

How to Gold and Silver Plate using Spa Plating's Brush Plating Equipment



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Welcome to.....



...and the exciting world of brush plating

This manual is the product of over twenty years of our experience and expertise in the field of electroplating. It is our aim to pass on this information, so that you too can reap the benefits and get started on brush plating, confident in the knowledge that you're in safe hands.

Brush plating is a very straight forward process that most people find they can easily master. This manual is designed to introduce you to the fundamentals, so that you can tackle most of the common brush plating jobs that will come your way, as well as some of the more unusual ones!

I trust you will find this manual as inspirational to read and follow as I have found it satisfying to write.

Happy plating!



Richard Palmer,
Director

Introducing..... our project-led approach

The thinking behind this manual is unique, as, for the first time in the UK, the knowledge you need to get started on brush plating is presented in the form of graded projects. We felt that this would be the best approach, as it is practical and 'hands on'. Our advice is to begin with the first and easiest of these projects and then work your way through all of them. This will ensure you will cover all of what you need to know to get started.

Denise Palmer, Marketing Director

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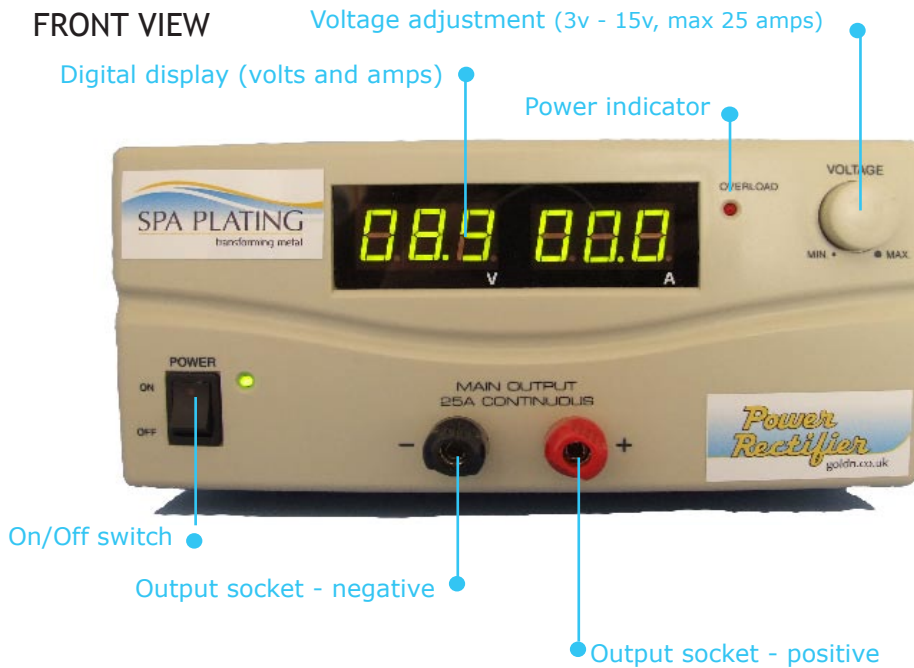
EQUIPMENT AND MATERIALS

For brush plating

Take a little time to get to know your equipment and materials by looking through this step-by-step guide we've put together. It will help you to familiarise yourself with the most important items in your kit, giving you the practical knowledge to get started on the first plating projects, which are introduced later in this manual.

The Power Plating Rectifier

FRONT VIEW



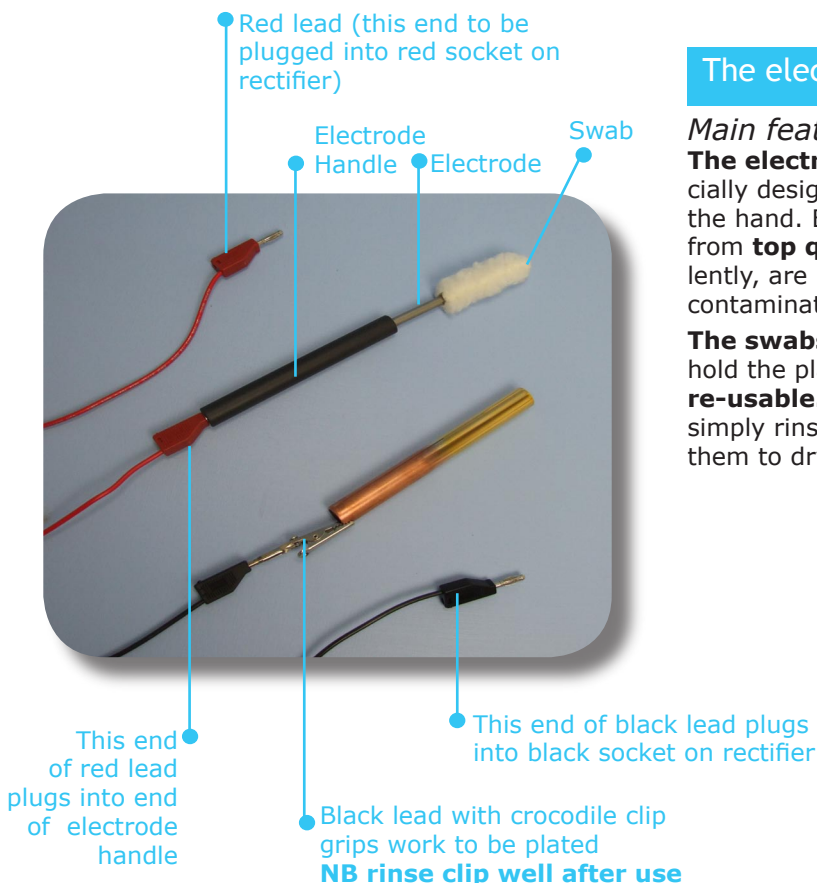
Main features;

compact and lightweight - used as easily for on-site jobs as in your workshop.

Variable voltage (from 3v to 15v), max 25 amps - you're in full control of the power level, letting you tackle the smallest to the largest of jobs with confidence.

Safety - the overload and radio frequency interference protection means you can use the rectifier in any environment.

BACK VIEW



The electrodes, swabs and leads

Main features;

The electrode handles have been specially designed to be **comfortable** to hold in the hand. Because the electrodes are made from **top quality materials**, they plate excellently, are hard-wearing and present no risk of contamination.

The swabs have been specifically designed to hold the plating solution efficiently and to be **re-usable**. Once you have finished plating, you simply rinse them out in tap water and allow them to dry.

Large electrode with swab and lead



Main features

This electrode is much broader and flatter than the normal electrodes and allows you to process large, flat areas more evenly

ly and quickly. This electrode should only be used for plating very thin, or 'flash', layers of gold and not for normal gold plating.

The Pen Plating Kit

Main features;

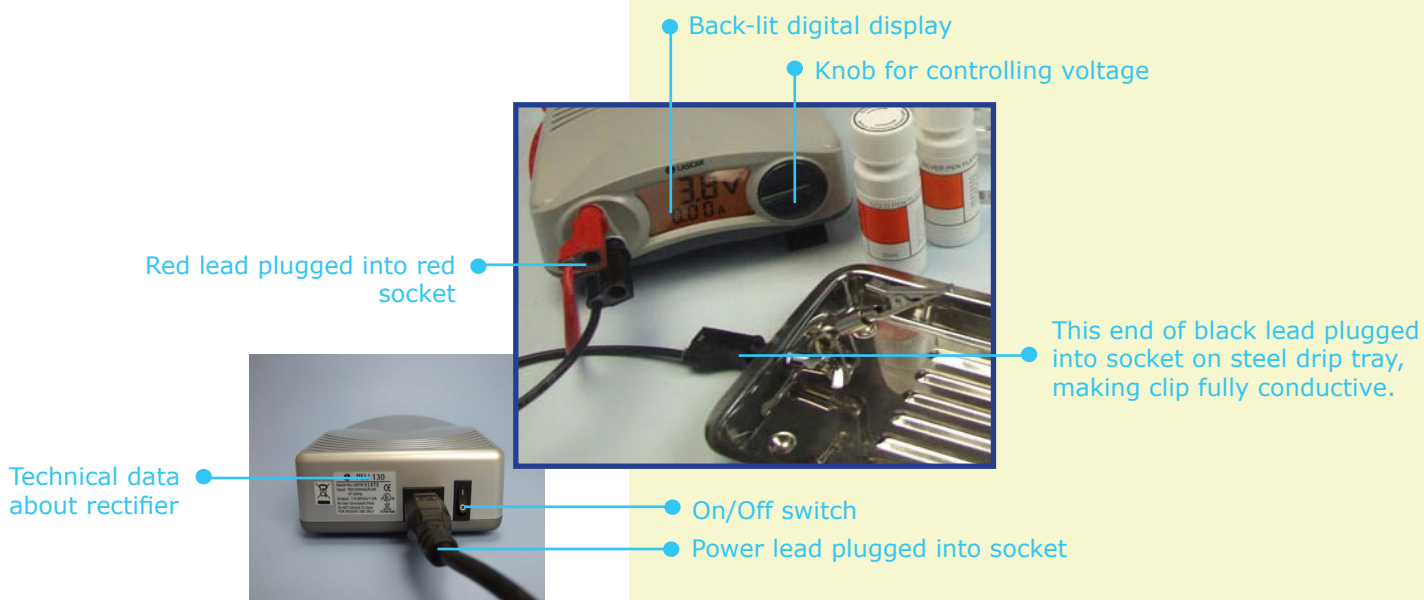
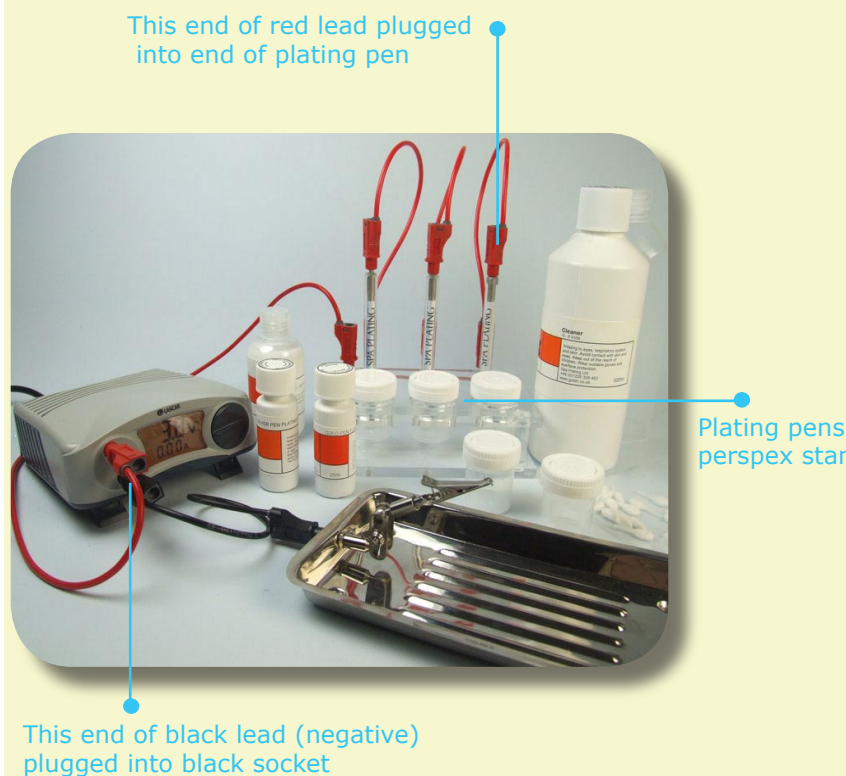
The pen plating rectifier is ideal for supplying power for smaller, precision plating jobs.

The digital display is brightly lit and clear and the red and black leads plug into the red and black sockets on the front, similar to the Power Plating Rectifier.

The mini contact probe connects to one end of the black lead, while the other end of the lead plugs into the black socket on the rectifier. By touching the end of the contact probe to the surface of your work, you complete the electric circuit and plating takes place.

The clear perspex stand provides a handy docking area to keep your plating pens organised and is part of the electrical contact to the rectifier.

The plating pens come with two styles of cotton tips, one pointed for precision work, the other paddle shaped for covering larger areas more quickly.

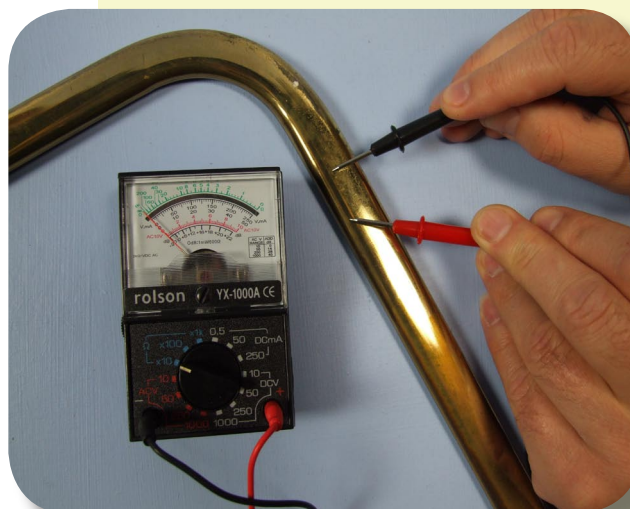


Conductivity tester

Main features;

Time saver - this is used to test whether the surface you want to plate is conductive or not. Sometimes metal can be finished with a thin, invisible layer of lacquer to stop corrosion. If you don't know it's there, it could mean you waste a lot of time trying to plate something, when it can't be plated.

Multi-functional - not only can the tester be used to establish conductivity, it can also be used for diagnostic tests on your electrodes, leads and rectifier.



SOLUTIONS AND POLISHES

All of Spa Plating's solutions have been specifically developed for the process of brush plating. Over the past twenty years, we have concentrated our efforts into researching and developing formulations that offer optimal performance especially for this process.

Polishes and solutions used for the preparation of metal surfaces for plating

An excellent example of our commitment to on-going R&D is our new preparation product, MPU. Up until now, anyone starting off in brush plating has been advised to electroclean and electro-activate or both. With MPU, in a lot of cases, these stages become unnecessary, as all you have to do is rub the surface of your work with MPU, clean off with a paper towel and get straight on with the plating. This saves significant amounts of time, effort and space; all very important considerations when setting up your brush plating business for the first time.



Preparation solutions

ActiClean - as the name suggests, an activator and cleaner, all in one! It removes the strong oxide layer that quickly builds on nickel and nickel containing alloys, such as stainless steel and is also a very effective de-greaser. Of course, by combining these two stages, you can save time, effort and money.

Deionised water - this is water in its purest form, with all traces of solid matter filtered out. Use this to rinse between each application of solution, to prevent cross contamination and ensure a good plate.

Chrome stripper - use this to remove old layers of chrome, before you start plating on top.



Brush plating solutions



Gold and silver is by far the most popular choice for brush plating, for obvious reasons. However, other metals play a vital role in brush plating; our White Bronze Mixer can be combined with our Copper Plating Solution to plate a brilliant white bronze, which can be used as a tarnish resistant alternative to silver.

The applications for our plating solutions are huge and cross a very wide range of industries, from decorative items such as jewellery, to large industrial processes such as the restoration of printing rollers with copper plate. All of these applications are open to you, the brush plater, and with experience and practice you will be able to tackle many of these jobs with confidence.

SOLUTIONS AND POLISHES: continued

Preparations for plating solutions



This group of solutions includes those that are designed to change the colour or shade of gold by adding small amounts to our gold brush plating solutions. This allows you to create the following shades of gold;

- yellow
- rose
- red
- green
- white

The large white bottle in the centre of the picture is a bottle of thickener. Adding equal amounts of this powder to your plating solution turns it into a gel. This cuts down on wastage, as very little solution runs off the piece you are plating. There is also less mess, which may be an important consideration if you are plating on-site, in someone's bathroom!

Gold Pen Plating Solution

This is another example of how our solutions have been tailor made for the brush and pen plating process. The Gold Pen Plating Solution has been specifically designed to work with optimum efficiency with our Battery Pen Plater and delivers a rich layer of gold every time. Mixing it with thickener will help you plate small, hard to reach areas on electrical equipment or pieces of jewellery.



Polishes and finishing compounds



Polishes form a vital part of the brush plater's kit, as they help you to create the optimum surface for successful plating. We sell polishes for hand polishing and the equipment for machine polishing can be easily bought online.

It is possible to polish and clean items ready for plating without using a polishing wheel. This depends on the initial condition of your work and how much time you are willing to spend. MPU, our polish designed for preparing the surface of your work, will clean it of traces of wax and silicone and also polish the surface to an acceptable shine. MetaSeal is designed to be used after you have plated, to seal the surface of your work and slow down the process of tarnishing.

An overview of the Brush Plating Process

Brush Plating can be broken down into

3 separate stages.....

1 Surface Preparation

The more attention you pay to polishing and cleaning at the start, the better your end result will be. This first stage includes polishing, cleaning and activation. Remember that plating can't hide deep scratches, so for a scratch free finish, make sure you polish these out before you start. If you are lucky, your work won't need polishing at all, and you can go straight ahead with simply cleaning and activating with MPU or ActiClean, before plating.



2 Plating/Stripping

This is the stage where you start using electricity from your rectifier to plate or strip your work. Please note however, that stripping is only necessary if the part you wish to plate is already chrome plated. You can also electro-activate and electroclean at this stage, although with MPU, electro-activating and electrocleaning has in most cases become unnecessary. Keep rinsing with deionised water throughout, to avoid cross contamination between solutions.



3 Finishing

This stage is quite simple and straightforward as it usually involves sealing the surface of your work with Meataseal.



An introduction to Preparing the surface of your work

There are two main stages in preparing the surface of your work; the polishing stage followed by the cleaning/activation stage.

At the polishing stage you can either choose hand polishing **or** machine polishing, depending on how scratched the surface of your work is.

Hand Polishing

Choose this for smaller, lightly scratched items.

- Wear protective gloves.
- We recommend starting off with an abrasive polish, for example, Autosol. Then move on to our MetaPrep polishing compound using kitchen paper towel or cotton wool pade, as in the picture opposite. To make sure the surface of your work is spotlessly clean and ready for plating, go onto the cleaning/degreasing stage, outlined below. For in-depth guidance on hand polishing, please refer to the page 'Hand polishing and cleaning' later in this manual.



Machine Polishing

Choose this if the item is large and/or deeply scratched.

- Wear a visor, gloves and tie loose hair back. Don't wear loose fitting clothing or jewellery.
- Bring the work up to the mop, using only the bottom section. You may have to work through two or three stages of polishing, changing mops and corresponding polishing bars. The table below gives guidance on which polishing bar to choose. To see examples of the various mops and polishing bars, refer to the in-depth section on polishing further on in this manual. Once the item is polished, go onto the cleaning/degreasing stage.



Surface of work	Type of polishing bar	Type of mop
For very deep scratches	Grey Bar	Sisal
For medium scratches	Green Bar	Stitched
For the final polishing	Blue Bar	Loose leaf

Cleaning/activating

Cleaning means removing all dirt and oil. Activating means removing the oxide layer that builds on metal, particularly with stainless steel, nickel and nickel containing alloys such as nickel silver.

Stages in cleaning/activating

Stage 1

MetaPrep;
removes the thicker layers of dirt and oil

Stage 2

If your work has

Either

A small to medium sized smooth surface

Or

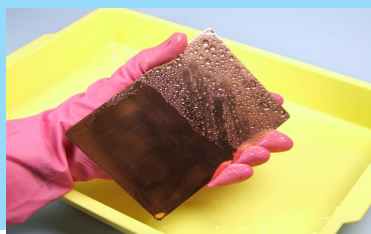
A larger surface or deep recesses

MPU;

cleans away remaining all traces of oil + activates (takes off the oxide layer)

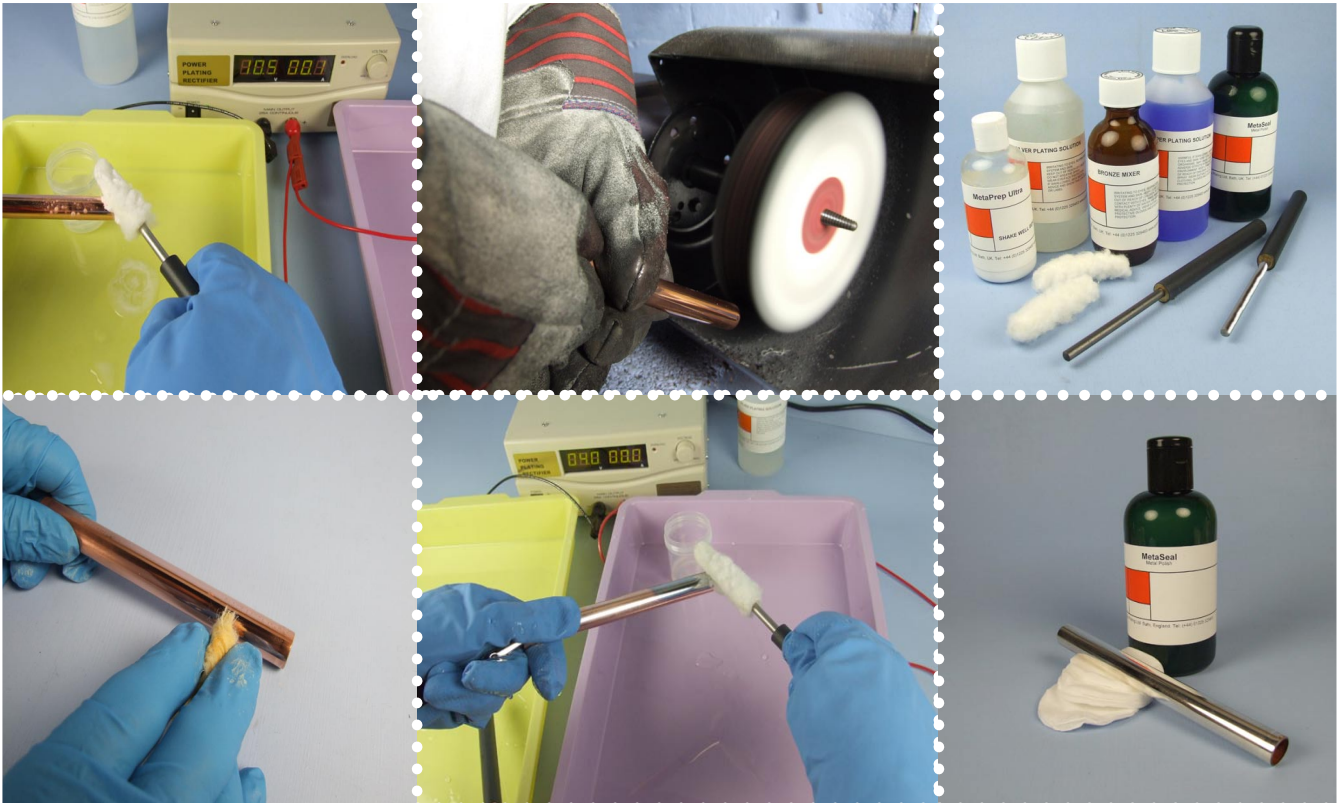
ActiClean;

electrocleaning and electro-activation - good for large surfaces and work with deep recesses.



A water-break free surface

When water runs over the surface of your work and forms a smooth unbroken sheet, this is called a water-break free surface and means it is completely free of oil and oxides. This should happen after you've completed stage 1 and 2 above.



Try out our step-by-step projects

At Spa Plating, we understand that starting off with a new process can be bit daunting, so we've put together a number of projects designed to take you through the basic techniques of brush plating. The projects are graded, so that the first one or two are designed to build your confidence in the basic skills you need and the subsequent projects gradually tackle more advanced skills.

The projects include;

1. Chrome stripping and gold plating
2. Silver plating on copper
3. Gold plating a **stainless steel** mobile phone cover
4. Using MPU to speed up the plating process
5. Using thickener when stripping and plating a bathroom mixer tap
6. Silver plating an antique EPNS matchbox
7. Black Chrome plating a brass door handle
8. Selective gold plating on zinc
9. Silver plating an antique pewter ink well

We are constantly adding more project pages to this manual, so keep in touch with us to see if we have added any new projects that might be of interest to you; we will be glad to send you an up-date in the post.

project 1

Silver Plating on Copper

Introduction

In this first project you'll get the chance to learn how to polish and then silver plate directly on to copper. The focus of this project is the cleaning and preparation stages of plating. Getting these stages right saves valuable time and ensures a professional end result. If you need in-depth guidance on silver plating, please refer to the Know How page on silver plating in this manual.



1 What you'll need

Try to get everything together before you start. You'll need Meta-Seal, MPU, Silver Plating Solution and kitchen tissue paper, as well as your length of un-plated copper tubing. You'll also need an electrode handle fitted with silver or a platinum electrode.

2 Polishing

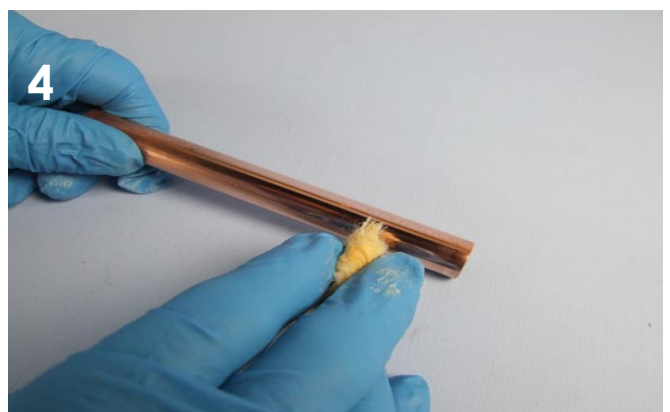
A clean, polished surface is essential if you want a top quality final result. Plating cannot cover scratches in metal, so if you want a flawless finish, your base metal needs to be highly polished. There are two ways you can polish; by machine or by hand.



3 Machine polishing

This is by far the most efficient way of polishing larger pieces of metal. You get a very good finish and it takes out scratches quickly and without too much effort.

For a more in-depth guide on polishing, please refer to the pages on polishing in this manual.

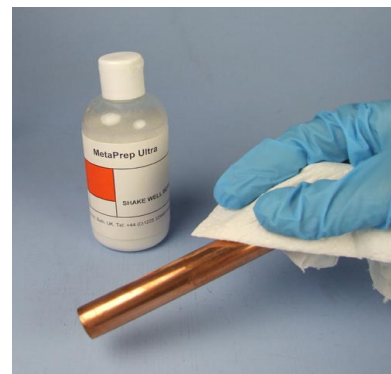


4 Hand polishing

If you don't have a polishing wheel, or if your piece of work is already fairly polished or very small and delicate, hand polishing is an option. It takes longer and is harder work, but perfectly acceptable finishes can be achieved. We recommend you use metal polishing wadding that can be bought from most hardware stores.

