Setting Stones in Metal Clay

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Designs of all the jewelry shown in this book belong to the artists. Unless otherwise noted, photos are courtesy of the artists.

Preceding page:
Pendant, Hiroaki Shinonome, "***Kugi***"
Fine silver, diamond. 2¼" x 1¼"

Front cover:
Brooch, Tim McCreight
Fine silver, malachite, moonstones. 2½" by 1 ¾"

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Acknowledgements

This book is dedicated to all artists working in metal clay. It is exciting to be part of the evolution of this wonderful material, watching as the field has developed from basics to the advanced work that we are seeing today. I hope this book will encourage the creation of innovative settings, and inspire superior work with gemstones of all kinds.

I'd like to say a special thank-you to my editor, Tim McCreight, whose confidence gave me the opportunity to experiment and describe the stonesetting ideas I was collecting. Thanks to Abby Johnston and Michael Deles at Brynmorgen Press for their care and energy in bringing this book to life. Thank you to Kevin Whitmore of Rio Grande for helping with my preliminary research. And a big thanks to the wonderful artists who offered images of their work to help illustrate some of the techniques in my book. I'm sure these beautiful examples will motivate others to push their limits.

And finally, thanks to my husband, Dave, for his patience while I put in the hours of research and writing. Your love, encouragement, and humor were a great pillar of support through all of it. Thank you! You are a treasure.

Introduction

When I began working with PMC, the wide range of textures, the spontaneous process of hand-building, and the flowing forms that resulted were a wonderful outlet for my creative sensibilities. As I became familiar and comfortable with the material, I began to look beyond the basics and searched for ways to incorporate color into my work. My first idea was to use stones. But I came to PMC from a potter's background and had no metalworking skills. The big question became, "How in the world do I do this? Besides pressing a cubic zirconia into a ball of clay and firing it, how do I set other kinds of stones?" Not having a background in metalworking, I was in a quandary. To get the color I wanted, I turned to other media, first resin, then vitreous enamels, and eventually colored pencils and oil pastels.

But there was this little voice, a persistent, unshakable force that kept calling. An affinity for beautiful, colorful, unusual natural stones was building. I began attending gem and jewelry shows and sought out shops that sold loose stones. Websites that sold unusual varieties and cuts of stones were being bookmarked on my computer. Gemstones had become a passion, and there was quite a collection accumulating in my drawer.

I began to ask myself some questions. Do bezels always have to be thin? Do they always have to press in at the edges? Do they have to be strictly functional? Do they have to be inconsequential in the design? Can they be decorative? Can they be a focal point that enhances the stone? Can they be a design element? Can they be textured? Can they be shaped? Can they be partial? What about prongs? How about incorporating ready-made setting components? And so my quest began. There are dozens of ways to attach gems to metal jewelry, and while any well-made setting will work technically, not all will work aesthetically in a given situation. The setting is an integral component of the overall piece and should be carefully considered to reflect the character of the whole design.

The goal of this book is to expand your repertoire of stonesetting options specifically for use with PMC. And bear in mind that in addition to stones, many of these techniques can be used to set other materials. Bezel settings, for instance, can be used to set enameled components or polymer clay elements. Prong settings can be used to set coins, tabs can be used to set decorative ceramic pieces, and dozens of other exciting objects.

This book is a collection of the settings that I have discovered so far, and illustrates their adaptation to metal clay. Some of the techniques are simple, fast, and easy; others require more planning. Some of these setting methods have great versatility and will be used often. Others are more specific to particular situations. Either way, there is a place for all of them.

I hope that these methods will jumpstart your creativity, leading you to the excitement of learning new techniques. The decision about which method to use depends on the character of the piece, the inherent nature of the stone (such as its resistance to heat, its strength, etc.), and the kind of skills you bring to the job. Whether you have metalworking skills or not, there is an option for everyone, and a way to set every stone.

In this book I reference the Precious Metal Clay brand because this is where my experience lies. These methods can be easily adapted to any kind of metal clay. In fact, there are also references to ways to use metal clay in work that has been fabricated with conventional metalsmithing techniques.

HOLLY GAGE

Holly Gage
Winter Dance
Fine silver, dendritic quartz, cubic zirconia

CHAPTER 1

Gemstones

Through the ages, humans have been drawn to the beauty and mysticism of gemstones. The many varieties have been used not only in making jewelry and wearable art, but also decoratively in functional and non-functional items such as tools, furniture, architecture, sculpture, and as currency. Gemstones were, and still are, used in religious objects such as monstrances, reliquaries, rosaries, and icons. Stones such as lapis were ground into powder for use as eye cosmetics.

