PMC Technic

CONTEMPORARY TECHNIQUES IN PRECIOUS METAL CLAY

Edited by Tim McCreight

tech·nic (tek' nik) n. 1. *Plural*. The theory, principles, or study of an art or process. 2. *Plural*. Technical details, rules, methods, or the like.

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ISBN 1-929565-21-6

Printed in Hong Kong

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Introduction

We are fortunate in the jewelry world to have hundreds of workshops taught each year. Talented artists take time from their lives to develop not only their technical skills, but their ability to convey their ideas with clarity and enthusiasm. But even those people who happily call themselves Workshop Junkies can't hope to attend all the classes they would like. That's where this book comes in.

Many years ago, I found myself holding a folder filled with handouts from a variety of workshops that had been given by leaders in the metalsmithing field. These were faded, over-copied, coffee-stained sheets, and they were almost priceless. Each page represented uncounted hours of experimentation, the results of which were gathered and explained by gifted teachers. In order to preserve those gems and at the same time give the information wider exposure, I created a book called ***Metals Technic.*** As I had hoped, the information continues to live on.

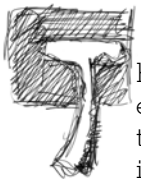
At the time, I felt that the formula would lend itself to other areas of crafts, and I considered a collection of articles on blacksmithing, stonesetting, and surface techniques. None of these felt quite right, so I set the idea aside… until recently. It has been just over ten years since Precious Metal Clay became available to artists. There are now thousands of hobbyists, art students, and professional designers working with PMC. Some of these people have developed unique techniques or approaches, and these, like the handout sheets from a previous generation, deserve to be saved and shared.

This is not a project book—no one is encouraging you to duplicate the work you see here. Instead, this is a record of what can happen when curiosity, passion, and talent spill together. In many cases, the authors who have contributed to this book have devoted many hours to experiments, some ending in triumph, and some ending, well, not in triumph… In science, it is standard practice to share results of experiments so that each generation can build on lessons already learned to advance quickly into new territory. That is the goal of this book. The authors join me in saying this: "Take a look at what I've done, and if it appeals to you, or gives you some ideas, explore them, push against them, then share your results with the world."

Put on a Pedestal
Fine silver, 23.5k gold (keum boo application), aquamarine and labradorite briolettes, pearls, glass, sterling chain, fine silver and 23.5k gold clasp.

Tonya Davidson

Using the PMC Syringe



The PMC Syringe is one of the most essential tools for PMC work and often the last tool considered. Unfortunately, it seems that many PMC artists think of it as a medium rather than a tool; a means to a specific look, rather than a versatile way to achieve many different effects. The first step in taking full advantage of the syringe is to develop confidence in how to use it. I'll cover that, then go on to describe some of the ways I use a syringe in my work. I have taught many people to overcome their mistrust of Syringe PMC, and I'm confident that the necessary skills can be mastered with the right guidance and practice. Once you learn how to use the syringe, I think you'll find that you use it for many projects. It can be used, for instance, to make filigree, to fill seams, to repair, to embellish, to set stones, to cement pieces together, to make bezels, to make cells for cloisonné enamel, and to build dimension.

Background

Initially I got interested in the PMC Syringe when I was looking for an alternate way to make bezels. Using rolled out clay always left them too thick, and I didn't like the effort or the result. I discovered that once I became proficient with the syringe, I could make bezels that had the delicacy of those made in traditional metalsmithing. Once I was comfortable with the syringe as a tool, I found that I reached for it more and more, using it for repairs and to attach parts. In my teaching, I find that many PMC artists have not learned to master this important tool, and as a result, they are missing out on some great opportunities. I hope the instructions here demonstrate how much can be done, and how efficient the syringe can be.

Whether it's a tennis racket or a planishing hammer, a new tool requires instruction and practice in how to hold it. In the case of the PMC Syringe, it is important to hold the syringe so you can deliver confident force without strain (and the wiggle that will come with exertion). The magic is in your thumb, which has much more strength than any finger. Lay the syringe across your palm so that the tip pokes out at the heel of your closed fist. People with large hands might find that the tip needs to emerge between their middle finger and ring finger, while curling the pinkie and ring finger into the palm. This makes it possible to see what they are doing without their hand obscuring or touching the work. This position works for most people, but if it doesn't, try holding the syringe with the plunger centered in the middle of your palm, with the tip exiting between the middle and ring finger. This will allow your palm to do most of the work.