5 MPU stage

Clean your work with MPU to remove all traces of polishing compound. Polishing by machine or by hand will leave your work covered in the polishing compound you have used. If this is left on the work, it will form a barrier to plating, so it has to be removed.



6 Setup

You'll only need one tray for the silver solution, plus a clean beaker.

- Plug the black lead into the black socket and attach the other end to your copper tubing.
- Plug the red lead into the red socket and plug the other end of the red lead into the end of the electrode handle.
- Pour out 10 ml of silver solution into a beaker, place this in your tray and put the bottle next to the tray.
- Set the rectifier to 4 volts.

Don't forget to wet the swab thoroughly before you start plating!



7 Silver plating 2.5-3 volts

Dip the electrode in the silver solution and start brushing the surface of the copper tube with circular movements. The layer of silver plate should quickly appear.

Carry on plating for three minutes to make sure you have a layer of silver that will stand up to reasonable wear. Rinse your work with deionised water and remember to rinse your electrode, swab and crocodile clip thoroughly.

8 Finishing

To bring out the final lustre of your work polish with Goddards Silver Polish. This helps to keep the surface shiny and free of oxidation.



The ActiClean Stage

Trouble shooting

ActiCleaning 5 - 7 volts

Type of problems	Possible reason	What to do
No foam appearing around the swab.	<ul style="list-style-type: none"> Electrical circuit not complete. Swab not saturated in ActiClean. Traces of grease or oil still on surface of work. 	<ul style="list-style-type: none"> Check for any faults with the rectifier. Re-dip the electrode and leave to soak for a few seconds. Dry work thoroughly and degrease with concentrated washing up liquid.
Blotches appearing on the surface of your work.	<ul style="list-style-type: none"> Unsuitable metal eg. aluminium. 	<ul style="list-style-type: none"> Aluminium can't be brush plated.
Swab turning black.	<ul style="list-style-type: none"> Traces of polish or cleaning compound left on surface of work. 	<ul style="list-style-type: none"> Clean thoroughly with MetaPrep.
Surface of work becomes dull and, in extreme cases, etched.	<ul style="list-style-type: none"> Plating leads plugged into sockets in reverse. 	<ul style="list-style-type: none"> Check that plating leads are connected for plating and not stripping.
Brown stain marks start to form, particularly on electro-plated nickel.	<ul style="list-style-type: none"> Voltage set too high. Impurities in the base metal. 	<ul style="list-style-type: none"> Reduce voltage. Reduce voltage and/or duration.

ActiClean combines cleaner and activator in one product.

In this respect it does the same job as MPU. Whether you choose to clean and activate using ActiClean or MPU depends on a number of factors; if the surface you're plating has deep recesses or you intend to plate a very large surface area, ActiClean would be a sensible choice.

Whichever you choose, this stage is essential as it ensures you end up with a water-break free surface and the invisible layer of oxide that builds especially quickly on nickel containing alloys such as stainless steel is removed.

Which electrode should I use?

Only a carbon or platinum electrode should be used with ActiClean.

Using a stainless steel electrode can result in blotchy and flaking plating results.

Choosing the *right* electrode for the job

OUR SELECTION OF ELECTRODES ARE MADE FROM A WIDE RANGE OF MATERIALS TO ENSURE YOU GET MAXIMUM PERFORMANCE FROM YOUR PLATING SOLUTIONS.



Once you're confident about which electrode to use with which process, you'll soon notice the benefits in terms of excellent results and cost savings.

Opposite is a quick reference table to get you started with choosing the best electrode to go with your chosen plating process. As well as the table, the notes below will help you further refine your choice.



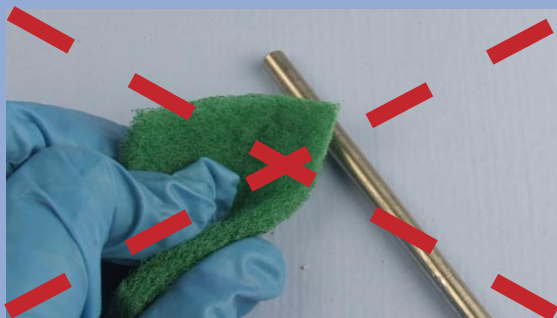
The stainless steel electrode must only be used for chrome stripping with Safe-T-Strip.

The platinum electrode plates to a very high standard and will not wear down or discolour the swab.

The carbon electrode is very useful as it can be used for a range of plating processes and is economically priced. However, it will wear with heavy use and tends to discolour the swab. This has no effect on the quality of the plate.

Choice of Electrode →	1st	2nd
Plating process ↓		
Chrome stripping	Stainless Steel	—
ActiCleaning	Carbon	Platinum
Copper plating	Copper	Carbon
White bronze plating	Platinum	Carbon
Black Chrome plating	Carbon	—
Silver plating	Silver	Platinum/Carbon
Gold plating	Platinum	Carbon
Nickel Plating	Nickel	Carbon
White palladium plating	Platinum	Carbon

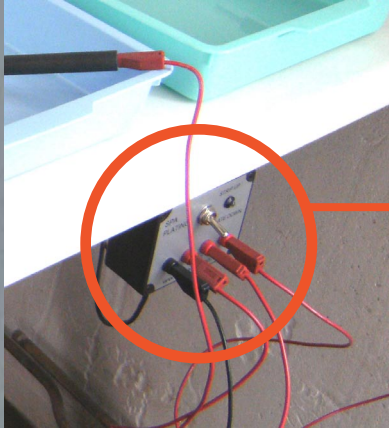
Technical tip



Warning!

Do not try to clean your platinum electrode with an abrasive cleaner. To remove any marks that can't be easily wiped off, connect the wand handle that has been fitted with a platinum electrode to the red lead and join a stainless steel electrode (with a swab) to the end of a black lead and brush at 5 to 7 volts with ActiClean. Carry on brushing until all marks have been removed.





fitting Spa Plating's Expansion Box

To get the most out of your expansion box

we recommend you fit it permanently to the underside of your bench. You'll then be able to move seamlessly from one plating stage to the next, without having your leads trailing over your plating trays. Instead, they'll be neatly stored under your bench and because the box is fixed at waist height, reaching the switch to reverse the current will also be much easier.



1

Assembled expansion box

Our expansion boxes allow you to change from strip to plate at the flick of a switch - no more swapping over leads at the rectifier! As well as this, the flashing red light helps you to avoid damaging your work by warning you you 're in stripping mode and preventing one of the most common problems in brush plating; going into the electro-activation/cleaning stage with the electrical current flowing in the wrong direction.



2

Disassembling the expansion box

To fix your expansion box to your bench, you'll first have to take the front plate off. Just remove the four screws from the corners of the front plate with a phillips screwdriver.



3

Disassembled expansion box

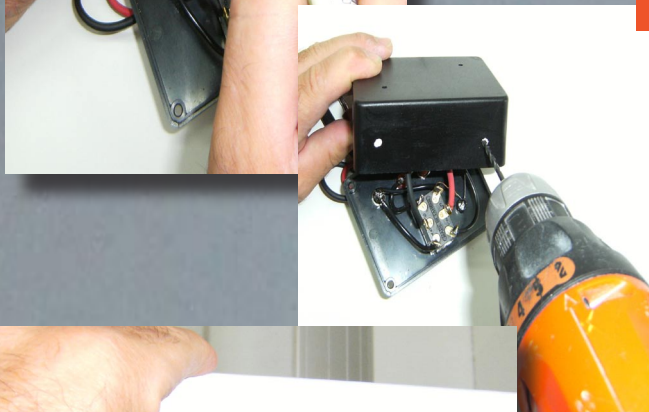
Here's how the box should look when you've taken it apart.



4

Marking the position of the drill holes

To fix the expansion box to the bench, you'll need to use screws. In this case we want to attach the box to the underside of the bench top, so the drill holes should go on the top of the box.



5

Drilling the holes

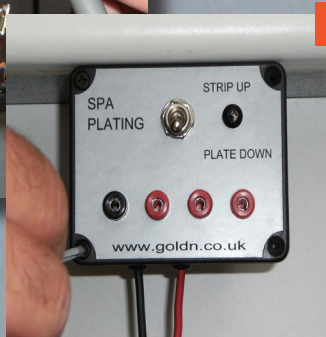
When drilling the holes, try to make sure you're supporting the box on an even surface.



6

Attaching the box

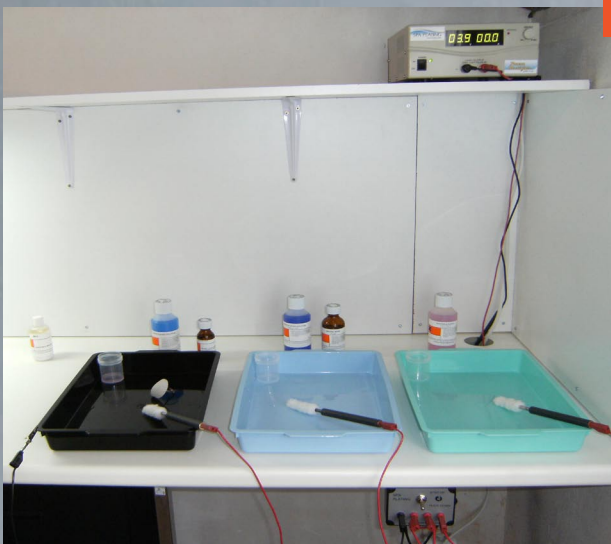
Position the box carefully and fix to the underside of the bench.



7

Reassembling the expansion box

Put all of the contents back in and replace the screws.



8

Connected expansion box

The expansion box is now connected to the full set of wands and the rectifier, showing just how useful the box is, in organising your work area. If you want to place the rectifier at any distance from the expansion box, you'll need to fit a couple of our extension leads, which you can get from our website.

NB! This is the ideal set up for plating the layers of plate you would need for non conductive surfaces, i.e., copper, nickel (or white bronze) and gold.

project 2

Chrome Stripping, Gold Plating and using the online plating calculator



Introduction

This project is designed to introduce you to stripping chrome plate, the use of ActiClean to activate and clean the surface of your work to make it ready for plating and finally gold plating.

If you want to plate something that has already been chrome plated (for example a bathroom tap), you'll have to strip off the chrome first. The reason is that it's almost impossible to plate any metal onto chrome.

Thanks to our extensive research into chrome stripping, we've developed a safer and greener chrome stripping solution called Safe-T-Strip. Not only is it much less hazardous and odour free compared to other stripping solutions on the market, you don't need to electro-activate after chrome stripping. All you need to do is rub with MPU to activate the nickel layer and get straight on with plating.

1 What you will need

Collect together all the things you will need before you start.

Preparation solutions; Safe-T-Strip, MPU. **Plating solutions;** gold.

Finishing; MetaSeal. **Equipment;** two beakers, Power Plating Rectifier.

Electrodes; one stainless steel and one platinum with the corresponding number of electrode handles, two swabs, two red leads and one black lead with a crocodile clip fitted.



2 Setup

Arrange your work area as shown in the picture. Take two beakers and pour out approximately 10ml of Safe-T-Strip and 10ml of gold solution. Place these beakers in this order next to the two trays. Plug the red leads into each other to form a stack (this can be seen in detail in the next picture). Then plug the other ends of the leads into the sockets in the electrode handles. Mount the stainless steel electrode in the first handle and the platinum in the second using the allen key. Place a swab on each electrode as shown in the picture.

3 Connecting the leads for chrome stripping

In order to strip the chrome, you need to reverse the normal current so, as in the picture, plug the black lead into the red socket on your rectifier and plug the two red leads into black socket. Grip the chrome plated tubing with the crocodile clip, which is at the other end of the black lead. The other ends of the two red leads should already be plugged into the ends of the two electrode handles.





5 Wetting swab

To help absorption of the solution, wet the swab thoroughly.



6 Chrome stripping 5-7 volts

Dip the swab into the Safe-T-Strip and brush the surface of your work with the carbon electrode using small circular movements.

Do this until all you can see is the straw-coloured layer of nickel underneath. The chrome layer should come off very quickly. Rinse your work with water.

NB - If you are using only one electrode to chrome strip and gold plate, make sure you rinse this and the swab thoroughly between stages.



7 Activation with MPU

Activate the surface of your work in preparation for gold plating by simply rubbing with MPU with a clean piece of tissue.



8 Connecting the leads for gold plating

In order to gold plate, you must restore the normal direction of current, so plug the two red leads into the red socket and the black lead into the black socket.



Try to keep as much contact between the swab and the work as possible, to get maximum plating results. In the left hand picture, there's less contact and therefore only 0.2 amps are flowing and the plating is consequently slower. In the main picture the swab has the maximum contact surface area with the work, 0.5 amps are flowing and the plating rate is more than doubled. To calculate exactly how much solution you'll need and how long the plating will take, take a look at our online Plating Calculator on our Help page.



9 Gold plating 4 - 7 volts

Take up the platinum electrode, dip it into the gold solution and start plating with the same circular movement, working gradually all over the surface of your work.

You will need to keep dipping the platinum electrode in the solution to replenish the gold. If your work has sharp corners, reduce the voltage while you plate these areas, otherwise it will burn and result in a soft plate that will easily wear off.

Keep plating for at least five minutes to build up a good layer of gold. Rinse.

10 Finishing

To bring out the final lustre of your work, polish with MetaSeal.



Silver Plating

Silver, probably the first metal to be electro-deposited on a commercial scale, has the highest electrical conductivity of any element and is fairly resistant to attack from most chemicals. However, it is very reactive with certain sulphide containing chemicals, for example some polishing compounds and detergents. Care should be taken to make sure your silver plate doesn't come into direct contact with these materials.

Because of its inherent qualities, silver plates quite fast; this can be deceptive as the resulting layer soon looks substantial but in reality is quite thin and patchy. We therefore recommend that you continue brushing on the silver for at least three minutes, to ensure you plate a layer that is thick enough to stand up to future polishing. Our silver plating solution isn't classified as toxic and is very easy to work with. It deposits



This EPNS matchbox was restored with our silver plating solution.

a bright, solid layer that needs only minimal hand polishing to bring up its lustre. It works excellently to restore decorative and household items that

are made from EPNS or tin based alloys such as pewter and Britannia metal. You can use a platinum electrode for silver plating, but for top quality results we recommend using one of our silver electrodes. *For more guidance on this process, please refer to Project 6 in this manual.*

Trouble shooting Silver Plating 2.5 - 3 volts

Type of problem	Possible reason	What to do
No plating taking place	<ul style="list-style-type: none"> Incomplete electrical circuit; check all connections. Surface not clean enough. Surface inactive. 	<ul style="list-style-type: none"> Check all electrical connections and clean if necessary. Make sure the swab is fully soaked in solution. Hand polish, clean and re-plate. Check that surface is conductive with a conductivity tester (see 'Using the Conductivity Tester')
Plating is patchy or is flaking off metals such as steel, nickel and nickel containing alloys. This could include stainless steel, nickel copper alloys (such as monel metal used to replace silver in coins) and EPNS	<ul style="list-style-type: none"> Silver doesn't plate directly onto these metals very readily, due to the chemical reaction between these base metals and the silver. 	<ul style="list-style-type: none"> First gold flash and then silver plate on top.
Dark lines appearing in the plate.	<ul style="list-style-type: none"> The silver solution is contaminated. The swab is contaminated. 	<ul style="list-style-type: none"> Replace with fresh solution. Don't tip the used solution back into the bottle. Wash swab thoroughly in tap water then rinse with deionised water.
Silver plating dull and rough.	<ul style="list-style-type: none"> Voltage too high. Brushing action of swab not quick enough. 	<ul style="list-style-type: none"> Turn down voltage. Speed up brushing action.
Plating dark, especially on the edges or corners of the work.	<ul style="list-style-type: none"> Voltage too high 	<ul style="list-style-type: none"> Reduce voltage and carry on plating until the stain has disappeared. Light staining and tarnishing can be removed after plating by MPU or ActiClean.

Pre-treatment stages for gold and silver plating onto different metals

There is a wide range of different metals that gold and silver can be plated onto and with each different metal base, different pre-treatments can apply.

- A lot of surfaces can be easily prepared by rubbing with MPU and buffing with a clean paper towel.
- In the table below, where it says 'Gold Flash', this means a thin and quickly applied layer of gold plate using our Gold Flash solution.
- For areas that are difficult to reach with MPU, electroclean and electro-activate all in one with our unique ActiClean.

Recommended Pre-treatment Stages		
Base metal	Gold Plating	Silver Plating
Copper, brass and bronze and its alloys	<ul style="list-style-type: none"> • MPU or ActiClean • White bronze plate 	<ul style="list-style-type: none"> • MPU or ActiClean
Stainless Steel	<ul style="list-style-type: none"> • MPU or ActiClean 	<ul style="list-style-type: none"> • MPU or ActiClean • Gold flash
Zinc and its alloys (pot metal, Zamak and Mazak)	<ul style="list-style-type: none"> • MPU only. Do not rinse! • Thickened copper 	<ul style="list-style-type: none"> • MPU only. Do not rinse! • Thickened copper • If adhesion is an issue, gold flash first.
Nickel and its alloys- (Monel metal, nickel silver)	<ul style="list-style-type: none"> • MPU or ActiClean 	<ul style="list-style-type: none"> • MPU or ActiClean • Gold flash
Tin and its alloys (pewter, Britannia metal and solder)	<ul style="list-style-type: none"> • MPU • Thickened copper • white bronze 	<ul style="list-style-type: none"> • MPU • Thickened copper
Silver	<ul style="list-style-type: none"> • MPU or ActiClean 	<ul style="list-style-type: none"> • MPU or ActiClean
Gold	<ul style="list-style-type: none"> • MPU or ActiClean 	<ul style="list-style-type: none"> • MPU or ActiClean

Despite its name, EPNS (Electro Plated Nickel Silver) does not contain any silver, but is an alloy of copper (60%), nickel and zinc. Monel metal is an alloy of nickel and copper, with some iron added for strength.

This table is designed to be used as a quick reference. For the detailed information you'll need for practical purposes, please consult the relevant project and Know How pages and the Quick Reference pages nos.1 and 2.

An *in-depth* focus on Surface Preparation.....

All of your detailed questions answered.

For more guidance on the correct use of mops and polishing bars, turn to Project 4 in the project section of this manual.

Hand polishing is the best option if the item you are working on is small and delicate or only needs a light polish to remove minor scratches. If you haven't got a buffing wheel, then polishing by

hand is the only option. You can achieve equally good results with hand polishing, but it will take you much longer! There are three polishes that we recommend;

General metal polish is the most abrasive and is used only for the stages before plating or polishing before re-plating.

Silver polish is used for polishing silver plated items to bring up the final lustre and to protect the surface from further tarnishing.

MPU is ideal for polishing and cleaning the surface of your work in preparation for plating and in many instances can be used instead of the Acti-Clean stage. If your work is very greasy, we still recommend cleaning with liquid detergent before cleaning with MPU.

MPU Fine is used for polishing thin, flash coatings of gold.

To recap, the two stages in surface preparation are polishing, followed by cleaning or degreasing. Polishing can either be done by hand or by machine.

Machine polishing usually involves using a buffing machine. However, if the item is very small and has an irregular surface, a hand-held machine called



a pendant drill can be used. This is particularly popular with jewellers. A small Dremmel mop is used to get into the angles created by the surface design of this EPNS matchbox. This can be a safer option than trying to introduce a

small, delicate item to the buffing machine.

The buffing machine however, is the logical choice if you need to polish a large, relatively smooth surface. As outlined in Know How 1 'Surface Preparation', there are three kinds of mop; the sisal, stitched and loose leaf.

Sisal mops are used for dented or very deeply scored items. A word of warning though; be careful not to distort the shape of your work, as this mop can cause a lot of traction if you press too hard.

Stitched mops are the next stage on from sisal and can be used on items in a medium scratched condition or the first stage of polishing of hard metals, such as stainless steel. You can apply considerable pressure to get the maximum cutting speed but again, take care not to distort your work.

Loose leaf mops are used for the final polishing stage or to remove minor scratches from items of work that don't need a lot of polishing.

Try to avoid cross contamination of your mops with the polishing bars.



Use only the grey bar with the sisal, the green with the stitched and the blue with the loose leaf.



Health and safety should be the first priority when using buffing machines.

Your buffing wheel must be guarded properly; this will prevent work from being thrown out if it catches and is snatched from your hands. It also stops you from using the wrong section of the wheel - remember, only use the front, bottom section. You should always wear polishing gloves, eye protection and a respirator to protect yourself from breathing in the fine metallic dust produced by the buffing wheel.

Many of the materials and equipment featured on these pages can be bought from Spa Plating.

Changing Electrodes

Our system of interchangeable electrodes ensures that you achieve the best possible brush plating results every time.

You can exactly match the right electrode with the right plating process, ensuring premium performance from the plating solution you are using.

This Know How page will show you how to easily and quickly swap electrodes, to take advantage of this flexible approach.



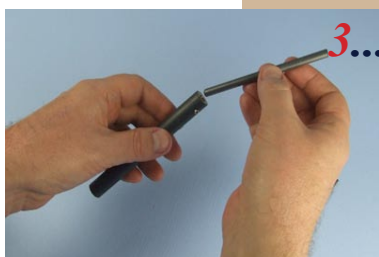
1.....

Get together your electrode handle, allen key and chosen electrode. We are demonstrating using a carbon electrode here, as care should be taken not to over tighten these electrodes.



2.....

Slowly unscrew the nut on the side of the electrode handle.



3.....

With the nut loosened, you will be able to insert the electrode into the end of the electrode handle.



4.....

With all of our electrodes, be careful not to over tighten with the allen key, but with carbon electrodes take particular care; if you tightened them up too much, they will snap off in the electrode handle and will need to be drilled out again.

project 3

Gold plating on stainless steel

This project takes you through the steps involved in gold brush plating on stainless steel, using a mobile phone cover for demonstration purposes.

Please be aware that most mobile phones are now made of aluminium and are therefore very difficult to brush plate. We do not recommend you buy any of our equipment or plating solutions if you want to gold plate aluminium iPhones.

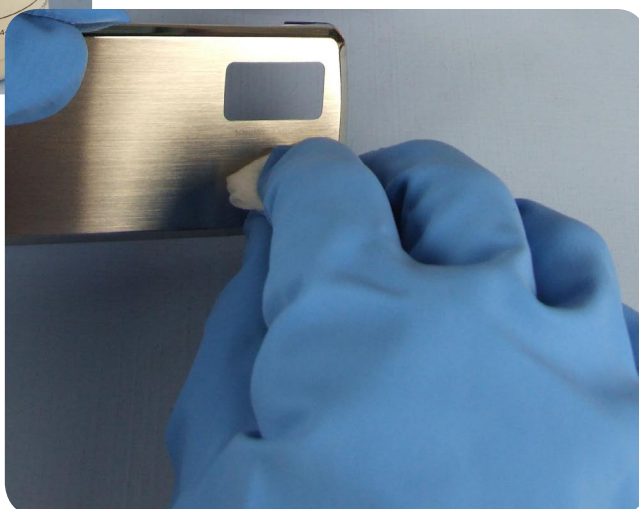
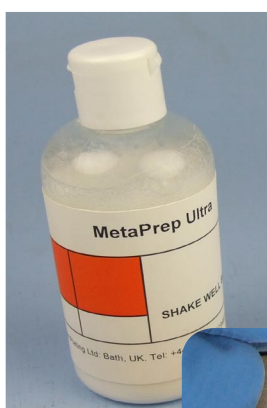


1 What you'll need

MetaSeal and MPU, Gold Plating Solution, spray bottle with deionised water. Electrode handle fitted with carbon electrode.

2 Hand Cleaning

Clean the surface of the mobile phone cover with MPU to get it ready for plating. Take care to move along the grain of the scratch, as this will make the MPU easier to clean off.

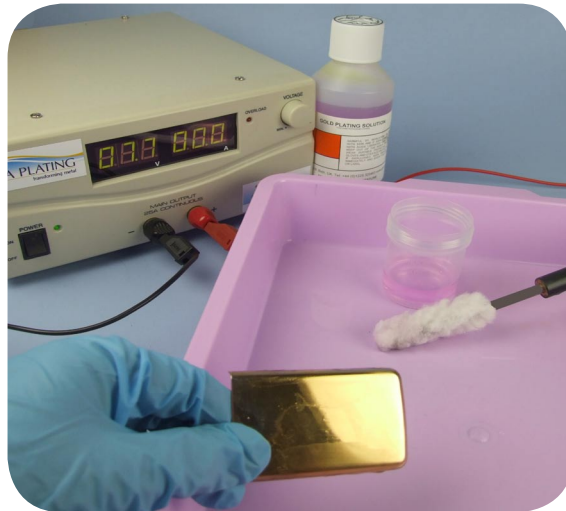


3 Gold Plating - 4 - 7 volts

The level of voltage will depend on the part of the object you are plating. If your work has sharp corners, plate these at 5-6 volts. This will ensure you plate a thick enough layer on the corners and edges.

On the flatter areas you can increase the voltage to 7- 8 volts.

Dip the swab in the gold solution and begin plating, brushing the gold solution on with regular circular movements. Keep replenishing the gold by dipping the swab into the solution. Plate for approximately 5 minutes to ensure a durable layer of gold.



Why not see how much quicker plating large flat surfaces could be with our large flat electrodes? Take a look at our online Plating Calculator on our Help page.



4 Finishing

Finish off your work by polishing the cover with MetaSeal. This will bring out the final lustre and help to protect the plate tarnishing from finger prints.



Gold Plating

Gold is by far the most popular deposited metal in the brush plating trade and spectacular results can be obtained on a wide range of polished surfaces. A large proportion of the average brush plater's business consists of gold plating personal items such as mp3 players, car badges and bathroom equipment. This trend looks set to continue as the market for these services carries on expanding.

An easy metal

Gold is one of the easiest metals to electroplate, mainly due to the fact that it is almost inert; that is to say, it does not react with other chemicals. For this reason it forms an excellent undercoat for plating onto passive metals, for example high chromium-nickel containing alloys such as stainless steel.

Flexibility

Our gold plating solution can be mixed with other specially designed mixing agents to produce a wide range of different coloured gold finishes. This flexibility means you can match all the most popular shades of gold found in bathrooms by mixing our gold solution with our gold mixer. Rose

gold is also easy to create using the same method, making it possible to match many of the commonly found shades of gold in precious jewellery.

Inexpensive

The technique of creating your own bespoke shade of gold using our gold mixers is inexpensive as you don't need to keep bulk supplies of all the different shades of gold and you only mix what you need to do the job. For in-depth information on gold mixing, refer the Know How page on gold mixer. A carbon or a platinum electrode should be used for all your gold plating.

