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Surface Design - Patinas and Glazes

Washes/Patinas

The terms wash and patina are used interchangeably in ceramics, and generally refer to a thin coating of colored or colorless medium that can be used in several ways. A transparent patina of thinned clear or colored glaze can be applied to introduce a slight "wetting" effect to a piece without the density and surface-modification of a normal glaze. Think of a pretty rock you pick up at the beach or river and quickly dip in water to make the colors appear. An appropriate patina can do the same thing, especially with colored clay or slip decoration, but such a thin glaze coating would be inadequate for food-contact surfaces.

Patinas colored with oxides or ceramic stains can be used in a number of ways. A patina that contains nothing but water plus coloring oxide cannot be used by itself on lowfire or midrange work, because most coloring oxides are quite refractory and will not bond to the surface at those temperatures, instead remaining powdery on the fired ware. If you want to use an oxide patina by itself at lowfire or midrange temperatures, combine 90% oxide and 10% 3134 frit to provide enough glass to fuse the oxide in place. At high-fire temperatures any patina containing iron, cobalt, rutile, or copper will flux and adhere to the surface by itself. Chrome oxide will not. Oxide patinas by themselves without a glaze cannot be used on food-contact surfaces.

For an oxide patina with a bit of gloss, increase the addition of 3134 frit to as much as 50% of the dry batch weight. Such combinations can accentuate the wetting effect without altering or diminishing the relief pattern or texture, whereas a glaze tends to soften relief texture and pattern by settling more thickly in the recesses. Keep in mind that when you get above 30% or 40% (of the dry batch weight) frit content, what you have is technically a glaze rather than an oxide wash, but such a glaze would not be stable in terms of chemical release and cannot be used on food-contact surfaces.

In some cases oxide/stain patinas contain an opacifier like Zircopax to increase the opacity of the coating, and/or some glassy frit to help flux the colorant to the substrate or to create a limited amount of "wetting" or shine as explained above. The patinas we keep in stock in the glaze room are made from the standard ceramic oxides and water, but a broader range of colors can be achieved by making patinas from commercial ceramic stains like Mason stains. Again, we have miscellaneous leftover stains purchased years ago, and you are welcome to experiment with them.

The most common use of oxide or ceramic stain patinas is for brushwork effects, as in classical Italian maiolica, where the colored mixtures are painted directly onto a dry, unfired glaze coating. Oxide or ceramic stain patinas are different from those made from thinned glaze in that they are usually just colorant suspended in water, and thus should be applied very thinly. In order to avoid having the brush drag on the dry glaze surface and deposit too much colorant, use a fully-loaded watercolor brush with high reservoir capacity and use quick, flowing strokes.

In this type of work, patinas can also be applied selectively over an unfired glaze coating by spray, spatter, or sponge-stamp to modify the glaze color locally and create interesting pattern and imagery. Keep in mind that if the glaze moves, the overglaze oxide decoration moves with it. On a sponge-stamped or brushed geometric or abstract design, glaze movement can greatly enhance the design, but it can diminish or ruin writing or pictorial imagery. If you want clear, crisp writing or pictorial imagery or tight linear patterning, it should be done with slips on greenware or underglazes/engobes on bisqueware and glazed with a stable transparent glaze.

You are already familiar with one of the uses of patinas to accentuate relief surfaces featuring raised or recessed pattern or texture. In this case the patina is brushed onto the bisque-fired surface and sponged back off the high spots to the desired degree, leaving material in the recessed areas. With an appropriate patina this technique can be used with or without a glaze on sculptural work, but on food-contact surfaces it requires a glaze. ***Note***: this technique is the only circumstance where we ever use an oxide patina/wash under a coating of glaze. Ceramic oxides are very powdery and some are quite refractory and will interfere with the glaze bonding to the claybody, and the glaze will often crawl away from the oxide during firing, often ruining the piece. As long as you apply an oxide to a relief texture or pattern and sponge away the excess from the high spots before glazing, the incidence of glaze crawling seems to be very low.

