

GLASS FUSING AND PMC WORKSHOP HANDOUT

If you are looking for brilliant color and the value of precious metal, glass and PMC3 is your answer. The new dichroic glass is vibrant. It is easy for glass fusers now to make their own one-of-a-kind settings. PMC3 works wonderfully with fused glass pieces. PMC3 allows you to use fully as well as tack fused glass in both flat and 3D creations. With a firing temperature as low as 1110° F / 600° C, the lowest firing silver clay now available, glass does not soften, preventing stress and discoloration. All kinds of glass now can be used: small bottles and beach glass as well as fusing glass.

C.O.E.

The first thing we must understand is the COE or Coefficient of Expansion. This is the rate at which all materials expand and contract. The COE of glass can be measured. The major glass manufacturers measure the COE of their glass and rate it as "tested compatible".

Use glass of the same COE which is "tested compatible". The COE of all the glass components must be the same in order to have the fused glass pieces remain stable after fusing. For example, if you use a COE 90 glass with a COE 104 glass, the resultant piece will be stressed and will craze or break. This may not show up immediately but the piece may separate weeks or months later.

COE – Coefficient of Expansion – Fusing Glass

Pyrex	COE 30	Bullseye Glass	COE 90
Uroboros Glass	COE 90	Wasser Glass	COE 90
Spectrum Glass	COE 96	Moretti Glass	COE 104
Moretti Millefiori	COE 104		

The viscosity of the glass also has an effect on the compatibility of glass. Making small jewelry pieces usually is easy and forgiving. The larger your work, the more there is to know about compatibility and fusing schedules. (See *Precious Metal Clay in Mixed Media* by Mary Ann Devos and *Introduction to Glass Fusing* by Petra Kaiser)

ORGANIZE YOUR GLASS,

Mark each piece of glass with its COE or store the glass of the same COE together in the same container.

The term Dichroic means two colors. These are the reflected and transmitted light which strike and pass through the glass.

The dichroic colors vary in intensity and degree of translucence. Depending upon the level of translucence the glass is used as a base, middle or top layer in a cabochon. If you use a base color in the middle or top layers, you will obliterate the glass colors under it.

We build our cabs for PMC with a thick layer of base glass and a thin top layer or with three thin layers.

When the dichroic side of the glass is up, you get a very vibrant, metallic, opaque color. If the dichroic side is down or covered with clear glass, you get a sense of depth.

It takes a little practice sometimes to be able to see which side has the dichroic coating. One way is to hold the glass up to the light. Look at the edge of the glass. You should be able to detect whether the metal surface is on the top or bottom of the glass. Another method is to touch the surface of the glass with a pen or pencil. Look at the place where the tip meets the glass. If the tip appears to float above the surface of the glass, the metal layer is on the bottom of the glass. If the tip appears to connect directly with its reflection, the metal layer is on top.

MAKING GLASS CABOCHONS

PREPARATION OF THE GLASS TO MAKE THE CABOCHON IS CRITICAL.

The glass must be very clean. If it has been out in the garage or in an open storage bin, wash the glass first with soap and water or glass cleaner. Then follow this by cleaning with denatured alcohol. If you have ground off the edges, wash off all of the glass particles. Then keep your fingerprints off the glass by wearing gloves or handling only the edges of the glass.

Pick the bottom layer of glass. I like to begin with black or an irrodized or colored piece but transparent colors also are great. At this point decide if your cab will be viewed from the front or from two sides. Fine jewelry should always look good from both the front and the back.

Place small cut pieces of glass on top of the base layer to make an interesting, contrasting design. For the top layer, use a lighter transparent color or Bullseye Crystal Clear. This gives a visual depth to the piece. Use a black/dichroic piece face down and add materials to the top in layers to get a dramatic vibrant effect. Use a thick ripple glass with a clear or transparent glass on top. The possibilities are limitless!!!

Use Klyr Fire or Elmer's gel glue applied with a toothpick to hold the pieces of glass together. You want just enough glue to hold the pieces together. Too much glue can cloud the transparency of the glass.

There are two methods of fusing the glass cabochons: tack fused and fully fused. A fully fused glass cabochon will have a smooth and rounded top, similar to a gemstone cabochon. A tack fused glass cabochon will have a surface which is multileveled with rounded edges but noticeable and distinct layers of glass.

FIRING OF GLASS CABOCHONS:

FULLY FUSED: Fire the glass with a ramp speed of 1500°F per hour to a hold temperature of 1470°F and a hold time of 10 to 15 minutes.

TACKED FUSED: Fire the glass with a ramp speed of 1500°F per hour to a hold temperature of 1470°F and a hold time of 2 to 4 minutes

Remember that many factors affect the fusing process. These include the size and type of kiln used, the stability of the heating process and degree of insulation and retention of heat as well as the size and type of glass used. As a result, it is important to monitor closely the fusing process to determine when the glass has reached the desired degree of fusion. Find your perfect temperature recipe. Everyone's kiln is slightly different.

FIRING GLASS AND PMC:

1. For the best results we fire our cabochons and then apply the PMC, firing the entire piece together, the glass for a second time.
2. We fire PMC3 in a Sierra kiln on the PMC Slo program. This uses a ramp speed of 1500° F per hour to a hold temperature of 1110° F and a hold time of 45 minutes. This is for glass cabochons ranging from the size of a dime to those the size of a half dollar. This will maintain the color of Moretti or Wasser glass. It also will allow you to tack fuse the glass and maintain the surface dimensions of the cabochon. Remember, however, that because the glass does not fully fuse, the silver must be securely attached to the glass, taking advantage of the shrinkage of the silver during sintering to "shrink lock" the silver to the glass. If the PMC3 is too loose and does not have prong-like holders or a slight overlap of the silver over the glass, the cabochon can separate from the silver.

FIRING SCHEDULE

1. Clean the glass and PMC piece again before firing. PMC particles on the glass will fire into the glass and you will have a less than desirable effect.

GLASS SCHEDULES EXPLAINED

1. The Initial Heating Phase: Start at room temperature and progress to the desired firing temperature. The strain release point for glass is between 930° and 1000° F. This process should take about 40 minutes.
2. The Rapid Heating Phase: The kiln temperature can be increase more rapidly from 1000° F to the desired hold temperature. More care should be used in firing large pieces such as plates.
3. Rapid Cool, Crash or Flash Cooling: At the end of the firing period, open the kiln door and allow the chamber temperature to decrease to 950° F. Then close the kiln door. The chamber temperature should remain at or below 1000° F. If not, repeat the process until the closed kiln remains at or slightly below 1000° F.
4. Annealing or Soak Period: The kiln temperature must be maintained between 1000° and 930° F for a period of 5 to 15 minutes for small jewelry pieces. In most ceramic fiber insulated kilns, the natural cooling of the chamber will provide a sufficient annealing period for most jewelry size glass cabs.
5. Cooling Phase: The kiln chamber should remain closed after the Crash Cool, from 1000° F to room temperature. DO NOT PEEK!!! If you open the kiln during this cooling process, the change in temperature can create a stress in the glass which will result in breakage, either immediate or postponed.

SUMMARY:

PMC3 is the best silver clay for glass. The low firing temperature prevents any fusing of the silver and the glass. This avoids later stress because you should have only a mechanical connection, a bezel like traditional settings, holding the glass in the silver.

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