SAVINGS....

Gold plating solution can be mixed with our Thickener to form gels. The great advantage of this is that the plating solution stays on the work and doesn't run off. This not only helps to build up a thicker layer of plate more quickly, but also saves on gold plating solution.

NB - all of our other plating solutions can also be mixed with Thickener, so you can make even more savings by using this technique.

Trouble shooting Gold Plating 4 - 7 volts

Type of problem	Possible reason	What to do
No plating taking place	<ul style="list-style-type: none"> Incomplete electrical circuit; check all connections. Surface not clean enough. Surface inactive. 	<ul style="list-style-type: none"> Check all electrical connections and clean if necessary. Make sure the swab is fully soaked in solution. Hand polish with MPU, clean and re-plate. Check that surface is conductive with a conductivity tester (see 'Using the Conductivity Tester')
Gold is plating but the wrong shade.	<ul style="list-style-type: none"> Incorrect mixing Solution contaminated 	<ul style="list-style-type: none"> Refer to the gold mixing table. Make sure the swab is clean and well rinsed with deionised water before plating. Don't pour used solution back into its storage bottle.
Rose gold plating coming out dark, especially in recessed areas.	<ul style="list-style-type: none"> Occasionally a blackish bloom may appear on rose gold. This isn't permanent and is caused by your work surface not being clean enough. 	<ul style="list-style-type: none"> Re-plate or clean with MPU and carry on plating.

GOLD PLATING TROUBLE SHOOTING

continued.....

Plating flaking off when plating nickel and nickel containing alloys.	<ul style="list-style-type: none"> • Surface of work inactive because of ineffective activation. 	<ul style="list-style-type: none"> • Reactivation with MPU or ActiClean is necessary as you are plating a nickel containing alloy; make sure you cover all areas.
Plate wears off very quickly on corners/edges of work.	<ul style="list-style-type: none"> • Voltage too high 	<ul style="list-style-type: none"> • Reduce voltage to 5-6 volts for plating corners/edges.
Dull patches of plate appearing.	<ul style="list-style-type: none"> • Surface inactive. • Surface of work insufficiently polished. 	<ul style="list-style-type: none"> • Clean with MPU, making sure you cover all areas. • Re-polish.
Plate peeling/ no plating around hinges on hinged articles.	<ul style="list-style-type: none"> • Polishing compounds and preparation chemicals still present on surface of work. • Contamination from oil oozing from hinges. 	<ul style="list-style-type: none"> • Dry your work thoroughly and clean with a little lighter fuel by squirting it directly into the hinge or onto the work's surface. Allow the fluid to fully evaporate, then re-plate.

*Some examples of items
that have been transformed
with our gold solutions.....*



Silver goblets turned to glistening gold



Business card holder, selectively gold plated



Silver gilt earrings, the top in 24ct gold, the bottom in green gold.

project 4

Using MPU to clean and activate

This project demonstrates two techniques;

- Using MPU instead of electrocleaning and electro-activating with ActiClean
- How to polish a stainless steel surface, turning it from matt to shiny.

Because the mobile phone cover is made of stainless steel, it is essential to activate the surface before plating. This can be done with ActiClean but you may find it more convenient to use MPU, as you don't need to set up another tray, lead and electrode to do so; all you need is a bottle of MPU and a paper towel.



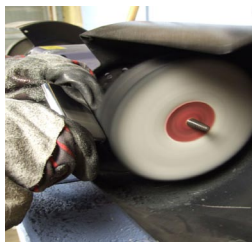
5 Finishing

After gold plating the cover, finish with MetaSeal.



1 What you will need

Instead of an extra drip tray and carbon electrode, all you will need is MPU, Gold Plating Solution and MetaSeal. For the removal of the matt surface, you will need a stitched mop with a green bar of polish and a loose leaf mop with a blue bar of polish. You can use either a carbon or platinised titanium electrode.



2 Machine polishing

Begin by removing the matt surface of the mobile phone cover with the stitched mop, loaded with the green polish. For the final buffing, use the loose leaf mop and the blue polish.

Buffing wheel safety

- Use goggles and gloves
- No loose clothing, hair or jewellery

3 Cleaning and activating 'all in one' with MPU

Use MPU to remove the remains of the buffing wheel polish, rubbing with a paper towel. When you have finished with the MPU, buff up to a high shine with a clean paper towel.

4 Gold plating

4 - 7 volts

Because you have used the MPU, you will find the plating stage a breeze, as all you will need is one tray and one red lead, instead of the normal three.

Just hold the clip against the underside of your work rather than gripping it, as this will avoid marks appearing on the surface.



Hold the clip to the underside of your work.

project 5

Using thickener to strip and gold plate a mixer tap



1. WHAT YOU'LL NEED

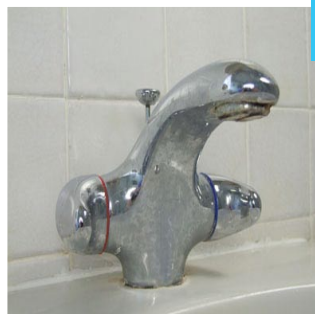
Solutions; Safe-T-Strip, Thickener, Gold Plating Solution, MPU, MetaSeal.

Equipment; Conductivity tester, two electrode handles with a stainless steel and platinum electrode fitted.

This project shows how useful thickener can be when plating on-site, in this case gold plating a mixer tap in the bathroom.

Thickener prevents your plating solutions from running off the object you're plating, which means less waste of precious plating solutions and thus, more savings for you.

The only solution that needs gelling is the gold and you should do this before you start the plating run. Please refer to the appropriate Know How page for guidance on preparing thickener.



2. PREPARING THE SURFACE

Make sure you have a clean surface before you start and if there is any lime scale, remove it with a non-abrasive cleaner.

At this point it would be a good idea to check the conductivity of the surface of your tap with the conductivity tester, as the handle of the tap may not form an electrical connection to the spout part. You'll be able to find this out with the conductivity tester.



3. CHROME STRIPPING USING SAFE-T-STRIP - 5-7 VOLTS

Reverse the normal current by plugging the black lead into the red socket and the red lead into the black socket. Remember to use the stainless steel electrode for this stage. Please see Project One for more guidance on chrome stripping and the correct voltages.

Chrome stripping should happen very quickly and you will soon see the straw colour of the layer of nickel appear below the chrome. As soon as you see this, move on to another area of the tap.



Figure a shows stripping taking place. Note that the crocodile clip is touching the underside of the spout of the tap. This is because where the clip touches it leaves a mark, so it's best to make contact in a place that's out of sight.

Note that both the swab and clip are touching the spout. If the clip were touching the handle, this might not form a circuit and stripping wouldn't happen.



Figure b clearly shows the difference in colour between the unstripped chrome handle and the stripped straw-coloured nickel base layer.

4. ACTIVATION WITH MPU

Before you go on to the next stage, rub the surface of your work thoroughly with MPU using a clean household tissue

5. PLATING WITH THE THICKENED GOLD SOLUTION; 4 -7 VOLTS

This stage is where the thickener really comes into its own, as you'll find hardly any of the solution is wasted - all of your gold is going on the tap rather than running away.

The gold may take a while to appear, as the thickened solution takes longer to soak through the swab. Just keep moving the carbon electrode in smooth circular strokes as normal and it will soon start to plate.

If unplated areas appear, then not all of the chrome may have been stripped. This is where MPU comes in handy, as it's much easier to re-activate using MPU than to electro-activate mid plating run. Chrome strip again and simply activate by rubbing with MPU.

Once you've finished gold plating, rinse, dry and finish with MetaSeal. To keep the tap clean from now on, use a non-abrasive cleaner.

Remember to reduce the voltage on any edges and corners to ensure you plate thickly enough in these areas!



Brush plating **KNOW HOW** 7

Chrome Stripping with Safe-T-Strip

One of the most important things to remember when you are chrome stripping is to make sure you reverse the voltage in order to strip and then, when stripping is complete, that you reverse the voltage back again to normal for plating. It's very easy to forget to do this, so keep checking as you go along.

All of this may sound tricky, but using our unique chrome stripper, Safe-T-Strip, makes the whole process much simpler, as you won't have to electro-activate after stripping and before plating. Instead of electro-activating, all you'll have to do is activate by



rubbing with MPU.

Added to the practical considerations of ease of use, Safe-T-Strip also represents a huge leap forward in solution safety; we've eliminated the hazardous by-products that most other chrome strippers contain, to ensure that our stripper is as kind as it can be, to you and the environment.

You can make chrome stripping even more straightforward by using our expansion box. It has a handy switch that allows you to quickly reverse and un-reverse the current, and means you don't have to reverse by plugging and unplugging your leads manually from the rectifier. This piece of equipment may prove to be vital, if you're planning to do a lot of chrome stripping. Use only a stainless steel electrode.

Trouble shooting Chrome Stripping 5 - 7 volts

Type of problem	Possible reason	What to do
No stripping taking place	<ul style="list-style-type: none"> Incomplete electrical circuit. Article not made of chrome, but some other shiny metal, possibly stainless steel. Chrome already stripped! Chrome is often first plated quite thinly and so takes little time to strip. It's very easy to mistake the nickel underneath as chrome and to carry on plating unnecessarily. 	<ul style="list-style-type: none"> Check all electrical connections and clean if necessary. Make sure the swab is fully soaked in solution; if not, re-dip the stainless steel electrode and leave to soak for a few seconds. Check you have reversed the normal current at the rectifier by either plugging the black lead into the red socket and the red into the black or, if you are using an expansion box, the switch is in the 'strip' position. CAUTION! Remember to reverse back all of the leads and switches when you come to plate, as you may damage your work if you forget. You may be able to go straight ahead with cleaning and activating with MPU or electro-cleaning and electro-activating with ActiClean and then plating. Pay special attention to parts that you suspect only have a thin layer of chrome. You can reduce the voltage to 4 volts to increase the stripping time.
Chrome stripping very slow.	<ul style="list-style-type: none"> Unusually thick layer of chrome plate. Poor electrical contacts. 	<ul style="list-style-type: none"> Allow more time than usual to strip. Check and clean all contacts.
After stripping, surface of work underneath is dull or, in extreme cases, etched.	<ul style="list-style-type: none"> Voltage for stripping set too high. 	<ul style="list-style-type: none"> Reduce the voltage to 6 volts and continue. This problem is particularly common with thick chrome plate, for example on some kinds of car badges. If the work is getting quite hot, stop stripping for a moment to allow it to cool and then continue. Polish out the dullness or etch using the buffing wheel.

Preparing Thickener



1. Measuring out the thickener

Pour out the amount of plating solution you need into a measuring beaker. If you are plating a medium sized tap, 20 ml should be enough. Then pour into the same beaker an equal amount of thickener.

One of the most useful things about thickener is how it helps you to be economical with your plating solutions.

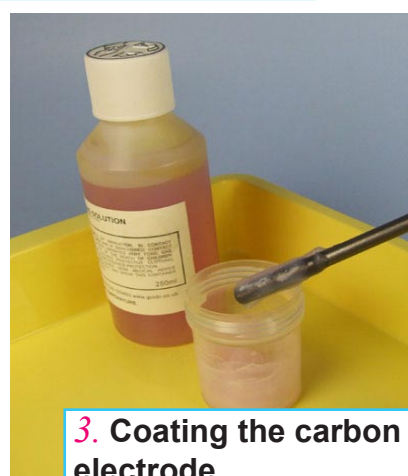
It's therefore particularly useful for mixing with gold, but can be equally helpful for all of our other solutions as well. By following these straightforward instructions you'll learn how to mix it up and apply it, making plating items on-site problem free.

Please refer to the appropriate pages in our manual for advice on gold plating and the correct voltages to use.



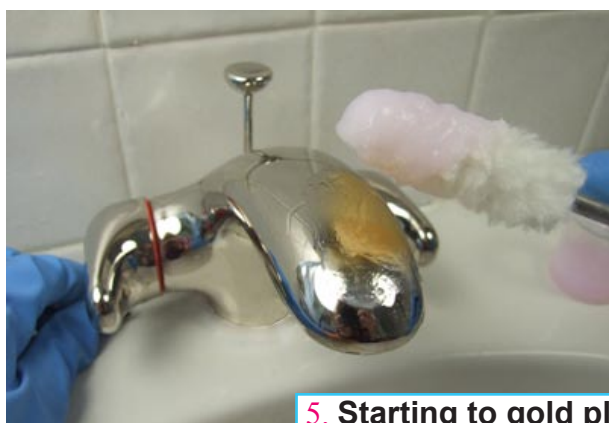
2. Mixing the thickener

By using the carbon electrode, you're not only mixing the thickener but also making sure the mixture coats it well. This will help the electrical current to flow when you come to start plating.



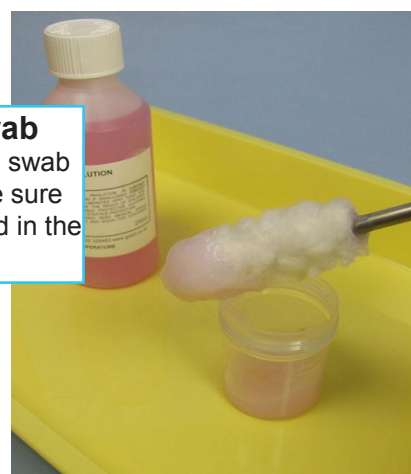
3. Coating the carbon electrode

Before you put the swab on the electrode, make sure it is thoroughly coated with the mixture.



4. Soaking the swab

Once you have put the swab on the electrode, make sure it is completely covered in the thickener.



5. Starting to gold plate

When you touch the swab to the tap, you may not instantly see gold plating happening. This will probably be because the thickened gold solution hasn't soaked through to the electrode and formed a circuit yet. To encourage this, carry on moving the swab in regular circular movements on the surface of the tap for a while and the gold will begin to appear.

Quick Reference

no.1

plating
solutions

All the technical data you need to know about **plating solutions** in one handy table.

Now you'll be able to quickly reference this information, without having to look through the whole manual!

NB-the voltages for many of these solutions will be different if you're pen plating; to find out about this, please see the pen plating supplement.

See table overleaf for details on alloys!

You can use this table to either

- quickly remind yourself of how a plating solution is used, its correct voltage and the right electrode to use with it or,
- if you are new to the process, use it to get a general overview and then look it up in more depth in the corresponding Know How and project pages.

Plating solution	Applications-decorative and functional	When plating onto...	Pre-plate with.....	Electrode
Gold 4-5v	Decorative finish on many items, for example jewellery. Does not tarnish and is a very good electrical conductor, making it especially useful for electrical contacts.	<ul style="list-style-type: none"> • copper and its alloys (see table overleaf) • tin and its alloys 	<ul style="list-style-type: none"> • nickel, white bronze, palladium or white palladium • white bronze 	Platinum/carbon
Gold Flash 5-6v	Used only functionally as an undercoat for many other plating solutions.	<ul style="list-style-type: none"> • stainless steel and its alloys 	NA	Platinum/carbon
Silver 2.5-3.5v	Decorative finish, for example on antiques. Although it tarnishes over time, it's an excellent electrical conductor, which makes it a cheaper alternative to gold plating for electrical contacts.	<ul style="list-style-type: none"> • stainless steel • tin and its alloys 	<ul style="list-style-type: none"> • Gold Flash • a layer of white bronze 	Platinum/silver
Copper 4v	Decorative finish on many items, for example sculpture. Used to build up a thick layer to fill in scratches as a base for further plating or repair to machinery. Used as base for mixing with our Bronze Mixer to make bronze plating solution	<ul style="list-style-type: none"> • nickel and its alloys 	<ul style="list-style-type: none"> • Gold Flash 	Carbon, platinum

plating solutions continued.....

Plating solution	Applications-decorative and functional	When plating onto...	Pre-plate with.....	Electrode
White Palladium 3v	Decorative finish on white gold jewellery to replace more costly rhodium or platinum, also plated onto silver jewellery to reduce tarnishing and scratching. Used as a hypoallergenic replacement for nickel. Makes a good barrier layer when plating gold onto copper.	<ul style="list-style-type: none"> stainless steel 	<ul style="list-style-type: none"> Gold Flash 	Platinum/carbon
Platinum 4-5v Temp; 20 degrees centigrade minimum	Decorative finish on jewellery, phones, mp3 players, watches. Used to plate electrical connectors and silver contacts.	<ul style="list-style-type: none"> copper or brass 	<ul style="list-style-type: none"> a thick layer (we recommend tank plating at least 2 microns) of gold, silver or nickel 	Carbon/platinum
Black Chrome 6-8v Temp; 25 degrees centigrade minimum	Decorative finish on bathroom sanitary ware and other household goods. Should not be used on exterior fittings, as brush plating alone provides minimum protection from the external environment.	<ul style="list-style-type: none"> Copper and brass stainless steel, nickel and its alloys 	<ul style="list-style-type: none"> Pre-plate with white bronze Gold Flash 	Carbon

What's this alloy made of?

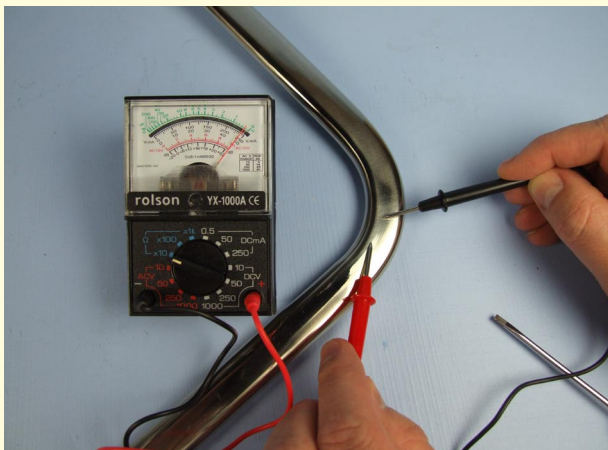
This is a common question and one that needs to be answered before you take crucial decisions about pre-treatments and which solutions to use. The table below gives you the information you need in an easily accessible form.

Alloy	Contains mostly.....	With some.....
Brass	Copper (67%)	Zinc (33%)
Britannia metal	Tin	Antimony, copper
Bronze	Copper	Tin
Cupronickel	Copper	Nickel, manganese
Gilding metal	Copper (95%)	Zinc (5%)
Monel Metal	Nickel	Copper, iron
Nickel Silver	Copper (60%)	Nickel (20%), zinc (20%)
Pewter	Tin (94%)	Copper, bismuth
Pot metal/Zamak/Mazak	Zinc	Tin, aluminium, copper
Stainless steel	Iron	Chromium (18%), nickel (5%)
Sterling silver	Silver (92.5%)	Copper (7.5%)

Using the Conductivity Tester

Before you try to plate the surface of your work, find out whether it will conduct electricity by using this conductivity tester. It may save you a lot of time and effort!

1. Check that the tester is working properly by turning the dial to the 10 ohm setting. Now touch the test probes together and if the needle moves to the end of the scale, the conductivity tester is working normally and will be able to show whether the surface is conductive or not. If it does not, the AA size battery may need changing.



2. To see if the surface of your work is conductive, touch both probes to the surface as demonstrated in the photo opposite. The meter needle has moved over fully to the other side of the dial. This means that, with any necessary further polishing and cleaning, the surface of your work can be plated.

3. If, after touching the probes to the surface, there is no movement from the meter needle, this means the surface of your work does not conduct electricity. There may be a number of reasons why this is so; it could be there is a surface layer of lacquer on the work, or the work isn't made of metal, but a non-conductive material such as plastic.



project 6

Using the flat electrode



With our range of flat electrodes, you'll be able to speed up plating of big objects by up to two to three times

They make light work of plating larger items such as pieces of sculpture or furniture. This not only saves you effort, but of course leads to higher turnover and increased profit margins!

Similar to our normal collection of electrodes, these flat electrodes come in a range of different metals to suit different plating jobs.

1. WHAT YOU'LL NEED

Plating solutions; Silver. **Equipment;** Stainless steel and platinum flat electrodes, 2 flat swabs, conductivity tester.

Cleaning/preparation solutions; ActiClean, Thickener, MetaSeal, MPU.

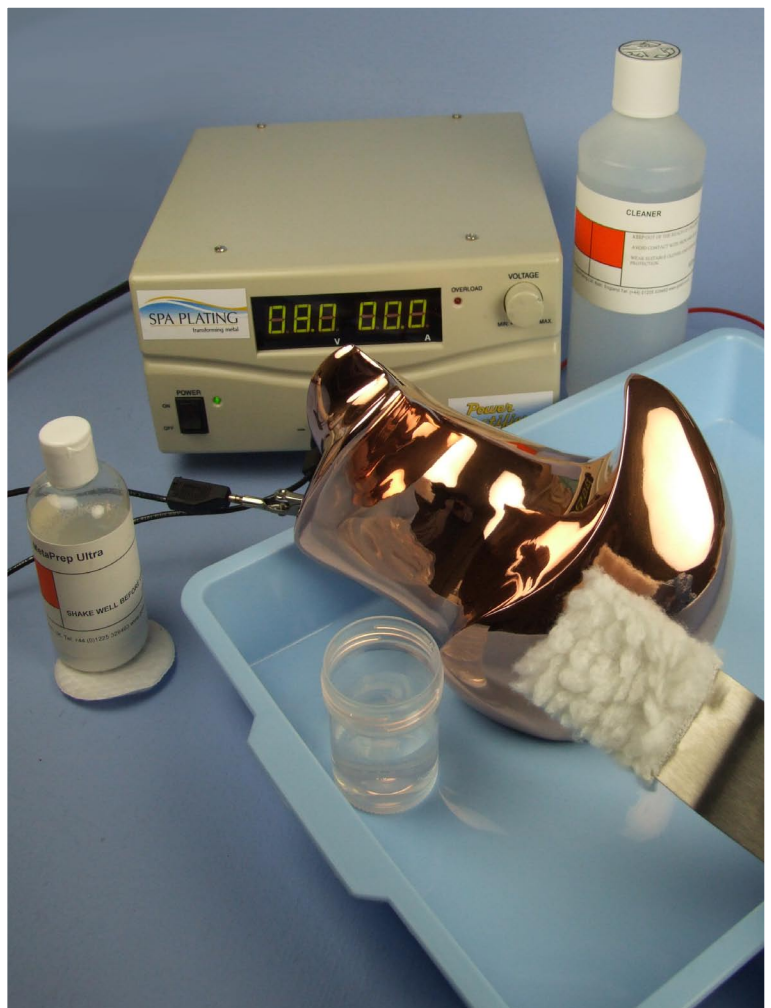
2. PREPARING THE SURFACE

With art objects such as sculpture, you may find that you have to remove a layer of lacquer first. To establish if this is the case, test the surface with the conductivity tester. If it is so, there are a variety of different removers you can use, according to the kind of varnish you're dealing with, all of which are easily obtainable in your local hardware shop.

Once all traces of the varnish are removed, clean and activate the surface thoroughly with MPU.

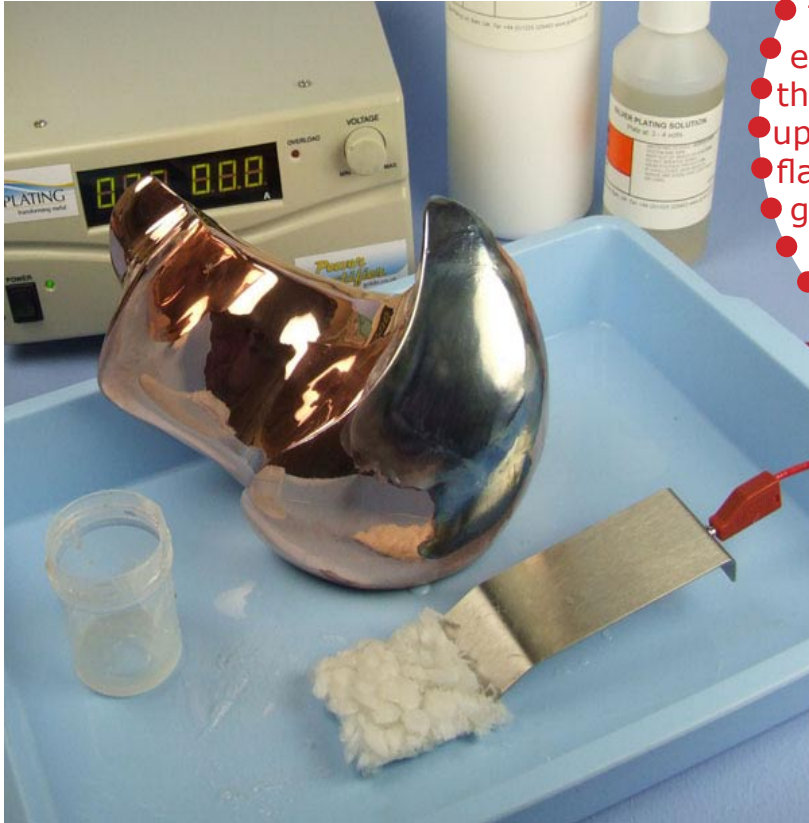
3. ACTICLEANING, 5V - 7v

Fit the flat platinum electrode to the red lead and soak the swab as usual with ActiClean. Set the rectifier to 8v and ActiClean the piece thoroughly.



4. SILVER PLATING 2.5 - 3v

With the flat platinum electrode and swab, start plating with the thickened silver solution. You'll immediately notice how quickly and efficiently the silver goes on to the surface of your piece.



Tip!

To increase the cushioning effect of the swab and thus the conductivity, try doubling up and slip on an extra large flat swab. This will help you get into any deep recesses.

Tip!

5. FINISHING

There are a number of ways of finishing the surface of the piece, depending on the final effect you're after. If you want a high, brilliant shine, Goddards silver polish is a good choice. It will bring out the reflectivity of the silver and help to protect the surface from oxidation.

However, if you'd like a softer, more subtle effect, you could try running the object under the tap and drying it with a paper towel.



a *practical* approach to metal recognition

Brush Plating

**KNOW
HOW**

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“What metal is this object made of?”

This is one of the trickiest and most crucial questions for the brush plater to answer correctly. However, getting this one right ensures successful plating and happy customers.

The **antique candelabra** we’ve selected to demonstrate how to tackle this question, is a typical example of a plating job you might be asked to take on. It provides a great opportunity to learn about different metal recognition techniques - in short, how to become a metal detective!



Become a metal detective!

The candelabra had originally been silver plated, which made it look as if it was one solid piece of metal. In reality it turned out to be made of three separate metals. *How did we find this out?*

1. The first pointer was the fact that the candelabra could be **completely disassembled** by unscrewing a nut and bolt that held all of its different parts together. This made it easier for the original manufacturer to make it out of different metals.

