

SPECIAL SECTION: SODA AND SALT FIRING: For each issue of the Newsletter, we choose a theme and ask our membership to send in their information about that theme. Feel free to suggest themes and send in any and all information that you can. We are hoping to have this be an informative "must read" section of your Newsletter. Got ideas for future themes? Send them to JanetBuskirk@gmail.com. The August Newsletter theme will be Pricing Your Work so we hope you will share what you charge for your work and why you charge that amount.

COMMERCIAL UNDERGLAZES submitted by Cynthia Spencer: For accents of color in vapor firings, a dab of commercial underglaze can be a simple way to do it. Below is a starter list of some underglazes that stay true to color in a low or residual salt firing. CCs are Duncans, Vs are Amaco Velvets. We fired them to cone 5-6:

CC132 - light blue
CC146 - orchid color
CC181 - purple
V 308 - yellow
V 309 - dark yellow
V 322 - dark blue
V 327 - teal blue
V 332 - royal bluish
V 345 - light green
V 387 - Red

FLASHING submitted by Cynthia Spencer: With salt firing I'm mostly interested in how clays will "flash" with the firings rather than if they get good orange peel or not. I pay attention to the amounts of iron in the Kaolin, what kind of Kaolin is in the clay body, and often use a slip with a slightly higher iron-content kaolin or ball clay in it to get the best glowing flash. To get the best flash you want lower amount of salt (1-3 pounds), and slightly lower temps/shorter soak (cone 9 rather than hard cone 10).

My notes below are just my simple key so hopefully someone will send you better techie info about it all.

Kaolins:

McNamee: Soft, meaning a lot more water needed to make it mix in, thus increasing the shrinkage of the claybody. Known for "peach" blush when fired in fuel kilns.

No. 6 Tile Clay: One of the purest, whitest Kaolins

Sapphire: Fine grained, strong; good substitute for No. 6 tile.

Grollegg: was considered whitest before 6 Tile Clay.

EPK: Semi-plastic. Cheapest

Helmer: Nice blushing, not mined for potters so there are chunks; needs sieving or milling

Glomax: Calcined kaolin from Georgia; slightly higher silica content

Some of the clays we use at Linn-Benton Community College's Ceramic Studio. Recipe percentages are proprietary but kaolin info below came from their websites and/or yakking with the manufacturers.

AARDVARK: Coleman: Grolleg based, beautiful flashes with slips

LAGUNA: Soldates: heavy iron content but with right slips or mixed with other clays for larger pieces can be very nice

GEORGIES:

Umpqua White: beautiful Helmer Kaolin Base

Wallowa White: Based entirely on "Clean" ball clays, for whitest look, can give the best "old fashioned" salt ware look (orange peel)

Mt. Hood Porcelain: needs a slip or can be too white/grayish, Sapphire/Grollegg blend

White Salmon: "kissing cousin to porcelain" works beautifully

G-Mix: Georgies version of Laguna B-Mix

CLAY ART CENTER:

Mac 10: First copy of B Mix, Macnamee based, EPK/Desert Minerals, Custer & Neph Sy

Takamori: 1/2 Grollegg 1/2 6 Tile Kaolin, Custer Feldspar

Kleiber: A lot like Turner Porcelain, No. 6 Tile Clay, Kaopaque Kaolin - processed, highly pure kaolin

Slips I like are Simple ones like:

