

Fearless Platinum Repair Techniques

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Before World War II platinum was the metal of choice for many fine jewelry pieces, especially engagement and wedding rings. Platinum was also used to enhance the beauty of diamonds and other precious gems. Many of the world's greatest diamonds are set in platinum, including the famous Star of Africa in the British Royal Scepter and the beautiful and famous Hope Diamond on display at the Smithsonian Institute in Washington DC. During World War II, platinum was classified as a strategic metal and deemed off limits to jewelry manufacturing, thus losing its market share to the newly developed white gold.

Today platinum is enjoying its renaissance. In the U.S., platinum consumption has risen by over 1000% since 1992. More jewelers are carrying platinum jewelry, and consumers are becoming more aware of the most noble of all metals.

Many jewelers are still turning down platinum repairs because they are not yet familiar with the metal and fear ruining an expensive piece. For many years platinum jewelry was rarely brought in for repair, as many pieces were estate jewelry and owners feared

irrevocable damage. Platinum's surge of popularity has created the need for trade and consumer education, as more jewelers sell and work with this metal.

WORKING WITH PLATINUM

What does it take to be successful at repairing, customizing and servicing platinum jewelry? First an understanding of properties unique to platinum, and realizing that it is not more difficult to work with, but different than any other metal you may have used in the past. Skilled jewelers should have no difficulty adapting to working with platinum, once they understand the metal's characteristics.

When platinum is mined, it is usually found along with its 5 sister metals, also called PGM's Platinum Group Metals.

They are Palladium, Osmium, Rhodium, Ruthenium and Iridium.

As with all precious metals, platinum in its pure state is too soft to be used in jewelry. It must be alloyed with another metal to improve its workability.

The most common alloys in the United States are Pt950/Ru which is composed of 95%Platinum with 5%Ruthenium, Pt950/Co, a platinum alloy made of 95%Platinum with 5%Cobalt Pt950/Ir , a platinum alloy containing 95% Platinum and 5% Iridium and Pt900/Ir containing 90%Platinum with 10%Iridium.

There are several other alloys on the market, but the aforementioned are the most common.

Platinum has an extremely high melting point (about 1773°C /3224° F) This varies somewhat depending on the alloy used. When soldered, brazed or welded, it becomes white hot. This intense white heat will give

of UV radiation which can harm unprotected eyes.

Use #5 gas- welding glasses for soldering small jewelry pieces for a short period of time. These goggles are sufficient for most repair work. When welding for longer periods of time use #6 goggles. But when casting platinum use #10 or even #11 electric welding goggles; their filtering lenses will protect you against harmful UV radiation generated by the high temperature flames.

Never use sunglasses to protect yourself against the rays and white light. Even the densest of sunglasses offer very little infra red protection against the image of a concentrated oxy-gas flame.

Platinum solders (often also referred to as filler metals) are available from "extra easy 1000" to "extra hard 1400" to "welding 1500," "special welding 1600," "Seamless 1700" and "Plat weld 1773". The number behind each solder corresponds with the approximate flow point in Celsius.

Flux is not needed when using solders over 1300°C / 2327°F, as platinum does not oxidize. Flux should be used for the lower temperature solders as they are usually made of palladium and silver and contain no platinum. Only high temperature solders contain up to 12% platinum.

Just recently new platinum solders have been introduced. These so called "Plumb Solders" contain a very high percentage of Platinum. Easy flow solder, which flows at about 1250 °C, contains 900 parts per 1000 Platinum. Medium flow solder, which flows at about 1350°C contains 925/1000 Platinum, and hard solder, flowing at around 1500°C contains 950/1000 Platinum.

WORK SPACE AND TOOLS

Cleanliness is essential when working with platinum. Your work bench, tools and the soldering area should be clean and clutter-free. Platinum is very easily contaminated, so tools used for gold or silver should not be used for platinum. Sand paper sticks as well as files should be used exclusively for platinum.