2. The second clue was its weight. The base and column felt a little heavier than the arms, although they were made of the same thickness of metal. They could therefore, be made of a denser metals, such as **brass or copper**. This made logical sense, as the base of the candelabra needs to be heavier,

to allow it to stand safely.

3. Next step - scratch tests! To prove our educated guesses, we carefully scratched the surface of the candelabra. This removed any previous plate, so we could have a good look at the base metal. We chose an **out of sight area** to do this, which was quite straightforward as the candelabra could be taken apart.



The candelabra could be taken apart, which made testing for metal much easier as the scratch tests could be done out of sight.

1. The first scratch test was carried out on the base of the candelabra.

A strong pinkish brown showed through, which proved the base to be made of copper.



Tools of the trade

To help you to identify the kind of metal your object's made of, equip yourself with.....

- > A pipette
- > Some spirit of salts from your local hardware shop
- > An eye glass
- > A metal file

2. The next part of the candelabra to be scratch tested was one of the arms.

You can clearly see a ring of shiny pink around a



silvery bluish patch of metal. This means the arm could be made of zinc, as zinc has to be copper plated before being nickel and then silver plated. The presence of copper ruled out pewter or other high-tin alloys as these don't need a layer of copper plate before a layer of silver.



3. To confirm the arm was made of zinc, a further test was carried out.

A drop of spirit of salts was carefully applied to the scratch test on the arm of the candelabra with a pipette. The appearance of small bubbles showed that the arm was indeed made of zinc.



4. The final scratch test was done on the column of the candelabra.

Arriving at the right metal was basically a process of elimination. The scratch test showed a silver grey, soft metal with no sign of copper plate, which meant that it wasn't zinc. The fact that it was a thick gauge casting and quite heavy ruled out EPNS. This left the most likely metal to be pewter as it was obviously cast and quite heavy.

So, although this candelabra looked like it was made of the same metal, it turned out to be made of copper, pewter and zinc. This knowledge allows you to choose the right plating process for the right metal and ensure a successful outcome.



Hand Polishing and cleaning

An *in-depth* focus



We've put together a quick reference guide to help you choose the right cleaning and polishing compound for every stage of the brush plating process.

Amongst all of these compounds, MPU will be the one you use most often. It is the ultimate all-in-one cleaning and activating compound, as you can use it on most surfaces in preparation for plating. If the surface of your work is very recessed, or if it is very large, we recommend cleaning and activating with ActiClean. Please see the relevant Know How page for guidance on using ActiClean.

Name of polish	Degree of cut (going from the smallest to the greatest)	Uses and applications	Needs to be cleaned off before plating?
MetaSeal	⦿	Seals the surface of items you have plated. Brings out the final lustre on gold plated items.	Yes
Goddard's Silver Polish	⦿⦿	Brings out the final lustre on silver plating. Sometimes gold can dull off at the edges of your work as you plate, if you plate a thick layer. Goddard's can be used after plating to bring back the shine.	Yes
MPU	⦿⦿⦿	Cleans and activates the surface of work before plating. It contains a fast cutting, non-scratch abrasive that can be used on small, non-recessed areas, and can replace the MetaPrep stage. Very useful for cleaning and activating during a plating run.	No
MetaPrep	⦿⦿⦿⦿	Prepares the surface of your work for plating but, unlike MPU, it needs to be cleaned off with water and liquid detergent.	Yes
Autosol	⦿⦿⦿⦿⦿	Removes scratches from steel, stainless steel, nickel and other hard metals. Can be used to remove old plate, if necessary.	Yes



What you need

Get together your bottles of White Bronze Mixer, Copper Plating Solution and your mixing kit, which consists of a beaker, a pipette and a measuring cylinder. A tray to stand the bottles in is a good idea, to catch any drips.

Mixing White Bronze Mixer with Copper Plating Solution to create.....

White bronze plating solution

The great advantage of our White Bronze Mixer is that you only have to prepare the amount of solution you need at the time, thus avoiding the need for bulk supplies.

White bronze plating solution has a wide variety of uses. For example it can be used as an allergy-free substitute for a nickel barrier layer or as a non-tarnish alternative to silver.

To make white bronze plating solution you mix Copper Plating Solution with White Bronze Mixer at a ratio of 1:2

So, if you are using 10ml of Copper Plating Solution you'll need 20ml of White Bronze Mixer.

leave at room temperature for 15 minutes before use.

Plate at 3-3.5v



Copper solution

Measure out the amount of Copper Plating Solution you need; in this example, 10ml is being poured out.

Pouring

Pour the measured solution into the beaker



White Bronze Mixer

Measure out the correct amount of White Bronze Mixer. In this case it's 20ml.



Final mix

Add the measured amount of the white bronze mixer to the copper solution in the beaker and give it a brief stir. The solution should be left to stand for 15 minutes before using.



White Bronze Plating

Brush Plating

**KNOW
HOW**

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Our **White Bronze Mixer**, when mixed with our Copper Plating Solution, creates a white bronze plating solution that plates a brilliant white layer. It has been introduced as an alternative to nickel plating solution. Nickel is now banned by the EU for use in the cosmetic industry, as it causes nickel allergy in some people. White bronze is the ideal substitute for nickel plate, where the surface of the metal is likely to come into contact with the skin, such as on jewellery or on spectacle frames. Nickel plate can also be used as a barrier layer between gold plate and copper or brass, to stop the gold diffusing back into to base metal. White bronze has now taken over this function



and the brass antique carriage clock in the accompanying picture is a good example of this. It was first polished, then white bronze plated and finally finished with gold plating solution. The lamp was plated gold to cut down on tarnishing and cleaning. White bronze also makes an excellent key layer when plating silver onto pewter, Britannia metal or other high-tin alloys. A platinum or carbon electrode should be used when white bronze plating and mixed solution should be left to stand for 15 minutes before using and used up within 24 hours. Best used at a room temperature of 20 degrees C.

Trouble shooting

White bronze plating 3-3.5 volts

Type of problem

Possible reason

What to do

No plating taking place

- Incomplete electrical circuit; check all connections.
- Surface not clean enough.

- Check all electrical connections and clean if necessary. Make sure the swab is fully soaked in solution.
- Repeat cleaning cycle.

Plating is patchy or not plating at all.

- Refer to first and second point above.

- Clean with MPU, paying particular attention to areas that are un-plated.

Surface is turning dull, especially on corners or protruding parts.

- Formation of inactive layer due to too high a voltage.

- Reduce the voltage

Faint lines appearing on plated work.

- Marks forming because of hardness in water.

- Spray work with deionised water before plating.

project 7

Up-cycling an antique EPNS matchbox



This project takes you through the stages of silver plating onto EPNS or electroplated nickel silver.

This is a relatively straightforward job with our Silver Plating Solution.

Once you have mastered this technique, you will be able to restore any piece of EPNS, a service that you will find is popular amongst your more discerning customers.

1. WHAT YOU NEED

Solutions; Silver Plating Solution, MPU, MPU Coarse. **Equipment;** one electrode handle, fitted with a silver or platinum electrode.

2. PREPARING THE SURFACE

As you can see, the original surface of the matchbox was considerably tarnished and had many small scratches. These were removed by first polishing on the buffing wheel and finishing with a Dremmel mop. The mop was mounted in a pendant drill and was used for reaching the small nooks and crannies in the curved design on the matchbox's surface.



3. CLEANING AND ACTIVATING WITH MPU

Give the piece you are working on a thorough clean with MPU to remove all traces of the polishing compound. We find kitchen tissue paper is the best for this, using a firm rubbing action. Continue with clean sheets of tissue, until there are no traces of polishing compound left.



4. SILVER PLATING 2.5 - 3 VOLTS

To build a solid layer of silver, keep moving the swab over your work in regular circular movements and dipping it into the silver solution to replenish it. You should be able to build up a substantial layer if you continue to plate for about five minutes.

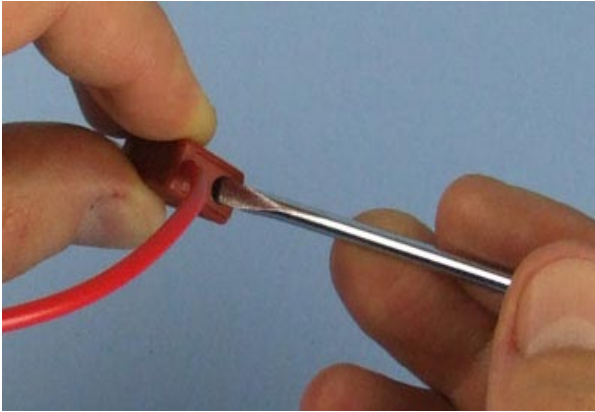
NB If the surface you are plating has many hollows and/or raised areas (created by repousse or embossing for example), it may be easier to use one of our Extra Fluffy Swabs to get into the difficult to reach spots.

Finish as usual with MetaSeal.



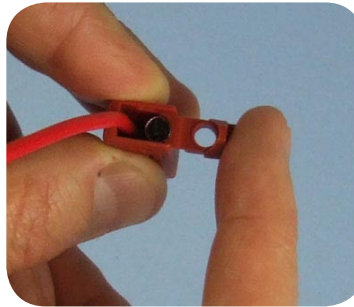
1 Opening the plug

Slip the flat end of the screwdriver into the hole in the end of the plug and gently lever open the plug lid.



2 Bending back lid of plug

Bend back the lid to reveal the inside of the plug.



Maintenance of leads

Over time or with constant, heavy use, you may find that one or two of your leads need to be repaired. The process is quite straightforward, and we have broken it down into its stages to show you clearly what you should do.

What you will need

- a small, flat head screwdriver, small enough to fit inside the pin of the plug
- a scalpel to trim away the plastic coating of the lead.

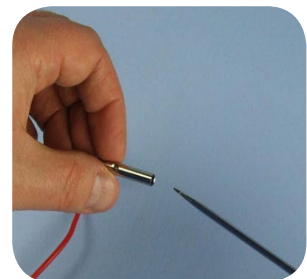
3 Removing pin and wire

The pin can be removed by pushing it up and out of the plug.



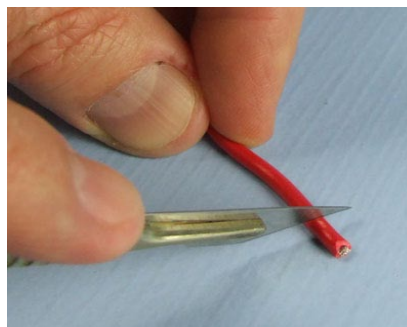
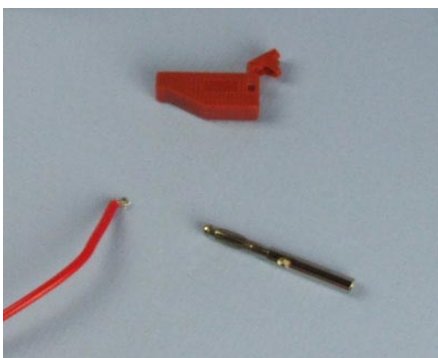
4 Releasing screw in pin

Slip your narrow, flat head screwdriver into the end of the plug. Locate the head of the screw and gently twist anti-clockwise.



5 Disassembled plug

The pin, plug and end of lead should now be completely separate.



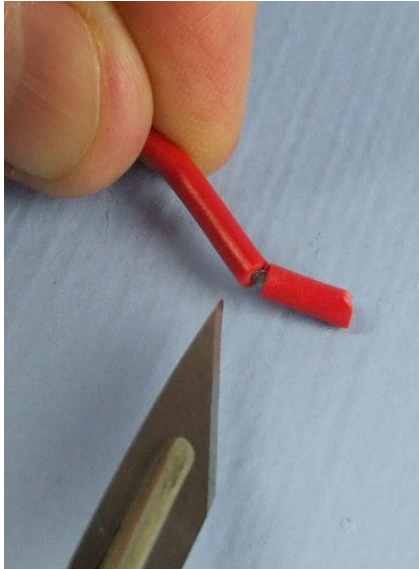
6 Stripping the plastic from the wire

Carefully put a cut all around the plastic covering of the lead only, not the wires.

....Continued overleaf

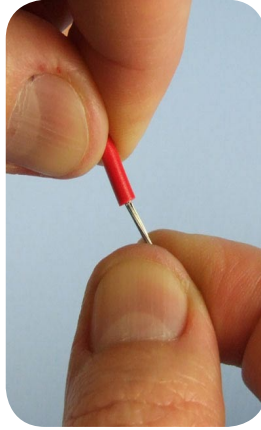
7 Cut lead

The plastic coating of the lead should now be completely severed and you can pull it free, over the wire.



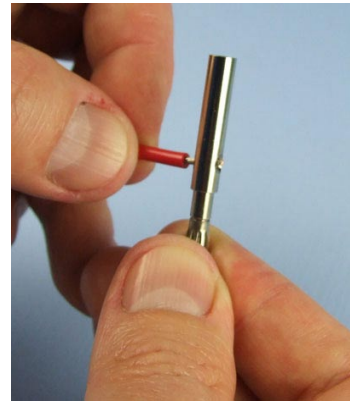
8 Twisting the wire

Twist the wire as shown, to stop the individual wires from separating as you re-assemble the plug.



9 Putting wire in pin

Thread the wire through the hole on the side of the pin.



10 Tightening screw on wire

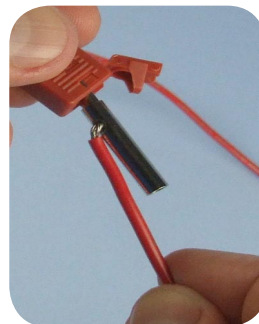
Insert your screwdriver again into the end of the pin and gently tighten the screw to hold the wire in place.

Be careful not to over tighten, as this will put too much pressure on the wires which will mean they will soon wear and break again.



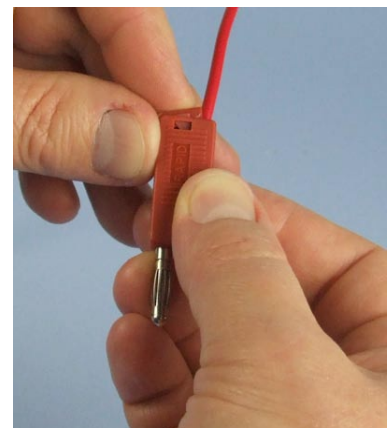
11 Putting pin in plug

Once the wire is secured, push the pin back into the plug.



12 Closing plug

Snap the lid of the plug firmly back into place. Your lead is now repaired.





Preparing Rose Gold Mixer

What you'll need

Rose Gold Mixer, K-Gold, Beaker, Measure, Pipette.



1. Measure out the amount of K-Gold you need. In this example we measured out 10ml, this being the correct amount for a ratio of 1:10.



2. Pour the measured solution into the beaker.



3. Measure out the amount of Rose Gold Mixer solution you'll need. In this case we measured out 1ml.



4. Add the measured amount of Rose Gold Mixer to the K-Gold in the beaker.



Once you have mixed the solution, use within a few hours.

Rose Gold Mixer has been

designed to be mixed with our K-Gold. We recommend you use a 1:10 ratio of rose gold to K-Gold, which means that if you are using 1ml of rose gold, you need to add it to 10ml of K-Gold. Plate at 4 volts and use a platinum or carbon electrode.

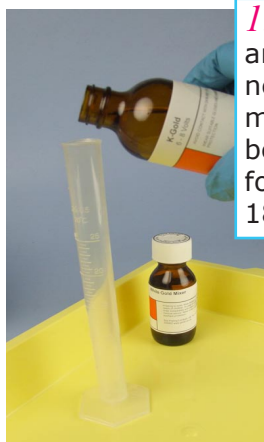
Occasionally a blackish bloom may appear on the surface of your rose gold plate. This is not permanent and is probably because the surface of your work wasn't perfectly clean, or you are getting contamination from a previous process.

You can either re-plate or clean with MPU and carry on plating. Remember to use a platinum electrode and for a perfect, scratch free surface, finish with MPU Fine.



What you'll need
Yellow Gold Mixer,
K-Gold, Beaker,
Measure, Pipette.

Preparing Yellow Gold Mixer



1. Measure out the amount of K-Gold you need. In this example we measured out 10ml, this being the correct amount for a ratio of 1:10, for an 18ct shade of plate.



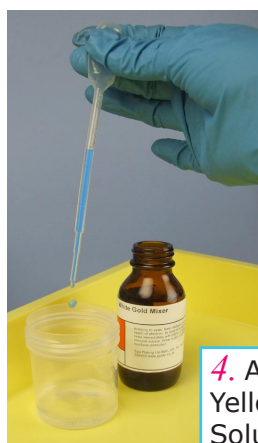
2. Pour the measured solution into the beaker.

Yellow Gold Mixer has been

designed to be mixed with our K-Gold solution. Different ratios will give you different shades of gold. For a shade that resembles 18ct, use a 1:10 ratio. If you are plating onto stainless steel, nickel or its alloys, you may need to plate a thin layer of gold using our Gold Flash solution before you start. Plate at 4 volts, using a platinum or carbon electrode.



3. Measure out the amount of Yellow Gold Mixer solution you'll need. In this case we measured out 1ml.



4. Add the measured amount of Yellow Gold Mixer to the Gold Plating Solution in the beaker.

Once you have mixed the solution, use within a few days.

Quick Reference

no.2 mixers

This is the 2nd of our quick reference pages, telling you all you need to know about **mixers and base solutions**

This table will help you decide which mixer you should combine with which base and the correct voltage and electrode you should use.

You can use this table to either

- quickly remind yourself of how the solutions are used, their correct voltages and the electrodes to use with them or,
- if you are new to the process, use it to get a general overview and then look it up in more depth in the corresponding Know How and project pages.

Plating solution	Type of mixer and base solution	Ratio of Mixer	To base solution	Voltage	How it's used and tips on practical application	Electrode
White bronze	White Bronze Mixer/ Copper Plating Solution. Leave to stand for 15 minutes before using. Use within 24 hours	2	1	3-3.5	Can be used as a low-cost, tarnish resistant alternative to silver plate. As an undercoat when gold plating onto copper and its alloys, tin and its alloys including solder. As an undercoat when black chrome plating onto copper.	Carbon/ Platinum
Rose gold	Rose Gold Mixer/ K-Gold	1 to 3 depending on shade	10	4	Pre-plate a layer of gold using Gold Flash, when plating onto stainless steel, nickel and nickel containing alloys.	Platinum/ Carbon
Yellow gold	18 carat Yellow Gold Mixer/ K-Gold	1 to 3 depending on shade	10	4	„	Platinum/ Carbon
Green gold	18 carat Green Gold Mixer/ K-Gold	1 to 3 depending on shade	10	4	„	Platinum/ Carbon
White gold	18 carat White Gold Mixer/ K-Gold	1	5	4	„	Platinum/ Carbon

Introducing THE PEN PLATING UNIT

Our pen plating kit is ideal for plating medium to small sized objects. Its compact size means that it takes up very little space on your work bench and is easy to move around, making it a very flexible piece of equipment.

To find out just how flexible this unit can be and discover its many applications, take a look at our Pen Plating Supplement at the end of this manual, or download it separately from our website.



MPU stage

As with any other brush plating process, prepare the surface of your work with MPU, using a clean, dry piece of paper towel.



Plating stage

With the choice of pointed or paddled shaped nibs, plating small, intricate objects such as items of jewellery becomes very straightforward. The LED rectifier is easy to use, and the pen and beaker stand keeps everything organised and within easy reach. The Pen Plating Clip Tray is fully conductive and holds your work safely, leaving you free concentrate on the plating.



Finishing stage

Again, this stage is very similar to brush plating, and usually involves protecting the surface with MetaSeal.



Mixing Black Chrome Plating Solution

Brush Plating
**KNOW
HOW**
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1.



1. Get together your bottles of Black Chrome Plating Solution Part A and B, a 25ml measure and a beaker.

Black Chrome Plating Solution comes in two parts, A and B and should be mixed at a room temperature of no less than 25 degrees centigrade.

Once you have mixed the amount you need, allow the freshly mixed solution to stand for a minimum of 3-4 hours and preferably overnight, before you start plating. Use within 5 days.

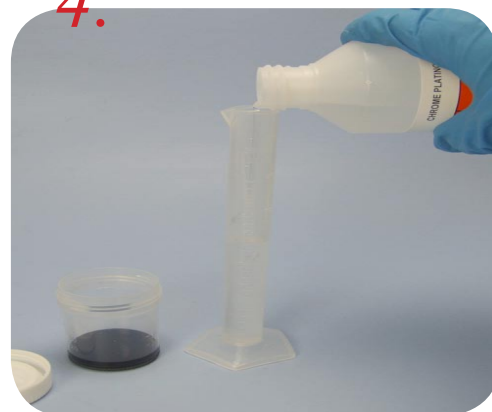
This Know How sheet shows you how to prepare 20ml of black chrome plating solution.

2.



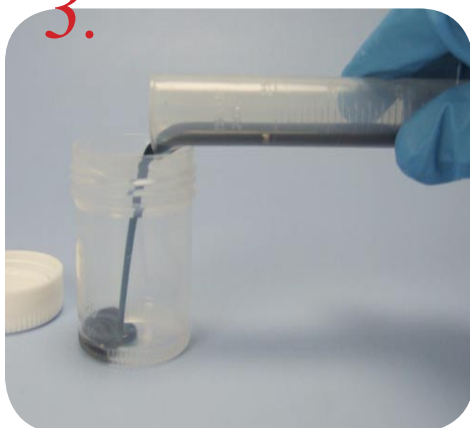
2. Start off by pouring 10ml of Black Chrome Plating Solution Part A into the measure.

4.



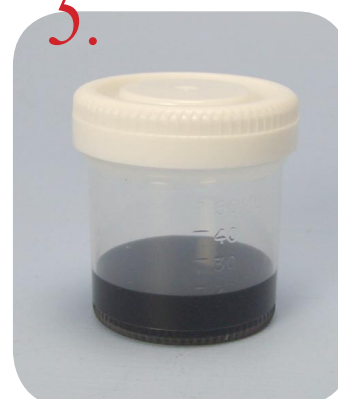
4. Measure out 10ml of Black Chrome Solution Part B and add to the beaker.

3.



3. Pour the measured solution into the beaker.

5.



5. Replace the lid on the beaker and allow the mixture to stand at room temperature (no less than 25 degrees centigrade) for 3-4 hours or for best results, overnight.

Our Black Chrome Plating Solution

comes in parts A and B so that you can maximise its shelf life; supplying it in this form means it will keep for at least two to three years. Although black chrome plating is probably one of the most challenging of all of the brush plating processes that you can tackle, it can lead to considerable rewards. Black chrome plating is in great demand from the plumbing and sanitary ware industry and is used extensively in the restoration of interior household items such as door furniture and light fittings. Brush plating with black chrome should be undertaken on items that are for interior use only; it isn't suitable



for objects that will be exposed to outdoors conditions. Because the process can be challenging, you need to be cautious about the size of the job that you take on, particularly at the beginning, when you are learning the skill. Areas of your work that are corroded will need to be stripped of chrome, nickel and any other possible undercoats, then ground with an abrasive to remove deep pits. Your work will then have to be polished to create a surface that can be successfully plated. It is always best to plan a black chrome plating job carefully before you start.

Black Chrome Plating

Brush Plating
**KNOW
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Black chrome forms a non-conductive oxide layer very quickly after plating and so it is best to start at one end of the item you are plating and to work methodically along to the other end, avoiding going back over what you've just plated. Gold flashing larger items helps you solve this problem.

When black chrome plating onto copper or brass, first plate a layer of white bronze (for guidance on the preparation and use of white bronze plating solution, please see the related pages in this manual). If you are black chrome plating onto nickel or stainless steel, first ActiClean or prepare with MPU, then gold flash (plate a thin layer of gold) and finally black chrome plate. Do not attempt to black chrome plate onto iron or steel as this can only be done successfully by plating it in a tank. A carbon electrode should be used for all black chrome plating.

Trouble shooting Black Chrome Plating 8 volts

Type of problem	Possible reason	What to do
No plating taking place	<ul style="list-style-type: none"> Incomplete electrical circuit; check all connections. Surface not clean enough. Surface inactive because of thin film of oxidation which has formed on the underlying nickel layer after cleaning. 	<ul style="list-style-type: none"> Check all electrical connections and clean if necessary. Make sure the swab is fully soaked in solution. Repeat cleaning cycle. Re-electroactivate with ActiClean (taking care that you don't leave out any areas) or rub with MPU. If the piece you are plating is large (making it likely that the nickel undercoat will be exposed for a length of time), we recommend you gold flash and then black chrome plate, to avoid this problem of oxidation.
Plating is patchy or not plating at all.	<ul style="list-style-type: none"> Refer to first and third point above. 	<ul style="list-style-type: none"> Strip the existing chrome, clean, electro-activate with ActiClean and re-plate. Polish if the underlying nickel layer is dull.
Surface is turning dull, especially on corners or protruding parts.	<ul style="list-style-type: none"> Poor cleaning. Solution is too fresh or old and stale. Temperature of solution is too low. 	<ul style="list-style-type: none"> Strip the existing chrome using a stainless steel electrode, electro-activate with ActiClean and re-plate. Pay particular attention to the cleaning stage. Allow the solution to stand for at least 3-4 hours or preferably, overnight. Do not use after three days. Make sure the temperature in which you are working is at least 25 degrees celsius.
Dark streaks appearing in the plating.	<ul style="list-style-type: none"> Metallic contamination, most commonly caused by iron from using a stainless steel electrode. 	<ul style="list-style-type: none"> Check that the contamination isn't caused by any other stage of the process and replace the stainless steel with a carbon electrode.

project 8

Black chrome plating a brass door handle

This project guides you through the process of black chrome plating on brass.

In order to plate black chrome successfully onto brass, it's necessary to first plate a layer of white bronze, because black chrome reacts with the copper and zinc in brass and contaminates the plate. Before you start, you'll need to mix up the required amount of black chrome plating solution, referring to the Black Chrome Plating Know How page, along with a quantity of white bronze plating solution, referring to the White Bronze Mixer Know How page.

You should mix the black chrome plating solution in an environment that is at room temperature (minimum 25 degrees centigrade). You should use a carbon electrode for all the plating in this project.

This project also demonstrates how useful the conductivity tester can be in saving you time before you start plating.



1. What you'll need

Solutions; copper, white bronze mixer, Black Chrome A and B. **Equipment;** conductivity tester, spray bottle, beaker, 25ml measure, 2 electrode handles, one fitted with a either a platinum or carbon electrode for the white bronze plating, the other with a carbon electrode for the black chrome plating.

Polishes/cleaners; MPU, MetaSeal.

