soda firing techniques, tips and recipes

a collection of four of our favorite soda firing articles
Soda Firing Techniques, Tips and Recipes
A collection of four of our favorite articles that show the possibilities with soda firing and offer advice to get you started.

With so many different firing techniques available to choose from, all with their own set of requirements, it can be difficult to decide which is best for your work, or intimidating to experiment with a new one. High-temperature atmospheric firing techniques like soda, salt, wood and reduction can be the most challenging to learn because of the many variables involved. To help you get started with soda firing, we’ve put together Soda Firing Techniques, Tips and Glaze Recipes as a free gift. Inside, you will find articles and images from Ceramics Monthly that demonstrate the exciting aesthetic possibilities with soda firing and share practical technical information, soda glaze recipes, atmospheric slip and glaze recipes, soda glazing techniques and tips for firing a soda kiln.

Use the advice, recipes and images of the artists’ work presented here as a guide to the surfaces you’ll get with soda firing, but be sure to do some experimenting and make the technique your own!

Soda Clay and Fire
by Gail Nichols

This excerpt from the book, Soda Clay and Fire, by ceramic artist Gail Nichols provides a primer on soda firing.

Lisa Hammond
Intuited Grace
by Phil Rogers

Along with an analysis of her work, this profile of ceramic artist Lisa Hammond includes cone 12 slip and glaze recipes for soda firing.

The Many Layers of Kiln Wash
by John Britt

Britt’s how-to article on kiln wash covers what it is, how it works, why it sometimes doesn’t work (and what to do about it), why there are so many recipes, and which to use for soda firings.

More is More:
Lorna Meaden
by Stephanie Lanter

Soda firing accentuates the forms and activates the surfaces of Lorna Meaden’s work.
Soda, Clay and Fire

After years of research, one of the foremost practitioners of soda glazing shares her expertise in a new book.
The following are excerpts from the book *Soda, Clay and Fire*, by Gail Nichols, published by the American Ceramic Society. For sample sections and full bibliographical data, see www.ceramics.org/publications/soda.

Soda glazing was once hailed as an alternative to salt glazing, but has proven to be much more than that. The choice of vapor glazing is now primarily one of aesthetics, with soda’s potential extending far beyond that of imitation salt. A contemporary challenge is to explore what soda has to offer in its own right, and to set aesthetic directions for this new ceramic process.

**What is Soda?**

Soda, or sodium oxide (Na₂O), is an active ceramic flux known for its bright color response in glazes. It is chemically related to two other alkaline oxides: potassia (K₂O) and lithia (Li₂O). Soda becomes unstable above 2192°F (1200°C), making it impractical as the sole flux in high temperature glazes, unless introduced in feldspathic form. However, its ability to volatilize at high temperature makes soda highly suited to vapor glazing. When sodium chloride or carbonates are introduced into a kiln at high temperature, they produce sodium oxide in vapor form. Where that vapor comes in contact with clay surfaces, it produces a glaze with a very simple composition: soda, alumina, silica.

Common sources of soda for vapor glazing include sodium chloride (salt) and sodium carbonates (soda ash, sodium bicarbonate), although sodium hydroxide (NaOH) has also been used. Borax (Na₂B₄O₇•10H₂O) is often used as a supplementary source of soda.

The use of salt in vapor glazing was developed in Germany during the twelfth to fifteenth centuries. Through its long history and widespread industrial use, the term “salt glazing” became nearly synonymous with vapor glazing. Industrial salt glazing declined in the mid-twentieth century, in favor of more efficient, economical and environmentally acceptable production methods. But the aesthetic merits of salt glazing continued to be valued and pursued by studio potters. During the 1970s, many potters seeking chloride-free alternatives to salt glazing began experimenting with sodium carbonates. For lack of a better name, this new form of vapor glazing became known as “soda glazing.” Technically, both salt and soda glaze are formed by clay materials being exposed to soda vapor.

**How Is Soda Introduced to a Kiln?**

At Alfred University in 1973–74, Jeff Zamek investigated three methods of sodium carbonate introduction:

1. Dry sodium carbonate/bicarbonate can be dropped into the firebox using a piece of steel angle. Frequent introduction of small amounts of material, dropped from the highest point above the firebox, gives the best results. This allows time for the soda compound to vaporize during its fall before landing...
on the firebox floor. Zamek noted that the firebox must be designed to cope with a buildup of molten soda.

2. Sodium carbonates can be introduced to the kiln through a burner-blower unit. This proved to be a highly efficient method of dispersing sodium carbonate vapor, but Zamek noted some dark patches on white clay bodies, which he blamed on corrosion of the burner/blower unit.

3. Sodium carbonate can be dissolved in water and sprayed into the firebox. This spray method proved to have good results, but excess sodium carbonate in the solution would cause the spray nozzle to clog up. A solution of 6 lb. of sodium carbonate to 12 quarts (.24 kg/L) of water was satisfactory (Zamek 1974, 2–3; 1999, 166–171).

In Rhode Island, U.S.A., Jay Lacouture developed a portable soda/sawdust injector that would introduce both materials to the kiln simultaneously. He claimed, “I could now be an urban wood/salt potter without using either material and be politically correct at the same time!” (Lacouture 1993, 29).

In Montana, Rick Pope mixed rock salt with soda to make it volatilize faster. He wrote, “This combination reacts nicely in the kiln and creates a much softer and less obviously salt-glazed surface than straight sodium chloride” (Pope 1993, 29).