The best way to hold the syringe is across the palm so your thumb can press the plunger.

People with large hands might find it better to let the syringe tip poke out between their fingers, like this. For some people, this allows better viewing of the extruded line.

Many people try to control the syringe and execute precision work with shoulder and bicep muscles. Because those muscles are so far distant from the hand, they cannot help much with control. Instead, learn to control your hand like this. Use the index finger of your opposite hand to create a bridge with your index finger (like painters do with their steady stick). Locate the lunate bone at the outside of your palm nearest the wrist. By pressing against this bone on the hand that operates the syringe, you'll find that your non-syringe hand can steer with great control. This allows you to relax your arm and shoulder and concentrate on the task at hand. In situations where the index finger/lunate bone does not offer control, try using the fingertips of your opposite hand to support the side of your syringe.

For maximum control, brace your hand by pressing the index finger of your other hand against the bones of your wrist. If that feels awkw ard, replace the single index finger with the three fingers of your other hand.

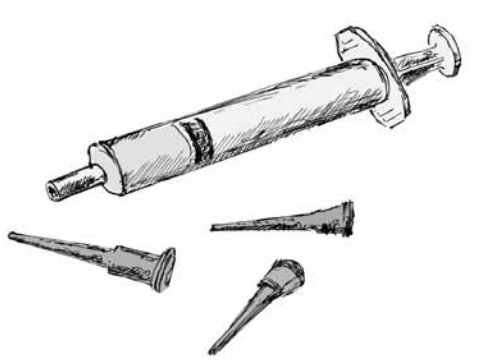
Peaceful Capture
Fine silver, CZ briolettes, pearls, semiprecious stone beads. The filigree grille was made with a 16 gauge ribbon tip.

Related tools

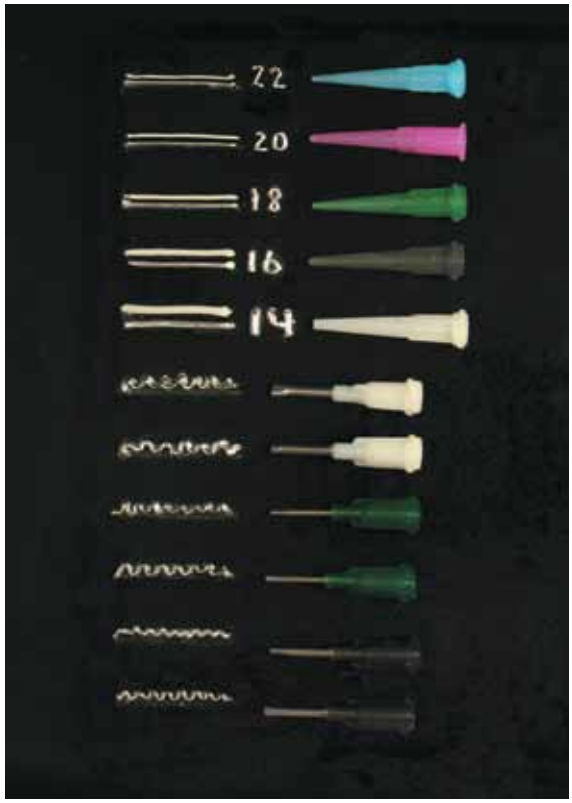
Most companies that sell PMC also offer the factory made, preloaded syringe. This version of metal clay is specially formulated to allow it to be forced through a small nozzle. All types of PMC can be thinned with water to allow them to be extruded, but once they leave the nozzle, the diluted clay sags and loses all traces of its original extruded shape. The syringe is ready to use, but to get the most from this versatile tool, I recommend a few additional tools.

