DRYING & FIRING Q&A

by **Cameron Harman Jr.**

Q *Sometimes I get blisters in the green firing of my ware. Why do these occur?*

A Several factors can cause blisters in green ware, and nearly all of them relate to organic materials in the ceramic mix. Sometimes suppliers or potters use additives, such as corn flour, to strengthen the wet ware or make it easier to shape. In other cases, the organic material is naturally present in the raw clay. For example, bentonite and ball clay both contain naturally occurring organics that can often cause blistering problems.

If you are adding an organic powder to your mix and are getting some small blisters, try completely wetting the organic by blending it thoroughly with water before adding it to your clay body. (The organic will not dissolve, but it can be completely saturated.) If you are using corn flour or cornstarch, for example, blend it in water first and mix it until the mixture is very smooth and creamy. When you add that mixture to your clay body, all of the additive grains will have been wetted and should blend more completely with the clay.

If you still have blisters, try firing more slowly between 400 and 900°F. You want to be certain that all of the organic material is oxidized (burned) before heating above 900°F. If you have thick-walled ceramic pieces or cold spots in your kiln, you must slow the firing until the inside of the coldest piece of ware is completely oxidized.

All organic materials will oxidize, but the oxidation process does not begin until about 400°F and is finished by 900°F. Organics heated above 900°F will crack into elemental carbon. While carbon will oxidize into carbon dioxide, it will do so only if it is heated above "red heat." This is why some ceramists hold their ware at temperature for a long time after it has reached about 1800°F. However, the carbon dioxide produced in the oxidation process can also create blisters in the ware. Slow heating in the early stages of firing will cause the organics to burn up more easily and will prevent the formation of blisters.

Organic materials can also cause a discoloration inside the ware, turning the inside black (called "black coring") or, in some cases, a different shade of white (known as "white coring"). The reason for this coring is that the organic material sometimes steals its oxygen from the surrounding ceramic rather than from the air, causing the ceramic to undergo a chemical reaction during the firing process. In red clay ware, the black ceramic is an iron silicate formed when the oxygen is taken from the iron oxide. This action reduces the iron oxide from ferrous iron to ferric iron and causes it to be more reactive with the available silica.

The same slow firing procedure that combats blisters will often eliminate coring problems as well.

Q *When I buy clear glazed pottery and put my own decorations on it, I sometimes get little blisters. How can I avoid this problem?*

A The problem occurs because the pottery is porous and has been on the shelf long enough (usually several weeks) to gradually absorb water from the air. During the decoration firing, the small amount of water in the ware tries to escape through the glaze and causes a "bubble" or "spit out" at that location.

The maddening thing about these spots is that they are not really predictable. Sometimes you can fire your ware successfully, but other times you will have a lot of blisters. Even firing very slowly will not stop this effect from happening.

I do not know of any way to check the moisture content of the ware ahead of time, and unfortunately, a dryer can't be used to solve the problem. It took weeks or maybe even months for the ware to absorb the water; a dryer might work as long and still not get the water out.

To avoid this problem, purchase a vitrified ceramic, such as porcelain or fully vitrified stoneware, or use pottery that has been fired within the last few days.

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