In yet another approach, Richard Behrens suggested dispersing alkaline carbonates in a sizeable quantity of calcium carbonate (Behrens 1974, 44). Separating the soda particles in such a nonreactive medium prevents them from melting together and promotes volatilization. It also enables soda introduction as a solid mixture, rather than as a sprayed solution.

Using Behrens’ proposal to increase the efficiency of vaporization, I tried introducing a dry mixture of sodium carbonate, sodium bicarbonate and calcium carbonate into the fireboxes [burner ports] of my gas-fired kiln. The soda did vaporize, but failed to disperse through the kiln chamber. Pots nearest the fireboxes were over-endowed with runny glassy glaze, while the rest of the pots remained dry and unglazed.

The discovery of my current soda introduction method occurred in 1992, a fortuitous accident that occurred while I was firing the soda kiln in my backyard studio in Sydney, Australia. I mistakenly spilled a quart of water into a container of dry calcium/sodium mix, and watched the unexpected setting process take place. After a few minutes, I was left with a bucketful of a hard white substance that looked like plaster. Faced with the question of what to do with it, I decided to try introducing pieces of it into the hot kiln. It went into the fireboxes quietly, no obvious drama taking place, but the draw rings began to show glaze buildup, so I repeated the process. The real moment of discovery occurred a few days later when I opened the cooled kiln. Acceptable quantities of glaze had formed on nearly all the pots, and there were some exciting flashing marks where pots had been packed closely together. Following many months of effort, this was my first soda firing that could be deemed a success. It was indeed a dandy firing, and even the need to clean kiln shelves was cause for
celebration. Here was a new and simple solution to the problem of soda introduction and glaze distribution. It opened my eyes to soda’s unexplored potential, and set the stage for further discoveries.

Clay

Soda tends to deposit large quantities of glaze on the pots it strikes first, leaving others unglazed or lightly flashed. A clay body that reacts with soda vapor too readily will result in runny, glassy, colorless glazes, particularly along the path of the flame where soda attacks the clay surfaces most heavily.

Coating pots with high-alumina kaolin slips to give them a more soda resistant surface proved a workable solution. Such slips act as effective barriers between the clay body and soda vapor, limiting glaze formation on heavily exposed areas while causing colorful flashing in lightly glazed areas (see Basic Soda Slip below).

The importance of the clay body in soda glazing cannot be overstated. In the absence of an applied glaze or slip, the clay body provides two of the major glaze components: silica and alumina (and to a lesser degree, some flux material). Understanding the roles of clay body components and their responses to soda vapor is fundamental to vapor-glaze work.

Using commercial bodies along with applied slips and glazes is a simple, practical approach to starting out with soda glazing, as it allows time and energy to be focused on mastering the mechanics of the firing process. Most potters who prepare their own clays for soda glazing also apply glazes and/or slips to the surfaces of their work.

recipes

BASIC SODA SLIP

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepheline Syenite</td>
<td>10</td>
</tr>
<tr>
<td>Kaolin</td>
<td>80</td>
</tr>
<tr>
<td>Silica (Flint)</td>
<td>10</td>
</tr>
<tr>
<td>Bentonite</td>
<td>5</td>
</tr>
<tr>
<td>Blue: Cobalt Carbonate</td>
<td>0.25-1%</td>
</tr>
<tr>
<td>Red/Brown: Iron oxide</td>
<td>1-5%</td>
</tr>
<tr>
<td>Purple/Black: Manganese Dioxide</td>
<td>1-5%</td>
</tr>
<tr>
<td>Gold: Rutile</td>
<td>1-5%</td>
</tr>
<tr>
<td>Turquoise/Green/Red: Copper Carb</td>
<td>2-10%</td>
</tr>
<tr>
<td>Commercial Stains</td>
<td>5-15%</td>
</tr>
</tbody>
</table>

100 %

The choice of kaolin used in this slip largely determines the color of the fired surface. Soda glaze quality is highly reliant on materials used, especially clay. It is important to become familiar with locally available clays and their responses to soda vapor. Developing and working with slips is a good place to start with such research.

GAIL NICHOLS SODA MIX

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Soda Ash</td>
<td>20</td>
</tr>
<tr>
<td>Sodium Bicarbonate (baking soda)</td>
<td>30</td>
</tr>
<tr>
<td>Calcium Carbonate</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Add 9 U.S. fl. oz. of water per 1 lb. (600 ml of water per 1 kg) of dry mix. Wearing gloves, mix the dry ingredients thoroughly, then add the water all at once. Stir until the mixture begins to set, then break it into small pieces.

Light soda ash is required for the setting process. A wet mixture of sodium bicarbonate and calcium carbonate will not set; neither will a mixture using dense soda ash. Sodium bicarbonate is not an essential part of the soda source, but it makes the wet mixture less caustic. Sodium bicarbonate is also inexpensive and readily available in the supermarket or from a bakers’ supplier.

As this mixture breaks down in the heat of the flame, water vapor is released along with the vaporizing soda. Water vapor helps to carry the soda through the kiln chamber, enabling good glaze distribution and evidence of flame movement on the work. Water vapor also appears to assist with soda dissociation and glaze formation.