80 Ball

20 Neph Sy

Or

80 Grolleg

20 Neph sy

Blair's Red: apply to white stoneware greenware for best results, if applied to porcelain, apply slightly thicker, to

iron bearing stonewares the red will turn darker buttery/leathery brown

Neph Sy 10

Grolleg 20

Helmer 70

Rhoda's Slip: nice on porcelain in soda firing

OM4 Ball Clay 70

Neph Sy 30

WOOD/ SODA: *Submitted by Hiroshi Ogawa:* I have been soda/wood firing for only 6-7 years, about 50 firings, and still in the learning process of how to do it. My soda chamber is a cantenary arch kiln that is 6' wide and 6' tall. It has a stacking space of about 80 cubic feet. I use about 36 silicon carbide 12" x 24" shelves. I use a thick kiln wash of Alumina hydrate, EPK, and lots of rice hulls. I use 9" and 4 1/2" silicon carbide posts. There are many clays that work: I don't use any of these but other potters have used them and had good results: Clay Art Center Welmar, and Helmar; Laguna B Mix and woodfire B Mix; Sam Hoffman alumina clay bodies; Georgies Umpqua white. I incorporate Bauer Slip on many of my pots, and use brush strokes of Iron Oxide and Manganese stain. I also use a number of glazes. They are Mark's temmoku, Peg's oribe, Jim's shino, and Jenny's celadon. I feel they all interact well with the soda. I introduce anywhere from 20 to 40 lbs of soda solution (light soda ash, sodium bicarbonate, and whiting) on wooden planks, and stoke the planks at cone 8, cone 9 and cone 10. After the last soda, we soak for one hour in hopes of getting the kiln even throughout at cone 11 or less. We then go into reduction cooling for 3 hours. This is the process we go through, but because of wood firing, we have variables every firing, and things change. Our firing is a lot different than gas firing, even though we do use gas in our firing, the wood adds another factor to the firing. We fire for approximately 30-34 hours. If you wish to see results, you might seek out work done by: Terry Inokuma, Natalie Warrens, Sam Hoffman, Jan Rentenaar, Jeff Gunn, or Hiroshi Ogawa.

CLAYS AND SLIPS *submitted by Craig Martell:* When firing salt I use my domestic porcelain body which salts very well. If a clay body has a silica/alumina ratio of 5/1 or higher it will usually be very receptive to vapor glazing. If you want a drier look you can adjust the clay to have a lower Si/Al ratio but using slips that are higher in alumina will do the trick too. Flashing slips are a good example of this and the higher alumina helps push small percentages of iron oxide to nice reds and oranges. You can actually use thin applications of kiln wash to get some nice fire color. I've used 50 kaolin/50 alumina oxide on pots with nice results. Another slip is just 50 kaolin/50 ball clay and gives some very nice warm colors too. Different ball clays will be higher in silica so it's nice to try a lot of them. You can get some very dry slips and also some very nicely salted ones. Again, it depends on the Si/Al ratio.

Porcelain slips will give good true color and you can add mineral oxides for color or any kind of stain you want to try. Some stains don't work well in salt unless you really control the atmosphere of the kiln and oxidize mainly. One slip that I like is my porcelain body with 10% red iron and 10% rutile. Very nice reds and oranges. The porcelain slips can be used on stoneware clays if they fit well and don't flake off. I spray my slips on mostly and spraying lets you get away with a lot in terms of the slips adhering to the clay. Best to try all kinds of applications and see what works and what doesn't. Sometimes, if I'm going to use really thick slips, I will calcine half the slip to cut the raw shrinkage. When I calcine slips and clays I use large bisqued bowls and fire to 1500 F. The clays and slips are still nice and powdery at that temp and easy to mix and sieve.

For glaze liners I use my celadons and a temmoku. Apply them fairly thin if they are going to interact with the vapor. If I'm glazing covered pots I apply the liners just as I would my not salted reduction fired porcelain.

If anyone would like more discussion of any of this email me at craigxmartell@gmail.com.