Some of the first known gem materials included lapis lazuli, amethyst, emerald, amber, turquoise, garnet, jade, and coral. In early societies these stones were reserved for the wealthy, and served in many cultures as symbols of status and power. Common folk would use more easily obtained ornaments such as shells, bone, seeds, and animal trophies like antler and teeth.

Folklore and legends abound, from the meaning of certain stones as amulets and talismans that ward off evil powers, to providing spiritual powers, magic healing powers, protection against injury, and as a source of inner strength. There are gemstones chosen to represent each of the planets that are seen as reflecting the cosmos. Zodiac stones are believed to relate to constellations and their effect on the timing of one's birth. These ancient traditions live on in the assignment of birthstones to the months of the year. The power of the gemstone industry today plays on the intrinsic value of a gem, its natural beauty, and its important role as a status symbol.

Gemstones are fascinating to study, and with the easy availability of hundreds of different kinds of stones, the varied and unusual cuts, and the continued discovery of new species, gemstones are a fun way to add color, dimension, and value to metal clay designs. The methods and techniques taught in this book will provide the freedom to use any kind of stone.

Natural Gemstones

Natural gemstones are divided into two categories, called precious and semiprecious. A gemstone that is rare and has a hardness of nine or ten on the Mohs scale is considered a precious stone. These gems have the highest commercial value. The most familiar examples are diamonds, rubies, emeralds, and sapphires. Semiprecious stones have a hardness of less than eight, and are abundantly available. Lesser quality precious stones are sometimes classed as semiprecious.

Some natural stones can withstand heat, and this allows them to be set into metal clay and fired in place. In addition to the mineral itself, we need to be aware of inclusions, cracks, and fissures in a natural gem because any of these can cause problems. While inclusions can produce beautiful and even spectacular effects in a stone, they can also predispose it to cracking and breaking when fired in the kiln.

There are a few organic materials, found on land and in the water, that are considered gems, though they are in fact formed by the biological processes of living organisms. These include pearl, ivory, shell, coral, amber, and jet. These gems should never be kiln-fired as they will burn up at a low temperature.

Synthetic Gemstones

Synthetic, lab-created, and lab-grown are synonymous terms. Synthetic stones are made in the laboratory, and have the same appearance, composition, hardness, and optical and chemical properties as natural gemstones. Their inclusions are very different from those of natural stones, being more like gas bubbles, or veil and feather patterns. Many, but not all, synthetic stones can be fired in the kiln at the lower temperature schedules of metal clay.

Simulated Gemstones

Simulated, or imitation gemstones are an inexpensive way to have a look-alike of an expensive or rare gemstone. These "stones" are not really stones at all. They look like natural gemstones, but the optical, physical, and chemical properties are different. The cubic zirconia (CZ) is the most widely known simulant. CZs are manufactured at a temperature of about 3000°F (1650°C), making them ideal for kiln-firing at any of the metal clay temperatures.

Glass and plastic are frequently used to make simulant gemstones. Polymer clay can be made to look very much like natural semiprecious stones. Plastic and polymer cannot withstand the heat of firing, period. Some glass may survive a firing schedule, but testing is recommended.

Synthetic and natural gemstones are also used to make simulants. These are composite stones, such as doublets and triplets, where the actual gemstone is the top layer, fused to some other material that makes up the rest of the stone. This fusing of the layers makes them unsuitable for kiln firing.

Enhancement

For as long as gems have been set in jewelry, people have experimented with ways to enhance their appearance. Modern techniques include oiling, dying, staining, waxing, foiling, heat-treating, irradiating, drilling, and filling. Kiln-firing will affect these applications and change the appearance of the stone. This means that even if a gem material is inherently capable of withstanding high temperatures, it is possible that a particular stone might fail because of its treatment. Part of the excitement of working with natural stones is the understanding that no two specimens are exactly alike. All the observations given in books (including this one) refer to researched results, but remember that there are no promises.