The syringe is packaged with a plastic tip that will extrude a round 20 gauge thread (.032" or 0.8 mm). Additional tips that fit onto the syringe are available in a variety of shapes and sizes, including round wires from 14 to 22 gauge (1.6–0.8 mm), flat ribbon tips from 14 through 18 gauge (1.6–1 mm) half-round wires from 14 to 18 gauge (1.6–1 mm), and even a square tip in 16 gauge (1.3 mm). Using the syringe without any tip offers a round rod of approximately 13 gauge (1.83 mm). These designations refer to sizes before firing; final dimensions will be about 15% smaller.

The choice of which tip to use for specific projects depends partly on the visual effect you are seeking, and partly on the strength that is required. Bear in mind that a delicate wire has proportionately less contact with the surface, and risks being torn away in high stress applications. And no matter which tip you use, be sure to pat down beginning and ending portions of extruded lines with a



The PMC Syringe comes loaded with a version of metal clay that is specially formulated to extrude. The package includes one tip, and others can be purchased separately. Syringe material can be used with all other versions of PMC.



The upper line in each example is the unfired extruded line, which is roughly the size of the B&S gauge number shown beside it (made with the syringe, of course). The lower line has been fired and is a bit smaller as a result.

The top group uses round syringe tips. The lower six lines are as follows:

14g ribbon
14g half-round
16g ribbon
16 half-round
18g ribbon
18g half-round

damp brush. These are the areas most likely to lift off the surface, so make a habit of insuring that they are well secured to the surface.

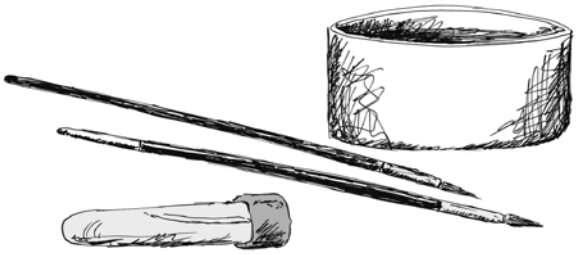
To harness the full potential of syringe metal clay, you will want a couple high quality paint brushes. I use a size 0 synthetic brush, to move and model most of my extruded lines. You may prefer a 2/0 or even 3/0 as well. Larger size brushes are more appropriate for brushing on slip. You'll use this brush to move, adjust, pick up, or remove any syringe line that is not desired. Keep in mind that wet clay sticks to wet clay, so proper use of the syringe involves constant monitoring of moisture content. This is more intuitive than cerebral, but it reminds us that you'll have a clean brush in your hand most of the time. A clean brush that is slightly damp is one of my favorite and frequently used tools.

To keep syringes from drying out during work sessions, I use a small jar or drinking glass half full of water. The tip should be totally submerged, but there is no reason to have the handle always wet—this just makes it messy to handle. For longer storage between sessions, I press each syringe into a florist's "bud tube" These keep the syringe moist for up to two weeks. For longer storage, put the syringe in a tightly sealed bag with a moistened bit of paper towel.

Syringe Basics

To start a line, touch the tip of the syringe to the surface and depress the plunger. If the clay does not stick to the base where you want it to, dampen the area with a brush, wait a few seconds for the water to soften the PMC, and try again. If the clay coming out of the syringe is not fresh, this will also make it difficult for the new line to adhere. Squeeze out a tiny amount of clay to clear the tip of the nozzle, and try again. Scraps can be put back into your paste jar. To end a syringe line, lower the syringe to the surface and stop depressing the plunger. Touch the surface with the tip of the syringe, and the line will disconnect.

In practice, the syringe should float a few millimeters above the surface, laying a line gracefully onto the surface. If you hold the syringe too high, you sacrifice control over the location of the line. If you hold it too low, there is a risk of bumping the tip into the line, leaving a mark. The pace at which the syringe travels should match the rate at which the clay is being pushed out of the tube. If you travel too slowly, the thread will double back on itself. If you travel too fast, the thread is stretched, and can sometimes break. Neither of these problems is serious, but both under-

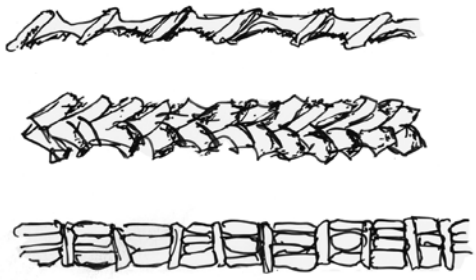


To get the most out of the syringe, you'll want a couple high quality Taklon brushes. To keep an opened syringe from drying out between uses, push it into a florists' water tube.

