

## **BRONZclay - Drying Bronze Clay to Avoid Distortion**

*by Mardel Rein – Updated 11/3/08*

Drying is a very important part of working with BRONZclay, and how it is done can make a big difference in the fired product.

Bill Struve of Metal Adventures, Inc (inventor of BRONZclay) tells me that the binder he uses in the clay stiffens when its warmed and softens when cooled. That explains why cracks appear in thick pieces (1/8" or more) that have been dried on a heat source. The outside begins to harden as it warms (because the binder stiffens from the heat) but the inside is still cool. The difference in temperature and moisture creates internal stress, and cracks are the result.

Sometimes stress cracks cannot be seen with the naked eye. In the photo in the upper right, a 1/4" slab of clay was air dried for 1 hour, then moved to a cup warmer at a very low temperature. After drying I observed that hairline cracks had formed on the surface. The cracks were so fine I could not see them without magnification.

The internal stress of uneven drying also causes warping of the item being dried. Thin pieces are more susceptible to warping, but all BRONZclay pieces can warp when dried un-evenly.

### **Drying Options**

The metal clay drying paradigm tells me to add heat to drive off the moisture. More and more I am learning that with BRONZclay I don't want heat at all. I want cold. So, I've been experimenting with different ways of drying the clay and I've made some very exciting discoveries.

All along BRONZclay has been telling me it doesn't like heat. It gets stiff when it warms and softer when it's cooled. So, as I was standing in my kitchen with my head in the freezer thinking about how cold contracts and heat expands, it dawned on me. Cold air dries just as well as warm. So, now I am using cold to dry, store, and work with BRONZclay. I have found that chilling the clay allows me more working time, a better consistency to the clay, less cracking and a better surface finish. I am currently still experimenting with this idea, and hopefully other will try my methods and push them further.

### **No-Dry Method**

BRONZclay can be fired at any stage of wetness. I can take a piece of clay directly from the package, totally wet, drop it in the activated carbon and fire it. As long as the schedule is correct for the thickness and the kiln being used, the clay will sinter beautifully.

### **Freezer/Refrigerator Drying**

Refrigerators and freezers are cold, dry places....perfect for drying BRONZclay. Place items to be dried on a project card and place in the refrigerator or freezer to dry. Turn after about 5 minutes, then turn again after another 5 minutes. Drying time is dependent upon the thickness. Up to 3mm pieces will dry in the freezer overnight or within a few hours in the refrigerator.

Be sure to read the section on Cold Forming BRONZclay. This is another exciting development in chilling, forming and working with BRONZclay.

### **Other Drying Options**

Here are some other methods for drying BRONZclay. Any combination of these methods can be used to accomplish the task at hand. As you become more adept at working with BRONZclay, you will know when to apply heat, when to use cold, etc.

**Dry:** Place pieces on a project card and set aside to dry. Turn regularly for faster, more even drying and to minimize distortion. Drying can be accelerated by placing in a warm location with good air circulation (80F is ideal). The warm top of a refrigerator makes a good spot to dry BRONZclay. Drying time is

completely dependent on humidity and temperature conditions. If you are in a warm, dry climate, drying will be faster than what we experience in the Midwest. That also means that you'll be re-hydrating more often as well.

**Food/Cup/Candle Warmer:** BRONZclay drying can be speeded by gently warming the clay on a heat source. Notice the word 'gently' in the previous sentence. The temperature of your heat source is very important with BRONZclay. If the temperature is too high, pieces distort. Thin pieces heated too quickly can end up looking like a potato chip.

To avoid distortion, dry slowly and turn every minute or so for the first few minutes to allow for even evaporation of the moisture throughout the clay.

There are many types of warming surfaces, but the most popular for metal clay is the cup or candle warmer. For the studio artist, these inexpensive warmers dry metal clay quickly and efficiently. BRONZclay should not be placed directly on the heating surface. Direct heat can cause distortion and cracks because the initial drying temperature is too high. The surface temperature of the small warmers that I have measured varied between 140F to 200F. Those temperatures, as low as they sound, are high enough to cause quite a bit of distortion in the BRONZclay during drying, and crack thicker pieces.

I've recycled worn-out 1/4" thick Cordierite kiln shelves as heat-reducers for my cup warmer. I broke one shelf into 1" square pieces and used those as risers for a large kiln shelf to sit on. Elevating the shelf cools the air between the warmer and the shelf. Add additional layers to lower the temperature further. A stack of 3 would work well as a temperature regulator. Corrugated plastic also works as does cardboard and foam core. Whatever you use as a heat reducer on your cup warmer, test it first to be sure it won't warp.

**Dehydrator:** A dehydrator is an efficient way to dry BRONZclay and has given me excellent results with large pieces. Do not rush drying. Drying too fast will cause cracks that will not heal during firing. BRONZclay will dry most thoroughly and evenly when placed directly on the drying racks. If drying on project cards, turn the pieces after about 5 minutes for even drying.

### **Cold Forming & Distortion Repair**

I have found a way to reform dry BRONZclay pieces. Since cold relaxes the binder and makes it more flexible, and heat stiffens it, I used these two characteristics to force warped clay back into the shape I want it to be.

To form dried BRONZclay, first chill the piece to make it flexible, reform it, then heat rapidly to set new the shape.

The sample shown in the photo at the right is the same piece before and after cold forming. The sample on the left was dried on a cup warmer and ended up looking like a potato chip. To reform it, I placed it in the freezer for about 10 minutes. Removed the item from the freezer and immediately placed it on a cup warmer, put a car-polishing pad on top of that and then added a steel bench block on for even pressure. I pressed it flat as quickly as it hit the heated surface and held it there until for about 30 seconds. I then turned off the cup warmer and allowed the piece to cool with the weight in place. The polishing pad protects the surface of the clay and helps to spread the weight of whatever you are using to flatten your piece so you don't break it.

The weight is not actually necessary. I used it so I could get even pressure on the piece and so I didn't have to stand there and wait for it to set. I have reformed links using just the heat of my fingers, but it's much faster and more reliable to use a warmer to get the shape to hold. It will want to spring back to its old shape if you do not get it hot enough after forming.

If you don't get all the movement you want on the first round, re-chill and go at it again.

**Crack Repair**

If you see hairline cracks in your BRONZclay before you fire it, you will see hairline (or larger) cracks after you fire it. Before the clay is fired, you can fill the cracks with lump clay, and in some cases you can burnish out the crack. BRONZclay can be burnished before firing if the surface lends itself to burnishing. After the clay is fired, it is possible to burnish out some hairline cracks. Some designs will be impossible to repair, so the best course of action is to allow the clay to dry very slowly and avoid cracks. Alternatively, to explore the idea of cracking, you might want to deliberately dry a piece very fast to allow cracks to form. The cracks could be inlaid or stones could be set in the spaces.