Standard Oxide Patinas for Overglaze Brushwork or for Accentuating Pattern/Texture
When making these patinas, mix the oxide(s) with water to a very thin, watery consistency. When brushed onto the clay or glaze, a single brush mark or coat should appear completely opaque, but should have no visible thickness as compared to a brush mark of glaze. ***These mixtures will settle very quickly and must be stirred frequently during use***. As mentioned above, when used to bring out relief pattern or texture, these patinas are normally brushed on and then sponged off the high spots before applying the glaze. They can also be sponged or brushed lightly onto the surface after applying the glaze so they only hit the high spots, giving exactly the opposite effect.

Black – equal parts manganese dioxide, black iron oxide, black cobalt oxide
Green – chrome oxide
Tan/Orange – rutile
Blue-green – copper carbonate
Blue – cobalt carbonate
Brown – red iron oxide
Brown-orange – equal parts red iron oxide and rutile

Note: for brushing, spattering, or sponge-stamping oxide patina over a dry glaze coating, you may wish to soften the oxide marks so they blend into the surface of the glaze. To accomplish that with an existing oxide patina, add a little clear glaze or 3134 frit and then add water to adjust the consistency. If you are mixing up a new batch of oxide patina and want to achieve this effect, add a quantity of liquid clear glaze (for the appropriate firing temperature) ½ by ***volume*** (not weight) of the amount of oxide, and then thin with water to the appropriate consistency. In other words, if you add two level tablespoons of coloring oxide, add one level tablespoon of liquid clear glaze.

Dry-Effect Oxide Patinas

An interesting category of patinas are those which simply approximate the accumulation of dirt and debris found in much ancient claywork. Varying proportions of zircon opacifier or tin oxide and coloring oxides with some 3134 frit (to flux the patina onto the surface) will give a range of "dirt" colors from very light to dark brown or black. These patinas can be used in many ways, but for the intended dry effect, they are never appropriate on food-contact surfaces. Following are a range of such patina recipes using oxides, opacifiers, and frit. Amounts are proportional by weight. Mix all patinas with water to a thin milky consistency.

Black - 4 black iron oxide, 3 manganese dioxide, 2 black cobalt oxide, 1 Ferro 3134 frit.
White - 9 tin oxide, 1 Ferro 3134 frit.
Dirt - 6 tin oxide, 2 red iron oxide, 1 copper carbonate, 1 Ferro 3134 frit.
Copper - 7 tin oxide, 2 copper carbonate, 1 Ferro 3134 frit.
Iron - 9 red iron oxide, 1 Ferro 3134 frit.

Wet-Effect Oxide Patinas - for a bit of shine, especially where thicker, as in corners and recesses. Never use on food-contact surfaces. Amounts are proportional by weight.

Black - 2 manganese dioxide, 2 black iron oxide, 2 black cobalt oxide, 4 Ferro 3134 frit.
White - 6 tin oxide, 4 Ferro 3134 frit.
Dirt - 3 tin oxide, 1 copper carbonate, 2 red iron oxide, 4 Ferro 3134 frit.
Copper - 4 tin oxide, 2 copper carbonate, 4 Ferro 3134 frit.
Iron - 6 red iron oxide, 4 Ferro 3134 frit.

Wax-based Patinas

Oxides and/or ceramic stains may be mixed with wax resist and used for brushed or stamped decoration on the bare clay or over a previously applied glaze. In applying a subsequent glaze, this mixture will both provide color and resist the glaze. If this mixture is to be applied over bare clay, add a little clear glaze or 3134 frit to help bond the oxide in place in the firing. As mentioned earlier, when used on bare clay, the amount of glaze or frit added will determine the degree of shine after the firing.

Cuerda Seca

A lesser-known use of wax-based oxide or ceramic stain patinas is found in the technique known by the Spanish term ***cuerda seca***, which translates as "dry cord." In this technique, oxides or ceramic stains and a small amount of glaze or 3134 frit are combined with wax resist as described above. This mixture is painted or thinly trailed onto the bisque-fired to create a line drawing of a pattern or image. Contrasting colored glazes are brushed into the intervening areas of bare clay, and the wax in the Cuerda Seca mix resists the glaze, simplifying application. After the glaze firing the tinted oxide lines are generally much less shiny than the glazed areas, and the resulting effect looks similar to tile work with a colored grout line between individual ceramic tiles.