When heating, platinum can easily be contaminated by other metals. Lower temperature metals will melt into platinum. The smallest amount of lead, can make platinum brittle and unworkable. Once contaminated, refining is the only way to reclaim the platinum. Contamination can also occur when gold or silver is melted into platinum. This can happen if small amounts of these metals are introduced to Platinum by files, from shavings on the bench pin, or as remains on a soldering surface. As you heat the platinum for welding or soldering, the attached metal will glow, then melt and then boil and enter the Platinum and contaminate it. Another source of such contamination are rolling mills and draw plates, where small amount of other metals can embed themselves into the platinum and then enter and contaminate during annealing.

Be careful when using holding devices such as tweezers, binding wire etc. as they can produce a dark stain contamination on platinum that only heavy abrasives can remove. Keep holding devices away from the heat source. Platinum has low heat conductivity, so working with the torch held 1/2 inch away is usually sufficient. Use Tungsten tweezers.

Use an alumina or zirconia-based ceramic soldering block for platinum repair work. The back of

a fused quartz crucible can be used for soldering as well. You'll also need safety goggles, a tungsten soldering pick, a pair of ceramic tip tweezers, double AA tweezers and a Third Hand. Platinum solders do not flow over distances. If you need to solder a seam, place many small pieces of solder close together and follow the seam with the flame until it is soldered.

I recommend rolling the solder very thin and then cutting it into small pieces. This way only very small amounts of solder are used at a time. It is not possible to move solder once it has melted; a new piece must be used.

All joints should fit close together; solder is not used to fill gaps. A properly soldered joint will look shiny and clean. When soldering platinum, you won't need fire coat or flux. Some jewelers use flux to hold a small piece of solder in place, but at the high temperature being used, the flux burns away and will be absorbed and can contaminate the Platinum

SOLDERING, BRAZING, WELDING DEFINED

In the jewelry industry, soldering is usually defined as two or more pieces joined together with a filler metal, creating a metallurgical bond. But this is actually the process of brazing. Soldering is done below 450°C/830°F and no metallurgical bond is achieved. Brazing joins metal together using a filler metal that melts above 450°C/830°F but below the melting point of the two pieces. Welding joins two metal pieces above 450°C/830°F at the melting point of the joining metals. Both brazing and welding produce a metallurgical bond. However, in the

context of jewelry-making the words *brazing* and *soldering* are often used synonymously.

REPAIR TECHNIQUES

Ring Sizing

To make a ring one size smaller remove 2.54 mm of the shank. Scribe the distance onto the shank and remove the metal with a jeweler's saw. Gently bend the shank together closing the gap. Cut through the seam one more time. This aligns both sides and guarantees a tight seam.

Roll a small piece of platinum until it is about .4 mm thick. If a rolling mill is not available, just hammer a small piece flat using a bench block. If the shank is heavy, use a three-square file and file a chamfer around the seam. This groove will then be filled during the welding process and guarantee a solid seam. Wedge that small thin piece into the cut allowing the tension of the shank to hold it in place. Grab the ring away from the seam with the Third Hand and weld the thin piece of platinum into the shank (use appropriate eye protection). As soon as the fusing takes place, move the torch and gradually continue with this procedure all the way around the shank.

This creates a complete metallurgical bond. Once the metal is fused, clean up the ring with a file. Make the ring about one half size too small and then hammer the weld to correct it. This will harden the seam and make polishing easier.

You can use 1700 seamless or hard plumb solder to size the ring. The procedure is a little different. Cut the ring to the proper size, round the shank gently as to not damage the finish. Then wedge the solder into the seam

and apply some light tension to the shank. Be sure the solder is smaller in cross section than the ring. Using a sharp oxidizing flame, the solder melts rapidly and the tension will make the seam close to a very tight fit. No solder is spilled on the surface of the ring and a few strokes of the polished Tungsten burnisher is all it takes to prepare for polishing. A sponge file is a very good tool to use. It is available from any Beauty Shop and comes in different grades.