Health and Safety Precautions

Soda ash dust is an irritant to the nose, throat, and lungs. In combination with lime, it will form sodium hydroxide (caustic soda), which can cause alkaline burns. Wear impervious rubber gloves and a NIOSH (National Institutes for Occupational Safety and Health) approved respirator mask. Chemical safety goggles are recommended for eye protection, and long sleeves and trousers should be worn. These precautions apply to all preparation and handling stages for the calcium/sodium mix, including handling the firebox residue, which is high in sodium hydroxide.

Vase, 13 in. (33 cm) in height, 2001. Dolomite wadding was used to set this vase in the kiln. The form has softened and distorted during the firing.
Hammond (who appears to be enjoying herself immensely) dries the top section of a two-part bottle before adding the shoulder and neck.
It is not surprising that Lisa Hammond has been described as the best woman potter working in Britain at the moment. I would go further. I would say that she is a prominent member of a very elite group of perhaps ten potters who, irrespective of style, gender or genre, are at the very top of a very competitive ladder. Hammond’s recent work exudes the strength, style and finesse of a potter at the very peak of her form. Classic yet somehow contemporary, crisply defined yet with a softness of form and surface, Hammond’s pots carry with them a complete “rightness” of orchestration that is the result of a thirty-year career as a professional maker of pots for a domestic setting.

Hammond is indeed a rarity in British studio ceramics: a potter making strong, adventurous, vapor-glazed stoneware...
in an inner-city, urban setting. Maze Hill Pottery, her second workshop in Greenwich, is situated in a small Victorian brick building that used to be the ticket office at Maze Hill Station, Southeast London. Hammond has been at this location since 1994, prodigiously producing an extensive range of soda glazed kitchen and tableware with an ever-increasing number of individual pieces. Alongside her production work she has organized and taught a series of twice-weekly throwing classes which she views as an important way to introduce pottery to a wider audience and, in a small way, to supplement the ever-decreasing availability of classes in the public sector. Her seemingly indefatigable energy has also seen the coming and going of a series of apprentices who, in many cases, now have their own successful careers.

The pottery itself isn’t large. Where people once purchased their tickets for the short journey into central London there are now rows of shelves lined with tall, medieval-inspired jugs, chawan (teabowls), squared and faceted bottles and lidded jars. The throwing area is small, but a well-structured system of regular monthly firings ensures that there is no bottleneck and the space is utilized to its maximum efficiency. A small corner of the building serves as a gallery and sales area. The kilns, one 90 cubic feet and another, a more modest 40 cubic feet, are situated outside next to the railway line and must have caused more than one quizzical glance from a passing passenger in the darkness of night.

Presently, in the United Kingdom at least, there seems to be a plethora of metropolitan potters making inane, frankly, very boring, and extremely “safe” porcelain tableware in that ubiquitous minimalist or interiors style. Hammond, on the other hand, is a potter that has never been afraid to take her work to new and often taxing levels. Throughout her career she has consistently tested her materials to the limit and continues to research new clay bodies and slips that will both complement the Shino glazes and respond well with the capricious atmosphere of the vapor kiln. Hammond has never been content with the relative comfort of past successes. Her inquisitive nature and fascination for all things ceramic demands continuous experimentation.
She is no less vigorous in her quest for the perfect firing and is constantly tweaking the schedule in response to unexpected, often minute but possibly welcome, variance in a previous firing. Recently Hammond’s work has taken another interesting and imaginative path with her newfound passion for the Japanese Shino glaze, which she fires in two different ways: in a dedicated eighty-hour, gas-fueled kiln; and in conjunction with the vaporous atmosphere of the soda kiln. These new experiments have yielded glazes with great physical depth and intensity of color and can quite genuinely be said to be innovative and groundbreaking.

The Boston potter Warren Mather is credited by many in the U.S. for the introduction of vapor glazing by virtue of sodium carbonate rather than sodium chloride. Initially thought to be environmentally less damaging than the chloride, there was much enthusiasm for the carbonate as a friendlier alternative. Research carried out in the U.S. by Wil Shynkaruk and Gil Stengel (see “The Truth About Salt,” by Gil Stengel, September 1998 CM) and in the U.K. by Peter Meanley, has shown fairly conclusively that this may not, in fact, be the case. However, whatever the rights or wrongs of the environmental issues, it is fair to say that Hammond, as far back as 1982, was a pioneer of the technique in the United Kingdom.

Early experiments were not immediately successful. Eventually though, it was realized that the sodium carbonate, on exposure to the white heat of 2300°F (1260°C), is chemically broken down in a very different way than sodium chloride. Instead of that all-consuming explosion of vapor that occurs with the chloride, the carbonate is a slower process and the vapors less overwhelming. In contrast to the plumes of white exhaust at the chimney of the salt kiln, there is little to see from the chimney of a soda firing. Hammond set about exploiting the tendency of sodium carbonate to exit the kiln by a well-defined path and encouraged the characteristic flashing associated with sodium carbonate. Later, she taught the technique at Goldsmiths College in London where, amongst others, Ruthanne Tidball was a receptive student.