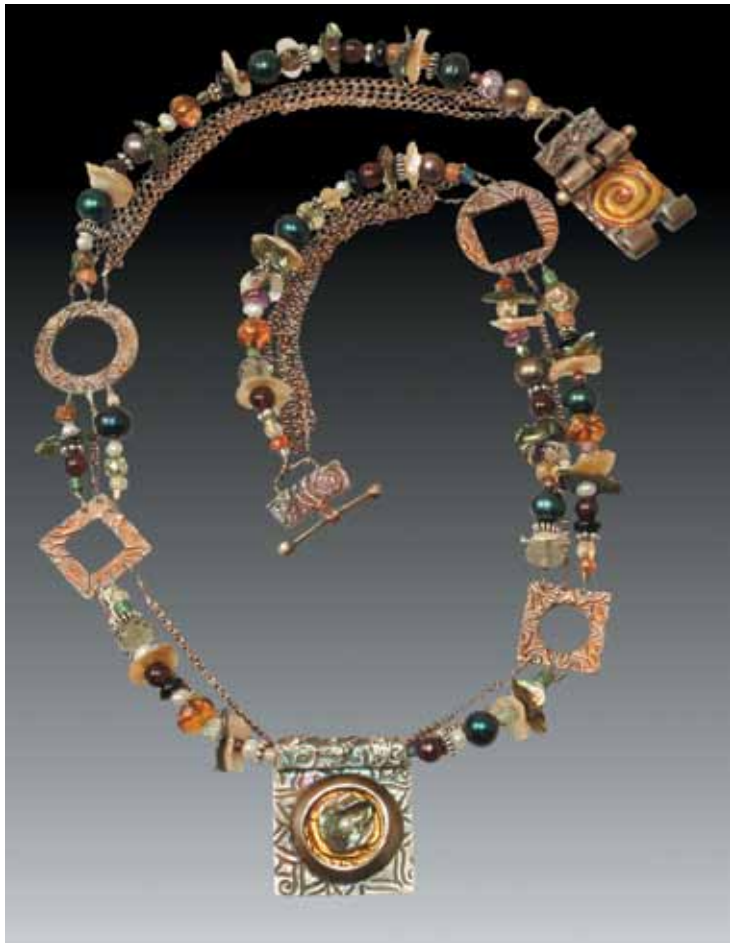
The syringe should hover about a quarter of an inch above the work, allowing the thread to drop down into position. Touch the tip to the work to start and to terminate a line.

mine your control. Learn to match these two elements—pressing the plunger and steering the thread—and you have mastered Syringe 101.

Most often we see syringe used as embellishment just as it comes from the tube. The range of tips allows for wires that are other than round, but even these do not exhaust the possibilities. You can embellish syringe lines by texturing them when they are semi-hard. Wait a few minutes after extruding, then press the line with a stylus to create lines that appear braided, twisted, or ornamented in other ways. You can also let a syringe line dry, then sand across the top to create the effect of a hammered wire. To achieve an irregular "hammered" effect, flatten a partially dry line with a dampened finger in certain areas.



We sometimes forget that a line made with a syringe might be a starting point for further work. Simple tools can alter a syringe line to create striking textures.

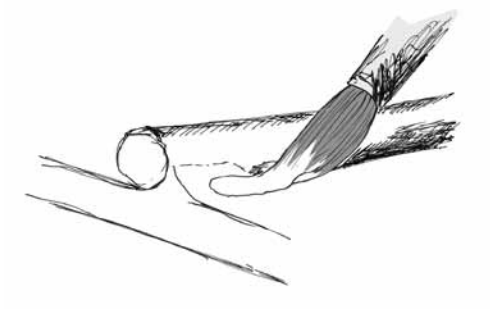


Square Peg
Fine silver, 22k gold, pearls, sterling chain, garnet, glass. The syringe was only used to embellish the bail.

