Unlock the secrets to Mid-Range Glazes

John Britt has created the ultimate guide to mid-range glazes for working potters with hundreds of glaze recipes. It will help ceramic artists understand that glazes require not only a recipe, but also a suitable clay body, mixing directions, proper application, and specific firing and cooling cycles.

With intense stains, washes, and underglazes, Britt coaches potters through ways to boost their colors and achieve mid-range results that are every bit as stunning as high-fire. John also covers the frontier of mid-range, with instructions and tips for wood, salt, and soda firing.
Salt, Soda, and Wood-Fired Glazes

Salt, soda, and especially wood firing are traditionally cone 10 processes. But recently, cone 6 soda firing has become more popular, perhaps because soda firing is a relatively recent innovation and potters feel a bit freer to experiment with it.

I'll discuss these two types of firing separately, first salt/soda, then wood, but they're in no way mutually exclusive.

Many potters fire with wood and also add salt or soda at the end of the firing. And some potters, out of necessity, merely use wood as a fuel source, thereby including many other glaze types.

Salt and Soda Glazes

Before delving into the subject of salt and soda firing, I want to emphasize that there are really no "official" salt or soda glazes, in the way that there are crystalline or matte glazes. Soda and salt glazes are merely glazes that look good in soda or salt firings. These are generally arrived at by the aesthetic sensibilities of the artist, obtained through old-fashioned trial and error. Almost any glaze in this book can be used in a salt or soda firing. (See tiles 1-8.)

One of the tricks to choosing glazes for salt and soda is to pick matte glazes that are on the verge of being glossy. That way, when the soda or salt vapors hit the glaze it easily changes to a glossy glaze in that area. This helps accentuate the directional nature of the firing (one side of the pot is glossy green, for example, and the other is a black matte). For this reason, potters often just try their cone 10 recipes at cone 6 soda or salt. These glazes may be a bit stiff or unmelted in a regular electric cone 6 firing, but in the soda or salt they're wonderful for decorative ware.

SALT/SODAS

<table>
<thead>
<tr>
<th>Glaze</th>
<th>Recipe</th>
<th>Firing Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden Fake Ash</td>
<td>Porcelain; soda fired</td>
<td>15.4</td>
</tr>
<tr>
<td>Karen's Starshine</td>
<td>Stone 2; soda fired porcelain; soda fired</td>
<td>13.7</td>
</tr>
<tr>
<td>Silverman Blue, Hamade Turquoise, Chartreuse, Kareo Black, and Sombradite Green</td>
<td>10x4x8 in. (254 x 101 x 203 mm); Parabolic cone 6; oxidized soda</td>
<td>16.0</td>
</tr>
</tbody>
</table>

* Indicates toxic ingredient.
**BLACK SLIPS**

Porcelain; soda fired

Alberta Slip

Ball Clay

Nepheline Syenite

Frit 3124

Mason 6300

*Chrome Oxide

*Cobalt Oxide

*Cobalt Carbonate

*Copper Oxide

Red Iron Oxide

*Glauber's Salt

*Glauber's Salt; porcelain; soda fired

9 Silicon Dioxide; porcelain; soda fired

10 Silicon Dioxide; stone 1; soda fired

11 Joe's Yellow 2; porcelain; soda fired

12 Joe's Yellow 2; stone 2; soda fired

13 Lignite Slip; porcelain; soda fired

14 Lignite Slip; stone 1; soda fired

15 Lignite Slip; stone 2; soda fired

16 Lignite and Helmer; porcelain; soda fired

17 Lignite and Helmer; stone 1; soda fired

18 Lignite and Helmer; stone 2; soda fired

*Indicates toxic ingredient

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**FLASHING SLIPS**

Porcelain; soda fired

Nepheline Syenite

Edwald Feldspar

Spodumene

Kainit

Helmer Kainit

Georgin Kainit

Tile & Kainit

Ball Clay

Silica

Talc

Borax

Soda Ash

Zirconia

Titanium Dioxide

*Glazes containing copper oxide are often a favorite in both salt and soda firing because copper oxide produces bright, attractive blues and greens in the presence of sodium oxide (see tiles 9 and 10). Copper glazes can also be matte black if saturated with copper oxide. As the sodium vapors flux areas, dynamic surfaces of alternating matte and glossy can be created either where the pots are directly sprayed or on those adjacent to them. This is particularly evident in directional (cross-draft) kilns due to uneven distribution of sodium oxide on the pot.

**Salt Firing**

Salt and soda firing are two forms of atmospheric glazing. This process occurs inside the kiln when common salt (sodium chloride, NaCl) or soda ash (Na₂CO₃) is introduced into the kiln at high temperatures (2500-2900°F/1370-1620°C). This is typically a high-fire technique, but salt/soda does volatilize above 2012°F/1100°C, so this allows a wide temperature range. (There's even low-temperature [cone 6a] salt fuming, possible because the fire box, where the salt and soda are introduced, is much hotter than the chamber, allowing material to volatilize.)