KILNS, SHELVES & SODA SPRAYING *Submitted by Rhoda Fleishman:* In 2004, we brought Ruthanne Tudball, author of *Soda Glazing*, to Eugene for a workshop. Who knew what a turn my pottery would take. I have not looked back and have fired with soda ever since. We took my sprung arch soft brick kiln, drilled holes in the sides and started spraying. While the kiln does have a hardbrick firebox, bagwall, flue and chimney, the body of the kiln and the roof are softbrick.. The spray ports are now lined with mullite kiln shelves (the thinner ones used in bisque kilns) and I do wash the tops of shelves and where the roll-in floor keys into the walls. I do not, however, use a coating on the inside of the kiln. I did try a coating on my retro-fitted kiln and Ruthanne correctly said that it would start flaking by the seventh firing. When I rebuilt my kiln I did not coat it. It's approximately thirty firings later on the rebuilt kiln and the inside face of the soft bricks is flaking off. I now cover my stack with a top shelf and pick and vacuum the bricks between firings. I used new bricks in the arch and they have aged similarly to the used soft bricks I used in the walls. My kiln is three 12" x 24" shelves with a 48" tall stack. I fire for about 13 hours to ^11 (^12 soft) in a neutral to reducing atmosphere using 3 pounds of sodium bicarbonate. This is

sprayed in over two hours near the end of the firing. The soda is sprayed with an agricultural sprayer that has been refitted with heavy duty brass fittings, using a flat fan nozzle. The soda is dissolved in boiling water that is sieved into the sprayer to minimize clogging. After a bit of a soak and shutting off burners, I leave the damper open for 15 minutes to quick cool for brighter colors and a glossier finish. I have used a number of different shelves and find that if it weren't for the weight I would stick with mullite shelves. I have used the nitide bonded shelves out of China (the ones with the slits) and though they work great in the beginning after they have a coat of soda on them the soda bubbles and boils right up the wads onto the pots leaving an off colored crust that has to ground off. The Advancer shelves do a bit better, but still there is some bubbling, though to a lesser degree. Grinding in between firings doesn't seem to affect this. The high alumina shelves do fine fore several firings then flake badly and crack or break when grinding or chipping them clean. I'm trying the Corelite shelves now and after five or six firings they seem to be doing great. Time will tell. I do have some mullite shelves bought in the eighties that have seen too many firing to possibly count and though they are warping and look tired they are doing the best so far.

As Ruthanne says "More soda-more bleaching, less soda-more flashing". I have been able to get some fabulous colors and great flashing without a lot of culls. When Ruthanne comes out Feb. 25-26, 2012 I hope to tweek my kiln and firing schedule for even better results

WHAT I'VE LEARNED THE HARD WAY ABOUT SODA FIRING *submitted by Deb Shapiro:* At the risk of sounding ignorant, I will admit that I knew absolutely *nothing* about soda firing before the start of 2010. In fact, there was a magical mystery that surrounded the process, and it seemed to be the secret property of a select few. I was attracted to the energy that soda firing gave to slips, and it was the exact look that I wanted for my new work, so I gave myself the goal of demystifying soda and learning all that I could. I'd like to share the small window of knowledge that I have opened.

First, I read Gail Nichols's book, *Soda, Clay and Fire*. It was very informative, but had so much info that it left my head spinning. I decided to simplify my experiments by 1) working with the clay I was already using (S-Porcelain from Laguna) and 2) limiting my experiments to two slip recipes that I could vary (one from Gail Nichols, one from Robin Hopper.)

It helped that I had a small gas kiln that had been sitting, unused, for more than 10 years. I did not know that this was the worst design for a soda kiln, a very small (8 cubic-feet) flat-top, 4-burner up-draft with no bag walls, so the burners fill with soda crud every time I fire. Luckily, I have learned that pure bicarbonate of soda is easy to wash off burners after the firing. It dissolves in hot water. And luckily, I learned that soda firing does not require even reduction, which is a real challenge for this kiln. I'm making my "piece-o-shit kiln" work.

I learned that soda DOES eat soft kiln bricks! If you want to preserve your bricks, be sure that you coat the inside of the kiln *before* you do your first firing. I did not. I now have boxes of new bricks waiting to replace the bricks that have become paper-fragile and almost hollow. This time I will coat them with an ITC Coating, or something better I find in my research, or Gail Nichol's "Soda Resistant Coating for Insulating Bricks," Proportions by weight: Kaolin 33, Molochite 30/80# 33, Alumina 33. (A quick internet search shows that Molochite 30/80 is a calcined kaolin grog that is low in iron and alkalis and high in alumina.)