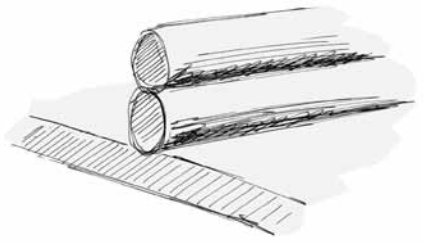
Using the syringe to build dimension

Build dimension and depth by placing one syringe line on top of a previously dried syringe line. This is a great way to build a bezel or to make cloisonné cells. In most cases, I start with the broad round line that comes from the syringe itself. Remove the tip, dampen the surface lightly to insure a good bond, and squeeze out a broad line in the shape desired. Refine the line with a damp brush, lifting, sliding, or otherwise adjusting it to create the shape you want. If you are making a closed form, use the damp brush to sculpt the ends together. You may need to add a bit of slip at this time to fill in gaps. Also, if you find that the line was uneven because of stretching, apply slip to build up those areas. This first line is a foundation, so it pays to get it right.

Dry this first layer, then add a second layer of syringe directly on top of the first layer, again using the untipped syringe. Mend and adjust with a damp brush as needed, then allow the second layer to dry thoroughly. To develop a delicate wall (like a bezel, for instance), make a third layer with the 18 gauge (pink) tip, centered on the ridge that you've



Paint slip along the base of a syringe thread to merge it into the surface. This has the double effect of added strength and visual harmony.



To build a bezel, lay down a single syringe line, allow it to dry, then lay another on top of the first.

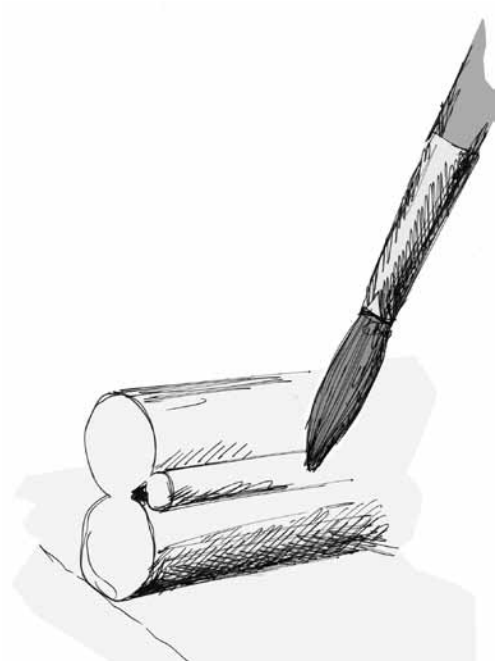
She's the Bee's Knees
Fine silver, resin
The syringe was used for ornamentation on the front and back.
4" high

Fine silver band, 22k and 24k gold, raw diamonds. Silver syringe was used to do the swirl in silver and 22k syringe was used for the base of the gold ring around the bottom to mimic the texture of the top.

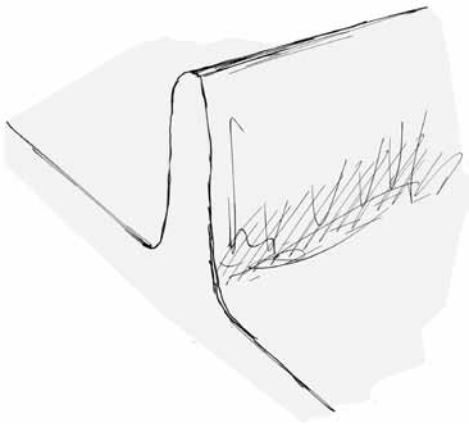
created. Extrude about a half inch, then stop to pat down the line with a wet brush. This will blend the layers together so the resulting wall doesn't look banded. Continue on, laying down another half inch or so, and smoothing that portion as you go. When you have completed the intended shape, set the work aside and allow it to dry (or speed dry in a dehydrator).