Cuts of Stones

CABOCHON

Cabochons are the simplest cuts, with plain, polished surfaces. They can be domed, or squared as in a buff top. They usually have flat, unpolished backs and can be cut to varying thicknesses ranging from a very thin few millimeters, to tall domes called tongues or bullets. While simple in their

domed look, cabochons can be cut into endless shapes. This cut shows off the spectacular effects that occur in stones such as jaspers, rutile quartz, and agates. Most cabochons are cut so that the curve of their profile creates a slope or angle at the bottom edge, where the top meets the bottom. This is what allows a bezel to hold the stone securely in place.

Most cabochons fall into one of these four types: standard, high (bullet), buff top, or double (lentil).

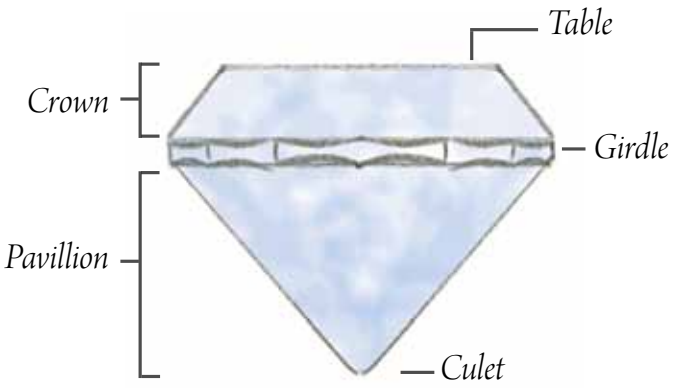
A well-cut cabochon has a sharp edge like the stone on the left. Cabs with round or irregular edges around the base will be more difficult to set.

FACETED

Understanding the parts of a faceted stone will clarify details of the setting process. Faceting is done mostly on transparent gemstones, though opaque and translucent stones are sometimes faceted. Facets are the highly polished, flat planes that reflect light. They are cut in geometric patterns designed to achieve the best play of light. The quality of the cut is important because a stone's color and fire is determined by the way light enters the gem and is reflected from the bottom facets back through the top.

In the language of faceted gems, the term "shape" refers to the outline of the perimeter of the stone. Some common shapes of faceted stones are round, marquise, oval, emerald, pear, baguette, cushion, trillion, square, and heart.

Parts of a Faceted Gemstone



It is helpful to know the proper names for the parts of a faceted stone. There are more terms that are important for lapidaries, but for setting, these will be enough.

Faceted stones are cut in a variety of shapes, of which these are the most common.

Choosing the Right Setting

There are several factors to consider in determining what kind of setting to use for any particular stone.

The Cut

To get the maximum sparkle from a faceted stone, consider a prong setting or a bezel cup setting with an open back. A closed bezel setting might highlight a spectacular buff top agate cabochon. A tab setting, or combination tab setting with a short bezel at its base, might showcase a cabochon stone that has beautiful striations throughout the top and sides.

The Shape

Shapes such as the marquise, heart, and square faceted stones have points that are vulnerable to chipping. These need to be protected in the setting by double prongs or a partial bezel at the tips. Thinly cut cabochons need a setting with a solid back to give it extra support in order to avoid breaking.

Hardness

Hardness is a factor when choosing stones for objects that expose stones to hard wear. A pendant or pair of earrings, for instance, rarely see much stress, but bracelets and rings are subject to accidental bangs and bumps during normal wear. Hard stones, such as rubies or sapphires, can be safely set in a high profile prong setting. Softer stones such as turquoise benefit from a sheltering setting like a full bezel, or a bezel cup. Brittleness is different from hardness, but in terms of matching stones to objects, the same rules apply. Objects that are likely to see hard wear are not well suited to fragile, soft, or brittle stones.

BABETTE BELMONDO

Barbara Becker Simon, "Ant Lentil Bead"
Fine silver, 24k gold, diamond
1¼" diameter

Heat Sensitivity

In traditional jewelrymaking, this factor is not usually very important because stones are always set after all heat processes are completed. For metal clay artists, the ability of a stone to withstand heat is one of the first items to be determined. Stones that can withstand temperatures over 1110°F (540°C) can be set into metal clay and fired in position. Obviously, such stones could also be set after firing using more conventional methods. Gemstones that cannot reliably withstand sintering temperatures require techniques that will allow us to complete the metal object and then secure the stone in place by pressing a metal rim or prong onto the stone. We can think of this as a fork in the road: If a stone is able to withstand high temperatures, a specific set of options is available. If not, that path is closed and we can immediately focus attention on setting methods that are used after firing.