Unless you are using the Plumb solders, I do not recommend using lower temperature solder for sizing rings: lower temperature solders contain no platinum, but are a mixture of palladium and silver. The filler solder is softer and will polish out of the seam leaving a visible indentation. It may also oxidize leaving a dark line in the sizing area. Plumb solders polish flat and do not oxidize. However when using the welding technique, there will be no seam.

To enlarge a ring one size, repeat the above technique, except add 2.54 mm of sizing stock. Again, for soldering, a tight fit is needed. I prefer to weld the piece in place. When the shank has been cut, I spread the ring to the proper size. I now file the ends of the shank at a 45 degree angle and keep the sizing stock straight. This will be leaving a V shaped gap between the sizing stock and the ring shank. I now hold the stock with a third hand and wedge a thin piece of Platinum into each gap. I now weld first one side, then the other. Between welds, I can make any necessary adjustment.

Sizing a ring up or down a size is actually easier with platinum, as heat does not travel as quickly as it does with gold. If

stones are present, some sizing's will need to be done with white gold solders, as any platinum solder or weld will damage the stones. A laser welder will eliminate this concern all together.

Be sure when holding the ring in place you use tungsten tweezers. Steel tweezers may leave a dark spot on the ring and when you heat this ring again, this dark spot will become a permanent contamination, unless removed.

Platinum / Cobalt Alloy

The recent introduction of 95/5 Platinum Cobalt Alloy has caused some dialog in the industry and raised some questions about just how to handle this metal. As you may or may not know, Pt/Co is slightly Ferromagnetic. This feature helps in identifying it, by just filing a small stroke on a shank and then picking up the filing with a magnet. It requires care, as many jewelers use a magnet to separate broken saw blades from filing in the working tray and that is not feasible when dealing with Pt/Co as it will be picked up with that magnet too.

When welding or soldering with a torch, the cobalt tends to slightly oxidize. This oxidation is sometimes so minor that it can be removed with a wipe of the finger, or, if it is more pronounced, can be easily remedied by fire-coating the ring after the welding job has been completed, and then re-heating it to a red color and pickling. The cobalt does not oxidize until it is heated to over 1000°C, so that in everyday wear, there is no reason to be concerned.

On the positive side, this great alloy allows for beautiful castings, as it has a lower melting point and is more "wet" and is thus ideal for casting applications.

Annealing

Before reducing the thickness of platinum sheet or wire in a rolling mill, make sure the rollers are clean. It is possible to roll small remnants of gold or other metals into the surface of the platinum. Never reduce platinum more than 70% without annealing.

Before annealing platinum, be sure the metal is clean. This can be done by steaming, Ultra Sonic cleaning, or acid washing in a 10% solution of Nitric acid. Be sure you have adequate ventilation if you chose the acid method.

This cleans the metal sufficiently for heating. Relieve stress build-up from cold working platinum by heating the piece to about 600°C/1100°F. Softening requires about 1000°C/1830°F. To anneal, heat the platinum to a bright orange (about 1000°C/1830°F) and hold it there. The size of the piece determines how long it needs to anneal. Annealing too long creates grain growth; if you anneal for too short of a time, your piece won't be soft. Be sure and wear #5 or #6 goggles.

It takes about one minute to anneal a 1 mm thick, 25 mm square piece of platinum stock. Quench or air-cool the piece. When picking it up with regular tweezers, wait till it is no longer red hot to prevent staining.

Retipping

Retipping is usually defined as "to rebuild a prong tip with the stone in place"

This definition limits the job as only a few stones can take the heat needed to place a new tip onto a prong. No stone can withstand the high temperature of soldering and welding in an oxygen environment. Retipping a platinum prong with platinum

solder will damage any stone. So here is a bench trick I highly recommend.

File the remainder of the platinum prong flat and melt a small amount of easy white gold solder on the tip. Carefully file it flat again leaving a thin layer of solder covering the top. Now place a piece of platinum wire on the tip and connect it by flowing the solder. Cut off excess wire, shape the new platinum tip and polish. This technique guarantees a platinum retip, and the soldering will not harm the stone (Diamonds, Rubies, Sapphires).