To further perfect and even out the wall in preparation for sanding, I apply PMC slip using a painting technique called "puddle and pull." Dilute slip to the thickness of yogurt, mixing well to make a smooth consistency. Gather a droplet of slip (puddle) on the tip of a brush and touch it against the wall. Lift the brush slightly, allowing the slip to trail behind in a thin thread, and steer this so it lays into the low spots of the bezel wall. Note that you are not brushing or stroking the slip, but grabbing a thread of slip gathered by surface tension and pulling it across the area you want to fill. Once you get the hang of it, this method is faster than applying several layers of slip, and creates a denser result.

When the slip is completely dry, sand the sides with sanding sticks or miniature files to create a perfect bezel. For me, this method of building a bezel is quicker than using clay and allows me the freedom to work with free-form shapes.



To fill the space between the two structural lines, slide a small tip onto the syringe and extrude a line into the space between the two threads.

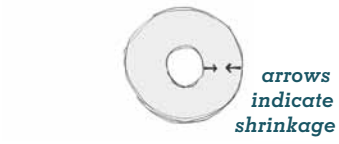


When the bezel wall has dried, lay thick slip along the wall to create an even surface. Smooth with a damp brush as needed, dry, then sand.

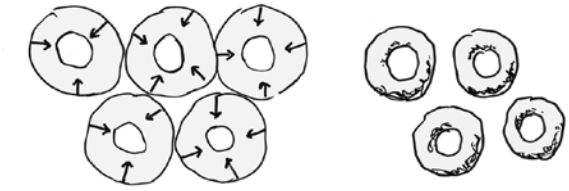
Making filigree beads

The PMC Syringe lends itself to making hollow filigree beads. I like to use cork clay as a core, but almost any combustible material will work. The goal is to have a core that is easily formed, and that will burn away safely midway through the firing process. If using cork, be sure it is thoroughly dry before applying PMC—a process that can take 24 hours naturally or as little as two hours in a dehydrator.

A filigree bead offers an excellent demonstration of just how PMC shrinks, and why it is important to understand the phenomenon. Metal clay shrinks; the spaces between parts, which are made of "air" do not. Imagine a bead made up of small PMC rings. In our minds' eye, the whole bead shrinks, pulling all the parts together. In reality, each metal ring shrinks, pulling in on itself and away from the adjacent rings, which are, of course, drawing in on themselves too. Understanding this effect, we can see why it is important to secure the bonds between each component. Use a brush well-loaded with slip to reinforce each joint. As each unit shrinks, this will hold them together and force them to remain bonded.



This drawing shows how shrinkage will affect a PMC ring. The silver parts will shrink, but the center hole will not—it is made of air, which doesn't shrink. The ring will be smaller after firing than it was before, but the hole will be about the same.

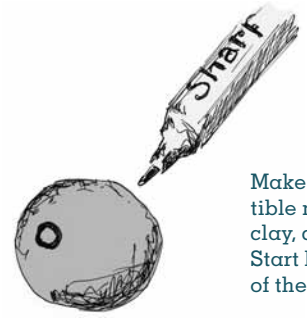


This means there is a tendency to pull apart; reinforce joints to protect against this.

Agua Dulce
Fine silver, limoge painted enamels, pearls, chalcedony, glass, sterling beads. The syringe was used in the back to join the inner piece to the outer square frame.

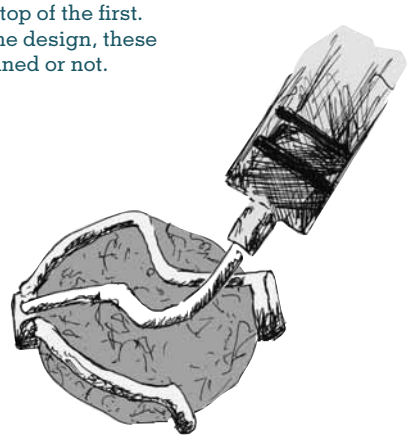
Start by marking the location of the bead holes with a Sharpie. Make sure to engineer the holes so the bead doesn't tilt forward or hang lopsided. With a syringe, make a circle on that spot, remembering that the holes should be large enough so that even after shrinking, a cord can fit through easily. Allow the ring to dry, then add a second layer on top of this first line, just as described for a bezel. In this case there is no need to hide the lines between the rings because other embellishments on the bead will cover them up.