How do you know which category a stone fits into? Fortunately, several people have conducted experiments and are willing to share the results of their research. No two stones are exactly alike, particularly natural stones, so there are never guarantees, but the chart on the next page will allow an educated guess about whether a gem will survive. If you are unsure about a particular stone, either purchase several and test one by heating it, or set the stone after the metal clay piece has been fired. Bear in mind that you don't need to include metal clay to determine if a stone will survive. Simply set the gem on a kiln shelf and run it through a firing sequence. If it survives, you will know it is worth investing time and materials to use in a piece. If the stone discolors or breaks, you won't have wasted any time or metal clay.

Naoko Tanaka
"Jyoman"
Fine silver, quartz crystal
19½" x 15½" x 12"

Gem Tests

Kevin Whitmore and the staff at Rio Grande conducted tests with gemstones, first alone, and then set into PMC. They share their results here, along with a warning that every stone is unique, so your results may vary. Used with permission (and thanks).

Test 1: TORCH FIRING

Heat to 1110°F (600°C) then hold for 3 minutes. By definition, this will be a fast ramp.

GEMSTONE	STONE IN PMC	OPINION
Natural Gemstones		
Blue Sapphire (AAA-Grade)	survived	good bet
Blue Sapphire (A-Grade)	survived	good bet
Labradorite	damaged	unsafe
Peach Moonstone	damaged	unsafe
Peridot	survived	good bet
Rhodolite	survived	good bet
Ruby (A-Grade)	survived	good bet
Ruby (AAA-Grade)	survived	good bet
Silver Moonstone	damaged	unsafe
Tanzanite	survived	good bet
White Sapphire	survived	good bet
Lab-Grown Gemstones		
Blue Spinel	survived	good bet
Green Garnet	survived	good bet
Green CZ	damaged	unsafe
Moissanite	damaged	unsafe
White CZ	survived	good bet
White Sapphire	survived	good bet

Test 2: SYNTHETIC GEMSTONES

Fast ramp to 1110°F (600°C) then hold for 30 minutes.

GEMSTONE	STONE IN PMC	OPINION
Alexandrite	survived	good bet
CZ	survived	good bet
Emerald	survived	good bet
Ruby	survived	good bet
Sapphire	survived	good bet
Spinel	survived	good bet
Tavalite CZ	survived	iffy
Star Corundum	survived	iffy

Test 3:
SLOW RAMP

Slow ramp to 1110°F (600°C) then hold for 30 minutes.

GEMSTONE	STONE ONLY	STONE IN PMC	OPINION
Amethyst	damaged	not tried	unsafe
Aquamarine	survived	damaged	iffy
Citrine	damaged	not tried	unsafe
Green Tourmaline	survived	survived	good bet
Green Topaz	survived	survived	good bet
Labradorite	survived	survived	iffy
Peach Moonstone	slight damage	slight damage	iffy
Pink Tourmaline	damaged	not tried	unsafe
Rainbow Moonstone	damaged	damaged	iffy
Rainbow Topaz	damaged	damaged	unsafe
Silver Moonstone	slight damage	slight damage	iffy
Smoky Quartz	damaged	not tried	unsafe
Tanzanite	survived	survived	good bet
White Topaz	survived	survived	good bet

Test Four:
NATURALS

Heat natural gemstones and hold at 1110°F (600°C) for 30 minutes.

GEMSTONE	STONE ONLY	STONE IN PMC	OPINION
Almandine Garnet	survived	survived	good bet
Amethyst	destroyed	not tried	unsafe
Aquamarine	not tried	damaged	unsafe
Aventurine	damaged	not tried	unsafe
Black Onyx	damaged	damaged	unsafe
Black Star Sapphire	survived	survived	good bet
Blue Mist Chalcedony	damaged	not tried	unsafe
Blue Topaz	destroyed	not tried	unsafe
Carnelian	damaged	not tried	unsafe
Chrome Diopside	not tried	survived	good bet
Citrine	damaged	not tried	unsafe
Denim Lapis	survived	survived	iffy
Hematite	not tried	survived	good bet
Iolite	destroyed	not tried	unsafe
Jadeite	damaged	not tried	unsafe
Lapis Lazuli–Dark	damaged	not tried	iffy
Malachite	destroyed	not tried	unsafe
Mexican Fire Opal	not tried	damaged	unsafe
Moonstone	survived	survived	good bet
Peridot	survived	survived	good bet
Pyrope Garnet	survived	survived	good bet
Rhodochrosite	damaged	not tried	unsafe
Rose Quartz	destroyed	not tried	unsafe
Tsavorite Garnet	not tried	survived	good bet
Tiger's Eye	darkened	not ried	unsafe
Tourmaline	survived	damaged	iffy
Turquoise	destroyed	not tried	unsafe