Janet and Jim have been very generous with their information, and from them I learned to introduce soda by spraying it with a garden sprayer. I bought a cheap one at Home Depot that has a metal tube for spraying. By altering/squeezing the tip of the metal tube, I'm able to make the spray fan out into a few streams and cover a wide area.

I mix 2 lbs of Bicarbonate of Soda (cheap at Costco) to 10 pints of boiling water. You can introduce much more soda than I'm using, but I'm not looking for the thick, "soda ice glaze" look that Gail Nichols achieves. I'm firing platters with drawings on them (using Amaco Underglaze Crayons) so I want to give the underlying slips some interest and give the whole surface some sheen without totally distorting the drawn lines.

Sometimes, when you let the hot soda/water solution cool too long before spraying it into the kiln, I learned the hard way that it can crystallize and settle to the bottom of your sprayer. It will also *clog* your sprayer at the most inopportune time... just when you are ready to spray into the kiln. So, I tried a different way of introducing the soda: I took those chunks of crystallized soda, wrapped them in paper, and tossed them into the kiln. That *might* have been successful had I been looking for heavy soda results, but, alas, all I accomplished was creating splotchy areas of totally glassy, smudged and obliterated drawings where the paper packets had landed. Now, I wait to mix my solution when the kiln is getting near to cone 8. Then it is just cool enough to pour into my sprayer when cone 8 is down and cone 9 is tipping. That's when I start spraying.

I'm still learning about the timing of spraying. (Note here: I learned to remove my temperature thermocouple from the kiln *before* I start spraying, or it will also get caked with soda crud.) I let the kiln atmosphere clear between sprays, but even though I try to slow myself down I still seem to be finished spraying within about 20-30 minutes. Then I put the kiln into reduction for awhile before I start to fire down. (Yes, I fire down for the first few hours since I've had the experience of cracking all 4 large platters in the kiln because of too-quick cooling. Even

with a p-o-s kiln, there is so much to learn!)

I'm still a novice at soda firing, and I'm still learning. My next experiments will be with adding "Light Soda Ash" to my Bicarbonate of Soda to see if I can get a slightly softer look with more sheen. People add all sorts of chemicals to their soda, including colorants. Hmm... lots of fun to look forward to. Because soda firing (and drawing nudes on platters) is new to me, and has not been production work necessary for my income, the whole process has been a stress-free joy. Even the frequent disasters have been positive because I've learned from them and tried to laugh about them. I think it's time to re-read Gail Nichols's book and absorb some more information. The finished platters you may have seen in my booth at Showcase were the winning ones that made it through the soda kiln successfully!

Here is a variation I created on a **Robin Hopper soda slip**:

Custer spar	5
OM4	65
Newman Red Clay	10
EPK	10
Silica (200 mesh)	10

It is a warm, light brown that varies greatly in color from the soda. I brush it or pour it on thick when the piece is just thrown.

SODA FIRING FOR COLOR DEVELOPMENT + SOME KILN NOTES *submitted by Chris Baskin*: Soda firing is one tool I utilize in the process of making individualized expressive pottery. I chose to work with soda because firing this way provides elements that I love as an artist, and also produces results that many people who collect and utilize pots for their own environments can appreciate. There are myriad directions that soda fire offers and can be developed. Last summer a class I taught fired oxidation and reduction kilns at high - cone 9, mid range - cone 6, and low fire --cone 1. All of the 6 firings had really interesting surface results. There are forays into really heavy soda glaze with the WOW factor, as Gail Nichols has developed, and lighter soda glazes for more practical and utilitarian purposes.