Japan has always been a place that Hammond has turned to both for inspiration and,
in recent years, as a market for her pots. Indeed, early in 2007 she will be only the second non–Japanese potter to have an exhibition of her work at the Mashiko Museum of Ceramic Art and then at the prestigious Keio department store in Tokyo. The experience of a prolonged working period alongside renowned Shino potter Rizu Takahashi at his pottery in Mino was to become a watershed in her career. Having been, for many years, the leading exponent of the art of soda firing, Hammond had found, in Shino glazes, a new and exciting means of expression that she instinctively felt would sit comfortably alongside the soda glazed aspect of her work. In Hammond’s hands, the rich oranges and pinks from the soda kiln rely heavily on a surfeit of alumina. Shino too, produces similar coloring from alumina rich feldspars, and the plan was born to combine both in one kiln. The Shino glaze, in the hands of the traditional Japanese potter, is quite unlike the overly refined, somewhat synthetic Western versions. Difficult, unreliable, inconsistent and demanding, Shino in its truest form is an enigma. In essence, the ingredients are very simple; the recipe sometimes contains just one material: feldspar. The difficult part—the mystery that makes the perfect Shino almost the potter’s Holy Grail—is the complex, often protracted firing with its irregular temperature gradient and reduction cooling. With an understanding rare in the West, Hammond inspects every nuance, every unexpected variance of color or texture in great detail, either in an attempt to repeat an effect or to eliminate it in the next firing. Uncompromising in her quest for the qualities she seeks, Hammond is always open and receptive to alternative directions that the kilns or the materials might suggest to her. The combination of the capricious vaporeous atmosphere, the unctuous Shino glazes and the constant search for variation and refinement within her repertoire of faceted and altered, thrown shapes has created a new, wholly more sophisticated and seasoned body of work.

I have often related to students the notion that a good pot, irrespective of the outward appearance, should contain an inner skeleton. The fashion amongst wood firers, for instance, to make “loose” or “freely thrown” work is an attempt to ape some of the better-known Japanese wood-fired wares such as Iga or Shigaraki (particularly Iga).

Often, these pots fail because there is little understanding of the nature of the original, together with scant regard to the ‘bones’ of the pot, the skeleton I spoke of. One is left with flabby, formless and unstructured forms where it is hoped that the flashed effects of the fire will perform a miraculous rescue. Hammond’s pots display the structured form implicitly and with obvious clarity even though the outward appearance can be softened by the thick, sometimes crawled Shino glaze or the extreme variation of the directional soda vapor. The outer skin is draped over an inner framework and the pots sit erect and dignified, confident in their poise and balance. There is never a brushed decorative motif, no decorative afterthought. All decoration is in the clay or in the glaze itself—confident faceting, the spontaneous sweep of the fingers through wet glaze, the unwavering and direct marks of a coarse brush or the ghostly impression of a scallop shell adding its own dynamic to the side of a swollen bottle. All of these are decorative treatments that are dictated by the structure of the pot and together they create an integral whole; an expression of the entire unity of clay, glaze and form.

It is my contention that the element that marks out the work of an excellent potter from that of the ordinary is an almost indefinable “correctness” of orchestration. There is for some an intuitive ability to see almost immediately that the proportions of a pot are correct. The neck is suited to the body; the height of the pot is appropriate to its breadth; the angle of growth appropriate to the width of the base and height of the wall to the shoulder and so on. Cardew had this talent, more so than Leach. Hamada certainly had it. Hammond
recipes

LINER GLAZE
Nepheline Syenite .................. 33.3 %
Soda Feldspar ..................... 33.3
AT Ball Clay ....................... 33.4
100.0 %

SLIP FOR SODA FIRING
China Clay ......................... 50 %
Excelsior Ball Clay ................. 40
Silica (Flint) ....................... 10
100 %

SHINO 2
Potash Feldspar ................... 55
Soda Feldspar (fine) ............... 20
China Clay ....................... 15
Ball Clay ....................... 10
100 %
This glaze can fire pink in a long firing (80 hours)
or white over a period of 12–20 hours.

PINK SHINO GLAZE
Potash Feldspar ................... 55 %
Soda Feldspar (50 mesh) ........... 25
HVAR Ball Clay ................... 20
100 %

FIRINGS
For a soda glaze firing, pots are raw fired in a gas kiln to Cone 12 over a 30-hour cycle.
Reduction commences at cone 07. The soda is sprayed in as a saturated solution at cone 8
and there is a 1½ hour soak at the end.
A Shino glaze firing lasts approximately 80 hours. Hammond fires 18 hours to 1688°F
(920°C) when a strong reduction commences. Then it is a very slow climb to 2048°F (1120°C) and then a period
of neutral fire to 2300°F (1260°C). A 5-hour soak is then followed by a slow firing down
in reduction to 920°C.

Hammond’s recent show at the impressive Goldmark Gallery in Uppingham, U.K., was an amazing success. Of 160 pieces shown almost all were sold, and collectors were unanimous in their opinion that it was an exhibition of importance and one to remember and to savor. Hammond showed her full range of shapes, colors and textures: Thick, unctuous Shinos, pitted and crawled in the most marvelous ways, glowing with pink and orange warmth. Ash celadons provide a cooler green or blue counterpoise to the heat of the Shino. Finger sweeps through slip and glaze create an energy over the surface of the chawan (teabowl) and yunomi (teacup) complimenting the relaxed throwing. The sensitive and imaginative use of a second, poured layer of glaze conjures images of landscape or waterfall. The exhibition was a tour de force and is fortunately recorded in a lavishly illustrated catalog that is available from the Goldmark Gallery (www.modernpots.com).