DREW DAVIDSON

Doris King

Spriral Treasure

Shell Ring

Fine silver, 14k gold, shell, hessonite garnet

CHAPTER 2

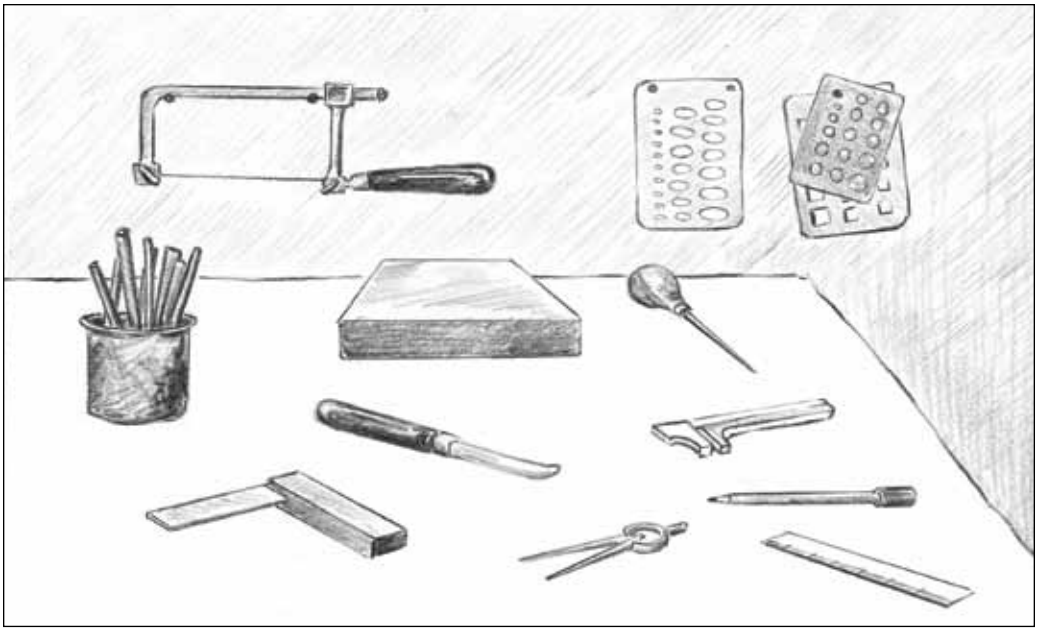
Tools and Materials

Many books and videos describe the basic tools used with metal clay, so I won't repeat that information here. If you are just getting started, turn to any of those books for an introduction to metal clay techniques. What might not be familiar, even to experienced metal clay artists, are the tools and materials of traditional jewelrymaking. Since these will come up in the following pages, it makes sense to describe them here.

Part of the fun of working with PMC is discovering (and accumulating) new tools. Every time I look through a jewelry supply catalog, something else catches my eye. And that's not to mention a stroll through a hardware store or a toy shop. In addition to tools we buy, many artists enjoy creating tools, or modifying tools to make them especially useful for the task at hand.

Bench Tools

- A **jewelers sawframe** with assorted blades is a useful tool to cut wire, trim away excess, clean up seams, and cut sizing plugs.
- An **awl** is handy for making starter holes for drilling, and for flaring tube rivets.
- An **automatic center punch** creates a starter point for drilling holes.
- **Steel punches** can be used along with a hammer to move a thick bezel, for instance when setting a stone into a thick-walled bezel after the piece has been fired.
- **Burnishers** have several functions in stonesetting. A rocking motion with a curved burnisher will push a bezel over a stone. Burnishers come in many shapes and sizes—use the one most appropriate for the area being worked.
- A **ruler** with metric and inch measurements is a must.
- A **machinists square** (also called a try square) is great, especially if you are working with square stones or making boxes with square corners.
- **Dividers** are useful for comparing distances and retaining measurements.
- A **sliding caliper** is a fast way to measure stones, burs, bits, and metals. A simple version shows size with a mark on a ruler. More sophisticated versions have either a digital readout or a dial that shows the reading.
- A **bench plate** or **bench block** is nothing more than a piece of steel that is used as an anvil at the jewelers bench. Commercial versions are hardened and polished (which is nice) but in fact any block with flat surfaces will do.