Creating *bright rich glaze colors* is one direction soda firing can be taken. Many if not all of these colors are available in mid range soda, cone 5-7, (2200 degrees F), as well as higher fire, cone 9-11 (2300 degrees F). Sodium (from varied sources) in small amounts is one of the elements used to produce bright colors in glazes. These colors can be washed out with too much sodium and they can be dulled or grayed out with reduction, too much reduction or reduction at the wrong time. (This is not to say that reduction can't produce a wonderful pallet all its own but that is a different intent and needs to be prepared for in a different way.)

One way to look at atmospheric firing of which soda is a subset is to see it as making or *producing glazes in the kiln* in the midst of the firing process. The addition of sodium in vapor form connects with what is put in the kiln: clays, slips and glazes. This produces different glaze types in infinite variations that keep things interesting and engage ones curiosity. Here I'm using glaze to include: 1) clay and soda, 2) slip and soda and 3) "glaze" and soda. Brighter colors come when the right mix in the kiln is made, of A) carbon, from reduction, of B) sodium, from the introduced sodium vapor, and C) from how that all combines with what is in the clay, slips, and glazes applied.

It is exciting to engage the work in the firing process, and an important metaphor in making meaning. Soda offers possibilities from the very simple to more complex. *Warm colored clay bodies* with a soda glazed surface can be wonderful in their own right. Flashing slips produce softer varied surfaces, with their high alumina content resisting the orange peeled surface but still taking the sodium introduced to produce colors from pink to orange, to red, gold and opal. Both these techniques take only 1 or 2 steps! More complexity can be introduced with glazes and the relationships of layering clays, slips, then glazes.

2 high fire bodies for Soda:

Toasty Orange Stoneware:

Fireclay	37
Goldart	20
Helmar	15
XX Saggar Ball	13
G-200*	12
Kyanite 48 mesh	3

Add grog to taste, for standard type smaller ware:

Grog 30/48	4
Grog 48-fine	10

Flashing Porcelain:

Grolleg	55
Silica 200 mesh	22

Kona (soda) Feldspar 23

Macaloid or Bentonite 2

Flashing slips are often just different kaolins or ball clays fluxed down enough to melt and connect with the clay body with neph sy or soda ash. I like to put flashing slips on bisqueware rather than on green or leather hard ware. Calcining about half of the clay in the slip and watering it down can adjust the slip to fit on bisque. Tile 6 slip recipe at the right thickness gives an interesting crackle pattern, in more neutral to oxidizing atmospheres, it produces rich creams and white's which are lovely to decorate on ... (see Michael Simon, Suze Lindsay, Sam Taylor... and Penland school). The Newman Red is a deep rich red to brighter orange in more oxidizing atmospheres.

Flashing Slips apply thin, 2% milk thickness, to bisque

6 Tile Slip:

6 Tile 35

Calcined 6 tile 35

Grolleg 15

Flint 5

Neph Sy 10

Bentonite 2

Newman Red for Bisque

EPK 10

Calcined 6 Tile 35

6 Tile 15

Neph Sy 30

Newman Red Clay* 10

*sieve out the coarse particles

Glazes: Many of the glazes that are used for cone 6 or cone 10 work in soda, but adding sodium vapor is adding a flux so they will melt sooner and run sooner when the sodium connects. Other glazes just don't seem to go together with sodium vapor and crawl or shrivel; many celadons are in this category (but amber Celadon works great). One that does seem to work really well over and over, but needs good reduction (as do all celadons by traditional definition) to develop nice color is this Blue Green Celadon. One glaze sensitive to oxidation/reduction and goes a steely matt turquoise in oxidation and a purple in reduction is Nick's. I like this one in Oxidation.