2. Using the conductivity tester



Before you start, check that the surface you're plating on is conductive. This is particularly important if the object you're plating is a decorative item that is designed to be handled regularly, as these items are often coated with a protective layer of lacquer to prevent tarnishing. This layer will stop any plating taking place and will be detected by the conductivity tester. If this is the case and your item is coated with lacquer, proceed to the next step. If not and the needle on your tester shows the surface to be conductive, go straight to the fourth stage.

3. Removing the lacquer



Strip the lacquer off with the same kind of preparation you would use to strip household paint from doors or varnish from floors. We suggest that you do this twice, to be absolutely sure that you've removed all traces of lacquer. Clean thoroughly with MPU and then test with the conductivity tester again before you start plating.

4. White bronze plating 3 - 3.5 volts

Remember to fit a platinum or carbon electrode into your electrode handle, using the allen key supplied with the electrode handle kit. Adjust the voltage if necessary and start plating with the usual circular strokes of the swab.



5. Black chrome plating 8 volts

Adjust the voltage to 8 volts and start plating with regular, circular strokes. Try to touch the crocodile clip to a part of the surface of the item which is out of sight, as it might leave a small, black mark. Alternatively you could use one of our Conductor Strips, which can be purchased from our website.



6. Finishing

To bring out the high shine in the black chrome, polish with MetaSeal.



The Battery Pen Plater



Ideal for 'plating on the go', the Battery Pen Plater can be slipped into a bag, ready to be used in any situation.

a) For silver and gold pen plating

Slip the nib into the end of the pen and make sure the fluffy end of the nib is in full contact with the silver end of the pen.



a)



b)

b) For rhodium pen plating

Draw out the required amount of solution from the bottle using a pipette and transfer it into the glass beaker that is supplied with our rhodium plating kit. Using the tweezers supplied, place the fibre nib into the rhodium solution and let it soak for at least an hour so that the rhodium solution completely permeates into the fibre nib (from this point on, the nib can be stored permanently in the rhodium pen solution). After an hour, using your tweezers, place the fibre nib into the end of a pen. It is essential to use the tweezers as using gloved hands would cause contamination of the pen plating solution.

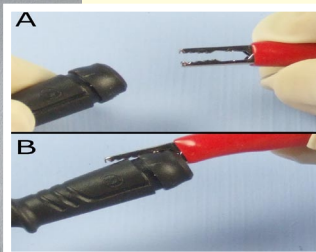
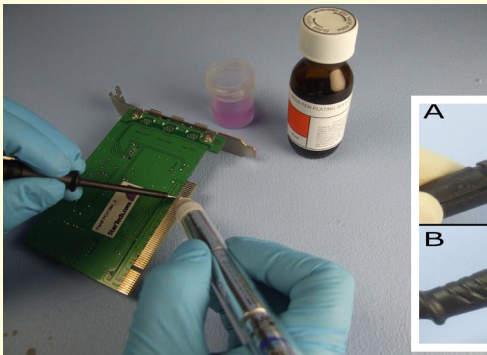


2. Grip one end of the Conductor Strip in the crocodile clip and touch the other end of the Conductor Strip to the surface of your work. Start plating by continuously stroking the tip over the surface of the work in circular movements. Keep replenishing the plating solution by dipping the tip of the pen into the solution you are using.

If rhodium plating, try to avoid the nib actually touching the surface of your work; just let it hover over the surface, using the rhodium solution to provide the electrical contact.

The nibs that need to be used for rhodium plating are made of fibre and can deposit fine scratches in polished metal surfaces if rubbed against the metal surface.

Replace the tips by pulling them out of the end of the pen. The fibre nibs can be used multiple times and should be stored between uses submerged in rhodium plating solution in your glass beaker. Always use different tips for different solutions and rinse the end of the pen under running water before changing to a different solution.



3. Fig. A and B show how to connect the mini probe, which has been designed for precision work such as plating PCBs.



4. The casing has been specifically designed to take three size AAA batteries; we recommend Energiser Lithium for optimum performance.

Copper Plating

Copper, like gold, is one of the only two naturally occurring metals that is coloured. It is also relatively soft and therefore polishes easily and quickly.

These characteristics, along with its tendency to deposit quite rapidly while plating, makes it very useful to the brush plater. In the photo opposite, a dent in a coffee pot has been repaired with some of our Conductive Epoxy Filler. A layer of copper is being plated on top of this, so that it can be easily polished back to achieve a high shine. The polished copper will then be silver plated and finished with MetaSeal. This approach is also economical, as you are polishing back copper, a much cheaper alternative to polishing back the silver plating.

Copper plating also has important functional applications, one of the most important being



the repair of dents and notches in large printing press rollers. Brush plating is the only truly economical way of solving the problem of worn printing rollers as the plating can be done in situ, avoiding the necessity of shutting down production for long periods to dismantle the printing equipment. A carbon electrode should be used for copper plating.

Trouble shooting Copper Plating 4 volts

Type of problem	Possible reason	What to do
No plating taking place	<ul style="list-style-type: none"> • Incomplete electrical circuit or incorrect electrical polarity i.e. leads not in correct sockets. • Surface not clean enough • Surface inactive because of thin film of oxidation which has formed on the underlying metal. 	<ul style="list-style-type: none"> • Check all electrical connections and clean if necessary. Check the swab is fully saturated. • Lightly polish by hand and clean thoroughly. • Re-polish and clean.
Plating turning black, especially on the edges or corners of your work.	<ul style="list-style-type: none"> • Voltage too high. • Movement of swab over surface of work too slow. 	<ul style="list-style-type: none"> • Reduce voltage. • Move swab more rapidly over surface.
Plate peeling.	<ul style="list-style-type: none"> • Our Copper Plating Solution does not stick to nickel or steel, so make sure the metal you are trying to plate is not one of these metals. If it is, you'll need to gold flash first, which sticks to nickel or steel very efficiently. 	<ul style="list-style-type: none"> • If you want to go ahead with using our copper on nickel or steel, you'll need to plate with a thin layer of gold before you start.
Staining.	<ul style="list-style-type: none"> • It is quite common to see staining as you move the swab to other areas on the article you are plating. • Touching the work while you are plating. 	<ul style="list-style-type: none"> • Make sure you keep brushing the swab over areas where you can see staining. Light staining can be removed after plating by rubbing with MPU. • Copper is very touch sensitive. If possible, try to hold your work where it isn't going to be plated. It might be worthwhile making a jig to hold the work while you plate it, so you don't have to touch it.

project 9

Selective gold plating on zinc

1. What you'll need



Plating Solutions; Thickened copper, thickened gold for the selective gold plating and for a base layer if necessary, silver. **Preparation/polishing solutions;** MPU, MetaSeal. **Equipment;** a platinum electrode for the gold plating, a silver electrode for the silver plating and a platinum or carbon electrode for the copper plating, a plating pen, an artist's brush, nail varnish and varnish remover.

Because of recent developments in our research and development department, brush plating on zinc and zinc based alloys such as Zamak and Mazak is no longer the challenge that it used to be.

It is now perfectly possible to plate straight onto zinc with a layer of thickened copper plating solution undercoat and use this as a base for subsequent layers of silver or gold. For guidance on the preparation and use of copper plating solution, please see the relevant sections in this manual.

However, if adhesion proves to be an issue, then we recommend a gold undercoat first. If this turns out to be necessary, the process for this is detailed below in stages 3 and 4.

2. Surface preparation

Polish the zinc to a high shine on the polishing wheel and clean off all traces of polishing compound with MPU. You can now go straight to step 5 and the white bronze plating stage, but if adhesion is a problem, carry on to step three with the gelled gold. After cleaning with MPU, **do not rinse with water**, but go straight on with the next plated layer.



3. Copper plating 4 volts

Don't forget to thicken your copper plating solution first with our Thickener.

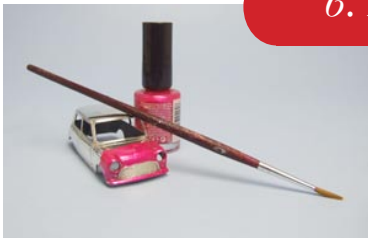


4. Silver plating 2.5 - 3.5 volts

After building up a good layer of copper undercoat, you can go straight ahead with silver plating.

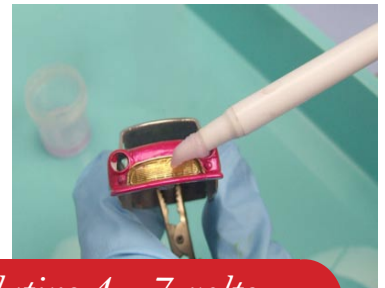


6. Masking out



Carefully mask out the area you don't wish to be plated with a strongly coloured nail varnish. Using an artist's brush instead

of the brush supplied with the nail varnish bottle will enable you to apply the varnish far more accurately. Allow to set in a warm dry place for at least 15 minutes before you start plating.



7. Selective gold plating 4 - 7 volts

Use the plating pen to carefully apply the gelled gold plating solution.



8. Finished Mini

Remove the nail varnish with nail varnish remover and finish the surface with MetaSeal.

Silver Plating an Antique Pewter Ink Well

Pewter is a tin-based alloy, the surface of which turns a dull, dark grey over time. If your pewter item has been plated silver, you may find a layer of black underneath the silver plate.

You needn't worry about removing all of this black layer before plating, as it is conductive and can be easily plated over.

What you'll need

Silver plating solution, prepared white bronze plating solution, MPU, Autosol, silver electrode for the silver plating, a platinum or carbon electrode for the white bronze plating, swabs, plating pen.

1.



2.



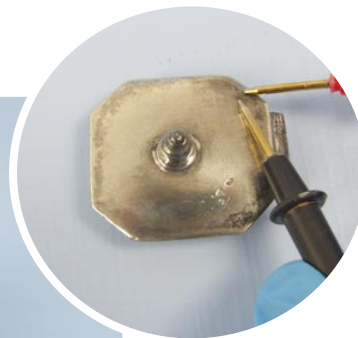
Cleaning with Autosol

Remove the remains of the old silver plate and most of the black layer with Autosol. The Autosol will now need to be thoroughly cleaned off. Most areas of the ink well can be cleaned with MPU. However, to clean the hinges of polishing compound, you'll need to rub in plenty of liquid detergent and then rinse thoroughly under warm or hot running water.

3.

Conductivity testing

If you are unsure about the conductivity of any of the remaining patches of black, check them with the conductivity tester.



Position the probes carefully to test for conductivity.

4.



White bronze undercoat, 3-3.5 volts

Build up a good, thick layer of white bronze.

5.

Silver plating 2.5 - 3 volts

Clean the hinges as described in stage 2 and silver plate.

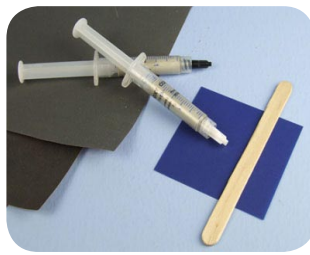


6.



Finishing

To seal the surface of your work and bring up the shine, polish with Goddards Silver Polish and/or MetaSeal.

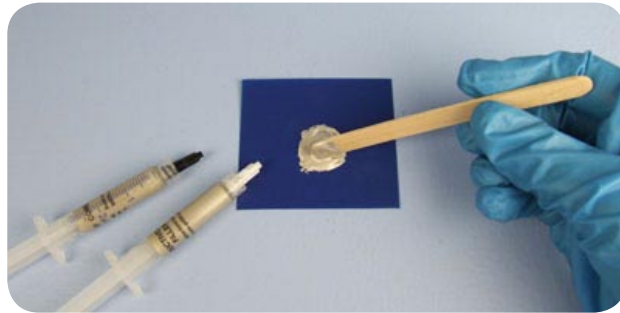


1 What you need

Syringes of A and B conductive epoxy resin, a small square of plastic and a mixing stick.

Preparing and using Conductive Epoxy Filler

Our Conductive Epoxy Filler is ideal for creating a firm and conductive bond between our Jigging Wire and the item you're brush plating or electroforming. It's great for plating and electroforming on non-conductive materials. Can also be used to fill in minor dents in metal surfaces before plating.



2 Mixing Filler

Squeeze out an equal amount of A and B and mix with the mixing stick. *Remember to put the right cap back on the right syringe, immediately after use!*

3 Applying Filler

Place a small amount of the mixed filler where you would like you jigging wire to join the item you're electroforming. With the electroformed agate example to the right, the copper jump ring was stuck to the Conductive Paint with the epoxy filler *after* the paint had been applied to the rim of the slice and had dried. The jump ring could then be used as the electrical connection for electroforming, as well as acting as the mechanism for hanging the agate slice on its silver chain.



Setting times for the filler will vary according to the temperature you are working in. They are as follows; at 24°C - 4 hours, 65° - 10 minutes. **Once you have mixed the filler, use within 10 minutes.**

Once the filler is fully hardened, you can smooth it down with wet and dry paper. Start with a grade 600 then move up to 1000 and finish with 1500.

You need to use water with the paper and a little soap increases the fineness even more. You can then machine polish to achieve a perfectly smooth result. Please refer to the pages on machine polishing in our manual for guidance.

4 Plating or electroforming

Once the Conductive Epoxy Resin is fully set and you've done any necessary sanding, you are now ready to plate over your join. If you're brush plating, we recommend plating a layer of PP Copper first, then a barrier layer of white bronze or nickel if you then wish to gold plate or straight in with silver.

If you're planning on electroforming, please see the section on electroforming at the back of this manual.

White palladium plating a watch casing

This project takes you through the stages of white palladium plating a watch casing.

Because of its resemblance to platinum and rhodium, white palladium is becoming an increasingly popular choice. It is widely used in the jewellery trade to plate items made of white gold which can, over time and with wear, take on an almost yellowish tint.

An added advantage of white palladium is that it is quite hard wearing, making it a suitable choice for pieces of jewellery such as rings and in this case, a watch surround.



1

Unless you are experienced in taking apart a wide range of different makes of watches, we highly recommend you take the watch to a professional jewellers to be both disassembled and re-assembled.



2

Once the watch is in it's constituent parts, polish the front casing on the buffing machine, use a pendant drill to polish the crown (taking care not to polish down the ribbing) and remove any scratches in the crystal with our MPU and kitchen tissue. The spring bars should also be cleaned, as these will need to be plated also.

3

You will need a bottle of Gold Flash and White Palladium Plating Solution, along with a platinum electrode for the Gold Flash and a platinum or a carbon electrode for the palladium. You will also need a couple of beakers and a plating pen with nibs.



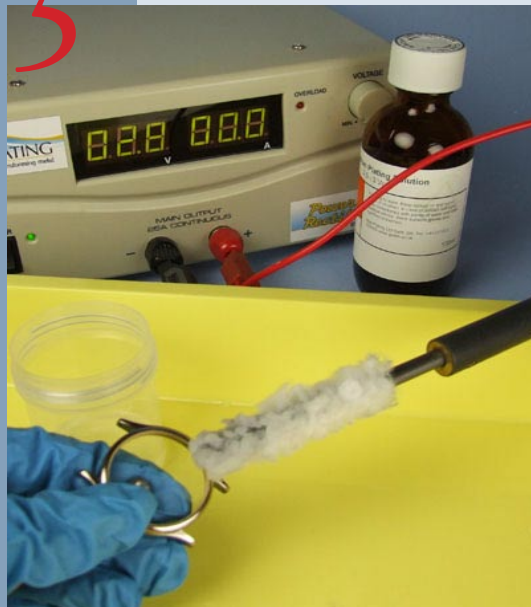
4



Plate a thin layer of gold using our Gold Flash solution. Fix a platinum electrode in to your electrode handle before you start and plate at 8-10 volts. Remember to gold plate all of the smaller watch parts as well, including the crown and the spring bars.

5

Using either a platinum or a carbon electrode fitted in your electrode handle, plate a layer of white palladium at 2.5 - 3 volts. A measure of 5ml solution should be enough for an item of this size. Keep plating for five minutes, replenishing the swab by regularly dipping it in the white palladium solution.



6

Don't forget to also plate the crown and the spring bars. A plating pen is ideal for this part of the job.



Once the front casing and the crown have been plated, they can be finished with MPU Fine and all of the parts of the watch can be taken back to the jewellers to be reassembled and a new watch strap fitted.

7



To properly dry the layers of conductive ink

for plating on non conductive materials such as plastic and glass, it is necessary to use a correctly calibrated fan oven. This Know How sheet will guide you through the process, using a digital thermometer.

Brush Plating

**KNOW
HOW**

19



1

Most domestic fan ovens at lower temperatures are inaccurate, so checking and marking the desired temperature with a digital thermometer is highly recommended for good drying results.

2

Place the temperature probe in the oven, taking care that it is well into the oven space. Turn on both the temperature dial and the fan to a position half way between 0 and 50.

3

Wait for the temperature of the oven to reach between 45-50 degrees

centigrade and then mark the position at some point between these temperatures with a marker pen on your dial. You are now set up to use this oven to dry off your layers of conductive ink at the optimum temperature.



project 12

Gold plating a Golf Ball

This project introduces you to the essential skills involved in plating on non-conductive surfaces.

Thanks to Spa Plating's most recent research, brush plating on non-conductive surfaces is now relatively hassle free. Follow these instructions closely and achieve great results every time.

Our innovations include;

- Conductive Ink that you can simply paint on as well as spray on and plates to mirror shine in seconds.
- Conductive ink you can either air dry or dry in a fan oven
- PP Copper Plating Solution that plates bright and thick, allowing for easy polishing back
- Conductor Strips that increase conductivity and dramatically speed up plating rates

NB- You only need to plate a layer of nickel (or a 'barrier layer') after PP Copper, if you're gold plating; for most other finishes you can go straight on with your desired plated finish after the copper layer.

NB If using ink bought before 7/8/2012, please download copy of old project 12 on online shop.

**Painting on
conductive ink**



**Spraying on
conductive ink**



1 What you'll need

Equipment for painting on ink; golf ball and brass screw, plastic palette, artist's brush, Conductor Strips, two carbon electrodes, one platinum electrode, three electrode handles. **Equipment for spraying on ink;** replace the brush and palette with the airbrush and a syringe.

Solutions; Conductive Ink, PP Copper, PP Stabiliser, Nickel Plating Solution, deionised water, Gold Plating Solution, clear lacquer spray, MetaSeal.

2 Screwing in a brass screw

To mount the ball, we have used a general purpose wood screw (5x50mm size). The screw should be made from brass or stainless steel, and must not be zinc or zinc plated, as this can lead to contaminated plating solution.

Once you have found a suitable screw, drill a small 1mm guiding hole in the ball to a depth of 10 – 15mm and attach it.



Attach the screw to a wooden base with a drop of glue from a glue gun. Spray on a layer of clear lacquer and allow to dry, according to manufacture's instructions. Currently, we recommend Halfords Clear Lacquer, which is an acrylic solvent based system.

3 Spraying on the layers of lacquer

The spraying on of lacquer is essential to ensure the Conductive Ink adheres to the surface of the golf ball. It needs to be a clear lacquer spray that can easily be bought from any DIY or car accessory shop. We recommend the use of Halfords Clear Lacquer.



If this isn't obtainable, you can try any other solvent based acrylic lacquer.

Follow the application instructions on the side of the can carefully and once you've sprayed on the recommended layers of lacquer, within 15 minutes of the lacquer becoming touch dry, start painting on the Conductive Ink.

For porous surfaces, such as wood, stone and where a smooth finish is required, we recommend more than one coat of lacquer.

4 Applying the conductive ink ; two approaches

Painting on the ink



1st coat

Apply the first coat of Conductive Ink with the sable brush, making sure you brush only in one direction, for example from top to bottom (as in the photo). Paint more ink around the point where the screw makes contact with the ball.

If air drying

Leave at room temperature for 24hrs.

If oven drying

Leave in a fan oven at a temperature of 45 - 50 degrees centigrade for three hours.

2nd coat

For the second coat of Conductive Ink, brush it on at right angles to the original coat, so that you 'cross hatch'. In the photo, the first layer was applied from top to bottom and so the second layer is being painted on from side to side.

If air drying

Leave to dry at room temperature for 3 days.

If oven drying

Leave in fan oven at a temperature of 45 - 50 degrees centigrade for three hours. Leave to cool down

before plating.

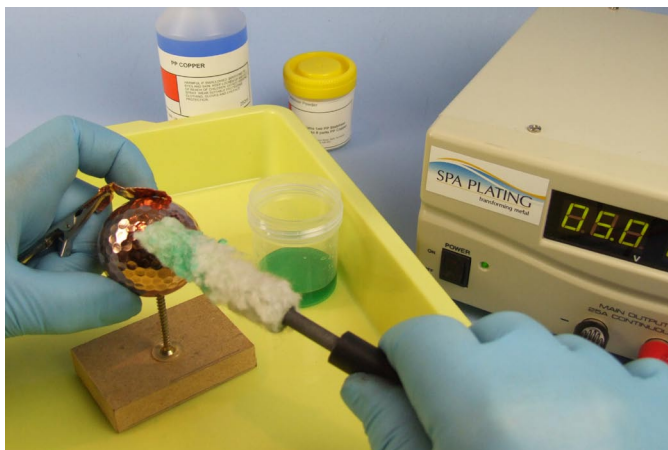
NB- do not be tempted to polish the layers of conductive ink, as they are quite delicate. Polishing will cause damage and result in unplated areas.

Spraying on the ink



First charge the airbrush with just enough conductive ink to cover the bottom of the airbrush well. This should only take about 5-6 drops of conductive ink. Spray at a distance of 5cm from the golf ball. Cover with only enough ink to block out the underlying surface of the object.

One layer of ink is enough - leave to dry in the same way as before.



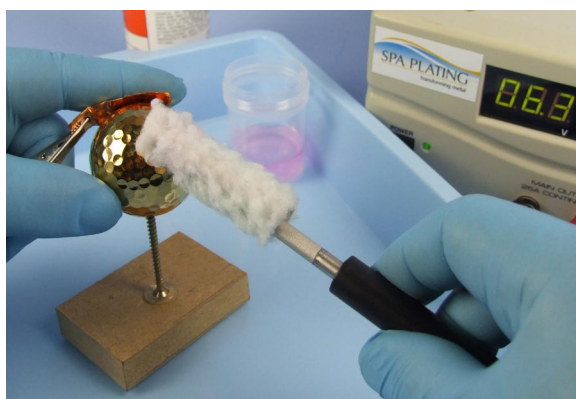
5 PP Copper plating 5-6 volts
Start copper plating at 6 volts with PP Copper stabilised with PP Stabiliser and a carbon electrode fitted. Hold the golf ball with the Conductive Strip wrapped around the screw and start plating a small area until you've got a reflective surface. Use the edge of this area to then move on to the next area. Repeat this process until all of the ball is covered in a reflective layer of copper. Rinse in deionised water. Now move the Conductor Strip from the screw

to the newly plated area and continue plating from the edge of the newly plated copper. If PP Copper isn't available, then white bronze can be substituted.



6 Nickel plating starting at 4v, with a range to 5volts

Nickel plate at room temperature. Rinse in deionised water. If nickel is unavailable, white bronze can be substituted.



7 Gold plating 6-7v

With a platinum electrode (carbon can be used), gold plate until the whole ball is covered.



8 The finished golf ball

Remove the screw fastener and finish with MetaSeal.

Preparing PP Stabiliser

1. What you'll need;
deionised water, 25ml measure, PP Stabiliser, Medium Beaker, spatula and ruler or plastic card.



PP Stabiliser has been developed by Spa Plating to suppress tarnishing in our product, PP Copper.

Although our PP Copper plates a beautifully smooth and lustrous layer it can, due to its reactivity, quickly become tarnished.

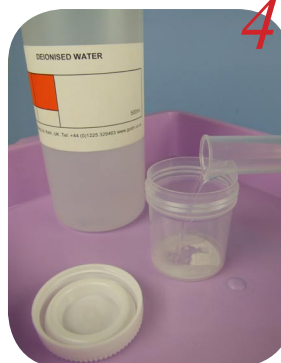
PP Stabiliser not only suppresses tarnishing but also brightens the layer of copper plate.

It must be made fresh and used within one week.

1ml of PP Stabiliser:10ml PP Copper



2. Measure out the right amount of PP Stabiliser by levelling off a heaped spatula full with a ruler or plastic card.



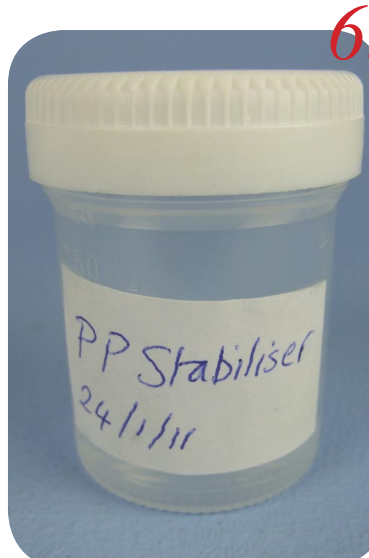
4. Measure out 8ml of deionised water and add it to the Stabiliser in the beaker.



5. Give the beaker a brisk shake until the Stabiliser is completely dissolved



3. Place the Stabiliser into the 60ml beaker.



6. Once you've added the water to the powder and given it a vigorous shake, label it clearly with the date it was mixed. Mix at a ratio of 1ml PP Stabiliser to 10ml PP Copper, within three days.

Making a cleaning cloth swab

We've found that a cleaning cloth swab is the best swab to use when stripping. You may find that when stripping chrome, or anodised layers from aluminium, that the swabs wear out at a fast rate.

So to save you the cost of having to replace our swabs so frequently, we've come up with the home-made, but equally effective solution of making your own from household cleaning cloths.

Not only is this a more economic solution, but fitting them couldn't be easier, because of our unique system of interchangeable electrodes.

Please bear in mind that these cleaning cloth swabs are only recommended for stripping and are not suitable for plating.

You'll need a cleaning cloth, a pair of scissors, an electrode with its handle an allen key and a size 10 or 12 elastic band.



Cut a strip from the longest edge of the cleaning cloth approximately 6 cm wide and fold it over on itself.



Wind the strip tightly round the electrode, leading with the cut end of the cloth. Make sure you wind the strip up against the end of the electrode, as this will make it easy to fit the elastic band around the end.



Secure the strip of cloth by winding the elastic band tightly round the end of the electrode and slip it up to the opposite end.