For me, at least, studio pottery should say something about the intimate and often elemental relationship of glaze to clay. A pot should communicate the makers joy and endeavor in its making and converse with its purchaser on a daily basis, revealing new and formerly unseen secrets. A pot should display a sense of adventure. For Lisa Hammond, pottery is an all-consuming vocation. Yes, it represents her livelihood, but to Hammond, pottery represents far more than a means to exist. Pottery is her life, her passion. I know no other potter who is more concerned with the search for constant improvement and refinement. The new work, with its austere Japanese influence integrated with a European potter’s instinctive marriage of function and aesthetic consideration, is elevated from merely good, honest, robust domestic pottery to pots with significant and lasting virtue.
Some people might think that kiln wash is the place where you take your car kiln to get it cleaned. Well, that may be a good idea for a lot of kilns I have seen, but kiln wash is really a necessary and valuable tool for potters. It protects kiln shelves from glaze runs, drips and other accidents that occur in red hot kilns, like pots that tip over, bloating or melting clay bodies, etc. It is also used to protect shelves from volatiles in atmospheric kilns like wood ash or sodium oxide in salt and soda kilns.

Most potters don’t give it a second thought and grab any recipe or just use anything that is in the bucket labeled “kiln wash.” However, in order to make a good kiln wash you need to select materials that have very high melting points and that, when combined, do not create eutectics that cause melting. Knowing a bit about the properties of materials and the principles of kiln wash allows you to choose the ingredients that make the best kiln wash for your specific situation and avoid costly problems.

Kiln wash is used in the full range of ceramics firing from cone 022 to cone 14 and everywhere in between. The type of kiln wash needed varies for each specific situation because some potters work in electric kilns at low-fire temperatures, while others work with fuel-fired kilns at very high temperatures.

Understanding the structure of a glaze is helpful when selecting or creating kiln wash recipes so you can understand how not to create a glaze on your kiln shelf. Very simply, a glaze is composed of a glass-former (silica), a flux (sodium, potassium, lithium, barium, magnesium, zinc, boron or lead oxide) and a refractory (alumina, usually sourced from clay/kaolin). Historically, what potters...
did was to leave out the flux in their glaze recipe to make their kiln wash. That meant that only silica and alumina (kaolin/clay) were used as the kiln wash.

One of the first kiln wash recipes I used was:

**BASIC KILN WASH**

- EPK Kaolin .......................... 50 %
- Silica (Flint) ........................ 50 %

This means you use 50 grams of silica and 50 grams of kaolin. In everyday practice, potters rushing to load a kiln, often just use a scoop of kaolin and a scoop of silica. This is not technically accurate because silica weighs more than kaolin, but it is close enough to work.

Silicon dioxide has a melting point of 3100°F (1710°C) and aluminum oxide has a melting point of 3722°F (2050°C). Since potters fire to temperatures between 1100°F (593°C) and 2400°F (1315°C) a mixture of these two materials will not melt, will not form a eutectic, and will protect the kiln shelves. (The source of alumina in kiln wash is often kaolin, but it can also be alumina hydrate or alumina oxide. The source of silicon dioxide is usually 200 mesh silica.)

This is a good kiln wash for low and midrange electric firings. The only problem is that it contains silica, which is a glass-former. So, if a lot of glaze drips onto the shelf, it can melt the silica in the kiln wash and form a glaze on the shelf. Also, when you scrape your shelves to clean them, you create a lot of silica dust, which is a known carcinogen. So using silica in your kiln wash is not always the best choice.

Another drawback of this recipe is that, if it is used in salt or soda firings, it will most certainly create a glaze on the shelf. This is because silica, as noted above, is a glass-former. When sodium oxide, which is a strong flux, is introduced atmospherically, it can easily melt the silica in the kiln wash into a glass. This is why silica should not be used in a kiln wash recipe for wood, salt or soda kilns.

For these types of firings this kiln wash is better:

**BASIC SALT KILN WASH**

- Alumina Hydrate ..................... 50 %
- EPK Kaolin .......................... 50 %

Kaolin has a melting point of 3218°F (1770°C) and alumina oxide has a melting point of 3722°F (2050°C), so it will not melt, even in a cone 10–13 firing. These ingredients are called refractory
washes is that they crack off the shelf. The reason for this is that clay has the physical property of shrinkage. When you put it on the shelf, it looks really uniform and smooth, but then as it dries it cracks like Texas soil in the summer sun. After several firings, you typically just scrape off the glaze drips and the pieces that have chipped up, apply more kiln wash to hide that firing’s issues; and then that new layer cracks and the crevasses just keep getting worse. This can cause your pots to crack when they get hung up on the uneven wash during periods of expansion/contraction. Or, when using porcelain, the foot can even become warped and uneven as it fluxes and conforms to the uneven surface of the shelf. Another more insidious problem with cracked kiln wash is that the turbulence created by the burners blows some of the kiln wash chips up into the air and they inevitably land in your favorite bowl, ruining it.

The best way to avoid this is to calcine the kaolin or buy calcined kaolin called Glomax. You can calcine kaolin by putting some in a bisque bowl and firing it to red heat (or just put it in with your bisque firing.) Calcining will eliminate the physical property of shrinkage but leave the chemical refractory properties of kaolin intact. What you have made is very fine ceramic grog. So you can adjust your kiln wash recipes by substituting half the kaolin with calcined kaolin or Glomax.