Blue Green Celadon

G-200* 13

Cornwall Stone 10

Whiting 25

Grolleg 27

Flint 25

Talc 7

Nick's Misfire

Neph Sy 40

Whiting 15

Talc 10

Grolleg 15

Flint 10

On Oxide 10

Copper Carb 1

A few notes on kiln building for Soda Firing: Building a soda kiln with soft brick rather than hard brick can save up to 50 percent or more on a fuel bill, the kiln will fire faster and is much easier to even out and move the temperature around in. I built a 65 cubic foot stacking area crossdraft soda kiln out of 2800 degree soft brick (K-28, G-28). Many of the soft brick kilns I've seen and used were out of 2300 degree brick and even with all kinds of different washes and brick surface glazes and treatments they deteriorate pretty quickly. The 2800 degree bricks were quite a bit denser and much more resilient. I fired every 6 weeks for 3 years with a simple kaolin alumina kiln wash on the walls and the kiln walls still looked relatively unmarked. I would highly recommend using a better quality soft brick if longevity of the kiln is a concern. Also hard brick around the door jam and soda ports is smart.

Having holes in the kiln to spray soda in makes sense too. You can always plug a hole but it's not always so easy to get the soda into the part of the kiln you need it to be. Many soda kilns leave dry areas because no forethought was given into how soda will be introduced. Stacking is still one of the most important aspects in the art of soda firing. Knowing what creates flashing and kissing and why the undersides of things often have the

best colors are aspects of the process to understand and utilize for purpose and to advantage. There will always be the unknown and mystery and there are lovely gifts from the kiln, but paying attention and gaining insight and perspective into what is happening can be its own reward. As knowledge increases one has more tools and vocabulary to engage the work with.

*The G200 feldspar in these formulas is the old version. Many people recommend blending 30% soda spar (like Minspar 200) with 70% of new G200 to make it match the old stuff.

SODA SLIP: *submitted by Jerrold Martisak*

EPK	150
Helmer kaolin	150
neph sy	50
soda ash	50
petalite	50

Note: This can be mixed thick and sprayed on greenware. If you mix it in a blender start with 3-1/2 cups of water. Hot to breakdown the soda ash; then add enough extra water to make 4-5 cups depending on the thickness you desire. I have never had it flake off if sprayed on green. The only time it flaked was when I dipped it on bisque. This is a warm slip. I think Stephen Mickey called it Evening Glow. To make the slip cooler to the more grayish but still warm use Grolleg instead EPK. Works on both stoneware and porcelain. I like it best on porcelain.

THE SEARCH FOR FLASHING SLIP *submitted by Janet Buskirk:* For no particularly good reason, I once bought a 50 lb bag of Avery kaolin. Years after the Avery mine closed, my husband (Jim Koudelka) and I at last realized what a great flashing slip Avery makes (75 Avery kaolin, 25 Neph Sy, apply very then to bisque). Avery flashes orange, brown and everything between. It looks good in every part of the kiln. As the bag slowly ran low, I began to run tests on other kaolins and ball clays to find a replacement. I have tested every clay that is readily available, using a basic clay 75% + Neph Sy 25% formula and the Bauer flashing slip formula (various versions of it float around, usually containing kaolin, ball clay, zircopax and boron), and nothing is close to Avery. Some clays flash well, but the color is dull, others have great color in some parts of the kiln but not in others. In general, Helmar kaolin flashes well, but gives somewhat brown flashing (Shane Blich uses 80 Helmar, 20 Neph Sy, mix to cream consistency and apply to leather hard clay). Old Hickory flashes ok, if you can find a really old bag of it, that will flash better. McNamee and Sapphire kaolins give good color, but not so much flashing. Dirtying the mixture helps, Newman red clay in amounts of 2-4% have helped. My suggestion is to take any promising flashing slip formula, and, in place of the clays in the formula, try Helmar, McNamee, Sapphire, Old Hickory and trace amounts of Newman.

LIGHT SODA ASH *submitted by Jim Koudelka:* I purchase light soda ash from swimming pool supply stores.

SOME ONLINE REFERENCES: Ceramic Arts Daily (www.CeramicArtsDaily.org) has a booklet on salt firing and one on soda firing, compiled from *Ceramics Monthly* articles. Look in the "topics" column on the left side of their home page. Wikipedia has a reference for flashing slips at <http://wiki clay.com/wiki/soda-firing-slip-recipes>