Patina/Wash Effects

- Patina applied over relief surface, sponged off high spots, high-fired without glaze.
- Patina applied over relief surface, sponged off high spots, glaze applied overall.
- Glaze applied over relief pattern/texture surface, and then oxide wash lightly brushed or sponge-stamped onto high spots.
- Patina brushwork on top of dry raw glaze surface.
- Sponge-stamped pattern/design applied with patina on dry raw glaze surface.
- Patina spattered (using fingers or toothbrush) on raw glaze surface for visual texture.
- Oxide wash sprayed over portions of raw glaze coating to give transitions in color.
- Cuerda Seca.

Glaze Qualities and Effects

There are a myriad of possibilities to consider in glazing. In approaching glazes we immediately think of color and gloss, but these are just two of many considerations. We will be studying the chemistry and physics of clay and glazes next semester, so I have kept this fairly simple and have included just enough technical information to help you understand what is going on.

Glaze Color

Color alone involves a range of variations including ***hue***, ***shade***, ***tint***, ***intensity***, and ***saturation***. This is the language of painting and drawing, and for the most part is applicable to glaze color. ***Hue*** is the actual color such as red or blue. In the value scale from light to dark, a ***shade*** of a color is darkened from the median point by the addition of black pigment, and a ***tint*** of a color is the opposite, lightened with addition of white pigment. ***Intensity*** is the brightness of the hue – the degree to which it commands attention and seems to jump off the surface. ***Saturation*** is the depth and richness of color, resulting from the combination of hue, intensity, and shade or tint. In ceramics, color is controlled primarily by the addition of ceramic stains or the metallic oxides of cobalt, chrome, iron, copper, manganese, and titanium, but each of those oxides can produce a range of colors depending on what else is in the glaze and through careful management of the firing atmosphere and cooling rate.

Glaze Transparency and Surface

Glaze is essentially a coating of glass, and in thinking of it as such we often assume a gloss surface, but gloss is just one of many options. Glazes are silica glass with various modifiers added to affect behavior and appearance. Depending on glaze materials and modifiers present, a glaze can be ***gloss***, ***semi-gloss***, ***semi-matt***, or ***matt***. These are qualities of reflectivity and visual/actual texture, but variables in glaze appearance may also include ***transparency/opacity***, ***translucency***, ***iridescence***, ***thickness***, and ***mobility*** (viscosity/flowing at maturation temperature). The most transparent glazes are invariably glossy, because anything other than a high-gloss surface interferes with transparency. However, high-gloss can be garish and will show every surface flaw. Most potters prefer semi-gloss or semi-matt glazes that provide a very appealing silky surface texture often far more pleasing to the touch. Even semi-gloss or semi-matt clear glazes can still have significant transparency, and can work very well over slip or engobe-decorated surfaces, showing the variations of color but with a muted surface reflectivity.

Glass is a non-crystalline substance, but various glaze materials can form crystalline bonds internally or on the surface. High-gloss glazes feature a well-formed glass with very little crystal-growth at the surface. This can be encouraged by higher percentages of the ***alkaline fluxes*** or ***melters***. Glossy surfaces are helped by fast cooling, but other desirable glaze effects can suffer from fast cooling, so it is best to achieve the desired degree of gloss through proper formulation of the glaze with a suitable content of alkaline fluxes. We will be working with this next semester in the clay-glaze class, and you will learn how to use the ***Insight*** glaze-calculation program, which makes it very easy to adjust such things in glaze recipes.

In a properly-formulated glaze, surface mattness is the result of crystal formation on the surface of the glaze during the cooling cycle, and the best semi-matt and matt glazes benefit from slow cooling to promote crystal growth. The primary glaze materials that form such crystals are the ***alkaline earth fluxes*** or melters. When a glaze is supposed to be matt but comes out semi-matt or semi-gloss, it is almost always the result of quick cooling. Large gas kilns do not need any special attention to cool slowly other than closing the damper for the first two to four hours after shutting off the burners. Small electric kilns like our toploaders are often "fired down" using a custom program that turns the elements back on to initiate a slow cool or soaking period at around 1800°F.