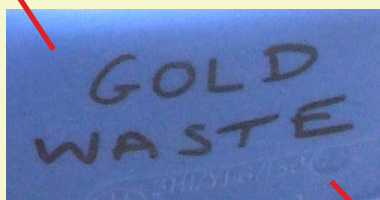
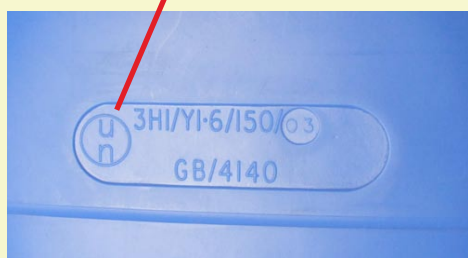
Fit the free end of the electrode into the electrode handle with the allen key.

Disposal considerations



The amount of solution used when you brush plate is so small that no special waste treatment equipment is required. However, solutions containing metals must be contained and disposed of in accordance with all national and local authority regulations. The recommended method of containment for metal containing solutions is as follows;

- ▶ Drippings from the metal solutions need to be collected by pouring them from the trays into a UN container.
- ▶ Gold waste needs to be collected in a separate, marked UN container and segregated from other wastes. Mixing the two will result in the development of dangerous gasses.



Make sure you label the gold solution container to distinguish it clearly from the other container!

- ▶ The UN marking should be clearly visible on the side of the container. This type of container can be easily purchased over the internet.
- ▶ Keep the UN containers in a safe, well marked area and consult your local telephone directory for waste disposal services in your area.

Your questions.... Answered!

As you become more experienced in brush plating, you will probably come up with questions about the process that need answering, in order for you to move forward.

We have collected the kind of questions we've most frequently been asked over the years and put together this quick reference section, to guide you through these queries. You may also wish to look at our web site for more information.

How far does the gold go?

As a rough guide, 29ml of Gold Plating Solution will plate 100 square centimetres (4 square inches) of metal to a thickness of 1 micron.

Can I plate gold straight onto brass?

It's possible, but we don't recommend it. Gold can diffuse back into metals such as brass and copper, so you should plate a barrier layer of white bronze to prevent this. Please see the White Bronze Know How page in this manual.

Can I gold plate directly onto EPNS?

You should plate a gold flash (thin coating of gold) before either gold or silver plating, to improve adhesion.

I am re-plating some old taps, but the plate isn't taking. Why is this?

Check if the taps are covered with a thin film of lacquer with a conductivity tester. If they are, you'll need to strip the lacquer off with paint stripper. Most paint strippers are corrosive, so you'll need to wear gloves and safety glasses.

Can I plate onto chrome?

No, the plate won't stick and will flake off.

Are the swabs reusable?

Yes - just rinse thoroughly and try to use the same swabs for the same solutions, to avoid cross contamination.

Are the solutions safe?

None of the solutions supplied by Spa Plating are classified in the high categories of danger e.g. toxic or corrosive.

Can I use the gold or silver plating solution for tank plating?

Yes, you can. Plate at 3-4 volts and keep

the article moving in the tank or beaker.

By dipping the electrode (without the swab) into the solution, you will complete the electrical circuit and plating will take place. However, if you intend to do a lot of tank plating with our solutions, we are afraid the technical support only covers brush plating.

Does the plating process cover or fill in scratches?

Some solutions are better at levelling out scratches than others. Copper and silver do this well and can be used for covering fine scratches. The best way of removing scratches, though, is to polish them out before you start plating.

If I want to start up a brush plating business, how much can I charge?

You should charge from £25-£40 an hour, with a minimum invoice charge of £25.

What surface area will 1 litre of gold plating solution and 1 litre of silver plating solution cover?

To calculate the volumes of plating solution required, use our plating thickness calculator on our website: <http://www.goldn.co.uk/calc.html>

I want to plate small areas - do you sell smaller swabs?

We do sell small swabs, as well as our standard size (which can also be used on our curved electrodes). We also sell large flat swabs for our flat electrodes for plating large, level areas such as clock faces.

When brush plating, how often should I dip the swab in the plating solution?

About once a minute. The drips in the tray can be poured back into the beaker as long as the tray is clean.

I have some pieces of cutlery where some of the silver has worn off. Can I plate over the bare patches or do I have to polish all the old silver off first and re-plate the whole item?

As long as the existing silver is firmly sticking to the surface, you can plate over the bare patches. Just polish up the article and follow the steps outlined earlier in this manual for plating on EPNS.

How do I keep the gold plate clean?

Gold doesn't tarnish, so all you have to do is wipe it occasionally with detergent to remove any greasy marks. Never use abrasive polishes like silver or brass polish, as you'll strip off the gold plate.

While plating a chrome badge I missed some chrome in the stripping process and the gold flaked off. Do I have to strip all the gold off, strip the chrome and start again?

There's no need to strip all the gold. Simply strip the chrome where the gold has flaked off, ActiClean and re-plate with gold.

Tiny, hair-like marks are appearing on a piece of steel I am gold plating - what should I do?

There are some kinds of steel that aren't made to be plated and give this result. You can overcome this by stopping plating when these marks appear, rinsing and silver plating for 5-10 minutes. Polish back until the marks disappear and carry on gold plating.

Dull spots are appearing in the silver plate that I'm putting on an old brass door knocker that goes on my front door. They are very hard to polish out - how do I get round this problem?

The dull spots are probably caused by the weathering of the underlying brass. Brass is a mixture of copper and zinc and the zinc can leach out of the brass, leaving behind a porous, copper-rich sponge that is difficult to plate. The only way round this is to polish it out of the brass or heavily copper plate and polish back, then silver plate.

Do the solutions damage the surrounding paint work on a car?

No, our solutions do not affect the paint work in any way.

Do I have to wait for the plate to dry before I can touch it?

No, this process has nothing to do with painting - the plated metal bonds atomically with the surface of your work.

pen plating *supplement*



GUIDED PROJECTS

Get the best out of your pen plating equipment: Special techniques for pen plating success: A growing library of guided projects for you to try out

Welcome!

To the latest exciting addition to Spa Plating Publications.

Just like our main Brush Plating Manual, this supplement is designed to help you get the most out of our pen plating equipment and solutions.

The R&D department at Spa Plating recognised the need to develop this highly specialised area and to apply the same level of cutting edge development to pen plating as it already has to brush plating.

We are now very pleased to present this focused research in the form of a range of graded projects, which will cover the skills and techniques necessary for successful pen plating.

If you are in any doubt whether pen plating will meet your plating needs, a cursory glance through this supplement will help you decide whether to go for brush or pen plating. The kind of projects we've chosen demonstrate exactly why pen plating is a better option in the given circumstances.

Remember-you can be sure that our equipment and solutions are the fruit of this work and unique to us; we don't sell other companies' plating solutions and much of our equipment is made in-house.

Our strength is in making sure our products perform at their maximum level, so you can be free to get on and achieve top notch results in whichever field of pen plating you're working in. So, from all of us at Spa Plating....

Happy pen plating!

Contents

The main focus of this supplement will be a growing collection of projects, dealing exclusively with pen plating. We have kept our introductory pages to a minimum, as many of the basic skills you need for pen plating are already covered at length in the main manual.

Below is a brief description of the first three projects; keep looking at the website and up-dating your copy of the manual, as more projects are certainly on their way!



Project 1

Because gold plating on silver is one of the most straightforward of plating tasks, we have chosen this project to kick off with. It also introduces the technique of masking out, which is an essential skill for the pen plater.



Project 2

This project shows how two tone plating, in this case rose gold and white palladium, is ideally suited to pen plating. It also features plating an initial gold flash layer onto a nickel based alloy, as a base for further plating.



Project 3

Moving from the decorative to the functional, we now focus on the use of pen plating in the field of electronics. Project three shows how to create a continuous electrical link by joining all of the connectors with copper wire, allowing you to plate efficiently and quickly.

APPLICATIONS

ONCE YOU'VE BOUGHT YOUR SPA PLATING PEN PLATING KIT, we guarantee you'll soon be discovering extra ways you can exploit its limitless potential.

Our latest research has come up with some suggested applications below, but we're confident that our customers will continue to come across a myriad of other uses. Stay in touch with our blog at www.goldn.co.uk to be kept up-to-date with all the latest news.



JEWELLERY

Our pen plating kits are proving extremely popular amongst jewellers, as pen plating allows the jeweller to take control of the plating process themselves, avoiding the cost and inconvenience of having to send their work away to be tank plated. Selective gold plating, two tone plating, small batch production, repair work on claw settings of precious stones - all become far more manageable and within reach. Of course, our pen plating kit has been designed to take up the minimal amount of bench space, so one-off jobs are much easier to undertake and are far more economic.



ELECTRONICS

An increasing number of scientific R&D departments in higher education and industry are turning to our pen plating kits to solve their high spec plating needs. Our plating solutions are extremely dependable and pen plating delivers just the right amount of plated metal in exactly the right place, without the need for large amounts of time-wasting masking out. The applications in electronics are huge; printed circuit boards, Hi-Fi equipment, scientific equipment such as photomultipliers - the list is growing as the industry recognises its potential.



ANTIQUES

Pen plating can prove extremely useful to those working in the many branches of the antiques business. It allows you to do those small repair jobs quickly and efficiently, freeing you up to get on with the more time consuming task of running your business.



MODEL MAKING

Here is another field where pen plating is making a real difference. Whether you're a professional model maker or a keen amateur, our pen plating kits mean that adding that touch of gold to a treasured model is now much easier and straight forward. Pen plating is ideal for the hobbyist, as all the solutions are safe to use at home and the volumes involved are small and easily stored.



DENTAL & SURGICAL APPLIANCES

Gold plating plays an essential role in these fields and Spa Plating's pen plating kits are proving to be increasingly popular with dental and surgical technicians. Our kits and plating solutions deliver consistently high standards, which is a vital consideration in the demanding world of medical technology.

Pen plating voltages

Please note that the voltages for pen plating are slightly different to brush plating and are as follows;



Why not cut out and keep this table, for quick reference?

Plating solution	Volts
Gold	6 - 7
Copper	4 - 5
Silver	4 - 6
White Bronze	4 - 5
Palladium	4 - 5



By its very nature, pen plating involves dealing with relatively small, delicate items.

Because of this, careful reading of the section on hand polishing in the main manual is a must for all prospective pen platers. There are a few other areas (such as how to prepare our Thickener), which are common to brush as well as pen platers, but apart from these, the projects you'll find in this supplement are exclusive and not repeated in the main manual.

DON'T FORGET THE MPU!

- it's just as vital in pen plating as in brush plating.

Your pen plating equipment in detail...

PLATING PENS

We've given the market standard design of plating pen a complete overhaul and our pens, again unique to us, are a breakthrough in pen plating technology. Their supreme efficiency is down to the titanium core and platinum tip, two features that guarantee maximum plating performance.

PEN PLATING NIBS

The two different shapes of these nibs - pointed and paddled - allow you greater flexibility whilst plating. Although they are highly

absorbent, they keep their shape when fully loaded with plating solution. The pointed nib stays pointed so you can almost 'draw' the finest of plated lines, without having to mask out.

The paddle shaped nib is excellent for covering larger areas of your work quickly and efficiently.

PEN PLATING DRIP TRAY

All the elements are made from high grade, chemically resistant stainless steel which means they maintain a highly efficient electrical contact with your work and will not rust and contaminate your gold solution over time. The crocodile clip and adjustable arm allows 'hands free' pen plating and holds your work securely leaving you free to perform precise selective plating jobs. Collects any drips of precious metal plating solution during pen plating which means you can save money by re-using your solution

LED PEN RECTIFIER

The rectifier is fully variable so you can reduce the voltage if you want to gold plate fine points or increase the voltage if you also want to rhodium or platinum plate jewellery.

MINI CONTACT PROBE

It's designed to help you make efficient electrical contact, no matter how small the piece you're working on.

PEN AND POT HOLDER

Unique to Spa Plating, the transparent holder lets you see at a glance how much and what kind of solutions you have available.



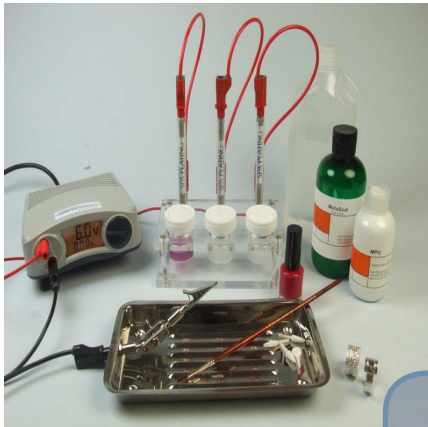
Selective gold plating

project
one

on silver

We've chosen selective gold plating on silver as the first project, as it's the easiest and often the most popular choice for those starting out in pen plating.

The two featured rings demonstrate two different approaches to selective plating; one involves masking out with nail varnish, the other careful application of the gold solution using one of the pointed nibs. For in-depth guidance on surface preparation, please refer to the relevant sections of the Brush Plating Manual.



1 What you'll need

Equipment; LED Pen Rectifier, plating pot stand, plating pen, tray, pen nibs (pointed and paddle shaped), artist's watercolour brush.

Solutions and Materials; gold plating solution, MetaSeal, MPU, nail varnish, kitchen paper towel.



2 Close-up

The pointed nib of our plating pen is ideal for plating inside the hollow shape of ring A, as well as applying a band of plated gold to the middle of ring B.



3 Surface preparation

Clean and prepare the surface of the silver with MPU.

Remember!

MPU has been specially formulated; all you have to do is to apply it with a clean paper towel and buff up with another clean paper towel.

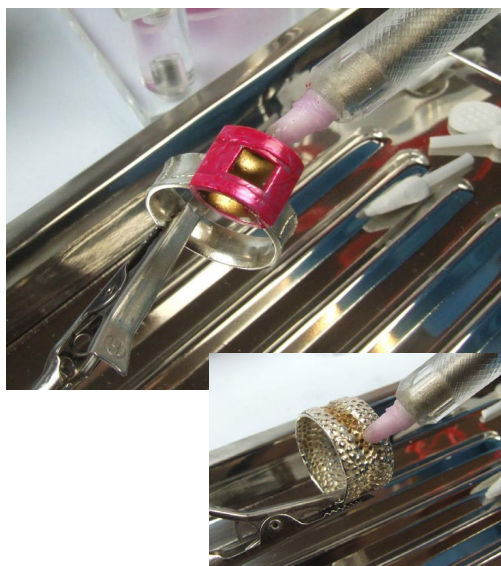
This process removes both tarnishing and grease, all in one go.

4 Masking out ring A

We recommend wearing gloves throughout this process, to avoid getting the clean surface of the ring dirty again with your fingers. A fine artist's watercolour brush is essential, as the brush supplied with the nail varnish isn't accurate enough.

Tip!

You can remove any mistakes you make with the nail varnish by carefully wiping it away with a spare pen nib, dipped in nail varnish remover!



5 Selective gold plating - 6v

Fit a nib into the end of the pen and adjust the rectifier to the correct voltage. Make sure the nib is fully pushed up into the end of the pen so that the cotton wool makes contact with the platinum tip. Dip the nib into the gold solution and brush the surface of the work with circular movements. Keep dipping the nib regularly into the solution to replenish the gold.

The pointed nib easily gets into the smallest of areas, allowing you to plate precisely and economically. The paddle shaped nib is great for plating the flatter areas of the ring, such as the band.

► The pointed nib also allows you to selectively gold plate very accurately freehand, without the need of masking out.

6 Finishing

Remove the nail varnish with nail varnish remover, using kitchen paper towel. To bring out the lustre of the gold plate, polish with MetaSeal.



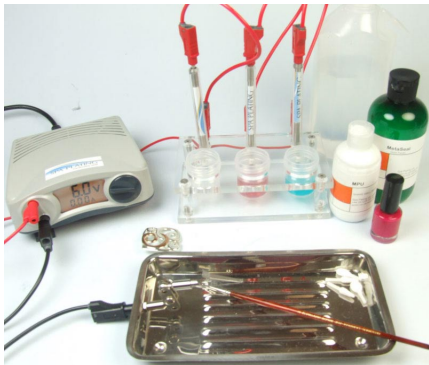
Two tone plating with

project
two

rose gold and white palladium

The contrasting tones of rose gold and white palladium effortlessly highlight the intricate design of this brooch, and show how two tone plating can turn a fairly humble piece of costume jewellery into something really quite special.

This project also demonstrates the vital role Gold Flash plays in providing a base for plating onto nickel and nickel containing alloys. You will need to mask out after the initial Gold Flash layer and again, between the layer of white palladium and rose gold.



1 What you'll need

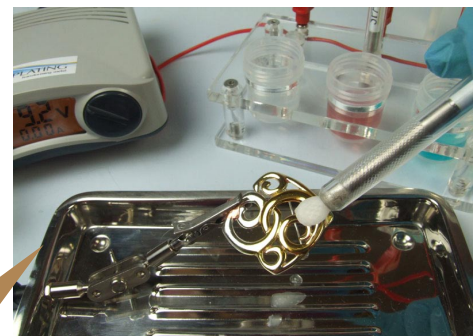
Equipment; LED Pen Rectifier, plating pot stand, plating pen, tray, pen nibs (pointed and paddle shaped), artist's water-colour brush.

Solutions and Materials; Gold Flash, White Palladium, prepared Rose Gold (for instructions on preparation, please see the Rose Gold Know How page in this manual), MetaSeal, MPU, nail varnish, kitchen paper towel.

2

Gold Flash, 8-10 v

Prepare the surface as normal with MPU and then plate a layer of Gold Flash to create a base for both the rose gold and white palladium. Rinse with the spray bottle containing deionised water.



Top tip!

To protect your work from scratching, cut off a small amount of connector strip and use this between the surface of your work and the crocodile clip.



3 Masking out

Carefully apply the nail varnish with the artist's brush, tidying any mistakes with nail varnish remover and a clean paper towel.



4 White palladium plating, 4.5v

Remember to adjust the voltage to 4.5 volts for the white palladium, applying the solution in circular movements and regularly dipping the pen into the pot. When finished, rinse with deionised water.



5 Second masking out and rose gold plating, 4v

Mask out the area that you have just plated, in this case the white palladium. Adjust the voltage to 4v and plate with the prepared rose gold solution. Rinse and remove all traces of nail varnish with nail varnish remover.

6 The finished piece

We recommend using MetaSeal at the final stage, to bring out the lustre of the plate and help protect the surface of your work.



Gold plating connectors on a photomultiplier

project three

Our third project is an introduction to the many applications the pen plating kit has in the field of electronics.

The piece of equipment being featured is a photomultiplier. It is an extremely sensitive detector of light in the ultraviolet, visible, and near-infrared ranges of the electromagnetic spectrum and is widely used in medical, astronomical and particle physics research. To optimise its performance and to enhance corrosion resistance in humid environments, the connectors are being

gold plated and this step by step project shows how to prepare the piece for plating. When plating any kind of electrical equipment, a vital consideration is avoiding moisture penetrating its workings and inhibiting the flow of electricity. The project shows how to get round this problem by using thickener, which stops your solution from dripping and running off.

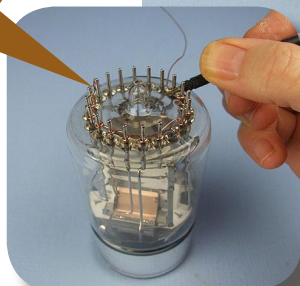
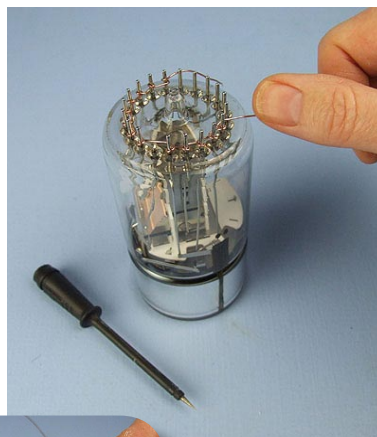
1 What you'll need

Equipment; LED Pen Rectifier, pen and beaker stand, plating pens, pen plating clip tray, pen nibs (pointed and paddle shaped), fine gauge copper wire, mini contact probe.

Solutions and Materials; Thickener, ActiClean, Gold Plating Solution, rinse bottle with deionised water.



The mini contact probe is really useful for keeping the wire down against the glass and preventing it from slipping back off the connectors.



2 Wiring up

Begin by cleaning the wire thoroughly with MPU and a piece of clean paper towel. Secure one end of the wire by wrapping it around one of the contacts and then proceed to weave/loop the wire in and out of the rest of the contacts, to form a continuous electrical link. This will save you a lot of time and hassle having to touch the black negative lead as well as the pen nib to each connector.

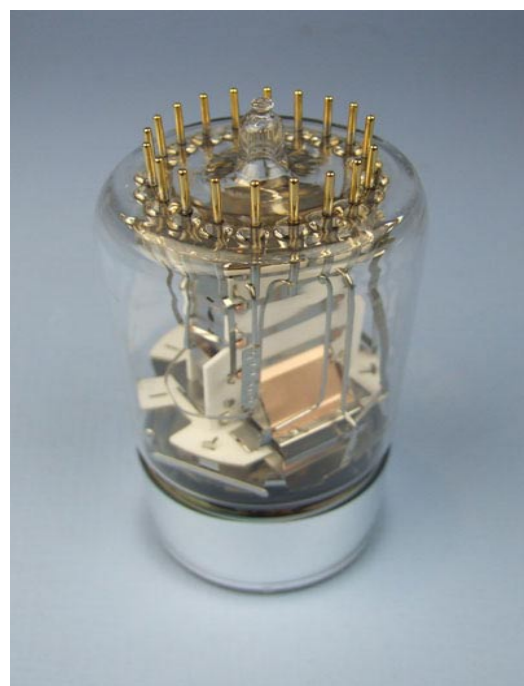


3 ActiCleaning 5 - 7 volts
Prepare the ActiClean by gelling it with the thickener; this will prevent it from running all over your piece of equipment. Grip one end of the copper wire with the crocodile clip, and Acti-Clean each connector in turn. Once you have finished, wipe off any excess gelled ActiClean with a clean paper towel and rinse lightly with the deionised water.



4 Gold plating 5 - 6 volts
Gel the gold solution and adjust the voltage for gold plating. Plate each connector for approximately 30 seconds. Repeat the cleaning process outlined in the previous step.

5 Finished photomultiplier
Don't worry if you were unable to plate right down to where the connector enters the glass. The aim of the gold plate is functional rather than aesthetic; it is there to aid connectivity and is therefore only critical at the ends of the connectors rather than at their base.



Creating reference swatches for different coloured golds



What you'll need

Solutions: Bronze Mixer, Copper Plating Solution, KGold, Rose Gold Mixer, MPU Fine. **Materials and equipment:** Strip of polished copper plate (10cm x 2.5cm x 1mm), beaker, electrical insulating tape, 1 x 3ml pipette, 1 x 1ml pipette, marker pen, ruler, scissors.

There's no better way to gain confidence in mixing our rose, green, yellow and white golds, than by creating colour swatches for all four. It takes a bit of time, but it's well worth it!

Creating your own swatches will help you;

- match your gold plate accurately to existing gold for spot-on repairs
- demonstrate to your customers the range of shades of gold available
- provide you with a very useful reference for further plating jobs

To make this process as economical as possible, we have developed a method that uses the minimum amount of gold solutions. The different shades of rose, yellow, white and green gold have been calibrated by mixing each sample shade drop by drop, with 1ml of KGold.

The swatch you will prepare in this project will have 5 sections; the first section will be plated with just KGold and then the subsequent four sections will show a 2, 4, 6 and 8 drop ratio to 1ml of KGold. All coloured gold solutions, once mixed, should be used within a couple of hours.

NB-The drop system has been developed for pen plating *only*, and is not suitable for brush plating.

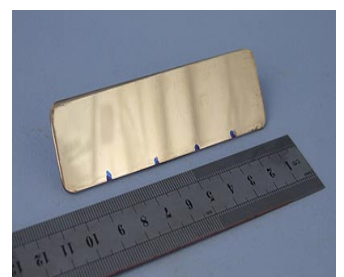


1 White bronze plating, 4v

Prepare a white bronze plating solution according to the ratios outlined in our Quick Reference no. 2 page in this manual. Plate the copper strip with a solid layer of white bronze.

2 Marking out

Divide the white bronze plated copper strip into five equal sections and mark each section with the pen.





3 KGold plating, 5v

Mask off the first section of your swatch with the insulating tape and plate with a good layer of KGold. This first section will form the reference colour for all of the different shades of rose gold you will subsequently plate. Keep a written record of the solutions and ratios you are using, to keep track of the tests you are doing and for future reference, so all of your results are easily repeatable.

4 Mixing the rose gold plating solution

With the 1ml pipette, draw up 1ml of KGold and squeeze this into a beaker. Replace this pipette carefully next to the bottle of KGold.

With the 3ml pipette, draw up some rose gold mixer and, for the first section of rose gold, put two drops into the beaker. Again, replace the 3ml pipette next to the bottle of rose gold mixer.

Keep these pipettes next to their corresponding bottles and the bottles clearly separate on your work bench. This will prevent you from accidentally using the wrong pipette in the wrong bottle, and contaminating your solution and mixture.



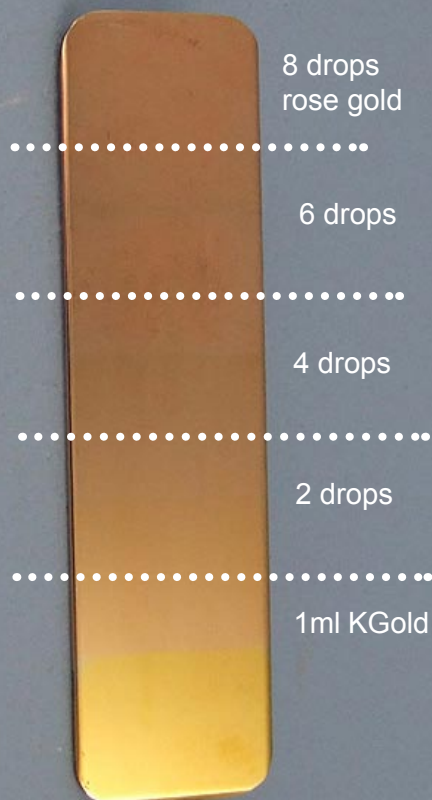
5 Masking out and plating the 2 drop rose gold section, 5v

Cover the KGold section with masking tape and mask out the next but one section, following the markings you made with the pen. Now use the 2 drop mixture to plate a good layer of rose gold. It's a good idea to time yourself - two to three minutes for each section should be fine - as this will give you standard results throughout.

Rinse out the beaker and now mix a solution at a 1ml KGold to 4 drops of rose gold ratio, plate and continue with the 6 and 8 drop ratio, rinsing the beaker thoroughly between each section.

Remember to up date your notes as you go along, keeping a clear record of the ratios you are using.