**Super Awesome No Crack Kiln Wash**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alumina Hydrate</td>
<td>50%</td>
</tr>
<tr>
<td>Calcined EPK Kaolin</td>
<td>25%</td>
</tr>
<tr>
<td>EPK Kaolin</td>
<td>25%</td>
</tr>
</tbody>
</table>

100%

Although it seems crazy to add flux to a kiln wash, this very small amount actually is just enough for the kiln wash to stick it lightly to itself and to the shelf, preventing the kiln wash chips from flying around the kiln and getting onto pots.

As you can see in the recipes on page 54, there are many kiln wash variations. However, it is essential to know the melting properties of ingredients to make sure that they don’t melt on your shelf. For example, zirconium oxide is a refractory and melts at 4892°F (2700°C) and zirconium silicate, which goes under various names like Zircopax, Ultrox, Superpax, milled zircon, zircon flour, etc., has a melting point of 4622°F (2550°C). So these can make excellent additions to a kiln wash recipe. The only drawback is that zirconium silicates can cost from $1.33 to $3.00 a pound, depending on the amount you buy.
Most potters apply kiln wash with some kind of brush. If you are coating the whole shelf, use a 4- or 5-inch house-painting brush, but if you are touching up bare spots after scraping off glaze drips, use a small 1-inch glaze brush and just dab it on in the spots that need it. If you use a brush, work very fast because the shelf will suck up the wash as soon as the brush touches it, making areas of uneven thickness.

Mix up the wash about as thick as heavy cream and paint on several thick layers to protect your shelves, allowing each to stiffen before applying the next coat. Then clean the edges with a wet sponge. Some potters leave a bare ½-inch or ¼-inch band at the edge of the shelf so that chips don’t fall onto the shelf below.

If you have a lot of shelves to kiln wash all at once, one of the best and fastest ways is to use a spray gun. Lay out all of your shelves in a row and coat them all very quickly and evenly. Depending on your spray gun, you may need to adjust the nozzle spray pattern and the thickness of the wash to get it to spray properly, but once you get that figured out you will be very happy with the consistency of the results. Any overspray on the sides of the shelves can be wiped off with a damp sponge.

If you don’t have a spray gun, another excellent method of coating the whole shelf is to use a paint roller with a short nap length. Just fill the rolling pan with kiln wash and roll on the wash for a smooth, even coat. Allow it to get tacky to the touch and then apply another one or two coats, depending on the thickness desired.

At my studio, I have a lot of students working and testing glazes, so the shelves get really beat up and have a lot of glaze drips. Once or twice a year I grind my shelves clean and re-apply the wash. Since I don’t have a spray gun, I prefer to use a roller because it gives a smooth even coat very quickly.
To illustrate the wide variety, some potters just dust alumina hydrate on their shelves to protect them, while some wood firing potters use 100% silica and wall paper paste to make a very thick (½-inch) coating that protects their shelves from excessive ash deposits. Still others, who have the new advanced nitride-bonded silicon carbide shelves, don’t even use kiln wash at all because the glaze drips shiver off when the shelves cool. Other potters, who are very neat and don’t share their space with others, may not even use kiln wash so that they can flip the shelves after every firing to prevent warping.

Kiln wash is such a ubiquitous material in the ceramics studio that we take it for granted. Potter's make a significant investment in their kiln shelves but rarely take more than a few minutes to mix up two scoops of kaolin and alumina to protect them. They also spend countless hours making and perfecting their work only to suffer unnecessary breakage and loss of pots because they just don’t know that a kiln wash doesn’t have to crack or fly off into the bottoms of pots. There are many kiln wash recipes to choose from and many solutions to common kiln wash problems if we just take the time to learn about the materials we use.

<table>
<thead>
<tr>
<th>recipes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KARL’S KILLER KILN WASH</strong></td>
</tr>
<tr>
<td>Ball Clay ........................................... 10 %</td>
</tr>
<tr>
<td>EPK Kaolin ........................................... 30</td>
</tr>
<tr>
<td>Silica (Flint) ...................................... 20</td>
</tr>
<tr>
<td>Ultrox ................................................ 40</td>
</tr>
<tr>
<td>100 %</td>
</tr>
<tr>
<td><strong>BUCK’S KILN WASH</strong></td>
</tr>
<tr>
<td>Alumina Hydrate ................................. 32 %</td>
</tr>
<tr>
<td>Kyanite (25 mesh) ............................... 17</td>
</tr>
<tr>
<td>EPK Kaolin .......................................... 35</td>
</tr>
<tr>
<td>Sand ................................................... 16</td>
</tr>
<tr>
<td>100 %</td>
</tr>
<tr>
<td><strong>KILN WASH I</strong></td>
</tr>
<tr>
<td>EPK Kaolin .......................................... 10 %</td>
</tr>
<tr>
<td>Zircopax ............................................ 90</td>
</tr>
<tr>
<td>100 %</td>
</tr>
<tr>
<td><strong>KILN WASH II</strong></td>
</tr>
<tr>
<td>Alumina Hydrate ................................. 25 %</td>
</tr>
<tr>
<td>Calcined EPK Kaolin ......................... 25</td>
</tr>
<tr>
<td>EPK Kaolin .......................................... 25</td>
</tr>
<tr>
<td>Zircopax ............................................ 25</td>
</tr>
<tr>
<td>100 %</td>
</tr>
<tr>
<td><strong>KILN WASH III</strong></td>
</tr>
<tr>
<td>Alumina Hydrate ................................. 9 %</td>
</tr>
<tr>
<td>Calcined EPK Kaolin ......................... 28</td>
</tr>
<tr>
<td>EPK Kaolin .......................................... 18</td>
</tr>
<tr>
<td>Silica (Flint) ...................................... 45</td>
</tr>
<tr>
<td>100 %</td>
</tr>
</tbody>
</table>

So as you can see, kiln wash doesn’t have to be just silica and alumina. As new materials have become more readily available, there are quite a variety of refractory ingredients in kiln wash recipes and knowing the properties and cost of the ingredients will allow you to select the ones that best serve your needs.