Popular handtools mentioned on previous page. Clockwise, from upper left: sawframe, bench block, graphic templates, awl, sliding calipers, automatic centerpunch, ruler, dividers, burnisher, machinists square, stamping punches.

- Gemstone and graphic arts **templates** are handy for initial design work and for laying out the locations of stones.

Tweezers

Tweezers come in an array of styles and sizes, from long, to short, curved to angled, and sharp to blunt. Most are made of stainless steel, and some have other materials on the tips or handles for specific tasks.

Cross-lock, straight, and curved tweezers all have their own feel and uses.

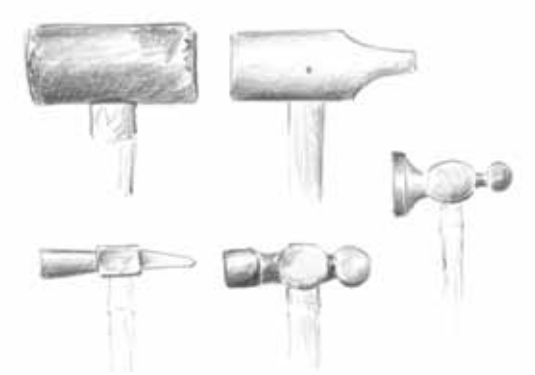
I recommend these tweezers to fill out a complete tool kit:

- multi-purpose fine point and medium point straight tweezers.
- fine point and medium curved tweezers.
- straight and curved cross-locking tweezers with a fiber handle for soldering.
- curved copper tongs for pickling.
- grooved tweezers for handling stones.

Hammers and Mallets

For cold connection stonesetting methods, there are three basic types of shaping hammers that come in handy.

- A rivet hammer is a delicate tool with one flat face and one wedge-shaped cross-peen. Besides forming rivets, this is useful for light planishing and creating textures.



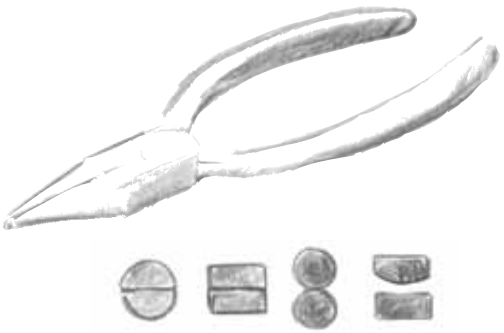
Here are some of the most common hammers and mallets. From the top: rawhide, plastic, chasing, ball-peen, and rivet.

- A ball-peen hammer (also called a machinists hammer) has one flat face and one round peen. It is used for shaping rivets and texturing the PMC.
- A chasing hammer is designed specifically for tapping small punches. It has a broad face, a light weight, and a handle that lends itself to hours of comfortable use. It is also handy for making rivets, for texturing, and for light shaping.

Mallets are used to move metal without marking it. The most common variety is made of a coil of rawhide, though other versions are made of plastic, rubber, or wood. You probably won't need more than one, and the choice is simply one of personal preference.

Pliers

Pliers are useful for bending and shaping metal, as well as for assembling jewelry components, for instance when adding jump rings to necklaces or bracelets, or putting earrings onto earwires. The most commonly used styles are chain-nose, round-nose, and flat-nose pliers. There are also several kinds of specialty pliers designed specifically for stonesetting. Some are used to open prongs in order to remove a stone, some are used to close prongs over the stone. The ones I find most useful for metal clay work are pictured here, but of course you'll need to experiment to determine which work best for you.



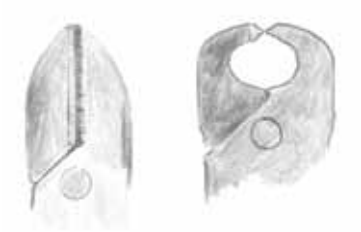
The shapes show the cross sections of the most popular pliers: chain-nose, flat, round-nose, and ring forming.

Wire Cutters

Wire cutters, also called snips, are used to cut prongs and bezel wire to size. There are many kinds and styles of cutters, and most come in several sizes. I prefer the 5½ inch side cutters for metal clay work.