Once the bead rings are in place, extrude lines on the cork that are well connected to these cord holes. Extrude a line, then confirm the bond to the ring by patting the joint with a wet brush. The possibilities for pattern development are huge, and include layering lines of different sizes, using symmetrical or asymmetrical lines, or adding dots and other pieces. Avoid gaps and large open spaces because they can create weak areas.



Make a core from a combustible material such as paper clay, cork clay, or Styrofoam. Start by marking the location of the holes with a marker.

Extrude a ring of PMC around the mark. Allow it to dry, then flow another ring on top of the first. Depending on the design, these rings can be refined or not.



To make a filigree bead, extrude multiple lines onto the core.

Using syringe on glass

When applying PMC to glass, the idea is to achieve a temperature at which the glass is soft enough to fuse with the silver, but not so soft that the silver sinks into it or it begins to enter full fuse stages. At high temperatures, the silver might cause discoloration, and introduce risks associated with the different expansion/contraction rates of metal and glass. I recommend firing all soda lime glass (this includes dichroic Bullseye, Moretti, Spectrum, etc.) with PMC at 1200° F (650° C) for 35 minutes. Pyrex and borosilicate glass require more advanced techniques and hotter temperatures. Because these colors change with the application of heat due to crystallization there are other methods that one must take for success. As this would imply, it is important to know what kind of glass has been used to make a bead you want to embellish with PMC. If you don't know, you can experiment, but understand that there is a risk of discoloration and bonding issues.

Make sure the bead is free of dust and oil, and extrude PMC from the syringe onto the glass just as described above. It is also possible to ornament a glass bead with slip or thin sheets of PMC, but remember not to enclose the bead so much that shrinkage will

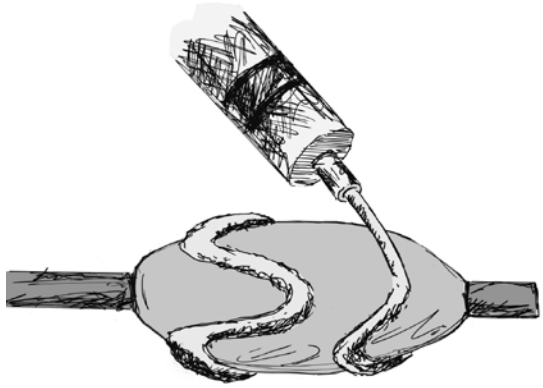
put stress on the glass. Allow the embellishment to dry, then clean away haze or dust from the unwanted clay by using a pointed makeup applicator (or similar tool) with glass cleaner or alcohol.

Again, the schedule I recommend as a good place to start is a hold time of 35 minutes at 1200° F (650° C). If the glass slumps, lower the temperature to 1175° F (635° C) on the next firing. Remember that glass is susceptible to thermal shock in both the heating and cooling stages. The larger the bead, the more important it is to heat and cool slowly. Especially for larger beads, ramp up slowly, between 250 and 1500 degrees Fahrenheit per hour. Especially for large beads, I recommend soaking the bead at the annealing temperature of 940°–960° F (about 510° C) for 20 minutes to an hour. The general rule is 15 minutes per quarter-inch of thickness. After that, allow the bead to cool to room temperature before opening the kiln. It is tempting to peek into the kiln during the annealing process, but don't do it!

Glass workers will be sensitive to a problem called devitrification. This refers to the possible creation of a thick, semi-opaque film that can form on glass as it cools. The solution for this, called crash cooling, is not necessary in this case because this method (which uses PMC3) does not go above 1300° F (700° C). Similarly, concerns about yellowing are avoided at these temperatures, because the silver is not heated to temperatures at which fuming occurs. One other potential problem, cracking, is avoided by staying below the temperatures at which the glass becomes viscous. At those high temperatures, the glass is expanding just as the metal clay is shrinking, so stresses are inevitable. Full sintering of PMC3 takes place at safe temperatures that avoid this problem.