This pot, by Linda McFarling, is on wadding made from Basic Salt Kiln Wash. Notice what happens to the shelf edges when silica and soda meet.

more is more:
Lorna Meaden
by Stephanie Lanter

Punch Bowl, 19 in (48 cm) in height, thrown and altered porcelain, soda fired to cone 10, 2008.
Ms. Meaden is going to buy the flowers herself—and the punch, and the whisky, and the gravy, and the sugar and the lemonade and the tea and the candles and the ice and everything else. There’s going to be a party.

And at this party, unlike Andrea del Sarto’s assertion that, “less is more, Lucrezia” (Robert Browning, “Faultless Painter,” 1855) less isn’t more. More is more. And perhaps Mies Van Der Rohe and Coco Chanel got it wrong anyway; maybe in this poem del Sarto was simply referring to his wife’s infidelity rather than declaring an aesthetic trump. Regardless, Lorna Meaden’s most distinctive functional works defy this Modernist mantra in more ways than one.

Lots of pots allude to social circumstances or celebrate community meals, but few so equally mirror and design social structures. Few can actually physically engage as many individuals at once as these can. Gratifications invite and then reward, disperse from their tidy places in containers or on hooks; set free for enjoyment by the hostess. Like the porcelain on her beloved wheel, a fete containing one of Meaden’s Punch Bowls with Cups would simply revolve around it. You know a pot has character when, in merely beholding it, visions of shoulder rubbing, sparkling socialites appear (eight in this case), and into the ear float bits of conversation. One can feel the tension as guests inch closer to that seductive black ladle, vying with clinking cups in hand for more beverage but behaving to preserve the balance of the occasion, the fragility of the edges. For not only are human borders breakable—clay on clay demands attention.

Perhaps invoked by the piece’s pattern of diamonds or the tiny scepter heads dotting the rim, a jester, costumed in patchwork and pinstripe, will creep in and crash the scene. This symbolic twin to the king, sprung from the bowels of the bowl, may begin a rant, pinstripe, will creep in and crash the scene. This symbolic twin to the king, sprung from the bowels of the bowl, may begin a rant, playfully, interpreting current dramas, overturning common notions, waxing poetic, his role as fool giving him immunity to the confines of propriety.

Even without the intoxicated company, however, the large, fleshy, green teureen seems to spin on its black platter base like a carnival ride, animated mugs flying, missing only the blinking lights and the music.

Yet rhythm pervades. In another corner of the warm, glowing room, near the coffee or tea, maybe, five spoons encircle the undulating perimeter of Meaden’s Lidded Sugar Bowl, waiting for their choreographic cue. Echoing the bowl’s rim, the horizontal line of its scalloping saucer lifts and falls like the wave of a conductor’s hand. Lively mishima (inlaid slip) lines crescendo up the curving volume of the piece, repeated in refrain and rest around the belly, ending up at the top of the lid in a knob of melodramatic vibrato.

Never a dull moment at this event! Time to unstack the whisky cups, unstop the flask, put away the bucket! (See Whiskey Bucket, p. 19)

On a more serious note, Meaden is fascinated by how “the cadence of daily life is punctuated by situations that revolve around eating and drinking.” To date, her most dynamic aesthetic examinations involve the more indulgent, festive ingesta. Perhaps this is because the ritual consumption of more “dangerous” delights bears a more complex cadence. She can naturally apply her passion for ornament and relish, and demand sensitivity of her guests. For here, a spoonful of medicine makes the sugar even sweeter: sharp points, thin wire attachments and handles must be encountered with the same gentle tempo and delicacy with which Meaden made them. Though the repeated candy-like glaze drips beg for impulsive finger licking, they also, in their very “frozen” nature, join in the chorus of their ceramic family, singing “Stop right there! Slow down . . . .” Quick, clumsy removal of the lid or spoons will yield no satisfaction, might even lead to fracture. The beauty of this active—possibly even didactic—metaphor is, ironically, its muteness.

Part of the charm of Meaden’s work, despite this layered density, is in fact its soft volume. Characteristically, it is comprised of a color palette that is rich and bright but not loud, a sense of proportion that is formal but not formidable, and a surface that is pretty but not pristine. A result of Lorna’s nostalgic motivation to honor family and heirlooms of her heritage, the blend makes sense. Learning to sew as a child, surrounded in her home by 18th century silver and Western European porcelain, Meaden combines the austerity of these mannered vessels with the sensibility of a seamstress. She imbues many of her pots with elegantly lifted feet, textile like motifs (in terms of dividing and decorating the form) and the antique, “used and loved” aura that the soda kiln bestows upon appropriately placed, action-packed slips and glazes. Bringing together metal and fabric, the industrial and the handmade, the subtle and the jovial, Meaden creates a world that is sophisticated...
but friendly, geometric and organic. It is the type of tension necessarily present in any successful creative work.