Wire cutters are commonly available in three blade types, each making a different cut.

- Super-flush cutters create a flat cut that requires the least amount of filing, sanding, and finishing. There will be only a very small raised point at the end of the wire.
- Flush cutters give a nice cut, but the raised point will be more pronounced. These are more durable than the super-flush cutters.
- Bevel cutters are the strongest and least expensive of the three types. They leave a noticeable point at the end of the wire that requires a bit of finishing.



The shape at the left is called a wire cutter, side cutter, or snip. They are sold in many sizes, and should match the scale of work you do. The tool on the right is called an end cutter.

This sketch shows the three kinds of cutting surfaces you will find in snips. The first is the most common, the cheapest, and the one that leaves the roughest end. The other two are styles of flush cutters, which means they leave one end of the cut with a square or nearly square tip.

Files

Files come in many sizes and shapes, and like tweezers, it is helpful to have a full selection at hand. Larger files are described by the length of the toothed section, while smaller files, called needle files, are described by their total length.

Files are available in several grades of coarseness, the most common being #0 (the roughest), #2, and #4. Diamond files come in grits ranging from 140 to 400.

- Needle files, miniature needle files, and micro needle files range in overall length from 4" to 8", with cutting surfaces from 1½" to 4" in length. These files are usually sold in sets of twelve various shapes, but they can also be purchased individually.
- Riffler files have shaped ends that are usually curved which makes them handy for hard-to-reach areas. They are typically about 6" long and have a cutting surface of an inch or less.
- Escapement files are basically miniature needle files, which makes them useful for really tight, detail areas. Because of their fine cut, they can create a delicate finish that resembles a sandpaper surface.

I have two sets of files of various sizes and shapes, one set dedicated for use on PMC before firing, and one set to be used on PMC after it has been fired. A stiff brass brush (the kind found at the local hardware store) is good for cleaning the files when they fill with PMC dust.

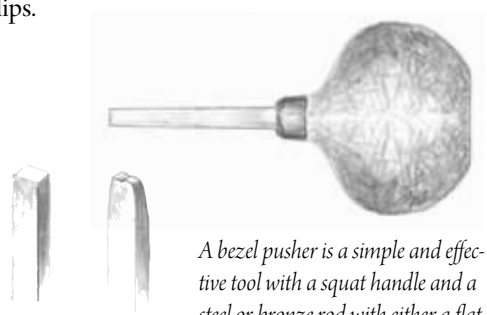
Needle files, rifflers, and escapement files are useful for delicate shapes and surface adjustments.

Deb Fitz
Fine silver, carnelian, agate
1¼" diameter

Setting Tools

Bezel and prong pushers, as their names indicate, are used to push metal bezels and prongs over a stone to hold it snugly in place. These pushers can be flat to press bezels and prongs, or grooved to press prongs.

A bezel roller is a tool with a curved edge that is used with a rocking motion to push the bezel onto the stone. These have larger handles than bezel pushers and therefore provide more leverage. The curved end of an old toothbrush handle works well as a bezel pusher, especially when setting soft stones that might be scratched if the tool slips.



A bezel pusher is a simple and effective tool with a squat handle and a steel or bronze rod with either a flat or notched face.

A toothbrush handle and a traditional steel bezel roller are other tools used to press a bezel over a stone.

Specialty burs are very helpful when setting stones into dry metal clay or after firing. The type of setting and personal preference come into play here, but typical would be setting burs, Hart burs, inverted cone burs, and cylinder burs.

These are the most common burs used in stonesetting. From left to right: setting, Hart, inverted cone, and cylinder.

Soldering Tools

The tools and equipment for soldering PMC are much the same as those used for conventional metal soldering.

- Torches range from small handheld models like a butane pencil torch or Bernz-o-Matic on a stand, to larger and more powerful oxygen/acetylene or oxygen/propane models. For metal clay stonesetting work, the handheld butane torch will handle most jobs, but a propane torch might also be useful.

For convenience and low cost, it's hard to beat a compact butane torch. For larger or extended work, the acetylene/air torch shown lying down here is a popular choice.