Upon its introduction, the salt or soda immediately vaporizes and flows vigorously throughout the kiln, coating everything with a thin layer of volatilized sodium oxide, which appears as a thin sheen of soda glass on the clay. This shading colors complement black and colored slips handomely. Another option is using a flashing slip in one area of the pot and a glaze in another. At cone 6, a variety of flashing slips can be used on bisque ware or green ware. Often the only difference is thinning the slip to a sp gr of 125. Due to the lower temperature, standard cone 10 slips don’t always flash as nicely because they’re high alumina, so often the kaolin is reduced and more flux is added to assist melting. A standard flashing slip at cone 10 would have 30-50 percent nepheline syenite, but at cone 6 it could be from 30-60 percent nepheline syenite. Other potters add borax, Zircorex, and titanium to get different flavors at cone 6. (See tiles 11 and 12.) Still other potters just use cone 10 slips and apply them thinly; then everything depends on the amount of soda or salt that is added as well as how much the kiln is reduced.

Another variation is to apply terra sigillatas at the benedry stage. Another method is to ball mill various clays like Newman Red, Redart, or Larenite and then make those into terra sigillatas. (See tiles 13-18.)

A typical firing in a large kiln requires 10-20 pounds (4.5-9 kg) of salt. Some potters use as little as 5 pounds (2.3 kg), while others prefer as much as 20-25 pounds (9-11 kg), depending on the amount of salt or soda introduced, the temperature and duration of the salting period, the type of clay body and its particle size, the glasses used, and whether the kiln is fired in an oxidation or a reduction atmosphere.

A typical firing in a large kiln requires 10-20 pounds (4.5-9 kg) of salt. Some potters use as little as 5 pounds (2.3 kg), while others prefer as much as 50 pounds (22.7 kg) per firing. You may use many forms of salt: table salt, pickling salt, kosher salt, sea salt, rock salt, or similar forms, which can have an adverse effect on the final outcome of the firing. There are many ways to salt a kiln, but most often at cone 6 it’s introduced into the kiln on an angle iron, sometime when the temperature is above cone 5. Another method is to wrap 1-2 pounds (0.5-0.9 kg) of salt into a newspaper package called a burrito, dip it in water, and throw it into the kiln. Or dissolve the salt in hot water and spray it in.

Surfaces. A variety of effects is produced, depending on the amount of soda or salt introduced, the temperature and duration of the salting period, the type of clay body and its particle size, the glasses used, and whether the kiln is fired in an oxidation or a reduction atmosphere.
Apply decals, china paints, and gold lusters: This is typically done on top of a glaze before a lower temperature re-fire, but you can mix it up and put the decals under the glaze. Some glazes will "eat" a decal in an interesting fashion, while other will obscure it to some degree.

Use wax and latex to apply resists in combination with glazes: It can be as complex or as simple as you want, but it's an easy way to add visual interest. Simply glaze a piece with one coat, wax a design, and then add another coat. Wherever the wax was painted on, it will resist the second coat, creating a two-color design. (See tile 1.)

Washes
Washes are coloring oxides combined with a flux and mixed with water, usually in a 50/50 blend. Rather than weighing the materials, most potters just measure them with a spoon. Here's a basic recipe, with variations.

Copper Wash 1
1 teaspoon copper carbonate (or Moon stains)
1 teaspoon fr1 3110 (or Gerstley borate)

Then add water to make it very thin, like watercolor paint. This is because a glaze may typically have 0.25-10 percent colorants in it, but a wash is 50 percent colorant, which is very strong; diluting it is essential, or the marks will be black and crusty instead of brown—in the case of iron oxide—or green, for copper carbonate.

This settles fairly quickly in the container, so you must continually stir it. To correct this, some potters add a teaspoon of EPK (kaolin). The kaolin suspends the other ingredients and doesn’t really interfere with the wash because it’s so high in colorant (pigments).

Copper Wash 2
1 teaspoon copper carbonate
1 teaspoon frit 3110

It would be almost impossible to list all the possible combinations of oxides, but it's easy enough to see the pattern. Just mix frit or Gerstley borate with oxides. You can also mix more than one oxide in a cup—copper, cobalt, and rutile, for example, and they don’t have to be all equal parts—and combine them with frit. Be adventurous and keep good records!

Slips
The term slip can be somewhat confusing. Slip is a mixture of clay and water. The simplest slip can be just your clay body watered down. But you can also have slip recipes. These high clay slips are usually put on leather-hard work well together.

A terra sigillata is an extreme version of this type of slip. It’s usually 100 percent clay. (Even the clay body that you make a slip from has flux and filler in addition to the clay.) But it’s deflocculated and then applied to bone-dry ware and sometimes burnished. If used very thin, it can be applied to bisque ware, too.

A simple recipe is 1500 gr of clay to 1 gallon (3.8 L) of water and 1 tablespoon (14.3 gr) of sodium silicate. Allow this to sit for several days, then siphon off the top layers, throwing away the coarse particles left at the bottom. (I avoid this process by using very fine clay like XX saggar or ball milling for two hours.) This terra sigillata can then be colored with oxides or stains.