

GLAZE MATERIALS AND GLAZE MIXING

Glossary words:

Expansion and contraction- All things become larger (expand) when heated and then reduce in size (contract). It's like your lungs when you inhale and exhale. There is not a permanent size increase, nor permanent shrinkage in expansion and contraction. So your ceramic work expands and contracts about 1/2%. Besides expansion and contraction, work that goes through a high-fired glaze firing will go through shrinkage, which is permanent. The shrinkage is due to the maturation of the clay.

Crazing- Crazing is the crackled finish found in some glazes. Crazing occurs when the glaze contracts more than the clay but not enough to cause the glaze to pop off, as does regular glass melted on clay. Crazing can happen as the glaze cools in the kiln or could take as long as years after the glaze firing.

Dunting- Dunting is when a clay contracts so much more than the glaze that the glaze becomes too big for the clay form and pops off in sheets.

Crawling- Crawling is when the pre-fired glaze has fine cracks that open up in the firing, leaving bare spots on the clay surface and beaded up in areas where the glaze has accumulated. The problem is usually caused by, too much raw clay in the glaze formula, dust on the bisqueware or the glaze being applied too heavily.

Pinholing- Pinholing is when there are little holes in the fired glaze due to clay pores releasing gases during the firing and, or problems with the bisque-firing or glaze-firing.

What is glaze?

Glaze is a glass that has been formulated to fit on top of a ceramic surface. "Regular" glass, if melted onto clay would eventually pop off. This is because the expansion and contraction of the glass is greater than the ceramic form it was fused to. Glaze is formulated to be much closer in expansion and contraction to our ceramic projects.

Glaze is made up of 4 things:

- 1) Glass former is what gives the glaze the glossy liquid appearance.
Silica sources: flint, clay, feldspar
Boron sources: gerstley borate, borax

- 2) Flux is what promotes the melting of the glaze. Note: Silica and Alumina melt at much too high a temperature on their own, so a flux is needed to bring down the melting temperature of the glaze.
Alkaline sources: feldspars, soda ash, lithium carbonate
Calcium sources: whiting (calcium carbonate), talc, wollastonite
Magnesium sources: Talc
Strontium sources: strontium carbonate
Boron sources: gerstley borate, borax
Barium sources: barium carbonate
Zinc sources: zinc oxide

- 3) Refractory is a material that resists melting and stabilizes the glaze which aids the glaze fit.
Alumina sources: feldspar, clay, alumina hydrate, alumina oxide

- 4) Colorant is a material that adds color to claybodies and glazes.
Some clays: Red Art Clay, Alberta Slip, Barnard Clay
Iron sources: red iron oxide, black iron oxide, yellow iron oxide, yellow ochre, rutile, iron chromate, Red Art Clay, Alberta Slip
Cobalt sources: cobalt carbonate, cobalt oxide
Copper sources: cooper carbonate, copper oxide
Chrome sources: green chrome oxide, black chrome oxide, iron chromate
Tin sources: tin oxide
Titanium sources: titanium oxide
Manganese sources: manganese carbonate, manganese oxide
Nickel sources: nickel carbonate, nickel oxide

Mixing-up a glaze:

Always wear a paper respirator when dealing with clay or glaze dust, especially when making glazes. The Respirators can be purchased at the PCC Bookstore.

Glaze recipes are almost always in the form of percent by weight. The below is an example:

Cone 10 Clear	
Custer Feldspar	40
Flint	30
Whiting	20
EPK	10
<hr/>	
	100

The numbers represent actual weights and keep everything in the correct proportions. The numbers could be used directly to make 100 grams, or 100 kilograms or 100 pounds of glaze. About 100 grams of glaze will cover a surface of approximately 12"x12" or 1 square foot if you're brushing the glaze on the work. For other glazing applications, you will probably need extra glaze.

You can increase or decrease the size of the glaze batch by multiplying all the ingredients by the same coefficient as you would do when cooking or baking. If you need half a batch of glaze, divide everything including the colorant by 2. If you need a triple sized batch, multiply everything by 3. I always add up the new numbers in order to check my math before mixing up the glaze.

General Glazing Rules:

NEVER MIX UP THE TEMPERATURES OF THE GLAZES. IN OTHER WORDS, DO NOT PUT RAKU OR LOW-FIRE GLAZES IN A HIGH-FIRE GLAZE FIRING. THE GLAZES WILL OVER-FIRE, RUN AND EAT INTO THE EXPENSIVE KILN SHELVES!!!

Sieve the glazes after they are thoroughly mixed with water. We have brushes specifically designated for gently coaxing the glaze through the sieves. Do not push too hard on the sieves for they will wear out more quickly and do not use expensive brushes because the sieves will ruin them.

Label the side of the glaze container and the lid with the glaze name and temperature (Raku, Low-fire, High-fire, to avoid mix-ups and accidents. Do not mix-up the lids. This could cause glaze from the wrong lid to fall into the glaze container, thereby contaminating the glaze. Contamination can cause the glaze to turn out differently, often times altering the glaze color.

Raku glazes go on to thickly if you pour or dip your work in them no matter how much you try to thin out the glazes with water. For that reason, I recommend brushing the raku glazes on when possible.

Raku and low-fire glazes are to be applied ½ dime or thinner, unless the glaze fired surface is a dry matte one. The satin and glossy glazes can run a lot in the firing, so apply them at ½ dime thick or thinner.

High-fire glazes are to be applied at ½ dime to 1 dime thick. Very runny glazes should be applied on the ½ dime side. Copper red glazes, such as the Vampire Red glaze, are very runny but need to be applied at least a dime thick and fired in reduction to get a good red color. In this dilemma, apply the glaze thinner towards the bottom of your piece or leave the bottom 1" unglazed so there is room for the glaze to run in the firing before it hits the kiln shelf.

Glaze Consistency:

You want the glaze to be the consistency of thin pancake batter for brushing and of heavy cream for dipping and pour your work.

Brushing glaze on can be difficult because the glaze dries so quickly you don't have much time to apply it evenly. You can dry mix 2% bentonite and 1.5% Vee-gum to your dry glaze before adding water. Then make sure you mix the glaze up the consistency of thick pancake batter. The two additives seem to artificially thicken the glaze and increase the glaze drying time so you have more time to get the glaze on even. If the glaze is too thin, you must apply more coats of glaze to build up a proper thickness.