To add PMC elements along with syringe lines, I recommend pre-firing the PMC shapes either with a torch or kiln. I usually use PMC Paper, either one or two thickness, but you could use thin sheets of PMC clay also. Hold the fired shape in tweezers and apply some slip or syringe to the backside. Flip this over and lay the pasted shape onto the glass, working quickly enough that the slip remains gooey. Because the sheet is so thin, even when laminated with two layers, it can easily conform to the shape below. When the slip is dry, clean up smudges and remove unwanted clay dust from the glass surface. If you do not pre-fire the shapes, you risk two things happening. First, you may get a hazing around the shape as it shrinks on the surface, making it less pristine. Second, putting slip on a small floppy sheet shape is challenging and can be frustrating.

Azul Tapestry
Fine silver, 22k and 24k gold, sapphire, sterling chain. The syringe was used to set the stone, set the 24k granules, to do the caging in 22k on the sides of the stone and the back of the piece.



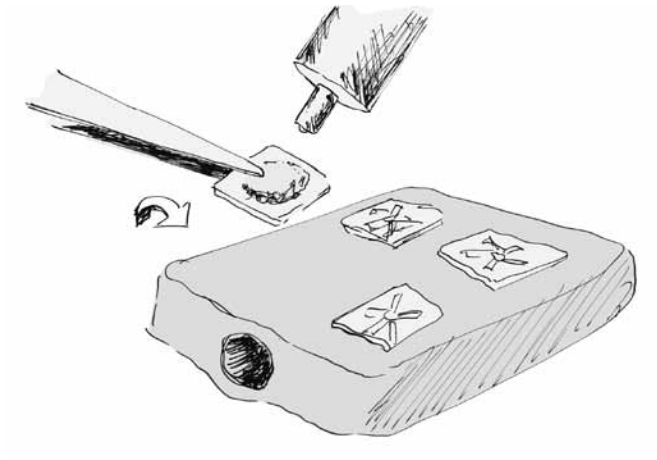
Syringe PMC can be applied to glass, for instance a bead like this. If you don't know the melting point of the glass, you should experiment to be sure it is compatible with PMC. If possible, use wavy threads, which will allow for shrinkage.

Using syringe on ceramic

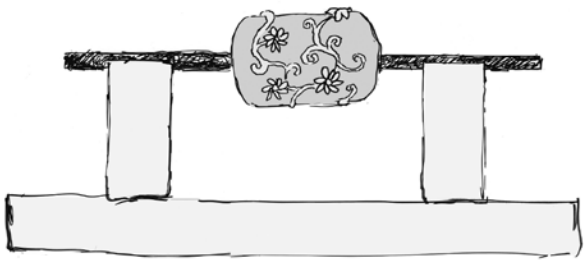
Syringe PMC can be applied to glazed ceramic objects, using the application methods described above. As with glass, allow the syringe clay to dry, then refine by filing, if necessary, and clean away any excess with a fine brush and glass cleaner.

Firing on ceramic is almost the reverse of the instructions just given for glass. In this case, we want a quick firing that gets as hot as the PMC will allow—1650° F (900° C) for 10 minutes. This will ensure a solid bond between the metal and glaze. Glazes contain a form of ground glass called frit, and those with less frit (matte glazes, for example), are less reliable in creating fusion. Raku glazes contain copper, and this makes the surface especially soft when the glaze melts. For this reason, use only thicker elements on raku glaze. Thin pieces will sink below the surface of the glaze, which is not desirable.

Glazed beads must be placed on stilts or hung from rods during firing, to prevent the glaze from sticking to the kiln shelf. An object with an unglazed underside can be placed directly on a fiberboard shelf, but I recommend reserving shelves just for this use to prevent silver stain contamination onto glass from shelf cross use.



To apply ornamental elements, pre-fire them, then place a dab of syringe on the back of each piece and press it onto the glass. Fire at 1200° F (650° C).



Fire glass or ceramic beads on a rack or stilt of some kind. These are commercially available, or you can use a piece of nichrome wire suspended between a couple pieces of soldering board or posts.