Each section made with 1ml KGold



6 Completed rose gold swatch

To finish your work, clean the surface with MetaSeal to reveal the subtle differences between the different shades of rose golds.

After successfully completing your first swatch, we are sure you'll have the confidence to produce a swatch for **the other coloured golds**. For green and white gold, use the same 2,4,6 and 8 drop ratio of coloured gold mixer to KGold. For all the carats of yellow gold,

- First mix rose gold with green gold at the varying ratios, described in the table below.
- Then each combination of rose and green gold will have to be mixed with the usual 1ml of KGold, to make a shade of yellow gold.

Rose Gold	0	2	4	6	8
Green Gold	8	6	4	2	0

For rose, green and yellow gold, plate at 5 volts and for white gold, plate at 4.

ALL THE COLOURED GOLD SWATCHES

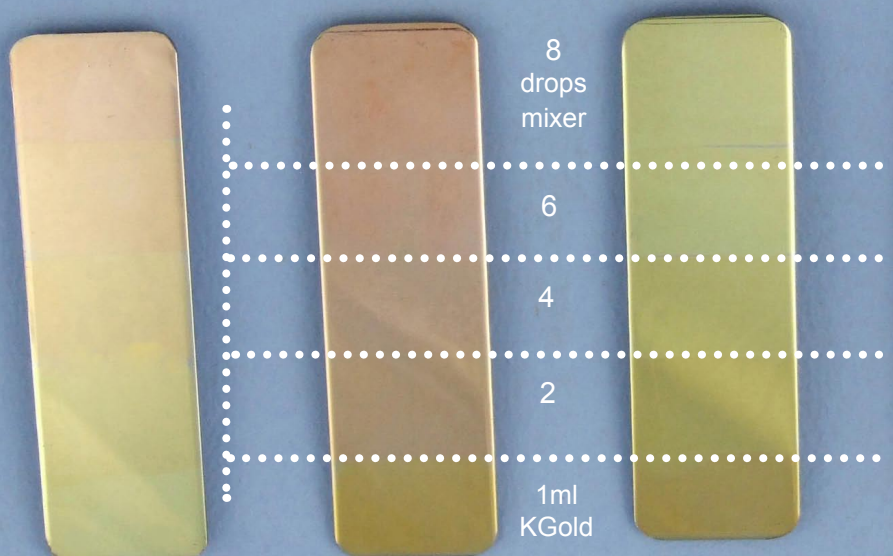
Once you've prepared all of your coloured gold swatches, you'll see immediately how useful they are!

Your customers will be impressed by the professional service you can offer, as you'll be able to exactly match most repairs or specifications of coloured golds to their requirements.

Yellow gold *

Rose gold

Green gold



* See above for ratios

Keep your swatches protected from scratches by storing them in clear, sealable plastic bags. This way, you'll be able to quickly refer to them whenever you want, and they'll last a life-time.

tank plating *supplement*



GUIDED PROJECTS: All the practical tips you need for high quality tank plating, presented in clearly illustrated step-by-step projects.

Welcome...

to our latest supplement for Tank Plating.

Just like our main Brush Plating Manual, this supplement is designed to help you get the most out of our tank plating equipment and solutions.

Spa Plating has focussed it's R&D on developing a system that targets small scale tank plating. Our tank plating kits are designed to be as easy to use for the inexperienced as well as the experienced tank plater. One of our tank plating kits can be used as a stand alone immersion plating facility or it can be used along side a brush plating set up.

Again, we are presenting guidance on how to use our kits in the form of a range of graded projects, which will cover the skills and techniques necessary for successful tank plating

Richard Palmer
Director
Spa Plating

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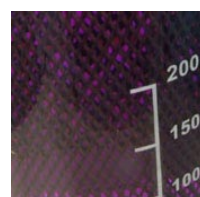
Below is a brief description of the first three tank plating projects and the techniques they cover; keep looking at the website and up-dating your copy of the manual, as more projects are certainly



Project 1

Gold Tank Plating a Ring to Vermeil Standard

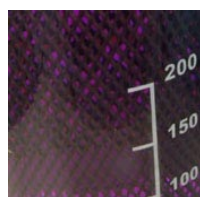
- Setting up your tank plating kit
- Calculating plating times and thicknesses
- Surface preparation



Project 2

Silver Tank Plating a Trumpet Mouthpiece

- Using solution factors to work out the amp levels
- Powered cleaning with our Cleaner
- Achieving a water break free surface



Project 3

Rhodium Tank Plating Silver Jewellery

- Setting up your rhodium tank plating kit
- Calculating plating times and thicknesses



Both The Plating Stand and Plating Arm are fully conductive, so the black negative lead connects to your work through the crocodile clip.

The Gold Tank Plating Solution plates bright and contains 4g of pure gold per litre. Use our online Plating Calculator to work out plating times and thicknesses.

The hot plate stirrer keeps your solution gently heated and agitated, which ensures your plating solution performs to its maximum capacity.

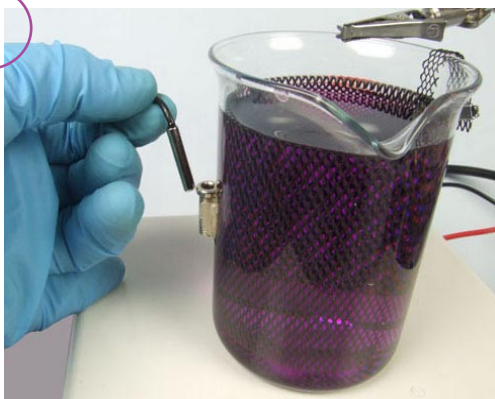
Gold tank plating a ring to vermeil standard



Setting up

Set up the kit as shown in the main picture above.

1



Turn on the **hot plate stirrer** and place the magnetic stirrer bar in the gold plating solution. Set the hot plate stirrer bar speed to 1 and the heat setting to between 0 and 1. You are aiming to heat the gold plating solution to 25 to 30 degrees centigrade, so you will need to adjust these settings as you go, to maintain a constant temperature.

b The other red lead should grip on to the mesh electrode in the **Cleaner beaker**.

Our Gold Tank Plating Kit, when used with our on-line Gold Tank Plating Calculator, means you're now in complete control of the gold plating process.

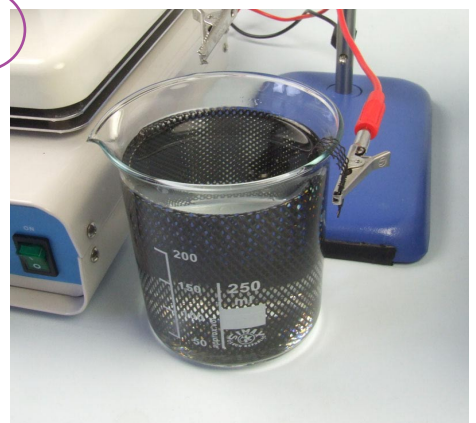
Plating to vermeil standard requires a layer of gold of at least 2.5 microns on sterling silver and our kit will help you plate to these kinds of specific and substantial thicknesses of gold.

You'll not only be confident that the layer of gold you've plated is of a uniform thickness, you'll also know how much gold is left in your remaining plating solution and therefore how long it will take to plate your next item to the same or a different specification.

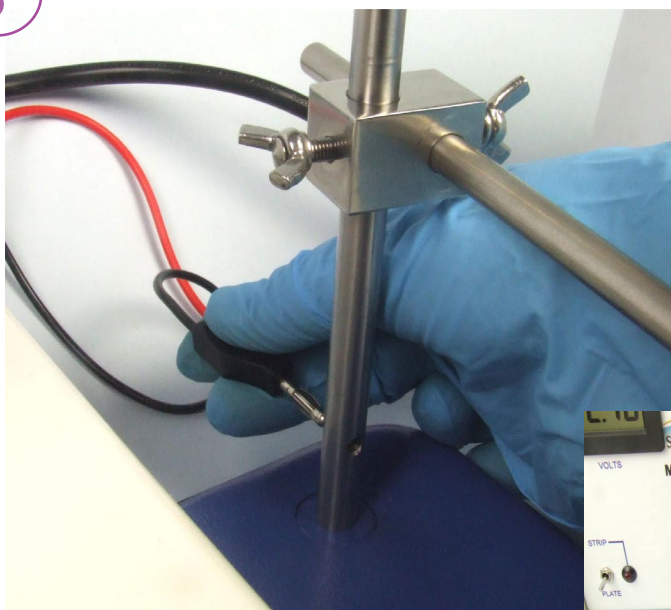
Our kit also offers you the flexibility of plating larger objects in our 500ml, 1 and 2 litre capacity Plating Beakers.

a Once the **Plating Beaker** is filled with gold solution and is on the hot plate stirrer, place the thermometer sensor into the sensor housing on the side of the gold plating beaker and grip one of the red leads to its mesh electrode.

2



3



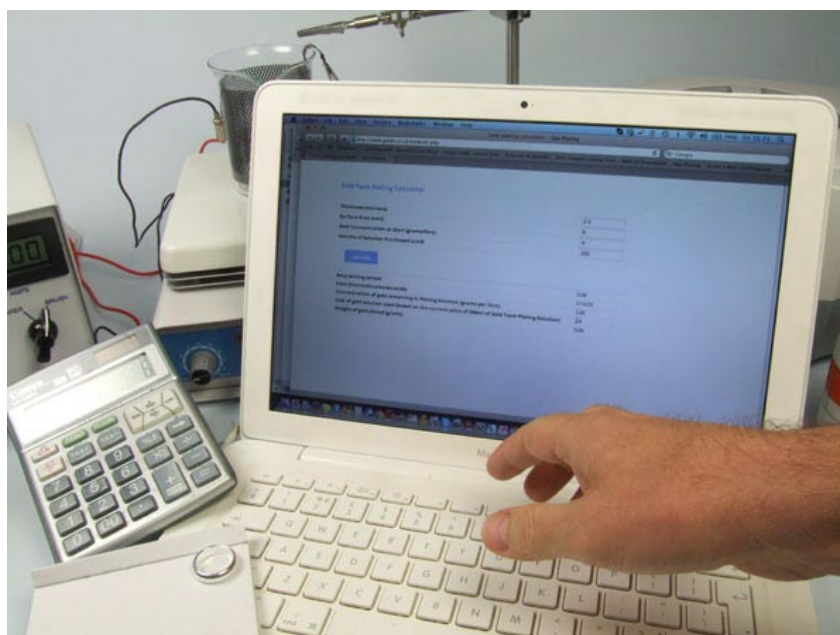
c The black lead should be plugged in to the base of the **Plating Stand**.

4



d The other ends of the red and black leads should be plugged in to the corresponding sockets on the **Deluxe Rectifier**.

5



Calculating plating and powered cleaning times

You'll need to work out the surface area you're plating and decide the thickness of plate you require.

In this case we'll be plating gold onto a sterling silver ring to **vermeil standard**. This means we'll be plating to a gold thick-

ness of 2.5 microns. The surface area of the example ring worked out at 8 square centimetres.

Go to the **Gold Tank Plating Calculator** on the Gold Tank Plating Kit shop page and enter in the required data. Press the 'Calculate' button and take a note of the results.

Based on the above data, the amp setting on the Deluxe Plating Rectifier for gold plating will be 0.08 for just over 14 minutes and for the powered cleaning stage it'll be 3 times the gold amps at 0.8 Set your Plating Timer for the gold plating time.

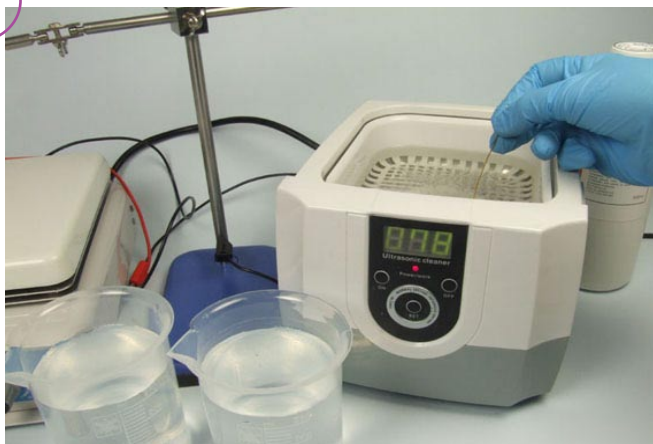
6



Preparing the surface of the ring for plating

a First clean the ring with **MPU** and a soft tissue. Then make a small jig to hold the ring, using the gold plated jigging wire and the wire cutters.

7

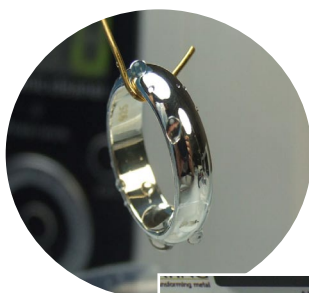


b Hang the ring on its wire jig in the **ultrasonic cleaner** and turn it on. A couple of minutes in the Ultrasonic Cleaner should be enough.

8



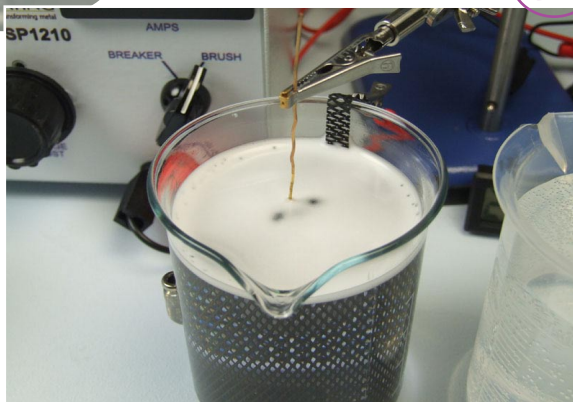
c Briefly dip the ring into the first and second of the six **rinse stages**. The water you use can be ordinary tap water for 5 out of 6 of the rinse stages; we recommend for the last 6th stage that you use deionised water.



Before power cleaning - water collects in drops on the surface of the ring, showing **water breaks** and that the surface isn't clean enough for successful tank plating.

9

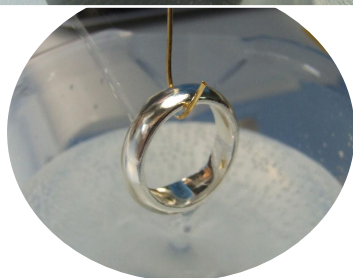
Powered cleaning



The Gold Tank Plating Calculator has told us that the amp setting for the gold plating stage should be 0.08 amps. For the **Cleaner stage**, the amps on the Deluxe Plating Rectifier should now be set to 0.8. Leave the ring in the Cleaner for 2-5 minutes. Once it's done, take the ring out of the Cleaner and pass it through rinse three and four of the six rinse stages.

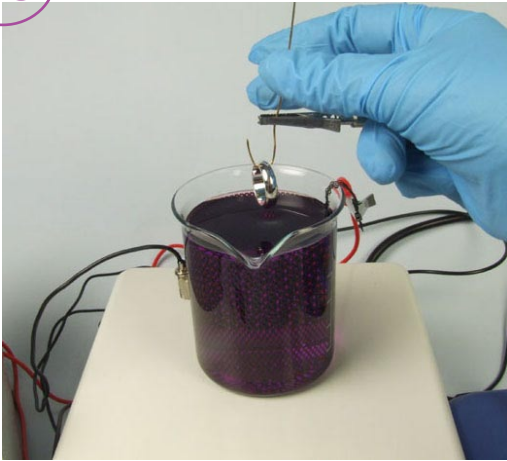
Please note

The Deluxe Rectifier is an unregulated power supply and the amps can only be set when the work piece is in the solution and the electrical circuit is complete.



After power cleaning - the water runs off smoothly in an unbroken sheet. The surface is now **water break free** and perfectly clean for top quality plating.

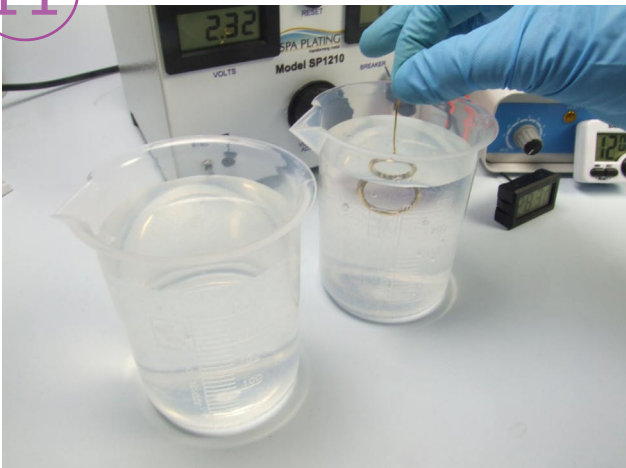
10 Gold tank plating



a Adjust the rectifier so that the amp reading is 0.08 Grip the wire jig (with the ring hanging from it) in the crocodile clip which is fixed to the arm of the plating stand.

Make sure the **Plating Timer** is set to the right time (in this case 14.04 minutes) and start the timer as soon as you lower the ring into the plating solution.

11



b After the plating has finished, take the ring out of the plating solution and pass it through the two remaining rinses.

We recommend that the last rinse should be **deionised water**.

12



c The gold plated ring can now be finished with **MetaSeal** to bring out the lustre of the plate and help seal its surface.

Silver tank plating a trumpet mouthpiece



How to work out the amps for the plating time

1. Decide how thick you require your plated layer to be. In this example, we wanted the plated layer of silver to be 5 microns.
2. Work out the approximate surface area of your work. The surface of this trumpet mouthpiece is about 36cm²
3. Multiply the surface area of the item by the solution factor for silver, which is 0.005. For our trumpet mouthpiece, this came out at $36 \times 0.005 = 0.18$, so the plating amps need to be set to 0.18
4. The silver tank plating solution plates at a rate of 0.3 microns per minute. So, to find out how long to leave the item in the solution, divide the required thickness (in this case 5 microns) by 0.3. This gives a plating time for the trumpet mouthpiece of 17 minutes.

NB As soon as you have worked out the correct time, enter this into the plating timer so that you're ready to go when you start plating.

You can handle Spa Plating's silver plating solution with complete peace of mind, as it's cyanide free. This project will show you how to renovate musical instruments, one of the many applications that are possible with our silver solution and tank plating kit. To work out the level of amps you'll need to set the rectifier at and how long to leave the item in the silver plating tank, follow the steps in the box to the left...

Setting up

Set up the kit as you would for gold tank plating, following the instructions which you can find in the previous project. However, rather than the Acti-clean stage, you'll be using our Cleaner. To work out the amp setting for this stage, multiply the surface area of the piece by the solution factor for Cleaner, which is 0.1. So for this project, the amp setting for the powered cleaning stage is $36\text{cm}^2 \times 0.1 = 3.6$

1 Preparing the surface



First, polish off all traces of the old silver plate and then make sure the surface of your work is perfectly clean by rubbing with undiluted washing up liquid, rinsing thoroughly under running water and rubbing with our MPU.



2 Ultrasonic Cleaning

Next, place the work in the Ultrasonic cleaner and leave it in for a minute or so.

Lift it out of the ultrasonic and pass it through the first two rinse stages.

Please note

The Deluxe Rectifier is an unregulated power supply and the amps can only be set when the work piece is in the solution and the electrical circuit is complete.



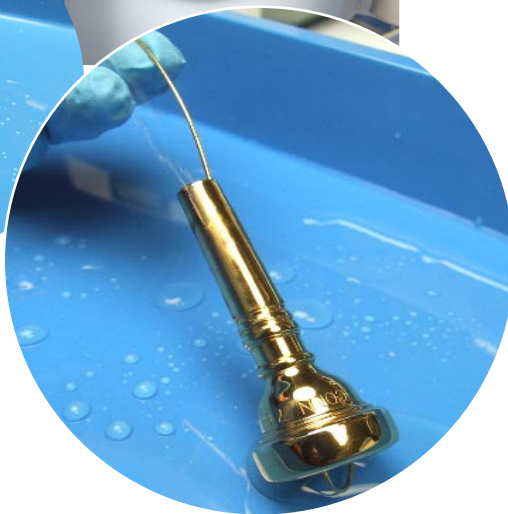
3 Powered Cleaning

Fix your work in the Cleaner tank and as soon as you have lowered the item into the solution, set the rectifier to the correct amp level. Almost immediately you should see bubbles form on the surface of the solution, which shows that it is working properly. We left the mouthpiece in for at least 4-5 minutes.



Before

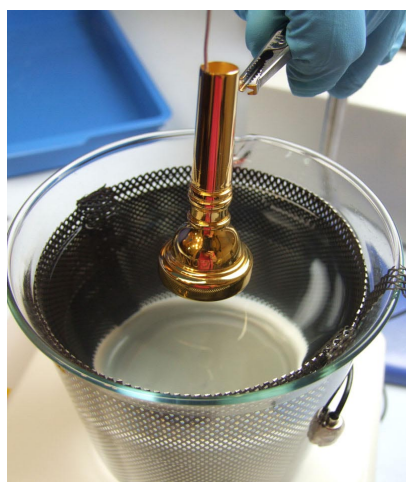
Powered Cleaning
Lots of water breaks.



After

Powered Cleaning

No water breaks; a perfectly clean surface and great for successful electroplating. For help with achieving a water-break free surface outside of a tank, please see 'Surface Preparation Know How 1' at the start of this manual.



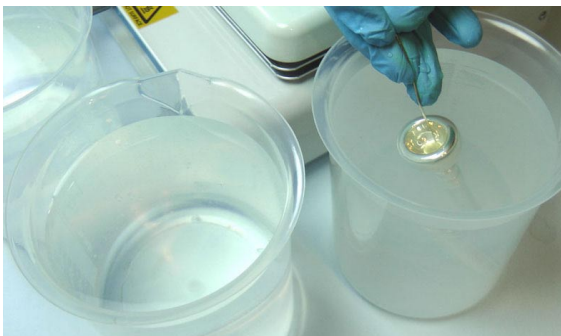
4 Silver plating

Fix your work in the crocodile clip on the plating arm and lower the work into the silver plating solution.



5 Setting plating times and amps

As soon as possible after lowering your work into the silver plating solution, adjust the rectifier to the level of amps previously calculated and start the plating timer.



6 Final rinses

Once the plating time is up, remove your work and pass it through the final two rinse stage.



7 Finishing

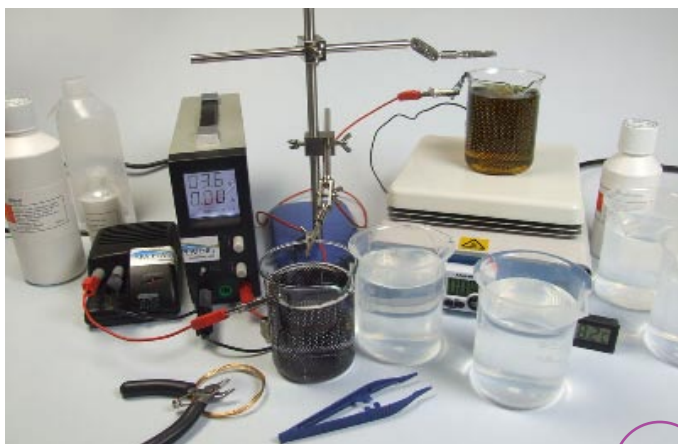
To bring out the lustre in your silver plate, we recommend polishing with Goddard's Silver Polish. This can be purchased from our online shop and is included in our Hand Polishing Kit.

Keeping your Silver Plating Tank in tip top working order

If you have to leave your tank unused over a period of time, you'll have to top up its pH level with our pH Adjuster to keep it working at its best.

its pH will fall back to a level of 6.5, rather than an optimum level of 8.5 and your plating results will be

Rhodium tank plating a ring



With our Rhodium Tank Plating Kit, you'll be able to white gold plate items of jewellery to specific thicknesses with ease.

We've designed the process so that you can pre-programme in the rectifier settings before you start plating. This means that once you start plating you don't have to adjust the equipment, leaving you free to concentrate on the plating itself.

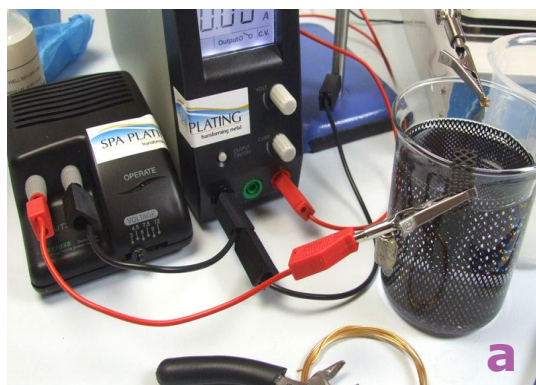
Setting up your kit 1

Set up the kit as shown in the main picture above. Turn on the Hot Plate Stirrer and bring the temperature of the solution up to 38-42 degrees centigrade.

For a step-by-step guide on setting up your tank plating equipment, please see the first project in this tank plating section, 'Gold Tank Plating a Ring to Vermeil Standard'.

To work out the amp level, multiply the surface area of your work by the plating factor for rhodium, which is 0.01. In this case, we estimated that the surface of the ring was 9cm². The calculation is therefore $0.01 \times 9 = 0.09$ amps.

So the amp setting on the large rectifier needs to be set at 0.09. Please follow the step-by-step guide on the next page for doing this.



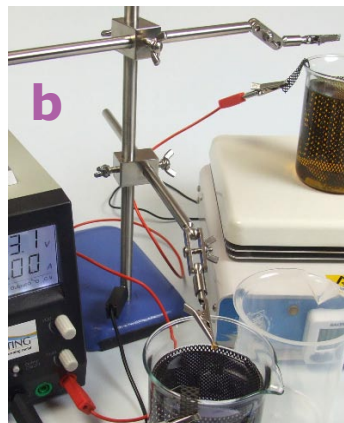
Connecting the leads

a Black leads x 2 (one short, one long)

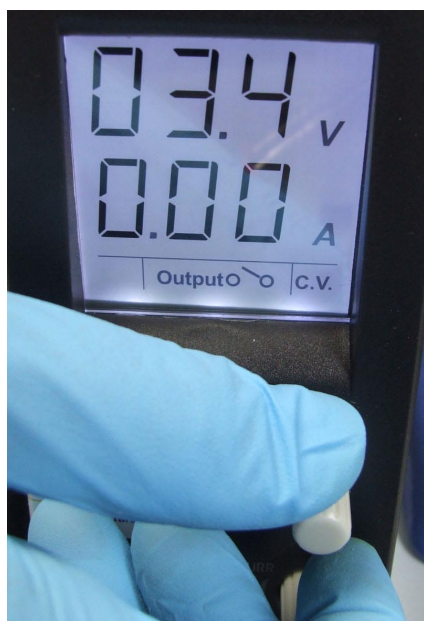
Plug the short black lead into the black socket on the Economy Plating Rectifier and then plug the other end into the black socket on the large rectifier. Take the longer black lead and 'stack' it by plugging one end into the back of the black lead you've just plugged into the large rectifier. Plug the other end into the socket at the base of the Plating Stand.

b Red leads x2 (one short, one long)

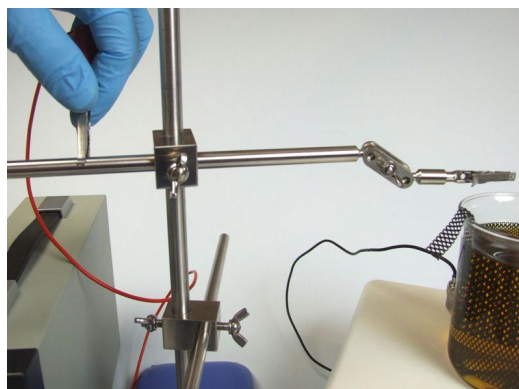
Plug the short red lead into the red socket on the Economy Plating Rectifier and then fix a crocodile clip to the other end of the lead and clip it to the mesh on the cleaner beaker. Plug the long red lead into the red socket on the large rectifier and clip the other end to the mesh on the rhodium beaker.