She finds comfort in patching together unlikely academic/historical influences as well as personal ones. Not only do Baroque, Victorian, and pastoral French and English serving sets play a role, but classical celadons from Song Dynasty China, flashing slips of the “Mingei Sota” potters, and Islamic designs present themselves. “It is such an American thing to pull from anywhere and everywhere you want to, referencing whatever you damn well please,” she says, quite accurately.

This desire to reconcile differences and to pack as much into the pots as possible might also stem from her career path, which recently has poised her in a spot similar to her subject matter—overflowing with promise. Meaden has an array of experiences to quilt together, to make sense of for herself. She was a studio potter in tiny Durango, Colorado for eight years before receiving her M.F.A. from Ohio University in Athens. Since graduating in 2005, she has not left the ceramics fast track for an instant. She has had teaching positions at Southern Illinois University and San Juan College in New Mexico, and artist residencies at the Archie Bray Foundation and the Anderson Ranch Arts Center. Somehow throughout all this, she managed to, in her words, “apply to every show I could,” and it paid off. In addition to being a featured demonstrator at the 2008 NCECA Conference, she is represented by numerous U.S. clay galleries. She has had a positive response to her elaborate works like these as well as cups, tumblers, bowls, plates, pitchers, teapots, crucet sets, salt and pepper shakers—you name it. From giving workshops to developing her website, Meaden is now a long way from the days of, “making round pots and putting blue glazes on them.” Stitching the first epiphany she had at a Julia Galloway workshop years ago to the values and insights embedded by mentor Brad Schwieger, she intends the studio and life she is now building to be based on balance.

But, amid all of this more, and more, and do it all, and more, how does one find balance? Whisky and gravy certainly don’t help much in

Above: Whiskey Bucket, 12 in (30 cm) in height, thrown and altered porcelain, soda fired, cone 10 to 2008.

Left: Lidded Jar, 11 in. (28 cm) in height, thrown and altered porcelain, soda fired to cone 10, 2008.
SODA FIRING FOR DEPTH AND BRIGHTNESS

I fire in heavy reduction until cone 9 is down. I then close the damper of the kiln, and turn up the gas. This produces unused fuel in the atmosphere of the kiln, trapping carbon on the surface of the pots. Then, I spray a soda ash solution into the kiln. I use a large amount of soda and water (5 lbs. soda ash to 3 gallons of water) and spray it in all at once. Afterwards, I let the kiln gain temperature until cone 10 is down. The finishing step is creating an oxidizing atmosphere to brighten the color of the glazes.

every day did they get liquor, cream or honey; wear jewelry or act with gaiety. Meaden, by perpetuating these extras—these top layers, in diet, in garment, in behavior—via carefully crafted ornamental pots, pays homage to the extravagant, the purposefully beautiful. She achieves this decadence through virtuosity in throwing, altering and handbuilding with porcelain, using textured press molds, and laboring intensely over layer by incised, scraped, brushed, resisted and dipped layer.

Demarcating these surface spaces—searching for order—is her biggest challenge, but symmetry and traditional patterns assist. Cadence runs through the assemblage of the wet and fired parts as well. But the beat is speeding up; her details are increasing. So, however, are the demands for Lorna’s work. Right now, she is “desperately trying to avoid having a list of pots I’m supposed to make hanging on the wall next to my wheel.” Another definition of balance, like the one you have in your checking account (right?), isn’t associated with equality, with canceling out. The weight is clearly on one side of the triple beam. Everyone wants steadiness, but, to resurrect the pre-party literature of del Sarto, (via Robert Browning), “A man’s reach should exceed his grasp . . . . Or what’s a heaven for?”

Ms. Meaden, get ready. The party must go on, and it might go late.

For more information on Lorna Meaden and her work, see www.lornameaden.com.

the author Stephanie Lanter, is currently Visiting Catron Professor of Art at Washburn University in Topeka, Kansas. See www.stephanielanter.com.

A VERY FINE LINE

by Lorna Meaden

Mishima pottery comes from the Japanese Island of Mishima, but it was originally transported from Korea around the 16th century. This surface design technique is a way of drawing by inlaying a slip of contrasting color into lines incised in leather-hard clay.

To create very fine lines, I use the sharpest knife I can find—a disposable scalpel—to draw on leather-hard pots. Then I fill in the etched lines with black slip, allow it to become leather hard, and scrape it off with a metal rib. After the pots are bisque fired, I then go back and divide up the space, using wax and latex glaze resist to create sections of color.

Soda firing for depth and brightness

I fire in heavy reduction until cone 9 is down. I then close the damper of the kiln, and turn up the gas. This produces unused fuel in the atmosphere of the kiln, trapping carbon on the surface of the pots. Then, I spray a soda ash solution into the kiln. I use a large amount of soda and water (5 lbs. soda ash to 3 gallons of water) and spray it in all at once. Afterwards, I let the kiln gain temperature until cone 10 is down. The finishing step is creating an oxidizing atmosphere to brighten the color of the glazes.

Mishima pottery comes from the Japanese Island of Mishima, but it was originally transported from Korea around the 16th century. This surface design technique is a way of drawing by inlaying a slip of contrasting color into lines incised in leather-hard clay.

To create very fine lines, I use the sharpest knife I can find—a disposable scalpel—to draw on leather-hard pots. Then I fill in the etched lines with black slip, allow it to become leather hard, and scrape it off with a metal rib. After the pots are bisque fired, I then go back and divide up the space, using wax and latex glaze resist to create sections of color.