- There are many kinds of surfaces that can be used for soldering, including Solderite boards, charcoal blocks, ceramic pads (some with honeycomb surface), and cordierite board (some with grooves, some with rubber feet).
- A tripod with firing screens is useful to raise the work in order to heat it from underneath.
- Soldering picks are nothing more than a wire in a wooden handle. Some are steel (a coat hanger will do) but other versions come with tungsten or titanium tips. Tungsten can withstand higher temperatures than the titanium tips, which is useful in working with platinum. For metal clay work, titanium picks work well. I prefer a tool with a wood handle because it remains cool during use.

Three time-tested soldering surfaces are a charcoal block, a soft firebrick, and a steel tripod, usually used with a screen on top.

- A properly equipped soldering station will also include a striker, flux, flux brushes, and some of the tweezers mentioned earlier. For details of these materials, consult a metalsmithing text.
- The PMC firing station will include a spatula for removing work from the kiln, work gloves to protect your hands, and support media such as firing tiles, vermiculite, alumina hydrate, or refractory wool.

Finishing Tools

Abrasives are used to shape metal clay before firing, and then to refine edges and surfaces after firing. Abrasives are available in a dizzying range of media, shapes, and styles. The most popular are silicon carbide sandpaper, sanding sponges, sanding sticks, and polishing papers. In recent years, metal clay artists have found new uses for manicure boards. I wonder if the manufacturer knows why sales are up? Maybe, like me, you've had the thrill of going into a beauty supply store and wanting to explain our peculiar use of their Salon Boards. These come in a variety of grits and can be used to refine and finish metal clay after it has been fired.

A soft bristle wire brush, either brass or steel, makes short work of polishing detailed PMC pieces to a satin or brushed finish. The brass brush can be used under running water along with a touch of polishing compound such as pumice or dishwashing liquid.

Whether steel or brass, lubricate the burnishing action with soap and water.

Power Tools

The flexible shaft machine ("flex-shaft" for short) is a valuable motorized tool for any metalworking studio. It doesn't take long to hand finish PMC, but there are times when the efficiency of the flex-shaft comes in handy. Bristle polishing disks and steel and brass brushes work well on fired metal clay. They also work quickly, so take care not to wear the design away. Always use protective goggles and a dust mask when using the flex-shaft machine. Other uses for the flex-shaft include drilling holes and cutting notches into prongs.

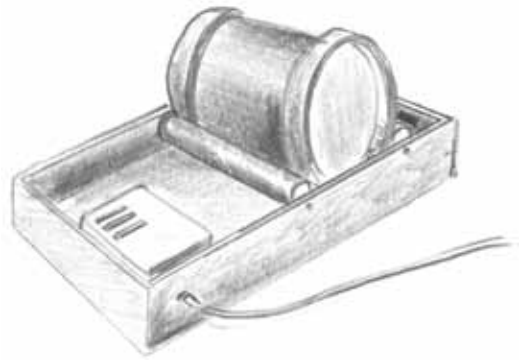
A flex-shaft is used for drilling, grinding, and polishing.

A tumbler is a machine with an electric motor that automates the burnishing process. To get the best results from your rotary tumbler, fill the barrel at least half full with tumbling medium (details below), add the metal clay pieces, fill the barrel with just enough burnishing liquid to cover the contents. Seal the barrel tightly with its lid, then tumble for about two hours. The barrel should never be more than three-quarters full with everything in it. The time will vary depending on the design of the tumbler, the size of the load, and the effect you want to achieve. Check frequently to catch it at the right stage.

Tumbling media are available in many materials, shapes, and degrees of coarseness. Most metal clay artists use the tumbler to duplicate hand burnishing, and this is best accomplished with steel or stainless steel shot. Stainless steel shot is preferred because it is easier to maintain. If you opt for the less expensive carbon steel shot, just be careful to prevent it from rusting. If properly cared for, the results of the two are identical. Most people use a mixture of shot with a variety of shapes. When the tumbling process is complete, rinse the shot thoroughly with clean water. If you will use the tumbler again soon, cover carbon shot with water to prevent exposure to air and the rust that will form. For longer storage, spill the shot onto a towel and dry it with a hairdryer.

Porcelain ceramic shot, used along with a burnishing solution, will produce a beautiful satin sheen. For best results, it should be seasoned by tumbling it for about 12 hours before using with finished metal clay pieces.

All tumbling should be done with a liquid media. In a pinch, use water with one to two drops of dishwashing liquid (the kind with the least amount of added fragrances and chemicals), but proprietary solutions deliver more consistently clean results. These are usually sold as concentrates that are mixed with water as needed.



A basic but very workable rotary tumbler.