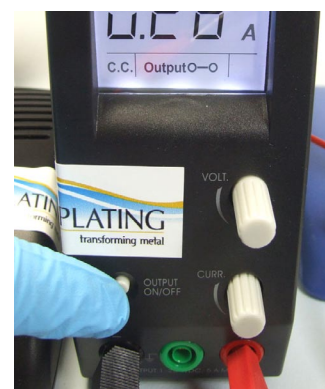
② Pre-setting the amps



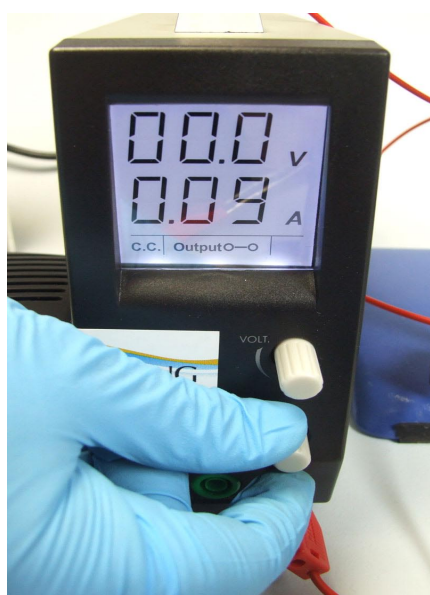
a Make sure output is off (open). Adjust volts to within a range of 3-3.4



b Short out by attaching red lead to plating arm.



c Turn on output



d Adjust amps to desired level (in this case 0.09).



e Turn off output.

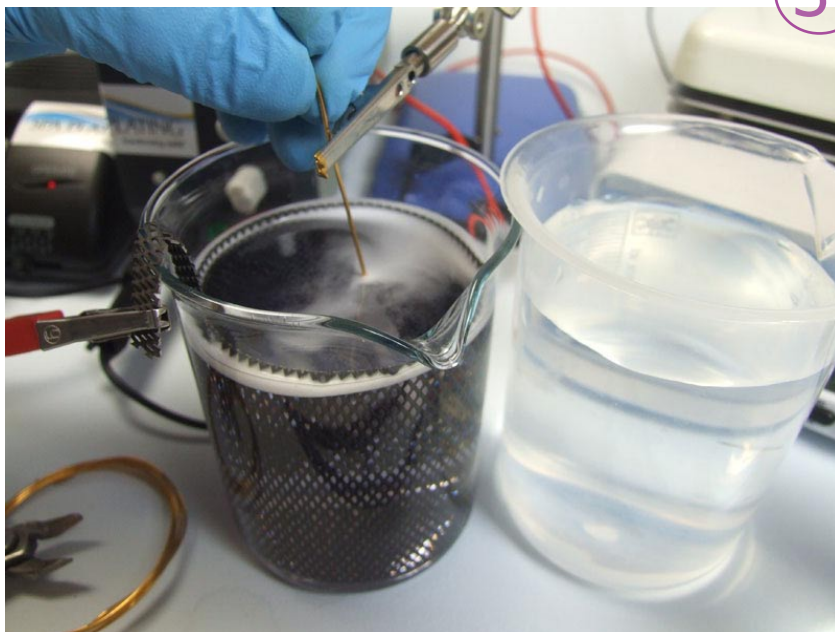


f Clip red lead back on to mesh in rhodium plating beaker.



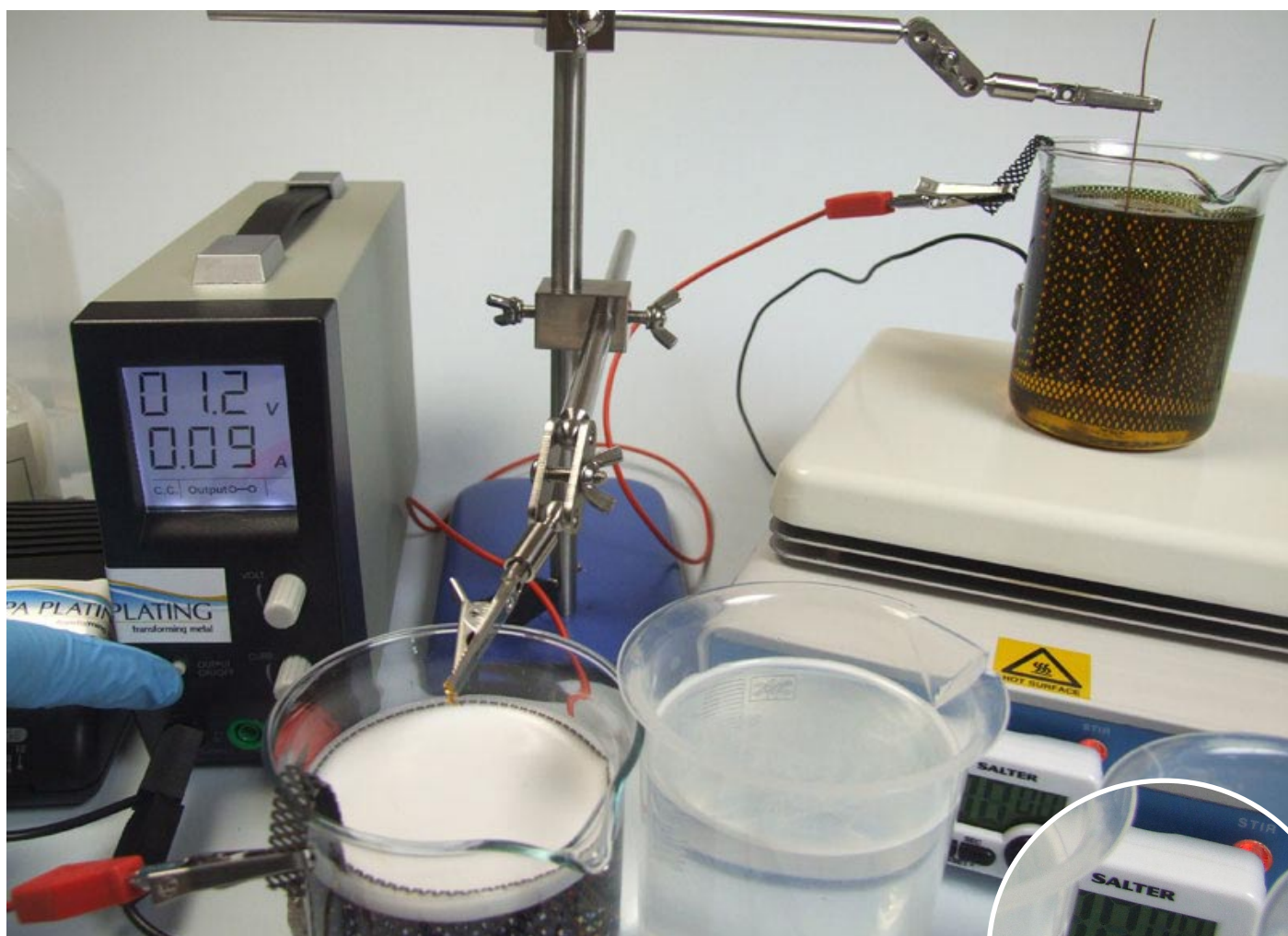
g Adjust voltage on small rectifier for the Cleaner beaker to 4.5

3 Power Cleaning

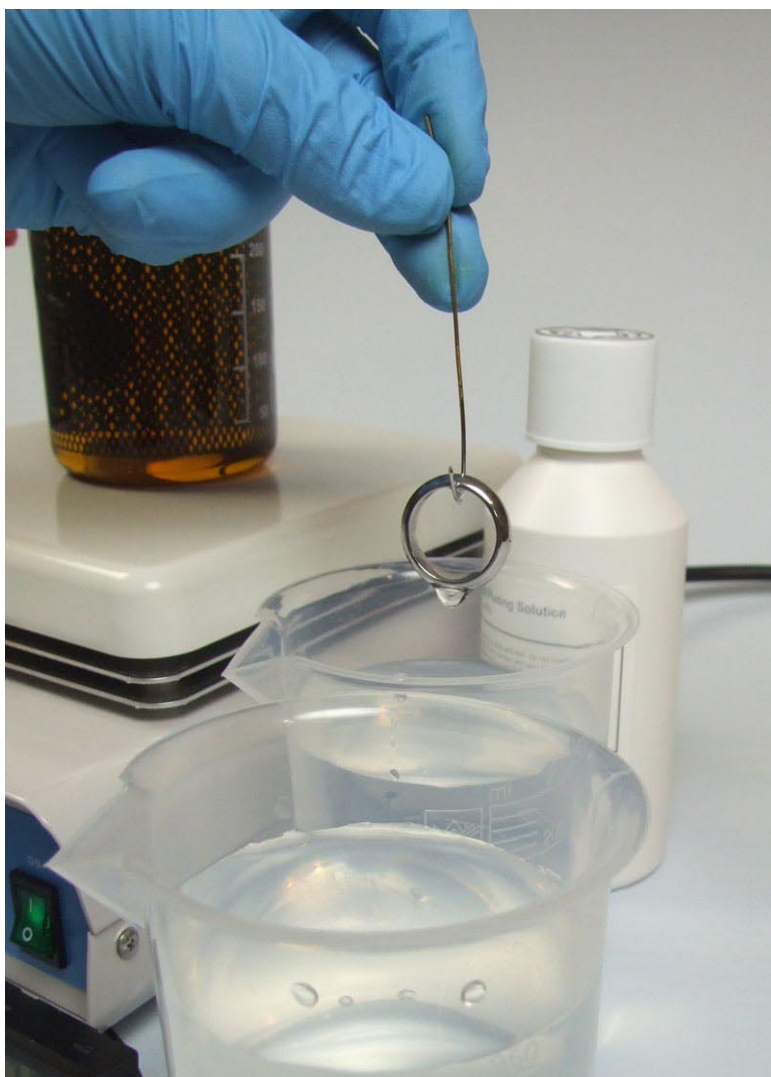


Place the ring in the Cleaner and touch the jigging wire which is holding the ring against the crocodile clip. Almost immediately you'll see bubbles forming, meaning that the Cleaner is getting to work. Leave your work in the Cleaner for 15-30 seconds and you will have a perfectly clean, water-break free surface which is ideal for plating. Please see our previous project, 'Gold Plating a Ring to Vermeil Standard' for further information on this stage.

Rhodium Plating 4



Hang your ring in the rhodium plating solution (check that the solution is at the optimum temperature) and then turn the output to on as soon as possible.



Once the plating time is up, turn the output on the rectifier to off and pass the ring through the two plating rinse stages.

The ring needs no further finishing as our system deposits a durable, pristine layer of rhodium which can be easily maintained for many years.



electroforming *supplement*



GUIDED PROJECTS: All the practical tips you need for high quality tank plating, presented in clearly illustrated step-by-step projects.

Welcome...

to our latest supplement for Electroforming.

Just like our main Brush Plating Manual, this supplement is designed to help you get the most out of our electroforming equipment and solutions.

Spa Plating has focussed it's R&D on developing a system that targets small scale electroforming. Our electroforming kits are designed to be as easy to use for the inexperienced as well as the experienced electroformer. As with our tank plating kits, our electroforming kit can be used as a stand alone facility or it can be used along side a brush plating set up.

Again, we are presenting guidance on how to use our kits in the form of a range of graded projects, which will cover the skills and techniques necessary for successful tank plating

Richard Palmer
Director
Spa Plating

C o n t e n t s

Why choose electroforming rather than brush plating? You may want to completely metalise a non-metal object and make it rigid, for example if you want to plate a leaf or a small plastic item. You will need to plate to a considerable thickness of 100 microns or more and only electroforming allows you to do this.

We will take the same approach as we have in the sections of this manual that cover brush, pen and small tank plating and present our electroforming system through a number of guided projects.

Project 1

How to electroform on plastic. Spraying on our Conductive Ink (hi-grade). How to set up your Electroforming Equipment. Plating subsequent layers of silver and gold with the brush plating method.

Project 2

Selectively electroforming an agate slice using our Conductive Paint.



A holly leaf electroformed with our system. The same approach outlined in the first project can also be applied to most other natural, non-conductive surfaces.



Both The Plating Stand and Plating Arm are fully conductive, so the black negative lead connects to your work through the crocodile clip.

The Copper Electroforming Solution electroforms bright and smooth, eradicating the need for post electroforming polishing.

The hot plate stirrer keeps your solution gently heated and agitated, which ensures your electroforming solution performs to its maximum capacity. If you wish to provide your own stirrer, you'll need a stirring rate of 150-200 RPM. The solution will need to be kept at room temperature or 22 - 25 degrees centigrade.

Project 1

Copper electroforming a plastic model soldier



Our Electroforming Kit, when used with our on-line Electroforming Calculator, means you can now electroform on to most non-conductive surfaces as well as metal to substantial and measurable thicknesses.

Unlike many other systems, you won't need to do lots of post electroforming buffing and polishing as our Copper Electroforming Solution plates consistently bright and smooth.

This project has three main stages;

1. Preparing the surface of the plastic

model soldier to make it conductive with our Conductive Ink (hi-grade).

2. Entering the settings into the Tank Plating Rectifier.

3. Electroforming in the Copper Electroforming Solution.

4. Post electroforming plating of silver and gold.

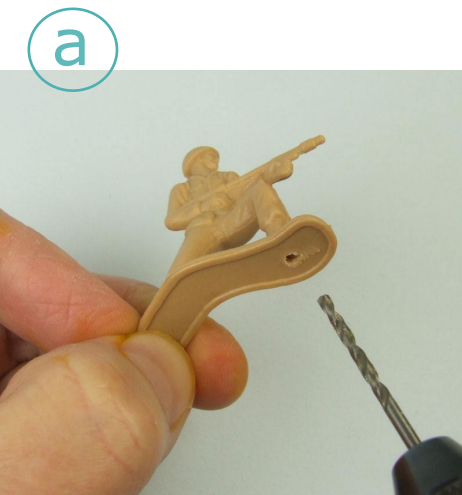
We'll be spraying on our Conductive Ink (hi-grade) to prepare the surface for electroforming. This could also be painted on. For guidance with this, please see our Gold Plating a Golf Ball project.

We could also use our Conductive Paint, guidance on the use of which comes in a following project 'Selectively Electroforming using our Conductive Paint'. However, the conductive paint is best used on a less smooth surface, such as a shell or a leaf. With a smooth plastic surface spraying on the Conductive Ink (hi-grade) will give a better result.

Stage 1

Making the surface of the plastic model soldier conductive

Drill a small guide hole in base where it can't be seen. At this point it's a good idea to calculate the surface area of your item, in preparation for entering the correct settings into the Tank Plating Rectifier later on. We estimated that this model has a surface area of approximately 20 squared centimetres.



Screw in a brass screw and then attach a small length of our Gold Plated Jigging wire to the other end. This will have two functions; it will form a conductive link between the object and the Copper Electroforming Solution and equipment, ensuring a good electrical circuit. It will also be able to be gripped securely in the crocodile clamp, making sure there's no danger of your piece falling in to the electroforming solution.



c



Spray the surface with a fine layer of clear lacquer that can be easily bought from any hardware or car accessory shop. We recommend using a solvent based clear lacquer spray.

The lacquer is an essential step as this forms a key layer for the next layer of conductive ink and in the case of porous materials such as wood, seals the surface. Wait for 10-15 minutes and once the lacquer is almost dry but retains a little stickiness, either spray or paint on our Conductive Ink (hi-grade).

d



Using the Airbrush spray on a fine layer of our Conductive Ink (hi-grade). You only need a few drops of ink - just enough to cover the bottom of the airbrush well. Use the syringe included in the kit to charge your ink well with ink. Spray at a distance of 5-6 cm and apply only enough to block out the underlying surface of the object. One layer of ink is usually enough.

If air drying

Leave at room temperature for 24hrs

If oven drying

Leave in a fan oven at a temperature of 45-50 degrees centigrade for three hours.

Working out the amps for the Tank Plating Rectifier and electroforming times

1. You first need to work out the surface area of your work in centimetres.

You can then **either** enter this into the Electroforming Calculator, which you will find on our website and all the calculations will be done for you,

or you can do it manually. If you choose to do the latter, multiply the surface area of your work by the solution factor for the Copper Electroforming Solution, which is 0.05. For our plastic model soldier the calculation works out as $20 \times 0.05 = 1.0$, so the plating amps will need to be set to 1.0

2. To work out how long to electroform for, decide how thick you require your electroformed layer to be. If you are electroforming an item that is quite fragile, you will probably need to build a fairly thick layer of copper and so you should be aiming to leave it in the solution for about 2 hours minimum. Our Copper Electroforming Solution deposits copper at a rate of approximately 1 micron a minute, so after 2 hours you should have a layer of about 120 microns. This plastic soldier is quite rigid, so it will be electroformed for about an hour.

Stage 2

Setting up your Electroforming Equipment



a

Set up your Electroforming Equipment as shown in the photograph. You will also need to fill the rinse beakers with tap water. Turn the Hot Plate Stirrer on to its lowest setting so that the copper solution is being agitated and make sure the temperature of the solution is in the range of 22-28 degrees centigrade.

b

Make sure the Output switch is open on your Tank Plating Rectifier and adjust the volts to 3 - 3.5



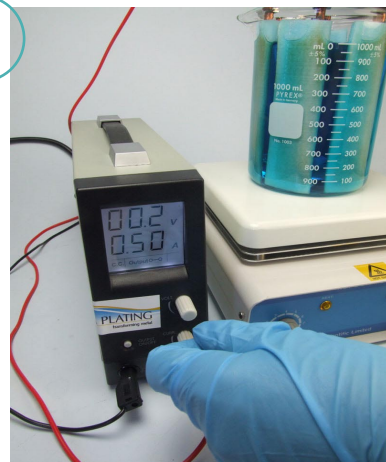
c

Attach the red lead to the Plating Arm.



d

Close the Output switch and adjust the amps to 0.5 to start with and then, once you've started electroforming, after about 15 minutes, you can increase it to the full 1.00 amps.



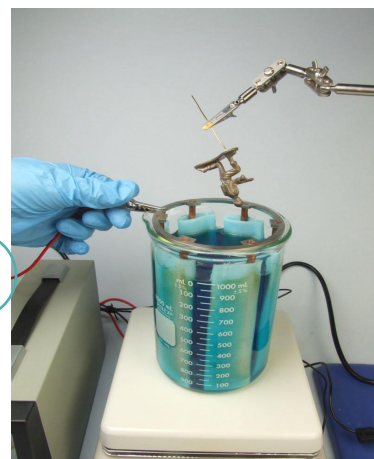
e

Open the Output switch



f

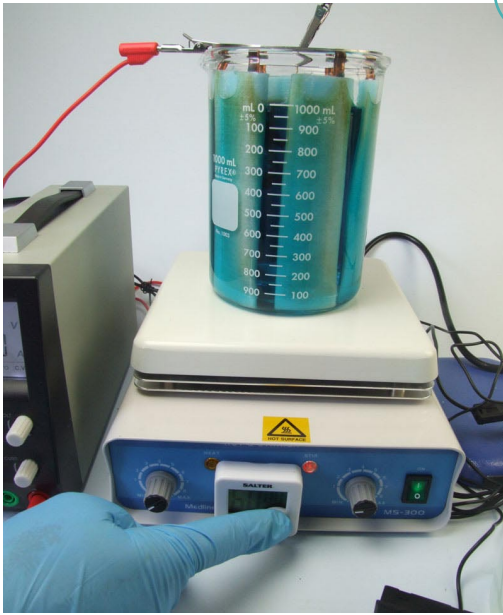
Attach the red lead to the Electrode Ring



Stage 3

Electroforming your item

a



Lower your work into the solution and start the timer. Turn on Output and check that the amp level is correct; in this case with the plastic soldier it should be reading 0.5 to be increased after 5 minutes to 1.00

You should quickly see a layer of copper building on your item.

b



When the time is up, remove your work from the electroforming solution and pass it through the two rinse beakers. As can be seen in the photograph, your work will be covered in a bright, shiny and substantial layer of copper that will require very little if any, polishing or buffing.

The same sequence of applying lacquer, conductive ink and then electroforming can be used on natural materials such as shell, wood, stone and leaves. If you want to electroform on glass, you'll need to use our Glass Primer, rather than the spray on lacquer and then follow the same stages with the Conductive Ink. Please see our video on plating a glass plaque which can be found on the Glass Primer page on our shop and see the instructions for use on our online shop.



Stage 4

Brush or tank plating subsequent layers

a



Once you have a substantial layer of electroformed copper on your piece, you can now go ahead and plate other layers such as silver or gold. If you wish to gold plate, you'll need to plate a barrier layer of white bronze or silver beforehand.

To prepare the copper electroformed surface for further plating, you can simply dip it into some Acticlean to restore it to that freshly copper plated look; you

don't need to use power via the rectifier.

b



The beauty of Spa Plating's system is its flexibility. You can move seamlessly between tank, brush and pen plating once you have our Tank Plating Rectifier.

To brush plate a barrier layer of silver, set up your brush plating equipment as normal by attaching a platinum electrode and handle to the red lead and grip a Conductor Strip into the crocodile clip on the black lead. Estimate how much Silver Plating Solution for Brush Plating you'll need with the online Plating Calculator, then follow the instructions for brush plating silver that you'll find in previous projects in this manual.



c



To gold brush plate the item, calculate how much gold solution you'll need with our Plating Calculator and then refer to the previous projects that include gold brush plating for guidance.



Project 2 Selectively copper electroforming using our Conductive Paint

Our Conductive Paint can be a much quicker option than using our Conductive Ink (hi-grade). This is down to two main factors;

- depending on the material you're electroforming onto, the Conductive Paint can be applied without having to first spray on a key layer of lacquer. This is great if you're intending to selectively electroplate, as you don't have to do any tricky masking out.
- touch dry time is 4-6 minutes and full cure time is 1hr at 60 degrees centigrade.

This considerable advantage needs to be weighed against certain other factors. In this project we'll be showing you how to prepare a slice of agate for electroforming. Agate is predominantly made of silica and therefore won't be attacked by the Copper Electroforming Solution. However, if you were intending to selectively electroform a shell, you would have to cover the entire surface in lacquer before you applied the Conductive Paint. This is because shells are made of calcium carbonate which would be attacked by the Copper Electroforming Solution.

Conductive Paint can only be painted on and if you were planning on electroforming a very smooth surface, the brush marks may show up. Also, it takes longer to build a shiny layer of copper on our Conductive Paint, so electroforming times may be longer.

Stage 1

Preparing the agate slice for electroforming

a

Get together everything

you need for preparing the agate slice; this will include the Conductive Paint, The tubes of Conductive Epoxy Filler and a jump ring to hang the agate piece on the chain, once it is electroformed. At this stage you need to work out the surface area of part of the item you're intending

to electroform. The rim of this slice of agate was 3.5 cm squared and this was noted for later use. It will also be useful to have your Conductivity Tester to hand, to check that the Conductive Paint and the Conductive Epoxy Filler you'll be applying is, in actual fact, conductive.



b



Carefully paint on the Conductive Paint around the rim of the agate slice, using the include brush. Once this is done, either leave to dry at room temperature (25 degrees centigrade) for 24 hours or dry in a fan oven at 60 degrees centigrade for an hour.

c



To attach the jump ring to the rim of the agate slice, mix up a small amount of our Conductive Epoxy Filler and use this to stick the ring directly onto the dried Conductive Paint. The ring now performs two functions; it allows the piece of agate to be hung from its chain and it also forms the conductive connection that the agate can be held by in the electroforming solution.

Stage 2

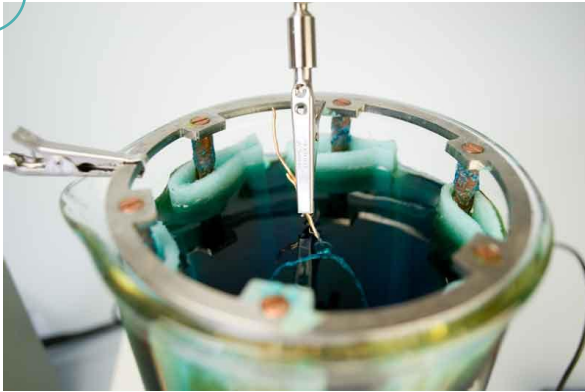
Electroforming the agate slice

a



Once you have worked out the amp setting and electroforming time by entering in the surface area into our online Electroforming Calculator, you can then follow the instructions for starting up your electroforming equipment that's detailed in the first electroforming project in this manual.

b



The surface area of the rim of this slice of agate is approximately 3.5 cm squared and the required thickness of the electroforming is 100 microns. These details are entered in to our on-line Electroforming Calculator and this produces an amp level of 0.175 and a plating time of 1.30 hours.

c



The finished piece of electroformed agate was taken out at the end of the allotted time and given a rinse. It is now possible to apply other plated layers of silver or gold, for example using either tank or brush plating or a combination of both.

A final note on selective electroforming;

Certain materials are suitable for selective electroforming, for example glass or slices of agate, as the exposed material will not react with or absorb the copper electroforming solution and be damaged by it.

However, many materials will need to be completely sealed to protect them against the copper plating solution, ei-

ther because they will be damaged by it or because their surface is porous and they will absorb the solution. In such cases, the surface of the material will have to be completely covered in lacquer. The downside to this is the surface of the un-electroformed part of the item will end up being coated in lacquer, which will alter the character of the finished piece.