Setting Stones

Platinum has the distinction of being called a "dead" metal. This means it has very little or no memory. When a platinum prong is pushed into place, it usually stays without sag or spring.

Platinum also tends to load up on drills and burrs, so some care must be taken. Use only sharp, well lubricated drills. Drill a small pilot hole, then enlarge it. When using a burr, make sure it is either new or well cleaned.

Use well polished gravers for pave and bead and bright settings. I recommend Tungsten Carbide gravers as they hold the polish and the sharpened edge best. The angle of the graver must be much shallower for bright-cutting Platinum. Usually about 15-20° versus 45-60° for gold.

When setting a stone into a platinum bezel, make a bright cut along the inside edge of the bezel after the seat has been made. When burnishing or hammering the bezel around the stone, that edge will be close to the stone; when the bezel is receiving its final bright cut, that edge will appear to extend all the way down.

Platinum burnishes well. Use a highly polished tungsten burnisher. Be careful; it will immediately drag over a polished surface, if there is any debris left on the surface. A light mineral oil can help in smooth cutting.

As a general rule, polish as much as you can prior to setting or assembly. Platinum does not oxidize, so the finish will not deteriorate during those steps.

Chain Repair

Repairing platinum chains is simpler than repairing gold chain. The high melting point of platinum makes it possible to solder even the finest wires without melt down.

When repairing chain, remember: Make sure the chain is totally clean, as body oils, perfumes, and hair will burn onto the metal. Measure and note the distance from the lock. Inspect the clasp and make recommendations as needed.

Use a low temperature platinum solder such as 1200 for chain repair.

Do all polishing with a small silicon wheel and only polish the repair. Never polish any chain on a regular polishing motor, unless it is properly mounted for safety.

FINISHING

After sizing and setting, you are ready to finish the ring. When platinum is polished properly, it will take on a shine that no other metal can produce. Platinum does not oxidize nor is it affected by atmospheric conditions. This assures a good finish is permanent. But it takes some effort to achieve maximum results. If platinum is being joined to gold, it is important to finish the platinum section first. Failure to do so will result in over-polishing the gold portion of

the piece. Because platinum does not oxidize, it will maintain its polish during the soldering / welding process.

Here is a typical finishing sequence for a platinum casting:

File the surface with a #6 cut file. Cross-file it in a diagonal direction without excessive pressure and without reducing the original surface. When filing over a curved surface follow the curve to avoid creating flat spots. Remove the file marks with abrasive paper starting with 400 and 600 grid. Silicon carbide or aluminum oxide papers are preferred. There are also diamond coated papers on the market ranging from 220-50,000 that work well. Sponge files and abrasive pads make the finishing process easier.

If you discover porosity, remove it with burnishing or hammering. (in some cases it needs to be filled) To burnish the edges and surfaces use a highly polished tungsten carbide burnisher and a light oil as a wetting agent. As an alternative to the 400 and 600 paper, use a unitized wheels to reduce the scratches to a finer consistency. A "Bear-tex" wheel of medium density can replace the bobbing compound. It is preferred as it leaves no residue on the surface. It is not possible to polish scratches out of platinum. They have to be removed totally with abrasives on the bench.

You can reduce scratches even further with a gray polishing compound (800 grid), followed by a white compound (1500 and 4000 grid)and finally by either orange or green or carrot rouge (8000 grid) to get the high reflective luster that makes platinum so fabulous. Do not attempt to polish Platinum with red rouges and regular tripoly. Use compounds designed for Platinum for best results.

There are constantly new and ever improving compounds on the market, and most every jeweler has a preference, but remember that finishing platinum does take an extra effort, but the finished product is well worth it.

SUMMARY

As platinum jewelry continues to gain market share, nearly every jeweler will have contact with this most precious metal. Education and information about platinum is good business. With minor modifications to a workspace and

just a few new tools to be used exclusively for platinum, any small workshop can perform most routine repairs on platinum. And it is plain to see, there is no need to fear working with platinum; after all, it is not difficult, just different.