Translucency and opacity can be controlled several ways. They can both result from the growth of crystals within and upon the glaze during the cooling ramp as described above. A glaze that is semi-gloss rather than a full-on gloss is inherently also slightly translucent rather than fully transparent, and more so with a semi-matt glaze. A matt glaze is generally quite opaque.

Translucency and opacity can result from particles or globules of inert materials suspended within the glaze. When we do not want to compromise a gloss or semi-gloss surface, opacity is achieved by adding highly refractory material such as tin oxide or a zircon opacifiers like Zircopax. The particles of these materials simply remain as inclusions suspended in the glaze, interfering with transparency without effecting any other quality of the glaze.

Iridescence can result from several different phenomena. With slow cooling, surface crystals are sometimes reflective, creating an iridescent effect, as in some aventurine and saturated iron "kaki" glazes. The presence of an immiscible material such as phosphorus (usually from bone ash) produces small globules suspended within the glaze. As long as the glaze is otherwise transparent, the reflective surface of these globules can create a very appealing iridescence as is often found in Chun blue glazes. Iridescence can also result from tiny bubbles suspended in the glaze, but this is difficult to control. When a glaze is formulated so that the degree of melting is just right for this effect, not all air escapes from the glaze as the particles fuse together into a glass, and the residual air remains as fine bubbles trapped within the glaze. The size and distribution of these bubbles results in pinpoints of reflected light. This effect is especially prized in some celadons.

Glaze Effects Resulting from Thickness of Application

Behavior of glazes obviously depends greatly on thickness of application. Viscosity in the glaze melt is a key issue, and we need to anticipate and control glaze mobility at maturation temperature to insure that they do not run excessively. We know that a thick application of an opaque glaze will conceal any subtleties in actual texture or relief pattern and might run all over the place. Inversely,

a very thin application of glaze will rarely run, but tends to lack the surface variation resulting from glaze pooling in recesses, and may leave a surface texture that feels raw and rough. Between these two extremes, an average thickness of glaze will deposit most thickly in recesses, thinner on flat surfaces, and thinnest on outside edges and corners.

Effect of Thickness on Value (Scale of Light to Dark)

Transparent colored glazes such as celadons and Chun blues will always appear darker where thicker, especially where the glaze deposits in inside corners, grooves, or other recesses in the surface. When such a glaze is applied quite thickly it may completely eliminate actual three-dimensional relief such as shallow carved or stamped pattern or texture, and yet the pattern or texture will still be fully visible due to the value scale of light to dark where the glaze is thick to thin. Classic Chinese Song Dynasty celadons are the prime example of this effect. When applied over a carved relief surface, the celadon glaze settles more thickly in the carved recesses, producing a range of value from light to dark from a single glaze.

For heavily textured surfaces, glaze may be applied by any of the conventional methods and then sponged off the high spots. The piece can be fired like that, or can be quick-dipped or sprayed with the same glaze or a different glaze to restore a thin glaze coating on the high spots.

Effect of Thickness on Reduction and Reoxidation – Color-Breaking

One of the most important and interesting glaze effects is ***color-breaking***, where a single glaze produces two or more contrasting colors dependent on glaze thickness and the effects of oxidation and reduction. The most dramatic color breaking generally occurs in reduction high-firing. The classic East-Asian brown-black temmoku glaze is a perfect example. The color in temmoku results from iron oxide in the glaze, and most of the iron color we encounter in rocks and in ceramics is red iron oxide, which is the oxidized form of iron, as in ordinary iron rust. In reduction-firing in a gas kiln we put the kiln into a reducing atmosphere at appropriate times during the firing, creating an atmosphere rich in free carbon monoxide and hydrogen molecules, which are active reducing agents aggressively seeking oxygen atoms in order to oxidize to the more stable carbon dioxide and water vapor. In a reducing atmosphere, the iron in a temmoku glaze gives up oxygen atoms and reduces to black iron oxide. Where the glaze is thick, this black coloring is permanently retained, but where thin, the iron will oxidize back to the red color after the kiln is shut down and abundant oxygen is available. A classic temmoku glaze is black or black-brown where thick, breaking to brown or red-brown where thinner, usually on rims and outside corners and edges. If a temmoku is applied too thin, the entire surface will re-oxidize to red-brown. If the glaze is applied fairly thick overall on a form with no variations in surface relief, the entire piece might be pure black except for where the glaze breaks to brown along the rim or other outward edges, which can be dramatic.

