperature	Tank Voltage
Copper Plating	Copper	Pyrex® Beaker or Stainless Steel	75° to 100°F	2 to 3
Electro-Stripping	Stainless Steel	Pyrex® Beaker or Stainless Steel	180°	6 for gold
				10 to 12 fire scale
Electro-Cleaning	Stainless Steel	Pyrex® Beaker or Stainless Steel	180° to 200°F	10 to 12
Gold Plating	Pure Gold	Pyrex® Beaker or Stainless Steel	120° to 160°F	2 to 3
	or Stainless Steel			
Nickel Plating	Pure Nickel	Pyrex® Beaker, Stainless Steel	Room Temperature	2 or less
		Rubber or Plastic	30Y	
Silver Plating	Pure Silver	Pyrex® Beaker or Stainless Steel	Room Temperature	2
Silver Strike	Stainless Steel	Pyrex® Beaker or Stainless Steel	Room Temperature	5 to 6



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