Similarly, when a properly formulated and applied copper red glaze is fired in a well-managed reduction firing with early body-reduction at cone-012, the very small percentage of copper present will reduce to red copper oxide, a very powerful red colorant. Wherever the glaze is thick the red will be retained, but where thin the copper will re-oxidize to black copper oxide, which in such small amounts is be invisible. This is especially striking on porcelain and white stoneware bodies, where the rims and outside edges are white against a deep red.

All of these glaze-thickness effects including color-breaking generally work best when the glaze is dipped or poured, but can work with other application methods done properly. They will work when glaze is applied with a brush as long as you lay down a flowing coat. Similarly, when glazes are sprayed, as long as you maintain a barely-flowing "puddle" where the glaze deposits on the work as you are spraying, the glaze will settle more deeply in recesses and promote these effects.

Layering Glazes and Patinas

Very interesting glaze effects can be achieved by layering glazes and patinas, and there are many ways to do this. A piece can be coated with one glaze, wax resist decoration applied with a brush or sponge-stamp over the dry glaze surface, followed by a second glaze or brushed on patina. Where the wax decoration has been applied, there will only be the single glaze. This can be repeated multiple times, but beware of piling on too much glaze. When in doubt, always fire the piece on wadding in a waster saucer or tray.

Any glaze or patina can be quick-dipped, brushed, trailed, sprayed, spattered, or sponge-stamped over another glaze. Again, keep in mind the general guidelines for glaze applications and avoid excessive buildup of glaze. Double dipping is rarely a good idea overall unless your glazes are adequately thinned and you do very quick dips. Sponge-stamped patterns are one of the most interesting ways to achieved rich layered pattern effects at all firing temperatures.

When glazes are brushed over a raw glaze coating the brush will tend to drag unless the second glaze is thinned with a little water. Select a soft watercolor brush with good reservoir capacity, load it up with glaze, and use quick, fluid strokes.

Glazes can be trailed and/or dripped over a raw glaze coating with a slip-trailing bulb, and this can create dramatic effects thickness of glaze decoration applied with the bulb as compared to the thinner coat from a brush. A brush coat atop another glaze tends to blend in with the glaze beneath, while trailed marks are more likely to remain distinctly separate, showing greater contrast between the two glazes.

Glaze Sgraffito

This is an underused technique that can create very interesting effects. Once the initial glaze coating is dry, paint wax resist over the whole surface. Carve or scrape a design through the wax and the glaze, exposing the claybody beneath. The wax is necessary to help prevent the glaze from chipping and flaking as you carve or scrape the design. When the piece is fired, bare clay will show wherever you have carved away the glaze.

Glaze Sgraffito with Glaze or Patina Inlay

The same technique can be carried a step farther. With a coat of glaze and a coat of wax, carve or scrape back down to the claybody and then either dip the piece in a second glaze, or brush or sponge a patina or glaze over the surface so that it adheres only to the carved/scraped areas. For a further elaboration, wax those surfaces and then carve/scrape more areas and repeat as many times as you wish with different glazes or patinas.

Glaze Effects – "RW" means "run-warning" – fire on a waster saucer/tray.

- Glaze applied (pour, dip, brush, spray) to relief surface and sponged off the high spots.
- Glaze applied (pour, dip, brush, spray) to a relief surface and sponged off the high spots, contrasting glaze applied only to high spots by dabbing with a glaze-loaded sponge.
- Glaze applied (pour, dip, brush, spray) to a relief surface and sponged off the high spots, and then quick-dipped or sprayed with a second glaze. ***RW***
- Glaze color-breaking - select glazes that tend to break color from thick to thin, apply to relief surface by dipping, pouring, brushing a flowing coat, or spraying a flowing coat. Experiment with thick and thin coats. ***RW*** if thick.
- Glaze design painted with brush over a raw glaze surface.
- Glaze surface variegation sprayed over raw glaze surface. ***RW***
- Glaze surface variegation by dusting wood-ash over raw glaze on rim/shoulder (when first glaze is still wet, ash will stick to vertical surfaces as well, but don't overdo it). ***RW***
- Contrasting glazes spattered on raw glaze surface for visual texture. ***RW*** if done heavily.
- Multiple glazes sprayed so as to give transitions in color and blended effects. Be carefully not to apply too much glaze. ***RW***
- Glaze design sponge-stamped over unglazed surface, for firing in salt or soda.
- Design sponge-stamped with contrasting glaze over a raw glaze surface.
- Glaze sgraffito cut or scraped through wax-coated glaze surface, exposing bare clay (maybe fire in salt/soda).
- Glaze sgraffito cut or scraped through wax-coated raw glaze surface. Apply a patina (high-fire only), underglaze, or another glaze to sgraffito areas by dipping, brushing, or trailing. Wipe residual patina, underglaze, or glaze from waxed areas with flat surface of a damp sponge, taking care not to remove any from sgraffito areas.
- Same as previous technique, but once you inlay glaze, patina, or underglaze in carved or scraped areas and wipe away the residue, wax those areas and carve or scrape more areas and inlay with different colors. Repeat as many times as you wish.
- Glaze trailing over bare clay on work to be salt or soda-fired.
- Glaze trailing over another glaze. ***RW*** if heavily done.
- Wax resist design painted or sponge-stamped over unglazed clay surface, quick-dipped or sprayed with glaze (maybe fire in salt or soda).
- Wax resist design painted or sponge-stamped over raw glaze surface, quick-dipped, brushed, or sprayed with second glaze or oxide patina. ***RW***
- Create resist design with masking tape or stickers over bare clay before applying glaze with sponge, pour, dip, brush, or spray, and fire in salt or soda.
- Create resist design with masking tape, stickers, or latex over bare clay before applying glaze with sponge, brush, pour, dip, or spray, remove masking tape, stickers, or latex and pour, dip, or spray second glaze overall. ***RW***
- Layering multiple glazes. Insides of bowls/plates are especially appropriate for experimentation since you do not have to worry about the glaze running off onto the shelf. Avoid deep pooling of glaze in the bottom of plates or bowls, because it is a gimmicky effect and renders the piece non-functional. When experimenting with layering multiple glazes on the outside of vertical forms, try to confine the layering to the upper portion of the form until you know the behavior of the glazes. ***RW!!***

In your tests be sure to use clear, opaque, gloss, and matt glazes. Try a good range of glazes on both flat and relief surfaces on both horizontal and vertical forms. On slip-decorated or underglaze-decorated work, if the slip/underglaze effect is primarily textural or relief (as in high-relief slip-trailing), then both transparent and opaque glazes will work. A slip/underglaze effect involving color contrast could be finished with a transparent or translucent glaze. With each test piece and with all the work you are firing for the rest of the semester, carefully plan and record all of the effects you use, so that you (and the rest of us) can learn as much as possible from your results no matter how they turn out.

As you approach glaze experiments, examine midrange and high-fire glazes and decide which glazes give good surface variation. Think about why this variation occurs. Consider all the variations in glaze color discussed above including value-contrast in transparent glazes, and color-breaking in other glazes. Consider transparency/opacity, translucency, and iridescence. Be thinking about all these phenomena when glazing your work, and be sure to record the specifics of all of your experiments carefully in a notebook or sketchbook so you can learn as much as possible from your results.

To really learn a lot about types of glazes and their behavior, get in the habit of doing lots of tests. Ceramic surface design techniques make up a visual vocabulary, and your experiments will provide you with a much broader vocabulary of possibility. Being able to effectively communicate your concept and intent through your work depends on the degree to which you can “speak this language” fluently.